Southeastern Archaeological Conference

Bulletin 22
1980
BULLETIN 22
SOUTHEASTERN ARCHAEOLOGICAL CONFERENCE

PROCEEDINGS OF THE
THIRTY-FIFTH
SOUTHEASTERN ARCHAEOLOGICAL CONFERENCE
KNOXVILLE, TENNESSEE
NOVEMBER 9-11, 1978

Edited by
JERALD T. MILANICH
FLORIDA STATE MUSEUM
GAINESVILLE, FLORIDA
1989
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 Farns and Sharon Parr of the Florida State Museum. I am grateful to them and to the authors of the Bulletins for their help and cooperation.

J. T. Milanich, Editor
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Program Chairperson: Jefferson Chapman

THURSDAY, NOVEMBER 9

SYMPOSIUM:

Evolution of Weeden Island and Mississippian Non-eгалitarian Societies in the Southeast: New Data, New Interpretations and Some Speculations from Northern Florida and the Georgia Atlantic Coast.

Chairperson: J. T. Milanič

J. T. Milanič: Introduction

T. A. Kohler (Washington State U): Social Dimensions of Village Occupation at the McKeithen Site, Weeden Island & North Florida

J. T. Milanič (Florida State Museum): The Mounds at the McKeithen Site—Weeden Island from Ranked Lineages into Chiefdom?

B. J. Lavelle (New School for Social Research): The Economic and Social Implications of the Distribution of Weeden Island Sites in North Florida

A. S. Cordell (U of Florida): Technological Investigation of the McKeithen Site Weeden Island Pottery

P. M. Rice (U of Florida): Trace Elemental Characterization of Weeden Island Pottery: Implications for Specialized Production

L. J. Louts (U of Florida): Spanish-Indian Economics at an Early Spanish Mission in Northern Florida

M. R. Cook, Jr (U of Florida): Mississippi Period Community Organization on the Georgia Coast

M. Safer (U of Florida): Technological Analysis of Some Sapoio Island Pottery—Societal and/or Functional Differences

J. S. Favall (Florida Division of Archives, History and Records Management): Fort Walton and the Development of Mississippi Chiefdoms in Northwest Florida

Discussions: David Rose (Case Western), C. Peeples (U of Michigan), S. Williams (Harvard Peabody Museum)

SYMPOSIUM:

Cultural Adaptations to Southern Highland Environments: the Ozarks and Southern Appalachia.

Chairpersons: M. L. Douthit and B. L. Purrington

B. L. Purrington (Appalachian State): Introduction: The Ozarks and Southern Appalachians as Potential Resource Areas

M. L. Douthit (Southwest Missouri): Settlement and Subsistence Patterns on the Western Ozark Escarpment: The Sedalum Complex

J. Price and C. Price (SEMO-Southwest Missouri): Early Historic Subsistence and Settlement Patterns on the Ozark Escarpment

M. Rach (U of Arkansas): Prehistoric Settlement and Subsistence in the Western Ozarks: A Lithic Model

C. Price (SEMO-Southwest Missouri): Late Woodland and Early Mississippian Development in the Eastern Ozarks of Southeast Missouri


Q. Bass (U of Tennessee): Prehistoric Settlement Patterns in the Great Smoky Mountains of Eastern Tennessee and Western North Carolina

H. Piper and J. Piper (U of South Florida): Prehistoric Campsites in the Appalachian Maggie of Southwestern Virginia: The Influence of Topographic Variables at Higher Elevations

G. Wilkinson (U of Tennessee): Prehistoric Subsistence and Settlement Patterns in the West Virginia Highlands

W. Cowan (U of Michigan): Prehistoric Adaptations to the Cumberland Plateau: A View from the Western Foothills

B. L. Purrington (Appalachian State U): Explanatory Models for Cultural Evolution in the Southern Highlands

Discussions: H. Davis (U of Arkansas) and R. Dickens (Georgia State U)

CONTRIBUTED PAPERS:

Program Chairperson: G. Schaefer

W. Prokopetz (USDA Forest Service, Tallahassee): Weeden Island Settlement and Subsistence in the Sapelo Drainage, Florida

V. P. Seppanen (Smithsonian Institution): moundtown Ceramic: Some Chronological and Technological Considerations

C. R. Nasca and E. H. Menter (U of Alabama): Changing Woodland Ceramic Functions and Technologies on the Northern Gulf Coastal Plain

J. W. Springer and S. R. Wirkowski (Northern Illinois U): A Reassessment of Southern Linguistic and Archaeology

R. Baby (Ohio State Museum): Hopewell: A New Perspective

W. R. Bowes (Georgia DOT): The Late Archaic in the Upper Duck Valley

C. J. Clausen and M. M. Ahmy (Little Salt Spring Project): Florida’s Little Salt Spring: A Site Preserving Unique Late Pleistocene/Holocene Cultural and Environmental Evidence

M. L. Powell: Health and Disease at a Late Archaic Tradition Site in Southeast Oklahoma: The McCune-McLaughlin Series

A. Frankin (U of Florida): Hog Jaws and Coo Meat: An Analysis of Faunal Remains from the Hamptons Plantation, St. Simon Island, Georgia

CONTRIBUTED PAPERS:

Program Chairperson: J. G. Brumbaugh

T. L. Tucker and C. M. Hofman: An Examination of the Early Stages of Earthenware Manufacture

J. K. Johnson (U of Missouri): Archaic Earthenware Manufacture: Production Failures, a Chronicle of the Misbegotten

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J. Stein (U of Minnesota): Results of Anceving Two Shellmounds in Western Kentucky
S. Williams (Harvard Peabody Museum): Arnoeel Phase: A Very Late Complex in the Lower Mississippi Valley
D. Anderson (U of South Carolina): Excavations at Four Full Line Sites in South Carolina: A Preliminary Statement on the Southeastern Columbian Beltway Project
J. Walker (NPS/SE Archaeological Center): Macon Plateau Period Settlement Pattern: Data from the 1978 Test Excavations
A. M. Early (Arkansas Archaeological Survey): Standridge Site: Investigations: Some Thoughts on Cadomian Settlement
W. Klippel and A. Reed (U of Tennessee): The Averbeck Site: A Mississippian Manifestation in the Nashville Basin
M. Corlack (Corps of Engineers—Wilmington): An Early Nineteenth Century Timber Dam on the Neuse River, Wake County, North Carolina

SPECIAL SESSION: Southeastern Archaeology—The Formative Years
Chairperson: J. Clapman
SATURDAY, NOVEMBER 11

SYMPOSIUM: Some Lower Mississippi Valley Research Strategies
Chairperson: S. Williams (Harvard Peabody Museum)
D. F. Morse (Arkansas Archaeological Survey): An Achica Hexus in Northeastern Arkansas
B. D. Smith (Smithsonian Institution): The Advance Lowlands
J. E. Price (Southeast Missouri Research Facility): Current Status of Southeast Missouri Archaeology
P. Morse (Arkansas Archaeological Survey): The Parkin Phase
J. P. Brain (Harvard Peabody Museum): The Tonica

CONTRIBUTED PAPERS:
Chairperson: W. Klippel
T. K. Perutura (Southern Methodist U): Caddoan Prehistory: Relationships to Southeastern Prehistory
E. S. Sheldon (Auburn U): Ethnobotany at the Ivory

Creek Archaeological Sites, Autauga County, Alabama
J. D. Nance (Simon Fraser U): Lower Cumberlands Investigations
K. A. Schneider (Chattahoochee-Oconee National Forest): A Clustered National Register: Use, Abuse, and Guilt
S. L. Findley (NPS/Southwest Region): The National Register Imnudation Study
M. Frinkley (U of Kentucky): Survey Methodology: The Perspective from the Carolinian Piedmont
L. M. Drucker (Carolina Archaeological Services): The Spiers Landing Site: Socioeconomic Patterns at an Undocumented 18th-19th Century Site in Berkeley County, South Carolina
M. Pennington (U of Georgia): Non-Naked Stone
T. Gates (Kentucky Heritage Commission): Surface collecting on the Small, Open Site: The State of the Art in Kentucky
R. C. Mainfort, Jr. (Tennessee Division of Archaeology): Interpretive Archaeology at Fort Pillow, A Civil War Fort in Western Tennessee
S. M. Gagliano (Coastal Environments, Inc.), Thomas M. Roem (Corps of Engineers—New Orleans) and R. A. Weinman (Coastal Environments, Inc.): A Geographic Perspective as Applied to Cultural Resources Survey in the Barataria Basin, Coastal Louisiana

SYMPOSIUM: The Wallace Reservoir Archaeological Project: Some Preliminary Results
Chairperson: P. R. Fish
P. R. Fish and D. J. Hally (U of Georgia): Introduction: Goals of Research
G. A. Brook (U of Georgia): Geoarchaeology of the Wallace Reservoir
P. R. Fish, G. Priest and J. L. Edleather (U of Georgia): Settlement and Demography: The Wallace Survey
A. F. Bartovics and R. B. Council (U of Georgia): Nineteenth Century Mill Communities on the Oconee River, Georgia
J. L. Rudolph (U of Georgia): The Exploitation of Aquatic Resources During the Lamar Period
S. K. Fish and R. W. Jeffries (U of Georgia): Site Plans at Cold Springs
M. T. Smith (U of Georgia): The Evolution of Lamar Ceramics in the Wallace Reservoir: The Evidence from the Dry Site, 9 GE 5
F. C. Shirk (U of Georgia): Experimentation with Soil Phosphate Analysis at Site 9 GE 10
C. C. Minker (U of Georgia): An Incised Site of Late Archaean Stone Reduction and Impurity Manufacture

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The McKee site in Columbia County, Florida, is one of three known major Weeden Island centers which bracket an area extending more than 866 km east-west and, in places, almost 460 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 South-east during the emergence of the ascribed status positions transitional to the chiefdom.

The position of the Kolomoki, Mitchell, and McKee sites near the geographical extremes of the Weeden Island core area (see Fig. 1) qualifies them as "gateway communities" in the sense of Hirth (1938). According to Hirth such communities may arise as a result of increased interregional trade and are generally located along major corridors of communication and at the critical passages between areas of high mineral, agriculural, 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 have first 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' 1952). A recent study by Wood (1977) of the period in the southern half of the Lower Valley . . . is a period of florescence, marked in its earlier part by strong inter- change with the by now more cohesive 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 import trade in high-status items possibly dealt with relatively uniquely by the emerging ranked elite in the Weeden Island area than to, by example, the contemporaneous St. Johns I 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; low 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.

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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 tip additions such as adorns 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”

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category identifies a similar group of ceramics, it re-
main a deceptively-defined term not appropriately
applied to ceramics in a midden context. These non-
local ceramics remaining after the subtraction of the el-
ite category will be called "trade" ceramics.

Other exotic materials which might be expected to
act as markers for high-status occupational areas
include exotic dyes, shell, and limestones. 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 cut coral,
quartz, galena, mica, and obviously non-local chal-
avic rocks have been aggregated to form a non-local listics
category.

Finally, a fourth category of evidence which has
been demonstrated to 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, H, which ac-
ually 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 prob-
ability, transect, and cluster samples as well as grid-
ding and mapping activities at the 18 hectare site.
Altogether 390 sq m of midden was excavated, pro-
viding a sampling proportion of about .002 when the
volume of the 18 hectare site is considered. The esti-
imation of site size, or about .006 when only the main
midden area is included. In spite of this small sam-
pling proportion I believe that the way in which the
sample was drawn and the sample size allow hypo-
thesis about distribution of artifact categories or
provenience of 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 enclos-
oring the large, residential Mound A on the south-
east, the "front-council" house platform on the south-
west and the barrial structure on the bluff of Orange
Creek C. Figure 1. Site plan of the Midden.

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 dif-
fierences 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 evi-
dence and an ordering of proveniences produced by a
principal components analysis of the relative fre-
quency of ceramic types in individual levels. The three
stratigraphic columns were placed in proper rela-
tion to each other by correlating changes in the
attributes which crosscut changes in typological dif-
fierences, 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 meter².

each of the stratigraphic columns while giving an ab-
solute indication of the relation of the stratigraphic
columns to each other. (For more detail see Kohler
1978:130-141.)

After the construction of this total site seriation the
chronological continuum was arbitrarily divided
into three phases which seem to correspond, in a gen-
eral way, to the period of construction and use of each
of the three mounds at the site. The first phase con-
sists of proveniences believed to have been deposited
between about A.D. 130 and A.D. 270; the second,
A.D. 250-A.D. 350; 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. SYMART
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 facil-
itate 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 collec-
tion for that provenience; blank areas indicate either
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

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

Both the mean relative frequency and the mean density of these elite ceramics increased 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 Zoomorphic Red decline in frequency and possibly disappear after about A.D. 550, while the remaining Weeden Island Incised and Punctuated types become (increasingly spottily 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 centered in one of the two peak areas for elite ceramics during the late phase.

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

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Table 1: Variations in the frequency, proportions, and correlations of the mapping variables between the early and late phases.

<table>
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<th>Variable</th>
<th>Early</th>
<th>Late</th>
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<tr>
<td>Color</td>
<td>Blue</td>
<td>Pink</td>
</tr>
<tr>
<td>Proportion</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Difference</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Proportion</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Difference</td>
<td>0.1</td>
<td>0.1</td>
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In the distributions of the non-local lilies (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 lilies, while in the late phase one of the areas of high frequency for the exotic lilies 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 lilies only during the final phase of occupation (see Table 1). Finally, if we look at ceramic type diversity as computed using the 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).
an increasing monopoly over the extra-local items re-
erced in fact, over three of the four variables ex-
a mine, 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 Mc-
Kethen 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. 590. It has been suggested elsewhere that
an increasing dependence on a more efficient agri-
cultural base might result in a centrifugal pattern of
settlement on the relatively poor soils of North Florida (Kolker
1978:284-287); see paper by Lavelle—this volume—for a
similar scenario. An equally plausible explanation for the
apparent decline of McKethen 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 Mc-
Kethen 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 intraregional
Weeden Island trade similar to that seen in
the record at McKethen. Thus the reasons for
the eclipse of Weeden Island during the last third of
the first millennium A.D. might best be sought not at
McKethen or Kolomoki but along the Florida and
Georgia Atlantic coasts, in tidewater Georgia and
Alabama, and along the Tombigbee.

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WEEDEN ISLAND STUDIES—PAST, PRESENT, AND FUTURE

Southeastern United States archeology had its
birth in the 1930s, sheltered by the federal government re-
lic programs and stimulated by a double-handful of
architects/ethnographers throughout the 1930s, and
by others, who have seen archeology confront the
archaeologists.

Reading back through the earliest publications of
the SEAC, one is struck by the complexity of the
Southeastern archeological cultures; not complexity of
organization or output by the few, numbers of diverse, newly
recognized archeological complexes. Consequently, re-
search initially became concerned with delineating and
discovering cultures, 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 arche-
ological inquiry has been shifting, and today generates
questions concerning cultural processes 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 con-
structed, to actually using that data base to generate
hypotheses which can be tested through scientific
methodology.

In some areas of the South, 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 severe factors, the most important of which was a lack of archeolo-
 gist able to devote many 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 longterm projects offering the opportunity to involve a succession of re-
searchers working related research.

One such archeological "laggar" is the Weeden
Island culture. Like many other Southeastern arche-
ological cultures, Weeden Island underwent a period
to conceptualization and a major development in length. During this period, from the late 1800s to the 1930s, C. B.
Moore, Jesse Folsom, and others excavated at a num-
ber 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 restored the concept of Weeden


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

For more than a decade since that date, Woodland Island has remained something of a delirious child who was argued about and fought over. In the last several years Southeastern archaeologists have completed this disputed area of occupation and we are now engaged in a variety of new research projects intended to finish the Woodland Island culture history studies begun in the 19th and 19th. We are also beginning to use these new research opportunities to examine questions of Woodland Island cultural continuity.

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

The Past and Present

In 1949 Willey published his monumental Archaeology of the Florida Gulf Coast which contained a description of the Woodland Island archeological com-

plex based on information gathered by Willey and others over the previous six decades. Willey and Woodbury (1947) and Willey (1945) actually published pertinent definitive criteria on Woodland Island which appeared in print prior to the Gulf Coast volume. Willey focused on the coastal distribution of Woodland 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 or nearby inland areas in Alabama and eastern Georgia, as well as from inland locations in Florida, for Willey to recognize that Woodland Island ceramics were present in those areas, and that Woodland Island was not re-

stricted to the coast. Today the widespread nature of Woodland Island is illustrated by surveys and excavations. The distribution of Woodland Island ce-

ramics extends from the Alabama River east to the Altamaha River, and from the fall line south to the Gulf of Mexico. The borders of this coastal plain region seem to be northeast Florida, southwest Georgia, and southeast Alabama.

The area of its publication the Gulf Coast volume was the only synthesis available for any major geographic region in Alabama, Georgia, or Florida. The coastal sequence of DeFoor, Santa Rosa-Swift Creek, Woodland Island I, and Woodland Island II, hypo-

thesized by Willey, served as the archetypal sequences 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 se-

quences existed within the Woodland Island region after a. A.D. 200. Today, we know that no single ceramic sequence can provide chronological control for the entire Woodland Island region.

In the past these theorems or definitive char-

acteristics of Woodland Island in time and space were also most difficult by the presence of what Sears (1917) has called the sacred-sect cultural dichotomy. The 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 Woodland Island archeological cultures often have very different secular pottery as-

semblages from one another. And, any one archeo-

gical culture has an inventory of secular pottery types which are found in the well-known Woodland Island sacred vessels generally found in tombs. [Although recent analysis suggests that regional differences in the sacred ceramic complex probably exist (Gladwell, 1979).]

Recently, we can demarcate the region occupied by the various Woodland Island cultures and, in some instances, list specific traits 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 Woodland Island religious activ-

ities. What we cannot do is offer a stringent definition or interpretation of Woodland Island "socio-political order" (McNair, 1981). Sears (1954, 1956a, 1958, 1962) and more recently, David S. Brown and George Perre (1979), and Karl Steinen (1976) have offered pertinent para-

digms, using their constructs mainly on interpreta-

tions of Sears' Kolomoki data and information from C. B. Moore's many reports. The lack of a widely ac-

cepted explanatory definition of Woodland 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 to address more general anthropo-

logical problems regarding the nature and evolution of culture in the Southeast. The same has been true of Hopewellian and Mississippiian studies; explanatory models have only emerged after a great many hypo-

theses were tested both in the field and against already available data.

The Kolomoki-derivative model of Woodland Island sociopolitical organization (simplly stated here) views the Woodland Island archeological complex as reflecting a complex society with ranked lineages similar in organi-

zation to that of the historically describe Natchez Indians. According to Sears, the Woodland Island polity was organized around the major set of Kolomoki at which the major priest-chief, the most important ritual figure, resided. This village and minor ceremonials experts and their lesser chiefs were under the political control of the major Kolo-

moki priest-chief. Although Sears (1962) has referred to this level of socio-political complexity as a state, most archaeologists 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 Woodland Island political influence. Thus, the distribu-

tion of Kolomoki hegemony is approximated by the range of the well-known Kolomoki effigy vases. These vessels—most are better described as effigies since their form indicates that they could not have con-
tained 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 (tomb for the chieft) along with other status and ceremonial objects. This model is similar to that gen-

erally accepted for distribution of certain status items within Mississippiian cultures (e.g., Peebles 1971). Sears originally postulated that this Kolomoki "som-

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plex' overlapped temporally with Mississippian cul-

tures. However, duration of the Weeden Island and Kolomoki Weeden Island components at the Kolomoki site is not well documented by stratigraphic, and new evidence related below points toward a pre-Mississi-
pian date for the Kolomoki Weeden Island complex. Additionally, whether or not the Weeden Island re-

dion was occupied by a single polity, organized around a principal or central polity of the site. Many ques-

tioned archaeologists feel that perhaps the Weeden Island archaelogical cultures represent separate ch'idious rather than one single unit, and others even disagree with the premise that Weeden Island society was or-

ganized on a ch'idious level at all. Emerging data sug-

gests that during Weeden Island times, ranked so-

cieties were developing.

Weeden Island site designation seven Weeden Island or Weeden Island-related archeological cultures which appear to be restricted geographically and which last through time, these groups are basing on various quan-
tities 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 Apalachee River Valley, we have almost no information beyond pointers for south-

eastern Alabama and southwestern Georgia (except-

ing Kolomoki). Basing the definition of these sub-

regional cultures solely on ceramic typologies is almost impossible since at this time we do not have sufficient analytical sherid-count dates from some subregional. Making comparisons of secular sherid counts in order to prove contemporaneity of Weeden Island cultures is also very difficult because of the great ceramic varia-
tion, 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 composed into a single complex within a sub-

region at any one point in time. All but one of the

traditions are composed entirely 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 entirely with bowl forms with distinctive incising rims; the tradi-
tion seems to have been earliest in South; (2) por-

tions of the central peninsular Gulf Coast by A.D. 1, later moving into North-Central Florida; some-

time prior to A.D. 400 a variety of new vessel shapes replaced the original large bowls; (2) check stamped pottery, a continuation of the carved-paddle malleant-

exclusion technique which originated with the Dyonol and later appeared in the Georgia Piedmont; (3) com-
plicated stamped pottery, a continuation of the carved-

paddle malleating technique which originated with Early Wild Creek, quite likely in the western Georgia Coastal Plain; and (4) incised and punctated pottery which is though by some to have originated in the Lower Mississippi Valley (Sears 1956a) although new evidence from northern Florida suggests an auto-

chthonic origin in that region with ties to the Lower Island (Yates). One characteristic of all these ceramic tradi-
tions is that during the Weeden Island period, the -Weeden Island- rim thickened or folded and sometimes with an 'inserted' line underlining the fold

comprises roughly 50% or less of the rim sherids; this phenomenon at three primary Weeden Island heartland region and lowest along the penins-

ular Gulf Coast and about 50% of the Weeden Island decorated rim sherids in the latter area are of this type.

As a definitive criteria the distributions of secular ceramic complexes (recognising that they change through time) in conjunction with available subsistence, settlement, and artifact data as well as geogra-

hical considerations, the seven Weeden Island or Weeden Island-related archeological cultures are as follows (some are archeological cultures in the broad-

est sense):

Cades Pond—A Weeden Island-related culture in North-Central Florida (Sears 1956b; Smith 1971; Com-

bax 1952; Hemmings 1958; Xilouhos 1978); late Cades Pond overlaps temporarily with early Weeden Island, as evidenced by the presence of Weeden Island secular pottery (less than 25%) in large storage middens and the presence of sacred vessels, including some effigy forms (but not Kolomoki-style pedestalled effigy) in mounds; both platform and borial 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 birotection, but it must have been pres-

Central Perinoular Florida Gulf Coast—A Weeden Island-related culture, distributed from approximately Pasco County south along the coast to Charlotte Harbor (Bullen 1971; Bulken and Bullen 1976; Sears 1971; Lauer 1975; Lauer and Abey 1970); the temporal position of Weeden Island-related cultures in this region is the same as that of the Weeden Island cul-
tures in northern and northwestern Florida, although they may terminate later than in the Panhandle; vil-

lage ceramics are 95% or more plain (St. Johns ware with characteristic sponge spacers in clay and, to a

less extent, limestone-tempered Pasco ware may compriale 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 ear); Weeden Island ceramics placed in middens; borial mounds are continuous-use and mass-use types; no patterned mounds with one-side pottery deposits, are known; as evidenced by Mound A at Bayshore Homes (Sears 1960); temple mounds appear later in the Weeden Island period; subsistence is centered on use of the salt marshes and adjacent shallow portions of the Gulf as well as numerous tramal middens (operating and site exists apart from other vil-

lages; island small camps are characterized by generic traits, whose functions (hunting or collection of other resources) are unknown (Hemmings 1975: Padgett 1967); recently Lauer and Abey 1970 have suggested the name: Mansasota for the Weeden Island-

related culture in this region.

North Perinoular Florida Gulf Coast—A Weeden Island-related culture distributed along the coast from Pasco County to Taylor County (Goldhurt 1966; Kohler 1975); temporal placement is the same as the Central Peninsula Gulf Coast culture; village pottery averages 95% plain with Pasco limestone-tempered ware accounting for 25%; larger Taylor County the relative frequencies of Weeden Island types increase (check stamped, punctated, and incised); Weeden Island related culture was in this area; the relative frequencies of Pasco type, multiple mound, and adjacent villages are known; subsistence like that of the Central Peninsula coastal region; one village

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is known to have been located inland along the Suwanee River (Butler 1955).

Wahulla Weeden Island (or, Tri-State Weeden Island)—A Weeden Island culture located along the Upper Apalachee River (Percy 1971; Percy and Brose 1974; Milianich 1971; Percy and Jones 1975), the Lower Chattahoochee River (Caldwell n.d.), and the Flint River (Kelby n.d.), and extending into south-eastern Alabama for an unknown distance where similar or related decorated cultures receive a variety of names (Chase 1967; Dickeman 1971; Nielsen 1976; Nance 1976; radicarbon dates for the culture in Florida are from ca. A.D. 600 to 1000 (Milianich 1974; Peebles 1974a:639-640); ca. 50% of the village pottery is Wakulla Creek 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 (Milianich 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 Ancilla River westward to 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 cutover between the coastal strand and the swale flatlands or adjacent to the salt marsh, (Willey and Woodbury 1942; Willey 1949; Lazarus 1961; Sears 1963; Biese 1969; Percy and Brose 1974); some small camps or homesteads are found further inland adjacent to water sources (Tesar 1976); few radicarbon dates are available for this region, but probably the culture dates from ca. A.D. 500 or 600 to 1200; village pottery consists of various plain, check, and wicker basket decorated stamp paste types; whose relative frequency vary both geographically and temporally, and it appears that no single ceramic sequence provide temporal control for the entire region; most village middens are small (ca. 100 m in diameter, Willey 1940-1942); a few “horsehoe-shaped” midden like some of those of the earlier Swift Creek sites are known; offer 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 south-western Georgia known almost exclusively from Sears (1960a) 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.65 in Butten 1958, 331; and from the Yon site on the Apalachicola River, Peebles 1974a:599); the later components of the culture are the same as those in Colome (1978); later village component is characterized by plain and complicated stamped pottery; exact dates for the two components are uncertain, but comparisons of the “covered” ceramic vessels from Mounds B and E with those of the well-documented Mclhbon 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 “horsehoe-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 variants, extend eastward from Kolomoki into the Georgia Coastal Plain (Walker 1974; Steichen 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.

McKeelhan Weeden Island—A Weeden Island culture centered in northern Florida east of the Suwanee 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. 372-500) mound complex (Kohler 1978; Coddell, Lavalle, and Milianich 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 pattern associated with these traits may also be absent.

Calling the cultures of peninsular Florida “Weeden Island” before we are sure what Weeden Island is, obscures attempts to examine 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 understand- ing of Weeden Island, nor can we verify present inter- pretations, without new data generated by addi- tional 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 continued 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 pattern is available. Detailed sub-
sistence information is available from only three vil-

dge sites, one each in the Wakulla Weeden Island region (Miallach 1974), the Calades Pond region (Cun-

ba 1972), and the North Peninsula Gulf Coast region (Kohler 1965). Recently Kohler (1978) has provided us with a comprehensive look on distributional pat-

terning of artifacts in the large McKeithen site village.

Northwestern Florida is one of the New World that for future Weeden Island archeological projects to be successful, they must be both problem-oriented and extensive enough to pro-

vide answers to the questions posed. And they need to be part of their respective state's design or inv-

volving more than one archeologist. Past experience has shown that Weeden Island covers a large geo-

graphical 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, fu-

ture 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 abo-

riginal 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 con-

tinuum" 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 developments which occurs 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 project being con-

ducted by the Florida State Museum over the 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. Rau of the Florida State Museum are investigating these and related questions on a simi-

lar specific level in northwestern Florida and the Upper Apalachicola River Valley. In addition, Judith Benet has begun a long term study of the Northeast Florida Weeden Island culture in the Saint Andrews Bay area near Panama City. Out of such regional studies, comparisons can be made and general hypo-

theses formulated and then vetted with more em-

pirical data. The eventual result will be an under-

standing of Weeden Island which also will have sig-

ificance 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 develop-

ment of Weeden Island through time. In northwestern Florida a date of ca. A.D. 400-500 is currently accepted for the beginning of Weeden Island, is 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 sup-

ported by radiocarbon dates for Swift Creek of A.D. 405 and A.D. 600 obtained by Pfeiple (1969) at the Gulf Breeze site and the dates of A.D. 270 (Peeples 1971) and A.D. 330 (Bullen 1958-59) from Swift Creek components at the Yon and J-86 sites, re-

spectively. Brone's work in the Upper Apalachicola

River Valley has demonstrated that the Weeden Island people 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 Flor-

ida, Weeden Island lasted approximately 600 years. A date of about A.D. 1400 for the Miller Mc-

Keithen site indicate an earlier A.D. 200-500 beginning date for Weeden Island (Swift Creek is not a rec-

ognizable component site). Latest Fort Walton sites are not present in that region and it presently appears that Weeden Island culture(s) lasted almost a mil-

Ienium.

The significance of these data is that the Weeden Island ceramic complex was in use in the Southeast for a long period of time. This, in turn, raises two pertinent questions: Do we have sufficient understand-

ing of changes in the technological complex through time to provide chronological controls? What changes in Weeden Island culture itself took place through time, e.g., did populations increase; were there changes in settlement and subsistence systems; and, were there changes in social-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 di-

visions seem 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 sites, no one has yet undertaken a detailed examination of Weeden Island village ceramics from graves and/or other sites. As a result, there are not recognizable changes that can provide chron-

ological (and, perhaps, spatial) controls. Statistical analyses of ceramic attributes is one approach to the problem. Percy has begun such an analysis with collec-

tions excavated from the Lower Apalachicola River 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 ce-

ramic 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 cul-

ture did not change and that these changes are not recognizable archaeologically. Yet our knowledge of Weeden Island development is so slight that it is diff-

cult to even formulate specific hypotheses. Several lines of future enquiry can be suggested, however, from data on related cultures.

Willey's (1939:397-401) list of early (Weeden Island I) versus later (Weeden Island II) Weeden Island middens in northwestern Florida shows three single component early sites and 35 single component late sites. Although Willey (1939:541-532), utilizing site quantities from the entire Gulf Coast, estimates "... the population to have been about equal for the two periods ...", this figure 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 Bues (1959) of upland localities in a portion of the Upper Apalachicola River Valley revealed a site density of four sites per mile² (with a survey area of 14.23 miles²). Nearly all of the sites, based on analysis of ceramics, were middle to late (ca. A.D. 600-1000) Weeden Island. None of those located were early Weeden Island.

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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 con-
tinually find and use suitable horticultural land. The latter hypothesis, originated and elaborated by Percy and Beswick (1962), does not contradict ob-
servations made by various persons who have collected archeological sites in south-central Georgia. In that area small sites with Wakaaha Creek 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 intensive into the valleys where the better horticultural soils were present.

Percy and Beswick's hypothesis proves to be true, then we would expect that Weeden Island populations did increase through time as they expanded geographi-
cally. 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 Beswick, 1974), we might expect to find that late Weeden Island sites would be both more numer-
sous 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) is the McKeen region has revealed many small activity loci, perhaps camps and households for hunting and agricultural activities and/or unknown activities, located out of mound-village complexes. The mound-village com-
plexes possibly functioned as centers for shared reli-
gious activities by the outlying population. There is some evidence of the incursion of such mounds and outlying settlements, perhaps reflecting ethnicity or the shared (Kin-based) communal reli-
gious activities. Such incursions are apparent in in-
crease in such non-mound associated sites after A.D. 260, perhaps the "flip-over" when agriculture be-
came the principal factor in site location selection.

The clear-cut developmental pattern—house-
holds and small villages placed to take advantage of better soil locations and the sharing by the people of power and religion, 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 involved 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. 1965; Flannery and Goe 1968; Flannery 1972; Sanders 1974), archeological research into New World chiefdoms per se is restricted largely to Mexo-
america. To date in the Southeast, there have been attempts to historically rigorous attempts to arche-
ologically determine the presence and nature of pre-
historic or historic chiefdoms, the major exception being Prebles' (1952, 1972,1975b) analyses of Mound-
ville data.

The presence of complex societies in the Southeast has long been suggested by anthropologists (Service 1962:158; Sanders and Marine 1975:98-112; Meggers 1972:118-143), although several researchers have re-
ferred to these societies as states (e.g. Sears 1962; Groggin and Sourvent 1964; Olaa 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 mostly 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 Prebles and Kos (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 were char-
acterized by ranked descent groups, redistributive com-
omics, hereditary leadership (Flannery 1972:401), and states (characterized by the above in addition to full-
time craft specialization, elite endogamy, social strati-
fication, codified laws, governmental bureaucracy, a kingship, military draft and taxation; Flannery 1972: 
401). We hope to represent an evolutionary con-
tinuum, thus implying a unilinear relationship (e.g.
Service 1962; Fried 1967; Renfrew 1974). More re-
cently, researchers working with Mesoamerican ex-
amples of complex societies have begun to stress a multilinear model, suggesting that different natural and cultural environmental conditions act as stimuli for the evolution of societies with different levels of social complexity (Toureille and Sabloff 1972:Fig. 2; Sanders and Webster 1978). Thus, under certain con-
ditions a state may develop, while under other condi-
tions, environmental factors may interact to result in a chiefdom.

Sanders and Webster (1978) have suggested that chiefdoms are more characteristic of the geographical regions which, although containing diverse habitats or offering differential access to certain non-food raw re-
sources, 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 con-
sidered 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 concern-
ing the results-linear environmental hypothesis. Al-
though Weeden Island is primarily an inland culture, there are Weeden Island cultures and Weeden Island-related cultures along the Gulf Coast, and the coastal zones would appear to offer sufficient (food re-
At the McKeen 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 presumably religious specialist at the site and by the apparent stratification of the burial debris in the village, these differences certainly do not reflect the social stratification present at Mississippian sites such as Mononville, Etowan, or Cahokia. More information is needed to solve this problem. Work in the village areas of Kohokomi and other West Florida sites should provide us evidence of social stratification, if it were present. However, I believe that West Florida is only one point in a continuum beginning with the appearance of the production of food surpluses and birds and gathering to large Mississippiian societies which are the first to be unquestionably recognizable in the archeological record of the eastern United States as stratified. Perhaps research to this day continues as just that and not be as concerned with a taxonomy that divides and subdivides, both through time and space. I strongly suspect that the cultural processes ongoing in the McKeen 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 MISSISSIPPIAN appeared and, more importantly, why.

These are just a few of the types of questions that can, in the future, be examined by West Florida researchers, and which are already beginning to arouse considerable interest. Building on the research of Willey and Scott, and on their own work of only several years ago, anthropologists have grasped the concept of West Florida as a peculiar and unique place to be studied. The evidence from the Southeastern Mississippi is clear and significant for a prehistoric, prehistoric, and anthropological in-terpretation of West Florida.  

Sources Cited:


PRELIMINARY REPORT ON TECHNOLOGICAL INVESTIGATIONS OF MCKEITHEN SITE-WEEDER ISLAND POTTERY

This paper addresses the question of local manufacture versus non-local or trade in origin of certain McKeithen site-Weedey Island ceramics. A preliminary technological investigation of physical and mineralogical properties was carried out on two batches of data for comparison. These include: (1) 18 of the 19 pottery vessels recovered from Mound C at the McKeithen site, and (2) five 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 sources 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 Table 1 in the appendix. The physical and mineralogical properties measured on 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 refined grid from each vessel considered. The sherds were held in a Thermoform 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 consistently similar to the groupings described above:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Grouping</th>
<th>Surface Color</th>
<th>Core Color</th>
<th>Surface Porosity</th>
<th>Core Porosity</th>
<th>Paste Texture</th>
<th>Fabric Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>pale tan to light brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>Brownish pale tan, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Light brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>red-brown</td>
<td>very pale brown</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>Red-brown, irregular surface, fine grooves, light brown, transparent.</td>
</tr>
</tbody>
</table>

Figure 1. Southeastern Archaeological Conference Bulletin 22, 1980

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sintestically similar to permit the grouping of these vessels with each other or with 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 shell cross-section with a binocular microscope. Scratch hardness is 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 feldspar components and organic materials in the clay and variability in firing conditions. The refining 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. Described vessels are here accorded to the attributes examined and presented schematically in the appendix. Explanations for particular features of data presentation are included. The measurement and observation specified are those made on the refined sherds.

**Group 1** consists of two derived effigy, vessels 4 and 8. 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 postulated effigy, and vessel 13, a squared paste. Identical technological data were obtained for these vessels. Retention of dark coring in this group may be related to the fineness of the paste. [30 to the possibility that these vessels represent a clay similar in organic materials relative to the ceramic resources represented by most of the other groupings, (3) to variations in original firing conditions which may not have been eliminated by refining, or (4) in a combination of any of these possibilities.** Group 3** consists of vessels 1 and 12—the two Weldon Parkienoid variants of a globular bowl form, and vessel 15—the multipotted globular bowl. The presence of nica as a paste constituent is this grouping's most distinguishing feature. Similarities in color, hardness, paste texture, and other paste constituents suggest that similar micaceous clays were selected for the manufacture of these vessels.

**Group 4** consists of vessels 10, 11, and 18. This grouping is one varietal as the attributes considered are all characteristic by the abundant occurrence of sponge spicules. The white to yellowish red inclinations 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 micaceous clay sources are represented by these vessels.

**Group 5** consists of vessels 5, 9, and 7. These are globular bowls with effigy and bag 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. Effigy. 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 vessels 8 and 11 together. Although differing somewhat in paste constituents, they are similar with reference to refined core colors. Vessel 16, except for greater retention of coring, is also broadly similar to vessels 8 and 11. 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 component in the paste and greater retention of coring after refining clays in this vessel are 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 1 and 9.

**Interpretation of Groupings**

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 resource may be postulated for the manufacture 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.

Shards from Mound C vessels were included in the sample of sherds and clays that were examined trajectorially by Prudence Rice (this volume). Group 2 (vessel 2, characterized by dark coring), Group 3 (vessel 12, characterized by micaceous paste), Group 4, and outlier vessel 14 were represented, and each vessel was found to be characterized by distinctly test-axially derived paste types. This evidence suggests maintenance of these 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 spiculate paste. Although their geographical extents have not been conclusively demonstrated, micaceous and spiculate clays have traditionally been thought to originate principally from the southwestern United States and the Rio Grande valley.

Analyses of surface and core color, scratch hardness, 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 McKethen site. FC-5A (designating the west 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 on 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 indi-
cating, however, that high degrees of similarity exist between FC-1 and Vessel Group 1 (vessels 1 and 2) and between FC-3A and outlier vessel 19. These findings tentatively permit a local origin to be posited for manufacture of these three vessels. FC-1 and FC-3A were also included in Ricc's investigation. They complemented two clay-bead paste types. This would support the distinction between Group 1 and outlier vessel 18. Therefore, from preliminary analyses of Mound C vessels and two local clays, it can be tenta-
vively hypothesized that three of the eighteen vessels (Group 1 and outlier vessel 19) were probably manu-
factured locally; seven more vessels (Groups 5, 4, and outlier vessel 17) were probably obtained from non-
local centers of manufacture. Three to five distinct ce-
ramic 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 deter-
miered groupings are tentative as is their interpretation regarding numbers and origins of ceramic re-
sources. Future analyses will include petrographic ex-
amination of shed thin sections to offer more precise geo-
chemical characterization 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 Lavalle. The results of these analyses will provide more data for comparison with Mound C and other McKeithen site ceramics. However, a pre-
liminary 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:
Vessel 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 posting activities. Shells firing all of these vessels were recovered by J. T. Mihanich's excavations. The caye of vessel 17 was deposited outside of or top of the primary mound. Vessel 15 was recovered by Mihanich from an undisturbed context and is thought to represent the northern extent of the east-side caye. Vessel 16 was recovered from the top of the mound's west side under the edge of or right beside the primary mound; it is apparently not associated with the east-side caye. Vessel 17 was obtained from a local collector; most of its base was recovered by Mihanich from an undisturbed context. The following descrip-
tions are presented according to the format and decorative terminology established by Seiss (1960) and Willey (1949).

Vessel 1 (Group 3) - Squared flattened globular bowl; Western Island Incised; unslipped bird mask.
Vessel 2 (Group 4) - Squared flattened globular bowl; Western Island Incised; unslipped bird mask.
Vessel 3 (Group 5) - Squared flat-rim bowl with triangular cut-out; associated with crested bird-head adornment; incised outlines body contours and wings; entire vessel exterior is slipped with a red-slipping substance.
Vessel 4 (Group 6) - Squared flat-rim bowl with triangular cut-out and pre-
hased body perforation; incised outlines body contours and wings; exterior slipped with red-slipping substance.
Vessel 5 (Group 7) - Squared flat-rim bowl with triangular cut-out and pre-
hased body perforation; incised outlines body contours and wings; exterior slipped with red-slipping substance.

The vessel has been undergoing restoration: its condi-
tion prevents further description.

Vessel 6 (Group 8) - Squared flat-rim bowl with triangular cut-out and pre-
hased body perforation; incised outlines body contours and wings; exterior slipped with red-slipping substance; incised outlines appear to have a "self-slip" resulting from surface finishing rather than decorative technique.

Vessel 7, 8 (Group 9) - Globular bowls; both specimens appear to have "self-slip" rather than decorative slip; one vessel has a rim rounded flange on opposite side attached to the rim; the other has a rim attached below the rim and a mid-body adorno (voluta) affixed to the lip portion of the rim on the opposite side.

Vessel 9 (Group 10) - Simple bowl; entire vessel exterior and interior surfaces slipped with a red-slipping sub-
stance; exterior surface appears to have a "self-slip".

Vessel 10 (Group 11) - Simple bowl; plain.

Vessel 11 (Group 12) - Square-shaped flat-rim bowl with molded rim; lip is punctuated, similar to Woodland Island Punctated. Approximately one-third of the bowl was recovered.

Vessel 12 (Group 13) - Unique flattened globular bowl; shaped like a "winged-s"; Woodland Island Incised; bird mask. Post-firing bowl "kill-hole" is present.

Vessel 13 (Group 14) - Squared flat-rim bowl; plain; foot of flat-rim bowl is affixed to a shocked rim. Post-firing bowl "kill-hole" is present.

Vessel 14 (Group 15) - Globular bowl; Indian Pass Incised. Approximately one-half of the vessel was recovered.

Vessel 15 (Group 16) - Globular bowl; plain; foot (flat-rim bowl) adheres to a shocked rim. Post-firing bowl "kill-hole" is present.

Vessel 16 (Group 17) - Globular bowl; Tidewater Ridge-ribbed.

Vessel 17 (Group 18) - Fitted gilled globular bowl; exterior sur-
face appears to have been slipped with the same ma-
terial used for the clay body. Post-firing bowl "kill-
hole" is present.

Vessel 18 (Group 19) - Large simple bowl; plain. Approx-
imately one-third of the vessel was recovered.

Vessel 19 (Group 20) - Derived effigy (jar form); Woodland Island Zoned Red; bird-head and tail sections are attached below the rim on opposite sides of the vessel; many 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 Mohs' Mineral Hardness scale under 50X magnification. Fresh cross-
sections of shells were examined under a stereoscopy microscope at 20X magnification. Composite analyses of water were made and relative frequencies of non-plastic were subjectively evaluated as rare, common, common, or abundant. Relative size of incisions was measured with reference to Wheat-
worth's Site Classification with the aid of an eyepiece microm-
crometer.

Data presentation:
Color is designated by Munsell color names rather than specific hue, value, and chroma measurements which were the orig-
inal measurements. A zero (0) color designation is given when a slipped surface of a vessel is not in the clay body color and not slip color that is relevant for the determination of the number of possible clay resources represented by the vessel. A zero designation is also given for scratch hardness of slipped surfaces and the designated exterior of vessel 19 (unslipped or 16) and unglazed.

Color names are presented for core (i.e., less oxidized core color) as well as for the more oxidized colors. When using'ssment, a zero designation is given. Relative frequency and size cate-
cories are here shared for clarity and includes cumulative, relative frequencies for mica and sponge incised designs which are applied. Cores identifying in type of type is preserved for use with the more oxidized color. A zero designation is also given. In addition, the core is given a textural designation (very fine, fine, medium, or coarse) derived from consideration of relative frequency and size of quartz inclusions.

References Cited:

Southeastern Archaeological Conference Bulletin 22, 1980
The transformation from egalitarian to rank so-
ciety 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-
mercurial ranked society within particular historical
context; (2) develop a preliminary, socio-political
model for Weedon Island society; (3) determine the
implications for our findings in comparison to com-
parable cross-cultural studies, and incorporate south-
eastern material when constructing evolutionary
models of pre-mercurial economic systems; and, (4)
contribute to the "demonization" 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 dis-
tribution of Weedon 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-settle-
ment 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) substanti-
ave, theoretical, and methodological history of Weedon
Island studies in the southeast and north Florida
specifically; and, (2) regional environmental com-
munities, 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 develop-
ment of ranking in Weedon Island society.

Theoretical. In approaching the task of collecting
data to explore relationships between economy, social
relations, and ideology, "economy" became theoret-
cially and methodologically pivotal for analytic pur-
poses. It is an "explicit strategy which provides a con-
sistent 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 anthropolo-
gists with a structure within which to work, as well as
a body of theories from the subfield economic anthro-
poLOGY.

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 "artificial
of operations which supply a society with its material
means of existence" (Godelier 1972:259). Distribution
is the process by which the product is 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 1973:285).

While the data base available to an archeologist is
less complete than that available to an ethnologist,
materiality defines the economic event sectors opera-
tionally for both subfields of anthropology. By identi-
fying the material conditions represented in the arche-
ological 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
in cultural responses. These material items, or "com-
modities," also represent social products, the produc-
tion, 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 Ulna Timacu, since one of the wider research
goals of the McKeehen Project was to determine
whether Weedon Island peoples were ancestral to
the Ulna Timacu. This region actually constitutes a
cultural sub-area and lies north of the Santa Fe River,
south of the Okefenokee Swamp, west of the Asulla
River (McMeth 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
features in spatial arrangements. Differences in
geologic, hydrologic, and meteorologic character-
istics 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-

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University Miscellanea Collections 115.
tion, and consumption of goods and services (Geelieder 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 target 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 Higgins 1970:5). What constitutes the economic range will differ for each archeological project depending on the ecocological 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 flatwoods.

Since preliminary research suggested that at least some types of villages were usually associated with burial mound sites during the Wewa 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 non-productive 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 McKee 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 3 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 middles initially. The east-west and north-south perimeters were determined in this way.

Phase two strategy was based on information ob-

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tain in the first stage. As a result of the latter, it was determined that an area of high mound frequency existed south of the McKenzie site and that a transect could be defined that, while not encompassing all the mounds, would give some indication of the intervening space. And, by extending the sampling area east it could include the four feared aquatic environments. A 3 x 10 mile transect was therefore defined which encompassed the natural areas on the western ridges. The eastern portion consisted of poorly drained flats. The 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 Lowland.

The 3 x 10 mile transect contained 30 sections with 1 mile to a side. Each of the 3 mile sections was divided into quarter sections which were numbered consecutively. A 1/4 mile sample was drawn at random. Within the selected quarter sections we ran diagonal transects consisting of test pits placed every 25 to 50 m apart. Each transect covered an area of 10 cm levels to depths ranging from 30-100 cm, depending upon topographic elevation. That is, if the terrain suggested deposition due to still water or other surficial processes, tests were adjusted for these deposits.

Information obtained from continuous excavations at the McKenzie 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 their cultural and diagnostic qualities. 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 homogeneous 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 sampling 2 x 2 mile area could be covered by transects using the quarter section procedure. The same diagonal line of subsurface tests and held method of excavation were used. The area was excavated during the summer months when rainfall was greater. The area was divided into two sections and low sections of the flood plain were approached, but not penetratecl when standing water was present.

The first and second areas targeted in stage three occurred within Coastal Lowland sections and were designated as the Coastal Lowland 1 and 2. The third sampling area was around Rocky Creek, located in the northeastern section of the county. The environmental zone is the 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. Coastal Lowland 2, which had not come to our attention. Of all the sites that were located and sampled in Columbia and Sumter counties, of all but a portion of one had been disturbed due to farm 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 portion of the survey area. Two weeks were all that were available for sampling this site. Two 3 x 5 meter squares were excavated in 5 cm levels. All artifacts were mapped in situ so that, in additional 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 established the "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 aerial placement observed within the ecological zones at a region (Douglas 1908; Pridmore 1908; Yellen 1956). In north Florida there are two natural regions that of the Coastal Lowland and the Central Highlands. The latter consists of the Coastal Lowlands and central Highlands. While they contain similar ecological zones, variations in elevation and hydrologic regimes affect the distributions of exploitable resources affect production activity and risk factors for dependent populations.

Coastal Lowlands. The Coastal Lowlands, which extend into northern portions of Columbia County, is north of Lake City, west of the Oklawaha Swamp, south of Beaufort County, and east of the Suwannee River, and south of the Georgia state line. Although the physiography is listed Coastal Lowlands, in reality this classification scheme seems localized differences. Elevations are generally 25 feet or lower. The upper levels are confined to upland terraces which are essentially a series of eroded, discontinuous sand ridges, the apaxes 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 feet above present sea level, and correspond to the Pleistocene shore line, - - - - - . The region is one of active karst expression. The upper layers of calcareous lime rock and sandstone, the apaxes of which are well to excessively drained. The lower elevations consist of poorly drained lowland swamps and the Suwannee River floodplain.

Biological precipitation on the Coastal Lowlands either evaporates or percolates into the ground, a well integrated drainage pattern of streams has generally

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those of the surgy area. This ecological factor would provide obvious constraints on productive potential and would affect the size of territories required to support hunting activities.

Coral reefs, Central Highlands in Colombia and Suwannee counties are composed of clay and sand which were terrace by Early Pleistocene Age sea. A high digit of crystalline of the Coast and Sunderland terraces, across central Columbia Country from east to west (Cook 1945; Meyer 1962). The ridge existed as a series of keys forming the southern boundary of the Okefenokee Sound.

The term in this area is population topography characterized by limestone outcrops, extreme changes in elevation, numerous sinkhole lakes and ponds and solution depressions, and significant fluctuations in water in part due to poor drainage and water perched water tables. The ridge is drained northward by tributary streams of the Suwannee River. There are more extreme in elevation within this zone compared to the Coastal Lowlands but the selective pressures exercised by fluctuations in the wet is still an important con-

tributor 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 intra 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 1970; Prashker 1971).

In addition to complexity and diversity of surficial hydrologic habitats, 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 90 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 dis-

tributions, type and function, population densities, and indirectly to developmental processes.

Description of Weedon Island Sites in North Florida

It was determined that Weedon 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 con (innuous use type; (2) habitation sites associated with the mounds; (3) dispersed habitation sites or 'hamlets' representing discrete subsistence units; (4) trade qurter sites; (5) clay quarries; and, (6) clay exposures which are listed as possible sites. In both zones, the pattern was one of mounds 'centres' and their associated vil-

lages and dispersed satellite villages, all within easy access to clay sources and other services.

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.

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not developed (Meyer 1962:12). Spring-fed sinkhole ponds and streams occur in this environment and there are highly restricted geographically and experience some fluctuations in water level. The most significant dynamic aspect is the availability of floral and faunal species this fluctuations in water resources. While the above mentioned ponds will remain watered by a support habitats 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 is no topographic feature of any importance in flow. The Suwannee originates in the Okefenokee Swamp, southeast of the region in question, and is subject to drought from local rainfall above White Springs, Florida. Below this point there is an increased backwater caused by the meandering nature of the habitat. Generally, there is a limited number of animal groups represented by a few species but many individuals. This varies locally, however, due to differences in acidity, velocity, vegetation, temperate, oxygen, and water hardness (Beck 1965; Helter 1967). In short, the streams and ponds differ chemically, physically, and biologically which creates micro-environmental differences 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) longleaf pine along lower bank regions of the Suwan-

nee River; (3) mesophytic hammocks; (4) dry pine-

stands in areas of low ground and occasional oak. White ibi is a somewhat simplified version of reality, from midpoints of these ridges there is access to these six environments over a mile distance.

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

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 vari-

cy is available for exploitation across these micro-

environments. Based on what is known of fauna utilization within these environments within a mile distance. Concerning the potential of the latter, an interesting differ-

dential has been documented for the reproductive rate between the region under study and the counties to the west and within the northern Piedmont physio-

graphic province.

Harlow (1972), Sico (1966), and Sherr (1969) have argued that low frequency rates of the white-
tailed deer are not related to over population or quantity of available forage, but that forest types and soils exert greater influence. Sherr (1969) states that terrestrial soils produce roughages that are seasonally

 deficient in net energy, protein and phosphorus. Harlow (1972:107) notes that uplands soils of counties west of Columbia and Suwannee have more clay pres-

ent and have higher potential fertility. In addition, certain mineral elements (iron, copper, cobalt) which are found deficient in soils which would include much of
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), decorticating flakes, retouched transverse and side scrapers, flake knives, gravers, spokeshaves, non-utilized flakes and cores. Shards 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 demonstrated.

The similarities of artifact categories suggest that comparable activities were being conducted at each of the hamlet sites, and that they were of a "maintenance" type (after Binford and Binford 1966). In addition to spacing and low intensity variability, the following similarities were noted for the hamlets: (1) all were within 300 m of a spring; (2) they occur within rain-shock environments; (3) the sectors within elevations ranging from 115 to 125 ft above msl (mean sea level); (4) if an excavated site is south of 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 cleared. No other similar raw or features are therefore available from most of the sites.

Village sites associated with the mound have the same tool assemblages as outlined above with two exceptions. A hammerstone and cutting 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 3 to 10 acre spring-fed pond.

The mound was 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 valuable 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 deteriorated condition and appeared to be secondary burials. Two nearly complete vessels were obtained from the east side, both were Carrahalie Punctated. A profile of the mound shaped construction has been started on a cleared surface, with a base of very white sand, followed by primary mound fill. There were charcoal scatterings and evidence of basin sand irregularly 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 tools made of non-local raw materials. 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 thought to be related to hunting activity. Non-aquatic faunal species are not abundant, specific on the Coastal Plain and would be available within all environments covered by our transects.

1. One might reasonably expect the distribution to be reflective of these kinds of extractive activities.

2. Both the clay and chert formations were exposed at different points along the Suwannee River channel, approximately 20 miles southeast of Mound 1. The chert outcropping seems to be the source of lithic samples obtained in village midden. It is at a distinct elevation and occurs along the eastern bank. This material is continuously accessible, except during flood stage. The clay is a possible source for village points but elemental analysis linking the samples from the exposure to specific vessels has not 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, how.

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ever, from Krell’s excavations at the McKeeben site (Krell 1978). This information, plus the nature of the lithic assemblages from the hamlets and their location with respect to potential resources, implies a broad based fishing-collecting-hunting economy relying on resources from all four environmental zones. This pattern has been amply documented by Cattabaga (1979) for contemporary Lakes Peacock Lake to the south.

SITE TYPE AND PLACEMENT: The unspecialized tool kit, localized nature of the material condition of production, and the insignificant amount of non-local items (except in the Two Cree arrivals context) suggest: (1) the economies to have been sedentary. 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 areas 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 famineary ritual (ritual construction specifically); (6) given the above it is doubtful that control of production factors could become site 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 distribution of the hamlets and their location: (1) for all the habitation sites have been noted, portable wadens, sumpock environments, and small aquatic micro-environments, elevations ranging from 115-225 ft above msl, a location within less than 1 mile of the local range of habitat diversity, and a location within 2 to 3 miles of the moun 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 fac tors (e.g., in flood and fire environment) suggest: (7) the unities 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 frequent 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 Planka 1974; Sanders and Wolter 1978; Chisholm 1968).

An examination of the data indicates 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 phases were also the frequency 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 the 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 McKeeben site and Peacock Lake; (4) non-local items of exchange, including perishable food from out areas, were in evidence at least one out of a six center.

Discussion

In the development of ranked society the number of valued status positions become limited (Fried 1967; 1969). 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 limited term. It represents the generalization of the form conceptual categories (e.g., economic, political and biologic al institutions) within this developmental stage. Expectations of social-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; Sahlin 1962, 1965); and, (2) eco nomic inequality that was characterized by the flow of goods into and out of a center.

Such redistribution occurs on the local or village basis and involves consumable goods and a "para mount" officiating. The generosity of the "chief" or "Big Man" in turn becomes the source of prestige and the platform for power (see Drucker 1965; Sahlin 1962:209-294). This particular kind of exchange is more prominent in the literature, but the types of distribution can vary with the nature of the commod ity being distributed. Salisbury (1962) identifies in small scale, non-monetary economies three types of exchange with different commoditv focuses: subsistence, ceremonial, and trade. It seems more bene fic 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. 2:985-111) has shown that produc tion resources are just one, and not necessarily the most fundamental type of resource, that can be manip ulated. She questions the dominance of production sectors in the development of inequality, and feels that evidence suggests the emergence of inequality depends on interaction 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 pri mary 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 l.
The pottery of the Weedon Island period, whether that site is in the eastern coastal zone of the Gulf Coast or the Aborignal Eastern United States, has been the focus of much study. Several factors have influenced the study of this pottery. First, the high quality of the clay used in its manufacture has attracted the attention of many scholars. Second, the distinctive shapes and designs of the pottery have led to the development of new classification systems. Third, the pottery has been found in a variety of contexts, including ceremonial and functional uses, providing evidence of the social and economic organization of the people who used it. Finally, the pottery has been studied in relation to other materials, such as bone and shell, providing a more complete understanding of the culture.
(2) Geographical (interite) variability—relating the pottery from the McKethen site to pottery from other Weedon 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 McKethen; all but two sherds are from round locations.

(5) Typological variability—the types analyzed represent three categories of Weedon Island period pottery types: (a) those that Kohler (1973a) hypothesized to be "elite or trade wares" (n = 30); (b) other proposed trade wares (n = 6); and (c) 15 miscellaneous sand-tempered, incised, or plain wares, presumably nonelite or "utilitarian". These 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:

(6) 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 area 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 Weedon Island pottery and its role in Weedon Island culture.

Clay Samples

For these kinds of provenience studies, it is desirable to have samples of ceramic resources (principal clays) from the local or hypothesized trade centers in question. No clays included in this analysis were from Georgia (the postulates center of manufacture of many of the Weedon Island types), but 12 clays from Florida were included. Eight clays were from the vicinity of the McKethen site; 2 from the street at the northern boundary of the site, 4 from a road 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.

Table 1.

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*from non-mound locations

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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 (are 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 Willaert's Cluster 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 sherd and clays reappeared more or less consistently, regardless of the statistical manipulation 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 Wendell Island Punctuated. It also has a subgroup that consists of 3 clay samples obtained from a roadcut near the McKeehen site. The 4 vessels from Mound C at McKeehen fall into 3 separate clusters, X, Y, and Z, plus 1 is an outlier. This agrees with the findings of Gosselé (1975), who included these same 4 vessels in Table 5.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Transition Metals</th>
<th>Rare Earths</th>
<th>Lanthanides</th>
<th>Flat</th>
<th>Shed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>X</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>Y</td>
<td>-</td>
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<tr>
<td>Z</td>
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<td>Plus</td>
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</tr>
</tbody>
</table>

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

Incision and stamping 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 southern Georgia or southeastern Alabama, 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 Paso 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-ware sherds appear to have a distinctive origin.

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

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The central hypotheses at local or nonlocal manufacture and distribution of Weeden Island pottery, and at the sacred-secular dichotomy, are that (1) socioeconomic complexity and centralization, Hypothesis 2b represents the simplest structure: in it the sacred-secular dichotomy appears to be purely deposi- 
tional (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 more flexible, in that it allows for a sphere of political-religious/socialization. There is one center of manufacture of the "sacred" vessels; from that center the vessels were distributed to other smaller groups ("secular"), some with 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 differences from those used in manufacture of "secular" vessels, presumably used for more mundane or non-elite service, which further reinforces their uniqueness and status.

The locations of the manufacture and distribution of the Weeden Island sherds included in this study should be attended by considering the distribution of the paste clusters from Table 1 with these models. Diagrammatically, following the form used above in Table 6, the paste clusters obtained through neutron activation analysis are distributed as below:

<table>
<thead>
<tr>
<th>Paste Clusters</th>
<th>Weeden Island &quot;Secular&quot; site types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>series types</td>
</tr>
<tr>
<td>McKeenhen</td>
<td>V</td>
</tr>
<tr>
<td>Palmetto Island</td>
<td>W</td>
</tr>
<tr>
<td>Mitchell, Ala.</td>
<td>Z</td>
</tr>
<tr>
<td>Grinnin, Fla.</td>
<td>Z</td>
</tr>
<tr>
<td>Okeechobee</td>
<td>Z</td>
</tr>
</tbody>
</table>

These data suggest that while the "sacred/secular" deposition context distinction may hold true for Weeden Island series pottery, the Weeden Island site itself appears to have a relatively complex pattern of manufacture and distribution. Although the high degree of variability of these analyses suggests that sites are not represented directly in the data, the cluster analysis may be used as a basis for formulating hypotheses about the nature and function of the sites.

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Group W (suggested McKeithen manufacture), the marks of these types from the different sites sampled fall into a variety of paste groups, suggesting multipurpose 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 mounded 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 a variable tech. In terms of provenience and type (though primarily "local") and one clay sample, from Alachua County, is associated. This grouping may represent another aspect or dimension of local/regional 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 midden at McKeithen represent a period of occupation from A.D. 109 to 750, and an alternative interpretation of the clusters obtained through this analysis may be based on time rather than on local-locale manufacture. There is some indication that the sherds in cluster V paste ("stellar") types are middle-late phase and in this analysis, which was done in a preliminary manner, those of cluster W paste ("local sacred") are primarily early-middle and mostly from the southern midden areas of the site. It will be remembered that cluster V includes a number of Weeden Island Incised sherds. Kohler (1976b) 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 middle. Thus, clusters V and W represent a time as well as a manufacturing dimension. Future analyses will be directed toward further exploration of temporal differences in resources available in manufacture at McKeithen.

Equally important is that for secure attribution of "local" or "non-local" 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, it is possible that the material that more or less clearly appears to be from McKeithen, no other sites or regions of manufacture can validly be suggested on this basis of analysis. Future studies will also attempt to obtain broader geographic sampling of clays and pottery for analysis.

More positively, what can be said with a high 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 single "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 were apparent and noticeable consistencies in manufacture of Weeden Island series "sacred" types. A relatively few (as yet unlocated) areas were engaged in manufacturing of this series. 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

I would like to acknowledge the assistance of John Lane, Department of Near Engineering, University of Florida, for performing the neutron activation analysis, and Roger K. Blackford, Department of Psychiatry, for performing the cluster analyses. Funds for this study were provided by Jerald T. Milamich through NSF grant 76-2929, and by the Department of Social Sciences, Florida State Museum; their as- sisstance is gratefully acknowledged. Helpful comments throughout the analysis and interpretations were pro- vided by Jerald T. Milamich, Timothy A. Kohler, Ann Cordell, and David Batchin. Errors of fact and theory remain my own.

Appendix 1: Division of Methods

Analyzing Fragments of sherds selected for chemical analysis were prepared by flattening them and applying to a 2.5 cm diameter in an excilor atmosphere in a temperature of approx- imately 900°C. The sherds were cleaned, rinsed and fired using approximately 0.065 mg with titanium carbonate directly, then the sherds were weighed. The powder was grinded to an average diameter small samples weighing 0.15 to 0.30 mg were used for 1 hour in the Metler reactor. The sherds were analyzed using a Geo-1400C reactor with 1986 channels.

Samples were analyzed three times after decay periods of 3, 90, and 90 days to pick up short, intermediate, and long half-lives. Elements of these types, lower transition, 10 were selected for the basis of nuclear, geochemical, and archaeological criteria to be experimentally the most salient. These were utilized in various combinations in the two major operations of this study: chemical characterization of the samples, and then use of this characterization data to form groupings of the samples through cluster analysis.

Characterization

The 15 elemental composition, which varied in the sherds from about 5 percent (low) to a few thousandths of a percent (high), were translated into a logarithmic scale for further multivariate analysis in order to minimize skewing caused by transforming variables. Principal component and simple components factor analysis of the standardized log data indicated a complex structure of variable interrelations. Basically, the 19 variables could be divided into three groups: (1) the iron oxides, including pb, Pb, Fe, and Cu, which were intercorrelated with Cr and Co; (2) the earth and halide/aluminate, Li, Na, K, and Mn, showing strongly with the iron oxides; and (3) miscellaneous elements not correlated with either of the above groups or any themselves; these include Pb, Zn, Ag, Au, Hg, and halide/aluminate, Eu, Ti, and La.

The net effect of such intercorrelations is that rather than having 16 variables, there were only 15 (by dropping zinc phosphate) and 14 unique elements left with which to work. This was done by final grouping procedures in Table 4 to arrive at clusters.

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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 splastic constituents. This paper presents an analysis of grit inclusions (grit size greater than 1.0 mm) with cord marking and the physical characteristics of potsherds. The patterns may reflect the exploitation of different raw materials and the social and functional differences between the two categories of pottery. It is toward evaluation of the hypothesis 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 sites (A.D. 1200-1500) and a structure at the Kenan site, located on the barrier island, Sapelo. The structures, designated I and II, were approximately large, low platforms and consisted of parts of several rectangular postholes, regularly spaced and oriented. The structures are at the periphery of an open, plan-like area. Structure I may be as large as 35 by 50 meters, but Structure II appears to be small (Crook 1979). Both structures have shell-filled pits, ash concentrations that may have been from small fires, and organic grain stems. There were two hearths in Structure I, one of which yielded a radiocarbon date of A.D. 1155±25 years. The hearth in Structure I was found at the edge of a low, in-situ structure mound, which may have served to drain rainwater from (that activity area. Structure II had one hearth, which appeared to be contemporaneous with the structure. Structure II had no mounds, but two wall trenches were exposed, one of which divided the structure into north-south halves.

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pottery most frequent along the north wall, and plain and cord marked pottery most frequent in the interior areas. In Structure II artifact materials came almost exclusively from along the north wall, with only sparse scatter of sherds and bone in the interior areas. In Structure I check stamped pottery was most frequent (35% of total) and in II cord marked pottery was most frequent (26% of total).

Crock (1978) has postulated an interpretation of these structures which is based upon the artifact inventories, spatial distribution of artifacts and features, the features, and ethnographic 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.

Crock's interpretation of Structure II is that it was also 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 ethnographic documents, Crock 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 (Crock 1978).

The pottery from Keman 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 so fit patterns. Moreover, the association of grog with cord-marking and grit with check stamping would not have been documented (Figure 1).

After noticing the aplastics/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 by the potter in the process of manufacturing and/or the selection of raw materials. If check stamped/grit pottery and cord marked/grig pottery from Keman 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 distinct constellations of physical traits would be found for each pottery category, and that these 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-à-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 random, 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/grig pottery. The variables studied were color, cueing, 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,
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 on the check stamped pottery. Eighty per cent of the cord marked pottery appears to be well-oxidized, as opposed to 50% of the check stamped.

The second variable considered was coring. The term coring refers to the presence of greyish-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 sample. The samples were fired 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 90% moderate and 10% lightly or not at all 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 size, surface 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 sherd and 3.5 for the marked. The maximum hardness for the cord marked group was 4.0, whereas the check stamped was 3.0.

Porosity was also measured for the data set. Porosity has to do with the permeability of the clay body and is computed as the inverse 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 88.6%, and for the cord marked it was 86.5%. A comparison of these results was significant at 0.1. The cord marked sherds were decidedly more porous, a trait that may have been caused by different sizes and shapes of aplastics inclusions, more complete firing and therefore less charred matter clogging pore spaces, or differences in the texture and composition of the raw clays employed.

Sherd thicknesses were also measured. Threemeasurements were taken for each sherd and the mean recorded as the thickness. The mean thickness of the cord marked sample was 8.0 cm and for the check stamped it was 6.7 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 interrelated values, thus the small variation may be interpreted carefully.

The last variables to be considered are the particle size and number. Aplastics particle sizes and quantities eff:ect several of the preceding dimensions, including hardness, porosity and coring. The sherds were examined under a magnification of 75X to rate particle size 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 grit was the next most frequent inclusion, which, whereas in the check stamped grit was. There were several minor types of inclusions, but they may be considered rare in each sample. The samples appear to carry equivalent kinds of aplastic inclusions, even though one has grit and the other has basalt. How-

A summary of the data shows the following. The cord marked sherds show more oxidized color development and less corrosion than the check stamped. 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 parsimo-
nious explanation of the group differences, in tech-
nological terms, lies on the relative levels of oxida-
tion in the two samples. Different firing techniques are postulated 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 pores and reducing permeability. The incomplete oxidation would increase the reducing atmosphere which could also increase hardness.

From the data just presented, it is apparent that a number of quantifiable differences between the two groups do exist. These differences bear out the research hypothesis that discret constituentes of traits related to raw materials and/or manufacturing techniques exist for the two samples. Specifically, the dark coring, 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 way, producing the obvious differences of decoration and aplastic inclusions.

The question now is, why would these differences exist? If manufacturing practices led to a difference in color, at least some of the sources 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, ab-
sorbent behavior, and resistance to weathering, shock, abrasion and thermal stress. Therefore the explana-
tion of functional differences as a source of physical variation cannot be discounted.

To illustrate how the traits defined for each pottery type might be related to a difference in function, one could suggest that the cord marked pottery was a cooking vessel and, therefore, the check stampede pottery for storage or container use. A potter manufacturing a cooking vessel would want an item which could withstand re-
petual 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 change through usage. The structures I and II card 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 card marked.

It is interesting to note that in fact, card 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 card marked pottery at Kenai Field function as a cooking ware.

The viability of the explanation pivoting on manufacturing group differences must still be considered as a source of the described patterning. Since, as has 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 cannot 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-wide 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. 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 II has a much higher frequency of check stamped pottery; and the situation is reversed in Structure I, where card 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 reflection 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 Kenai Field research, the functional explanation seems strong, 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 consequence of hypotheses arising from separate data bases is that, 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.

Acknowledgments:
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References Cited:

John F. Searcy

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

Fort Walton was originally defined as the latest aboriginal ceramic complex in northwestern Florida (Wiley and Woodbury 1945). This definition was based on data from a survey of 87 sites in northwest Florida, supplemented by limited stratigraphic test excava-
tions at six of these sites. Later, in 1959, Wiley 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" (Wiley 1969:65). Unfortunately, Wiley's data were limited, and its definition necessarily vague and general.

However, since the formulation of these initial concepts, a considerable amount of additional research has been conducted, resulting in a greatly enlarged data base. These additional data have allowed

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the formulation of a refined chronology for the Fort Walton Period in the Upper Apalachee Valley. The data also permitted a more detailed examination of models of Fort Walton development, particularly those aspects of the models concerned with the chronology of the change from Weedon Island to Fort Walton and the processes involved in that change.

The excavation program carried out by Brose and Percy, but also utilizing data from previous research in the Apalachee Valley and related areas, six phases have been tentatively identified for the Late Woodland Island and Fort Walton periods. These phases are: the Wakulla phase; the Chattahoochee Landing phase; the Bristol phase; the Cypress phase; the Smalls phase; and the You 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 Apalachee Valley. The present discussion will concentrate on minimal definition of each of the phases and the relation of the phases to the question of the chronological placement of the change from Weedon 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 Woodland II culture (cf. Bollen 1966; Hart 1925; Kelly 1955; Miliard 1974; Percy and Beene 1929; Sears 1972). Sites of the Wakulla phase are extremely common in the Upper Apalachee 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 Miliard at the Sycamore site, 84G13, and Percy at the Torreya site, 84L48. (Miliard 1974; Percy 1921, 1925). As defined here, the Wakulla phase can be equated to Percy and Brose's Weedon Island 5.

The ceramic assemblage of the Wakulla phase are marked by extremely high frequencies of the type Wakulla Check Stamped. At the Sycamore site, Miliard found that Wakulla Check Stamped formed 47.6% of the total ceramic assemblage and 81.9% of the decorated wares (Miliard 1974:16, Table 4). At Torreya, this type comprised 66.3% of the total assemblage and 97.2% of the decorated pottery (Percy 1921:26, Table 9, p. 1). Percy and Beene note that the remainder of the Wakulla phase assemblage includes "...very limited representation of Weedon Island types featuring incising and punctuating, and a minor occurrence of comprob marked pottery" (1924:9). At Sycamore, Northwest Finkel Collected was the second most frequent decorated type, forming 16.6% of the total assemblage and 29.9% of the decorated pottery (Miliard 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 22.5% of the total (25.3% of the plain wares) while rough plain formed 20.4% (37.5%).

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 Riggs (1972), and the resulting date corrected according to Dunlin et al. (1974) to yield a calendar date of A.D. 876. This compares well with the date from the Nichols site (Dunbar 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, Garter, and Goyens. The components of this phase contain the first indications of relationship to Mississippian cultures elsewhere in the Southeast.
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 43-70% 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-6 but differ from those found at sites J-18 and J-62 and in the Dayford zone at site J-5. Those from J-6 were shale of a less sandy paste and have the smooth frequently black interior surfaces lacking at sites J-18 and J-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 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 Colomarked and cordmarked ceramics continue to appear but in reduced frequencies. Lake Jackson Plain, Coos Brand 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/prairie complexes on the nature levee of the Alachualola. The components at these sites are also quite large, the one at Chattahoochee Landing is approximately 205 acres in extent. This is in marked contrast to the many small Wakulla phase sites scattered throughout the Basin.

One radiocarbon determination has been obtained for the Chattahoochee Landing phase component at the Curlee site. This date, A.D. 400 (BIC 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 Brisol 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 Brisol phase ceramic assemblage differs from those of the Chattahoochee Landing phase, there are elements indicative of some continuity, Wakulla Check Stamped, Northwest Florida Colomarked 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 undiagnosed 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 Brisol phase (Table 4). These dates were averaged and corrected to yield a calendrical date of A.D. 950. When this averaged date is compared to the average obtained for the Wakulla phase at Nocaimore, a value of 925 was obtained (Long and Rippetoe 1974). This indicates a probability of contemporaneity of approximately 0.6.

Typologically, the assemblage of the Brisol phase most closely resembles contemporary materials from the Middle Chattahoochee Valley at Comanchecholke (Schroedl, Knight, and Schnell 1978). However, there is also a slight resemblance to early materials at Moundville (cf. Steponaitis 1970 regarding engraved wares with areas of excision in Moundville I).

The Cayson phase is represented by components at Cayson, Curlee, and School Parking Lot. At Curlee, it is the major occupation. At Cayson, it is stratiographically above Chattahoochee Landing phase levels.

The ceramic assemblage of this phase is marked by

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Table 3: Chattahoochee Landing phase ceramic assemblages.

<table>
<thead>
<tr>
<th>Site</th>
<th>Bone flute</th>
<th>Shell flute</th>
<th>Bowl</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
<th>Incised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brisol Phase</td>
<td>100 (99.1)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
<td>50 (50.0)</td>
</tr>
</tbody>
</table>

---

Table 4: Brisol phase radiocarbon dates.

<table>
<thead>
<tr>
<th>Site</th>
<th>Date</th>
<th>Age</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nocaimore</td>
<td>925 BC</td>
<td>1080-50 BC</td>
<td>50</td>
</tr>
</tbody>
</table>

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Lake Jackson Plain, Pensacola Plain, Lake Jackson Incised, Fort Walton Incised, and Coos Branch Incised. Matt Island Incised, Point Washington Incised, Wakulla Creek Stamped, and Northwest Florida Coh- mohica Incised. Representa- tive assemblages of the Cayon phase are shown in Table 5.

Five radiocarbon dates have been obtained for the Cayon phase occupation at the type site (Table 6). Based on these dates and one date from Carlee, the Cayon phase may be dated to the period A.D. 1000 to A.D. 1200. The components of the Cayon 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. 14

The Sneds phase follows the Cayon phase in the Upper Apalachicola Valley. It is quite closely related to the early Aucilla phase and the ceramic assemblages share many features. The types Lake Jackson Plain, Lake Jackson Incised, and Fort Walton Incised con- tinue to dominate the assemblages of the Sneds phase. However, Wakulla Creek 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 Cayon 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 29.2%. In the upper levels of the site, shell tempering is found in only 7.5% 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 Brush phase continues through the Sneds phase and into the Yon phase. A similar trend was observed at the Sing-Moee site in Stewart County, Georgia, a Redo’s phase site (Knight 1978).

The Sneds phase ceramic component is dominated by coarsely tempered and incised/punctuated types. The complicated stampede ware occurs on a grit tem- pered paste. In this respect it differs from the Jefferson Stamped ceramics of the later Loo-Neely period in Levee County. The standard jar is the most often en- countered vessel form. The most common motifs noted, thus far, are bullseyes and bullseyes with dotted courses. Rims are frequently pinched, folded or marked with drape impressions. In general, this type closely re- sembles the Lamar Complicated Stampede as found in the Middle Chattahoochee Valley (Boyles 1962). Incised/punctuated wares assemblage in 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 Boiled Incised (Wiley 1949:95). Finally, a check stamped ware simi- lar to Leon or Mericue Check Stamped occurs. This type usually appears with large diamond-shaped checks. In general, the Yon phase assemblage displays closely related to those of the Bull Creek phase of the Middle Chattahoochee Valley (McMichael and Keller 1960).

The radiocarbon dates (Table 6) have indicated an earlier phase (about A.D. 750-1000) for the Sneds phase at the 105 site. It would appear that this date is slightly early, but not remarkably so. Obviously, addition- al determinations must be obtained. However, it is suggested that the Yon phase begins ca. A.D. 1350-
1960 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 the cultural history of the Fort Walton culture are extremely limited in the 1940s. Despite this limitation, Willey was able to postulate a model of Fort Walton origin, which specified a general chronological sequence 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. He also stated 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, displaced the Tunica and pushed them east into the Florida peninsula (Willey 1949:590).

This model has retained a widespread acceptance among archaeologists to the present day (see 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 relationships between Weeden Island and Fort Walton ceramics were recognized and used to suggest an evolution of Weeden Island cultures into Fort Walton. Willey and Woodbury (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 comparisons 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 (1949:16).

For several years, these two models remained as conflicting interpretations of rather limited data. In 1950, Bullein published the results of his survey of the Jim Woodruff Reservoir area in Florida. During the course of his study, Bullein made a radical change in settlement pattern from the late 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 Wakaia Check Stamped pottery, typical of the preceding period, indicates that the population of the valley was not entirely replaced by new people (1950:12).

In 1953, Bullein conducted additional survey work and excavations in the Woodruff Reservoir. As a result of these investigations, Bullein divided the Fort Walton period into four sequential phases (1958:149). Bullein assigned the ceramic assemblages of these phases as follows:

*Fort Walton I: Wakaia Check Stamped; Fort Walton Incised; Good Branch Incised; and Mariet Island Incised.*

*Fort Walton II: Fort Walton Incised; Good Branch Incised; and Mariet Island Incised.*

*Fort Walton III: Fort Walton Incised; and Point Washington Incised.*

*Fort Walton IV: Fort Walton Incised; Lake Jackson Incised; and Point Washington Incised.*

Based on data gathered in the Upper Apalachicola Basin, Peveto 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 Micoon Plateau. Details of this process are unclear. It is possible that they were, or had 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 isolation of the two. In Fort Walton, the community pattern seems to be strongly nucleated once again with larger villages concentrated into temple mounds 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 effective 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 (Perry and Rose 1979:21-22).

Unfortunately, while the data collected in the Upper Apalachicola Basin to this date are highly suggestive, the models proposed by Perry and Rose are not yet generally accepted. Since the presentation of the Perry-Rose model, additional excavations have been performed in the Upper Apalachicola Basin and previously collected materials have been reanalyzed. Data from these re-searches have resulted in the formulation of the Fort Walton chronology presented earlier. The chronological framework thus generated has been combined with additional data to form a Fort Walton chronology and processes of Fort Walton development in northeast 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;
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 from certain classes of data. For each of the occupational periods, 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 Van indicate that ceramic assemblages consistent with those of 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 varied 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 in Fort Walton structure and the accompanying intensive agriculture economy is much more difficult to date. Nonetheless, there are some archaeological indications that hierarchically organized social organizations were present in the Apalachicola Valley at an early date. There are indications that pyramidial temple mounds, frequently associated with hierarchically social systems in other portions of the Southeast, appear in the Apalachicola Valley as early as Cayson phase is dated to A.D. 1111 (D1C 65) (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 hierarchically social structures are the typological resemblance between Fort Walton ceramics and Early Rockshelter phase materials (Caldwell 1955; McMichael and Keller 1980; Schnell and Knight 1978; Schnell, Knight, and Schnell 1978) and Bessemer phase materials (DeJarlette and Winchler 1941; Wallholl 1977) both of which are dated earlier.

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 (1B1), Point Washington (8W106), Hogtown Bayou (8W39), Marsh Island (8W1A), and Chocta Creek (8W45)—do not fit this sequence (Moore 1901; 1902; 1905). All of these sites are post contact but, they hear 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 hyphepes examined is composed of those hyphepes which specify the location of the initial change from Weeden Island to Fort Walton. These hyphepes were harder to extract from the published models, as no model specified a certain location such as the Upper Apalachicola Valley, and some models do 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 hyphepes.

The hyphepes were operationalized by predicting which area should yield early dates, which area should have typologically early materials, directions of moves 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 its development or appropriate routes for diffusion or invasion). These operational possibilities 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 hyphepes 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, visible 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 Pecana culture).

Three mechanism hyphepes were developed as the third class of hyphepes to be examined. The testing of these hyphepes 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 restrict the number of suitable invaders or donor cultures for diffusion to Mason Plateau, early Roek's phase, and Bessemer phase—and even these were probably earlier than Fort Walton. Also, there is now real 1:1 correspondence between any of these cultures and early Fort Walton. Finally, the presence of unusual materials such as Chattahoochee Landings argue for in situ change of Weeden Island groups.

The final class of hyphepes examined in this study relates to causal factors which led to the establishment of Fort Walton in the late 18th century. Unfortunately, this aspect of the Fort Walton origin problem has been very neglected to date. Only one of the models examined, that of Percy and Brown (1974) proposes causal factors. In their model, in

creased population during the Weeden Island period leads to greater internal competition for available agricultural land. This in turn leads to conflict. Percy and Brown suggest two possible areas in which their model would have testable implications.

The first of these areas is the realm of ethno- botany. 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, perhaps, the introduction of new plants such as beams... (Percy and Brown 1975:22).

In an effort to examine this area, ethnohistorical and archaeological data have been, and are being, performed on materials from the upper Apalachicola Valley area. Weeden Island not yet completed, the analyses do suggest a change in the local environment at the Von site during the transition. This change is seen in the results of a palynological analysis performed by Beaufort W. Clapham (Brown 1975a). The results of ethnohistorical 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-Brown model is in social organization. Unfortunately, it has not been possible to investigate this area in detail. Additional merritory 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 Landings phase.

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Vineas P. Seponalis

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 mound complex located in central Alabama (Peabody 1971, 1978; McKenzie 1969). 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- and federal relief program and the Alabama Museum of Natural History (Peabody 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 430 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 society in this area developed, and later reversed 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 Wiggerly (1941) more than 35 years ago, and later was somewhat elaborated by McKenzie (1961, 1965, 1968). 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 prehistoric ceramics 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 horizoned bowls and jars 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 burned 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 lines. Three varieties of this type have been recognized in the Moundville assemblage.

3) Earthing Incised includes shell tempered vessels with burned surfaces that are decorated with a broad, "traced" 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) Moundville Filmed consists of shell tempered vessels with burned 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 formally fell under the rubric Moundville Filmed Engraved and Moundville Engraved Indented.

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

Chronology

Based on a preliminary examination 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

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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 Mountville, and on dates for comparative material in eastern Mississippi (Marshall 1977), I would assign the following dates to each of the periods:

Mountville I  A.D. 1100-1250
Mountville II  A.D. 1250-1400
Mountville 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.

Mountville I. The characteristic bottle form of this early period is the ovoid, pedestal- shaped bottle (e.g., Moore 1905: Figs. 129, 130). Decoration on these bottles is relatively uncommon; when it does occur, the decoration is usually engraved or a very dull, flat design. A typical motif is the 3-line running scroll with areas of excision (Hemphill Engraved, var. Eilotte Creek). Appearing later in Mountville I (and continuing into the subsequent phases) is another pedestal- shaped 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. Tuscawora, e.g., Moore 1905: Fig. 39).

The distinctive bowl forms dating to Mountville I are the hemispherical bowl with lug and rim effigy (e.g., McKenney 1968: Fig. 11c), the restricted bowl, and the shallow flaring rim bowl (e.g., McKenney 1968: Fig. 7). Decoration on these bowls is generally carried out with a broad "traced" incision, at least 1.5-2.0 mm wide. The Mount Poth mark, a band of 5-4 lines parallel to the lip, often occurs on the hemispherical bowls with excisions (Carthage Incised, see Avon); the arc motif occurs on restricted bowls (Carthage In- cised, var. Summersville); and zones of oblique parallel incisions ("chevron" design, see Carthage Incised) 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 arc motif of Mountville Incised (most commonly var. Mountville).

Mountville II. In this period, the ovoid pedestal- shaped bottle is completely replaced by the form with a wider body, exhibiting either a low pedestal (e.g., Moore 1905: Figs. 35, 37, 39, 55) 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. Maxwell Creek); e.g., Moore 1905: Figs. 30, 33), the vertical scroll (Hemphill Engraved, var. Foxfire- lane, e.g., Moore 1905: Figs. 59, 101, and 2), the scroll made up of 15 or more closely spaced lines (Hemphill Engraved, and Carthage Creek). Also, Moore 1905: Figs. 57, 119). Representational or "calt" motifs also occur, but they seem to be relatively infrequent until the later portion of this period (Hemphill En- graved, var. Hemphill; motifs such as those in Moore 1905: Figs. 8, 21, 87, and 121 probably are found in this earl). Another frequent characteristic of Mountville II is the presence of depressions or indentations in the vessel wall.

The simple, restricted, and flaring rim bowl forms that characterized Mountville I probably continue into Mountville II as well. There does occur a change, however, in the way these bowls are decorated. Unlike the earlier variants with the Mount Poth mark, 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. Foxfire Lane). Also, it is during this period that the hemispherical bowl with a straight applied strip along the rim, sometimes called the "beaded rim" bowl, begins to appear.

Four-handled jars become considerably more common in Mountville II than in the previous period. The simple, restricted, and flaring rim bowl forms continue in this period, and four-handled forms are added. A short-necked bowl stylistically related to the proto-historic "canella" form, and a cylindrical or semi-cylindrical bowl, with a simple lug, (Mc- Kenney 1968: Figs. 5, 18; Moore 1965: Figs. 120, 124). The beaded rim bowl, which first appeared in Mount- ville I, attains its greatest frequency in Mountville III. It is also at this time that ash effigy bowls (e.g., Moore 1907: Fig. 27) and frog effigy jars (e.g., Mc- Kenney 1968: Fig. 16) become common.

In regard to decoration, both fine-line engraving and burnish incising are being found on bowls and bottles. The most common motif is the 4-line running scroll, with or without a crossbarred back- ground (Carthage Incised, var. Carthage, Hemphill Engraved, var. Wiggins and Taylorville). Also commonly found are the engraved or incised "Southern Cala" motifs for which the Mountville ceramics are fasci- natingly famous (Hemphill Engraved, var. Hemphill, and Carthage Incised, var. Foxfire Lane). The incised excu- sion continues to predominate on bowls with the Mount Poth mark (Hemphill Engraved, var. Foxfire Lane, var. Moon Lake). Very late within this period, short-necked bowls are sometimes incised either with effigies (Carthage Incised, var. Moon Lake), or with a step and semi-circular design (Carthage Incised, var. Foxfire Lane).

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Table 1: chronology of decorated types and variation in profile and rarity description in the appendix.

<table>
<thead>
<tr>
<th>TYPE/variety</th>
<th>MOUNTVILLE PERIODS</th>
<th>77</th>
<th>97</th>
<th>111</th>
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<tr>
<td>Mountville Incised, var. Mountville</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>var. Carthage</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>var. Poths</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>var. Hemphill</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>var. MetalLake</td>
<td>x</td>
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<tr>
<td>var. Foxfire Lane</td>
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<td>var. Light</td>
<td>x</td>
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<td></td>
</tr>
<tr>
<td>var. Hemphill</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>var. MoonLake</td>
<td>x</td>
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<td></td>
</tr>
<tr>
<td>var. Poole</td>
<td>x</td>
<td></td>
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</tr>
</tbody>
</table>

* = strong presence
+ = moderate presence
? = weak or absent presence

X = fine-line engraving/inscriptions
The number of handles found on jars increases again in this period. The typical jar has four, some-what 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 Mound- ville III times, a number of jars were white with an organic paint that are almost certainly local in manufacture (cf. McKenzie 1905:55).

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 ribbed arrow) being predominantly early, others being predominantly late (e.g., winged serpent, talon, scalpel), and some occurring both early and late with slight differences in execution (e.g., pointed tail, hand and eye).

Another important point is this: The chronology outlined above should once and for all lay to rest McKenzie’s (1905: 1906:49-51) idea that the Moundville phase originated with a site-unit intrusion from the Central Mississippi Valley (i.e., 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, var. Hemphill and Wiggins—occurred 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 shattered site in Jefferson County, Ala- bama (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 II times, as indicated by the presence of an ovoid pre-dated bottle (Mississippi Plain, var. Hob), a flaring rim bowl with incised chevrons (Carrith Incised, var. Moon Lake), and a hemispherical bowl with the incised Mound Place motif (Carriage Incised, var. Akwes). 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 main- tained 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 (1902:140) 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 in a measure internally put on by the pot- ters. 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 conclu- sion that the black coating on the earthenware is carboneous 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 smoke and tar or oil might produce the effect, though the numerous lustrous particles resembling graphite rather suggest the carburettation of a tar-like sub- stance.

Considerably later, F. R. Matsuoe did a series of ex- periments on black painted sherds from the Gunterville 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 surface either by using a slip containing from which when fired under reducing conditions would produce a black iron oxide coating, or by applying an organic paint that a reducing atmo- sphere would carbonize (quoted in Helmlech 1952:29).

Matsuoe’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. (Matsuoe quoted in Helmlech 1952:5051). 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 accep- tance over the years, they are not as convincing as they would appear to be at first glance. The conclu- sions of both Keller and Matsuoe rested on the dubious premise that the carboneous 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 Matsuoe argue away 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 paint- ing. This process is referred to as “smudging,” which is described by Shepard (1956:88) as a “means of blackening pottery by causing carbon and tar 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 de- posited 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 introducing as needed, for example, coal tar, 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 de- posits 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 1956:48-50).

We cannot as yet conclusively demonstrate that the above procedure was actually the one used in making the black painted 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 through some kind of oxidizing 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 or, more accurately, smudged in firing. Conversely, black painted 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 confirmatory evidence has come from a series of experiments conducted by Neil 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 character of Moundville "black-painted" 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 Mississippian period. Thus, there would be no technological grounds for believing that the P.S. 110 wares be given an entirely distinct typological status.

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Intermediate Regional Exchange

In regard to the subject of trade, our work in the next few months will include petrographic and chemical analyses of the blackwared vessels, 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 possible sources of these types.

The most abundant group of trade vessels originated in the Middle Mississippi sub-area which straddled the Middle Cumberland drainage in central Tennessee to the Cahokia Lowland in southeast Missouri. Among the types thus far identified are Mattox very rare, etc., Beckett (4 jars) and var. Mcely (1 jar), Barton Incised (2 jars), Nashville Negative Painted (4 bowls), Bell Plain (at least 15 bowls and bottles), and Mississippi Plain (at least 8 bowls and 1 hill effigy bowl (Philips 1976)).

The most outstanding clay group appears to have originated in the Pianksho sub-area located along the Gulf coast of Alabama and extreme northwest Florida. The types thus far recognized include Pensa- cola Incised (1 bottle and 4 bowls), D'Olive Incised (2 shallow bowls), Mound Place Incised (3 bowls), and Mississippi Plain (at least 2 bowls) (Gobleu 1978).

Also present are some vessels apparently from the segment of the Mississippi Valley between southern most 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 Parka Punctated (Philips 1979).

Two other vessels originated in the Mississipp Valley south of the Arkansas River or possibly in the drainage of the Big Muddy River in central Missouri. One is a Plaquemine Brushed Jar, the other is a Leland Incised bottle (Philips 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 Sporo Engraved (a bowl) (Newell and Kreh 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 might come from the area of the old embellishments or Fort Valley trade area to the east and southeast.

Appendix. Abbreviated Type and Variety Descriptions

Mississippian Plain. This type includes all undecorated vessels with shell-tempered clay. This type is used in narrow sense to refer to incised, engraved, painted or painted designs. Thus, vessels exhibiting only modeled or applique embellishments are still subsumed within Mississippian Plain.

variety Hole-This variety is defined by the presence of a "honed" surface. Hole tends to have somewhat smaller temper particles than above. However, the surface is left unfinished, because the two varieties are quite a bit in their respect. Hole most commonly occurs in the form of bowls and jars. It should be noted that Mississippian Plain black Painted, along with numerous varieties whose surface color did not fit with the latter type (for illustrations, see Mowry 1905: Figs. 6, 12, 13a, 26, 78, 99, 100, 129, 135, 136, 144, 151, 152, 154; Moore 1957: Figs. 8, 9, 11, 13, 15, 18; Da-Cetre and LeBlanc 1903: 97 bottom, 300- 339, 369-369).

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

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vory Montebello—In this variety the design is established with a swoop of short incising radiating upward from, and nar- rowing around the top of, the badly formed neck. vory Geovallee—The design in this variety is made up of an arc or arc sections which occur either un- embelished with radiating incisions or punctures.

vory Castile—Iroquoise—This variety is established with punctures above the arch.

vory Carthage—Iroquoise—This variety is defined to include shell tempered vessels with a burnished surface that are decorated with broad, undulating incisions. Typically these incisions are from 1.5 to 2 mm wide, and are U-shaped in cross-section, having been ex- ecuted by scraping. This variety is considered one of the most common vessels in Carthage because it is relatively thin and has a low profile. The incised lines are usually embellished with dots or punctures at intervals. The design is executed with incised lines and punctures above the arch.

vory Carthage—Iroquoise—This variety is characterized by the presence of marked arches arranged end-to-end around the vessel's circumference. At Montebello, these arches have been observed in this variety.

vory Hempstead—This variety is defined to include shell tempered vessels with burnished surfaces which are decorated with either simple geometric patterns or finely decorated geometric patterns. These vessels are characterized by the presence of a single, prominent incised line around the vessel's circumference.
In 1973, a site testing project was conducted on Middle and Late Woodland sites near Selma, Alabama. The research was part of an ongoing program begun with excavations at the site of Dunbar Bend in 1970 (Nance 1976) and continued through archaeological surveys during the summers of 1971 and 1972 (Jeter 1975). The results of the 1975 field work are contained in a series of articles by Jeter (1975) and Jeter and Nance (1978) and are partially published in an article by Jeter (1977). The project is conducted by the University of Alabama, Archaeological Research Center, 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, those for which data is given in general.

Several findings emerged from the study. First, for all sites, check stamped sherds tend to decrease from lower to upper levels and probably through time. This trend is summarized in Table 1. Secondly, for all sites check stamp sherds tend to have darker paste colors than plain sherds (observations were made using the Macbeth Color Chart; see Nance 1976:37). Table 2 lists by site the ratio of dark to light stamped sherds for both plain and check stamped samples. Where Late Woodland samples are compared with those from Middle Woodland sites two significant differences emerge. Late Woodland pottery is thicker 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 pe- search, are they even significant? The typological approach developed for Southeastern archaeology has been useful in developing regional chronologies. How- ever, since this typology is based almost entirely on temper and the presence or absence of surface decor- ative 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 differences among sites for ceramic studies can be explored. For Mazon (1965), ceramics can be rooted 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 knaps and projectile points, for example, represent an index of hunting activity (Fotkner and McCollough 1973). Enquiries into changes in structural ceramics, however, are largely absent. Selection processes relate to the size and weight of a vessel and 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 tech- nology, and this is another matter largely unexplored in southeast 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 stressing change in manufac- turing technology. Changes in vessel morphology could be due either to a new technology, new vessel functions, or both. In the most instance, functional de- mands will affect technological change, in turn 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 be- tween plain and check stamped sherds and also, in general, between Middle and Late Woodland samples. Montez refired 20 sherds, five plain and five

C. Roger Nance and E. Hollis Mentzer

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

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Table 1. Below, check stamped plain and tempered sherds by level. Middle and Late Woodland sites.

| Site | Period of Occupation | R | S | G | F | B | E | M | N | P | Q | R | S
<table>
<thead>
<tr>
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1. Number of check stamped sherds.
2. Ratio of plain stamped to plain sherds.

Table 2. Ratio, dark to light sherds for plain and check stamped sherds, Middle and Late Woodland sites.

<table>
<thead>
<tr>
<th>Site</th>
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<th>Dark</th>
<th>Light</th>
<th>R</th>
<th>P</th>
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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. Ratio, dark to light sherds for plain and check stamped sherds, Middle and Late Woodland sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Period of Occupation</th>
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</table>

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.
check stamped, Middle Woodland, and five plain and five check stamped, Late Woodland. These were referred to as 530-900 CE, indicating an oxidizing atmosphere, and all traces of blackness or greyness disappeared from the sherds. Then, the sherds were carefully examined for any differences between Late and Middle Woodland sherds and between plain and check stamped sherds. This process required the use of various techniques for each vessel type. Specifically, this was performed to explore the possibility of distinguishing the two vessel types by their surface texture, which is a characteristic feature of Middle Woodland and late Woodland vessels.

This brings us to the question of whether there are differences in the size of the vessel. In Late Woodland contexts, check-stamped vessels are significantly larger than plain ones. One possible explanation for this difference might be related to the vessel's purpose. The size of the vessel could be an indicator of its capacity or function, such as being used for storage or transportation. This explanation is supported by the observation that larger vessels are more likely to be found in contexts associated with higher social status.

Furthermore, the size of pottery vessels is an important feature to consider when interpreting their use. Larger vessels are generally associated with more complex social and economic activities. Therefore, it is plausible to suggest that the larger vessels found in Late Woodland contexts may have been used for more significant events or activities, such as ceremonial purposes or as symbols of power and wealth.

In summary, the size differences between Late and Middle Woodland vessels and between plain and check-stamped vessels reflect different cultural practices and social structures. These differences can provide insights into the way in which pottery was used and understood in the context of these communities.
and the site 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 reappearance of decorated paddle stamping in ceramic manufacturing.

It requires some discussion to see other possibly functional-technological elements 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 piston wares (Dicksen 1971; Jeter 1977). Also, check stamped rim sherds more often have flattened lips than do piston rim sherds. This can be seen in rim form data from sites Ds 78 and Ds 79 (summarized in Table 1). At other sites near Selma, the correlation is statistically significant. Table 5 summarizes rim sherds (tip forms for Late Woodland wares classified by Jeter 1978). A similar result was obtained from the Late Woodland component at Durant Bowl (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 1945; and Prairie Coad-Modeled, Milamich 1971:35).

Turning to the subject of chronology, researchers in the Selma area, including Dicksen (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 Late Woodland assemblages resemble those from the earlier DeSoto (Middle Woodland) sites in the area. In terms of absolute chronology, Dicksen 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 1957 Late Woodland sites, all with relatively high check stamped percentages. These range between A.D. 730 ± 60 and 750 ± 185.

The significance of all five radiocarbon dates may be due to Late Woodland occupation 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 plains developed by Fred (1952), Willey (1966) and others. According to this interpretation, Weldon Island I is contemporary with Baytown of the lower Mississippi Valley and therefore dates prior to A.D. 700. Weldon Island II components consist of those of Weldon Island I through their high percentages of check stamped pottery, and are held to be contemporary with Coals Creek, thereby postdating A.D. 700.

Therefore, for both the eastern Gulf Coast and the southern edge of the Gulf coastal plain, there may have been a post-Middle Woodland period, A.D. 500-700 with linear 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 another area is incompatible with this suggestion.

Discussion now centers on the matter of settlement pattern and subsistence: Following the excavation of Bend Point (Nance 1956) and the 1971 and 1972 says of 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 cited during 1975. Most of the remaining sites are probably Late Woodland (Jeter 1975).

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, At 7, (radiocarbon dated at A.D. 920 ± 100) and Lo 32 (radiocarbon dated at A.D. 550 ± 100). Nut shells are abundant in samples from both sites, with the exception of a possible squash seed from Lo 32, the only domesticated plant remains, come from the later site. Faunal materials from Durant Bend are from the Middle, and Late Woodland and the Mississippi period. While samples from Wood-land contexts are small, there does appear to be a trend through time from an emphasis on fruiting in DeSoto times to increased diversification in later periods (Thompson 1976). The more diversified floral patterns, including more small game, is also evident in remains identified by Dicksen (1971) for the Late Woodland.

In summary, the Selma area data at least suggest a Shift from small villages with economies based on

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Table 1. Correlation of sites 1971

<table>
<thead>
<tr>
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Table 2. Sites by 1971 and 1972

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<tr>
<td>Group 3</td>
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<tr>
<td>Total</td>
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Table 3. Sites by 1971 and 1972

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Table 4. Sites by 1971 and 1972

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Table 5. Sites by 1971 and 1972

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<td>48</td>
</tr>
</tbody>
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1. Early from Jeter 1959 (July 9)
marily on hunting and gathering in Middle Woodland times to a 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 Curran (1957) 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. Milam's summary of 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—there sorts 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 access of the Alachua tradition (Milam 1971:46).

Similar developments are being recorded elsewhere in the Eastern Woodlands (e.g., Munson 1956; Gibson and Cate 1970).

The same diversification in hunting practices found for the Selma area is also described for the Tombigbee River sites (Curran 1957), and this led Jenkins and Curran 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 stamp or bowl bases in the Late Woodland makes, 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 applied to agriculture produce thick sherds, high percentages of these paddle-defined, design-impressed sherds, relatively thick design-impressed sherds, and high proportions of flat-topped and folded rim sherds, particularly on these paddle-defined impressed sherds, and as these tendencies fail to materialize for contemporary or earlier non-agricultural sites, the hypothesis will be supported.

References Cited


1928. Excavations at Middle and Late Woodland sites near Selma, Alabama. Unpublished report to the Alabama Historical Commission and the U.S. Department of Interior from the University of Alabama in Birmingham.


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 level 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 (1953, 1958) earlier views, and it is separated from Macro-

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

<table>
<thead>
<tr>
<th>Phylum</th>
<th>Family</th>
<th>Isolate</th>
<th>Age of Divergence</th>
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</thead>
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<td>Gulf Phylum</td>
<td>(6000 +)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Siouan Stock</td>
<td>(5000)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Siouan Family</td>
<td>(3000)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Natchez Language</td>
<td>Catawban Family</td>
<td>(3000)</td>
</tr>
<tr>
<td></td>
<td>Tuscarora Family</td>
<td>(3000)</td>
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<td>(3000)</td>
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</tr>
<tr>
<td></td>
<td>Tunican Family</td>
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<td>Tunican Family</td>
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<td></td>
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<tr>
<td></td>
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<tr>
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</tr>
<tr>
<td></td>
<td>Caddoan Family</td>
<td>(4000 +)</td>
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</tbody>
</table>

Algonquian. Gulf is extended to include Yuchi, Timucu-Tawana, Karankawan, Tomoka, Coe-

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 Algon-

A different pattern is found in the occurrence of the Gulf languages, excluding the Muskogean and Siouan Families. Here there are two 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

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James W. Springer and Stanley R. Witkowski

**A REASSESSMENT OF SOUTHEASTERN LINGUISTICS AND ARCHAEOLOGY**

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**Southeastern Archaeological Conference Bulletin 22, 1990**
standards, and political and linguistic groups were small and heterogeneous. By analogy, the rich coastal environments of the Gulf, exploited greedily by hunting and gathering, either favored small and isolated lan-
guages 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, Muskoge
gan, 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 arche-
ological 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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Turville-Petre, R. 1962. The proto-Gulf word for land (with a note in Proto-


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

Arlene Fradkin

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 Builder Point site on St. Simons Island, Georgia, are contrasted with the information recorded in the associated historical docu-
ments.

The site is located on the former Hampton Planta-

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tion and most probably represents the remains of a slave cabin of the early 19th century. The major writ-
ten record is a journal that had been kept by the famous English actress, Frances c.ime Kenbilee (1801), the wife of its absence owner. She had visited his estate for a period of two months during the winter of 1838-1839. Kenbilee, who only learned of her hus-
bard's southern property investments subsequent to her marriage, was vehemently opposed to the institu-

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tion of slavery and thus she painted a brutal and per-
haps exaggerated account of slave life. Her journal is
replete with the plight of the slaves and their con-
tinual petitions for food. Another journal by Frances's
dughter, Frances Butler Leigh (1957), gives informa-
tion on the condition of the estate after the Civil War.
Finally, sources from other plantations provide a more
complete, though by general, picture of slave condi-
tions 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 ma-
terial was quantitated 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 ani-
mals'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
highest possible edible meat weight totals.

The analysis of the faunal sample indicates that
the slaves living at the Hampton Plantation were consum-
ing both domestic and wild foods. The following dis-
cussion 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 Planters' Rations

The domestic portion of the slave diet was pri-
marily derived from meat rations provided by the
planter. At Butler Point, the relative bone weights of
large domestic animals seem to demonstrate a sur-
prisingly high consumption of beef. Cattle bones com-
pounded 41.3% of the total faunal weight. The cattle
elements recovered indicate that the slaves were con-
suming internal 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:
273). Documents from several other plantations along
along the Atlantic coast also discuss the distribution of beef

Pigs contributed substantially to the diet, though
to a lesser extent than cattle, and consisted 5.4% of
the total MNI and 10.2% of the total bone weights.
The evidence from the faunal remains indicates that
they were using the scanty meat portions of the pork,
hearts, shoulders, and lower legs of both immature
and adult pigs. In addition, they probably consumed some
of the internal organs such as intestines, or chitterlings.
Hognaught was often used in the preparation of vege-
table 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 hognaught and describes
one incidence of a stolen ham from the planter's
kitchen (Kemble 1961:189). The archaeological re-
nains 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 birds were present at
the site, such animals probably were not food items
and therefore were not included in the total calcula-
tions. It is suggested that they were kept in order to
scare away the vermin such as rats and mice that com-
monly infested the slave quarters (Kemble 1961) or they
may have possibly been used as fish bait (Otto 1975:355).

Food Supplements

The faunal evidence indicates that the slaves sup-
plemented their basic rations by the hunting and fish-
ing 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., Hamp-
ton and Altamaha Rivers (USGS 1954; Martinez 1975).

The live oak forests were the major source of ter-
restrial 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, re-
spectively.

It is interesting to note that evidence for the use
of foraging is lacking in the plantation's archaeological
record. Furthermore, Kemble states that the Hampton
slaves were prohibited from possessing such weapon
(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 rac-
coons, opossums. These animals are nocturnal and
may have been captured with traps during the slave
and dusk hours, which were the only leisure hours
that the slaves had (Genovese 1974:486-487). Several
historical accounts mention that opossums were initi-
ally prepared by parboiling and then were roasted
with food 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 planta-
tion. 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 (Mawrting 1972:46). Mention is
made of the frequent gathering and consumption of
oysters and clams (Kemble 1961:357; Leigh 1977:
124). Furthermore, the slaves did possess canoes
(Kemble 1961:90) which may have been used for
fishing such fish as catfish, shadpole, and drum,
important food supplements. Of special interest is an
incident in which Kemble noticed the master cook at
the plantation saving the interval 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

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of turtles, such as chicken turtle and diamondback terrapin, and alligators (Martinez 1955:41; Kemble 1961) that were occasionally collected by the slaves. Finally, birds were hunted, though, infrequently. Large numbers of waterfowl, such as herons, gulls, long-billed curlews, and lesser scapular 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 1955:37). 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 (1961:88) 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 73.4%, respectively, represented a significant amount while the planters' supply, 14.3% and 24.6%, respectively, 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 (22.1%) 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 factual 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.

Acknowledgments

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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 one of the best archaeological evidence of local forest compositions 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 Paleoenvironmental 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 adjustable 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 500°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-woven pitting they exhibit. Black locust exhibits vesture pitting on the vessel walls and osage orange exhibits non-vesture pitting. The SEM will have to be used to separate these genera until reliable differentiating characteristics 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 species of a particular genus such as Caryae (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

We greatly appreciate the help of Dr. Harold Core, the University of Tennessee Forestry Department. Dr. Core provided facilities and wood samples. We also thank Dr. Day of the Electrom Microscopy Laboratory at the College of Environmental Science and Forestry at Syracuse University for preparing the micrographs used in the presentation of our paper.

Analysis of paleoarcheobotanical remains from the Toqua site is funded by Heritage Conservation and Recreation Service contract # C590(78) and Tennessee Valley Authority contract # TV88-I7A.
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 road construction on the banks of the Ohio River. The funding was provided by the U. S. Army Corps of Engineers, under Mass-Bennett Act Legislation (PL 92-293) and the contract was administered by the Atlanta Office of the Interagency Archaeological Service.

Excavations at the Rosenberger site (15J16) 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 170 contained human burials. Assessment of the diagnostic artifacts, burial patterns and physiology of the skeletal remains indicated the presence of a predominantly Late Archaic occupation at the site, with suggestions of peripheral Middle Archaic and Early Woodland manifestations (Collins 1980).

Approximately one third of the burials contained associated artifacts, which included ground stone axes, atlatl components, projectile points, bifacial projectile and bone awls and needles. Perhaps the most impressive of the grave goods is the cache of bifaces associated with Feature 400. Examination of this feature revealed a series of closely spaced bifaces cached adjacent to a slightly flexed burial (Figure 1). An attempt was made to salvage the burial, however it is 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 slightly flexed adult.

The cache consists of 28 closely spaced bifaces, with three additional bifaces which were found in a disturbed context near the cache. This disturbance was caused by earth-moving equipment passing over the feature and resulting in damage to several specimens and loss of the tip 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 shell and a drum fish tool.

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 in the cache share a number of features. They are lanceolate in outline with slightly extended sides which converge to very acute tips. The bases are straight and the edges are normally regular, although occasionally they are slightly rounded. The widest point on the bifaces are normally one-fourth to one-half the length from the base; the point is long and acuminate; the tool is used as a cutting or spokeshave. The bifaces are finished by being flaked to a desired shape (Figures 2 and 3).

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. Grind- ing is present on the basal portions of the bifaces and all of the specimens from the cache have been manu-
factured from Muldraugh chert, a locally available ma-
terial.

Five measurements were taken on each of the bi-
faces (Figure 2). The range for each are: length 72 to
176 mm, width 28 to 53 mm, thickness 8 to 15 mm, base 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 longi-
tudinal 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.

The primary trimming of the bifaces was accom-
plished by platform preparation. This is evidenced by
the presence of small, short hinge fractures along por-
tions of the flake margin. These flake scars appear to
be the byproduct of a rasping motion to strengthen
the edges at 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-

The variation subsumed under the general char-
acteristics 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 59 complete bifaces
yielded a dendrogram which defined the two groups
(Figures 5 and 6). The 2MINIT program from the
NETSYS package was used (Robhll, Kishpaugh, and
Kirk 1974). The input data consisted of the raw mea-

Table 1. Metric attributes in mm.

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<tr>
<th>Biface Number</th>
<th>Cluster</th>
<th>Length</th>
<th>Width</th>
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Figure 3. Relationship of bifaces in cache, Feature 400.
Figure 4. Bifaces from Feature 400.

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Figure 5. Length of bifaces (mm), Feature 390.

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

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 a graphically alternating pattern. 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 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 60 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 7. Basal width of bifaces (mm). Feature 400.

Figure 8. Length from base to widest point of bifaces

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The Okefenokee Swamp Area Survey—A Status Report: 1978

C. T. Trowell

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 study 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

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archaeologically sensitive area. 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 Cobaw Island, a limited subaerial 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). Subaerial features were found in the village area. Charcoal from a pit associated with the features yielded a C-14 determination of 955 ± 195 B.P. or A.D. 955 (UGa-2156). Another limited test was made about five miles to the south at site 42 GI 34 in the Dowling Sit Complex. Features and relatively undisrupted artifacts were found in a moist site about to be planted in pine. Neither 9 We 1 nor 9 Cr 31 were deeply plowed and hedged with equipment currently used in land preparation in the area. Several local land managers 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 Mixtos 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. Geological Survey maps. A surface 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 26), the Widow Lake Site (9 Cr 3), the Groves Old Field Site (9 Cr 51) and the Alligator Creek Blister 1 Site (9 Cr 55) see Fig. 1. While this technique has proven to be effective for locating sites in this area, post-harvest techniques used at 9 We 1 have been less productive.

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 by texting as the survey continued. (See Table 1. Sites are inferred from chronologies from Florida, south Georgia, and the Georgia coast.) Little evidence of Paleo-Indian and early Archaic occupations has been found. It is possible that this evidence is deeply buried in this area. The only period of extensively dense settlement within the Swamp seems to have been during the late Woodland period. Evidence indicates that during the late Weeden Island Phase a sizable aboriginal population occupied the Swamp, but it was confined to the Swamp, its perimeter, and along the Suwanee River to the southeast. 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 Staffing Island and Satilla types. Early in the survey, fiber-tempered and semi-fiber-

telephones found on disturbed mounds were assumed to have been secondary deposits by Weeden Island mound-building activity. Recently, evidence from subaerial tests at 9 Cr 31 and from low mounds in the Barrows around the Swamp suggests the possibility of landscape engineering during the late Archaic and early Woodland period. 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 change. 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-woods 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. 500-800. No data are available for the A.D. 600-1200 period. Climate since 1700 was wetter than normal (Sparksman 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 hunters have noted the tendency for "Indian trails," including mounds, to be located in hammocks. Many of the sites on the Swamp islands and on the perimeter are associated with aerie and mastic 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 spears are not indigenous to the area, but were introduced by Indians. One question that will be investigated is when these species were 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 preferences/recreational distribution: Okefenokee Swamp area, Georgia (1932).

<table>
<thead>
<tr>
<th>DATED</th>
<th>CULTURAL TRADITION</th>
<th>HABITAT PREFERENCES</th>
<th>AREA DISTRIBUTION</th>
<th>AREA CONCENTRATIONS</th>
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<td>BEFORE 1,000 BP</td>
<td><strong>Early Archaic</strong></td>
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<td>EPW, WNW, Quiva Park</td>
<td>Storm-known</td>
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<tr>
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<td><strong>Late Archaic</strong></td>
<td>St. Simon, Swainsville</td>
<td>EPW, WNW, Swainsville, Bluff Creek</td>
<td>Storm-known</td>
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<tr>
<td>1,000-2,000 BP</td>
<td><strong>Early Woodland</strong></td>
<td>Satilla (Ricwood)</td>
<td>EPW, WNW, EPW, Satilla</td>
<td>Storm-known</td>
</tr>
<tr>
<td>2,000-3,000 BP</td>
<td><strong>Middle Woodland</strong></td>
<td>Satilla, Bluff Creek</td>
<td>EPW, WNW, EPW, Satilla, Bluff Creek</td>
<td>Storm-known</td>
</tr>
<tr>
<td>1,500-600 BP</td>
<td><strong>Late Woodland</strong></td>
<td>Savannah, Bluff Creek</td>
<td>EPW, WNW, Savannah, Bluff Creek</td>
<td>Storm-known</td>
</tr>
</tbody>
</table>

**Habitat Preferences**

- **Ricwood**: Savannah, Bluff Creek
- **Satilla**: Savannah, Bluff Creek
- **St. Simon**: Savannah, Bluff Creek
- **Quiva Park**: Savannah, Bluff Creek
- **Tallahassee**: Savannah, Bluff Creek
- **Ricwood**: Savannah, Bluff Creek
- **Bluff Creek**: Savannah, Bluff Creek
- **Savannah**: Savannah, Bluff Creek
- **Auburn**: Savannah, Bluff Creek

**Area Distribution**

- **EPW**: East Savannah, Bluff Creek
- **WNP**: West Savannah, Bluff Creek
- **Savannah**: Savannah, Bluff Creek
- **St. Mary's River**: Savannah, Bluff Creek
- **River 200**: Savannah, Bluff Creek

In conclusion, the Black Swamp is adjacent to the Swamp, also the result of Indian activity. Many of the sites in the Black Swamp area are associated with these features.

Many low "mounds" have been located in the flatlands area and along the Swamp periphery. 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 local debris. A few of these features contained potsherds, especially fiber-tempered and slipped sherds. Two of these features that were examined carefully showed very limited preparation activity containing Putnam projectile points, a salted scraper, and lithic debris. The formations vary from 5" to 10", are 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 flatlands. One small area of less than 30 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 Black Swamp to the east of the Swamp. Are some of these features related to the low mounds at Waverly Creek north of Kingland in Camden County? This low mound contained several fiber-tempered potsherds and numerous post-molds (Dwight Kirkland and Fred Cook, personal communication). They are related to the late Archaic-Carib Woodland sites reported by Sears and others in Florida (Sears 1977; Prokopetz 1979; Coggins 1918; Buleyn 1975); Are they related to the Refuge Phase mounds on St. Catherines Island that are being investigated by David Hurst Thomas? (Chesier DePratt, Personal Communication). Are they natural features formed in the pristine environment of the Pleistocene and early Holocene and were they selected for use by aborigines? Whatever their origin, these sites may contain significant evidence of man's use of the flatlands 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 Householder phase, (3) The Suwanee Canal Company, Hubbard 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. Bilby Island, Camp Cornelia, and other settlements will be studied in some depth. Bilby Island, a lumber camp of 600

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CERAMIC CHRONOLOGY IN THE GAINESVILLE RESERVOIR
nommenclature are those detailed by Phillips (1970:20-31). In the present study, the ceramic assemblages are segregated into varieties which are formulated on the basis of morphological and textural characteristics. Several varieties may, in turn, be grouped into types on the basis of certain common cultural 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 stratiﬁed 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 dissimilarity between these units based on type-variety covariation. This scaling may then be temporarily interpreted by several means including C-15 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 result of research by previous researchers (Nielson and Jenkins 1975: Brief, 1977: 75-76; Jenkins et al. 1973: 22-23). The present study represents a sequence originally defined by Jennings (1941, 1944). The techniques presented in...
this paper are based primarily on the association of non-local or "traded" sherds found in consistent asso-
ciation in approximately 300 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 Missis-
sippi in the form of the fiber tempered Wheeler series. These ceramics and the succeeding Alexander ce-
eramics of the Henson Springs phase have a southern origin. They are products of a long ceramic develop-
ment in the southern Coastal Plain referred to as the Gulf tradition (Caldwell 1968; Bullen 1970, 1974).

The genesis of this ceramic tradition is traceable to Atlantic Coast components of the Stallings Island cul-
ture (Farbanks 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 (1958) as the Gulf Formational Stage. It represents a stage intermediate between the Archaic and Woodland Stages, and is divided into three se-
quential 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 HJ379 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 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 cer-
eramic bearing midden have been found, not have numerous pit features, which could be associated, 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 (1973a) 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 Alex-
ander series date as early as 1000 B.C., the time and area where these attributes first occurred to form an Al-
xander-like complex is not certain. Jenkins (1973a) and Walthall and Jenkins (1976) have hypothesized an
origin for this phase 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 was never introduced into the
Tombigbee drainage. D.A. 1 from northwest Alabama where Flint River Cord Marked is a major
type produced by a Middle Woodland culture which constructed some mounds (Jenkins 1978). Future re-
search in northern Alabama and Mississippi should test this hypothesis.

The Miller culture sustained a long continuum of 100 years, 100 B.C.-A.D. 100. This continuum has been
divided by Jennings (1941, 1941) into Miller I, II, and III. Presently, there have been greatly supple-
mented Jennings' and Cotter and Corbett's (1951) work and we can now further divide the Miller se-
quence into subphases. Although cord marked, plain, and fabric marked were the major surface treatments for
1000 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 Stall's Plain and Safilo Fabric Marked. This subphase is
best represented at Mound D at the Bynum site (Cotter and Corbett 1951:21) and at site 22Lt62 (Jennings 1951). 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 Furr Cord Marked as a
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minority type along with Baldwin Plain and Satillo Fabric Marked. The appearance of Furr 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 Furr Cord Marked was found in a feature dug from the surface of the platform. Furs Cord Marked was also a minority type, 5% of the total, whereas the old humus of Mound E (Bohannan 1972: Tables 1-2). Marksville Stamped var. Marksville is securely dated between A.D. 1 and A.D. 200 in the Lower Mississippi Valley (Tooth 1975). Excavated components of this Miller I subphase are best demonstrated at the Pharr Mounds, and Mounds A and B at the Byum site. It is during this subphase that the Miller culture is most actively participating in the Hopewellian sphere of interactions. The estimated date for this subphase is A.D. 1 to A.D. 200.

After the initial appearance of Furr Cord Marked, it increases in frequency starting about A.D. 250 to form a major type. By the late Miller I subphase, Furr Cord Marked was a major type, although it was still outnumbered by Satillo Fabric Marked. At Site 10E2, in the Gainesville Reservoir, Furr Cord Marked accounts for approximately 20% of the late Miller I ceramic complex. A few sherds of Marksville Stamped var. Mannky and Marksville Incised var. unstamped were found in association with this complex (Johnson 1972: 108). In the Lower Mississippi Valley, Manny Stamped is dated from A.D. 250 to A.D. 400, in the late Marksville (Tooth 1975) 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 Satillo Fabric Marked decline, and when Baldwin Plain is the dominant type, followed by Furr Cord Marked. At the end of this phase, Baldwin Plain continues to increase in frequency, however, Furr 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 1938). Early Miller II ceramics are Furr Cord Marked, while only 11% are Satillo 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 been replaced by the most distinctive changes of the Miller continuum and numerous non-local ceramics occur in the features. Approximately 20% of the local Miller ceramics are plain. Furr Cord Marked now comprises only approximately 5% of the local ceramic complex. A narrow dowel variety of Satillo Fabric Marked, var. China Bluff which had always been an obscure minority, now comprises as much as 25% 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 unknown example appears to be Baldwin Plain. Gray 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 17.5% of the 50-100 grit tempered ware, Mulberry Creek Card Marked 20%, and Willikers Fabric Marked about 5%. Rare grog tempered types which also appear at this time are Gainesville Incised and replicated Stamped and an early variety of Wheeler Check Stamped. The complicated stamped pottery consists of doppy concentric circles and appears to be a grog tempered copy of Late Swift Creek Complicated Stamped. The check-stamped vessels are often angular or rectanglar to linear check, grog tempered version of McLeod Linear Check Stamped.

The late Miller II subphase is marked by numerous non-local ceramics occur in excavation pit features. Limestone tempered ceramics occur commonly in northeast Alabama, include Mulberry Creek Plain, Wight Creek Stamped, and Pickwick Complicated Stamped. These types are believed to have been produced by the late Miller II subphase at Site 36 Middle Woodland Coonera culture (Waltz 1973). McLeod ceramics occur in the same late Miller II features as the Coonera 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 Killis 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. 550-900.

John O’Hearn and T. L. Conn (1977) have obtained radiocarbon dates on A.D. 680 and A.D. 715 from a late Miller II component on upper McKays Creek, which lies in the extreme northern portion of the Miller area and 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 of the Gainesville Reservoir it appears that grog tempering does not reach the Tennessee Valley and Tombigbee drainage area before it enters into the central Tombigbee area. That is to say, the presence of this limestone tempered complex in the late Miller II sites 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

Currenty 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 1P61. The local Miller ceramics in these features are mostly 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.

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town 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, 84% is Purrs Cord Marked and 3% is Sattillo Fabric Marked var. Chine 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 ce-

ramics 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 IG1x1 and IG2x2. Also the Coffendon site fits nicely within this subphase (Blakeman et al. 1976). A series of radio-

carbon 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 47% 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 Simple Stamped, Evansville Punctate, Averyvilles Punctate, and a variety of Wheeler Check Stamped with large rhomboidal checks, comprise about 1% of the total ceramic count.

In the late Miller III subphase the late Miller III subphase have been excavated at sites 1P61 and 1P153. 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 Miller III style, but new types appear. A very small amount of shell tempered pottery is added, usually amounting to not more than one to two per-
cents 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 orienta-
tion to semi-extended on the back or side with heads oriented to the east. It is more complicated to say 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 Gaines-

vilIe phase to the early Mississippian manifestation which Marshall (1972) refers to as the Tchibbee Creek phase. The one available radiocarbon date for this phase is 900 A.D. 1310 ± 65 years. Ceramically there is little evidence for a development from the fabric and cord marked Miller ceramics into the incised and en-
graved Gainesville complex forms. Current evidence suggests that initially there may be a distinct Wood-

dland population and an intrusive Mississippian popu-

lation sometime between A.D. 1000 and A.D. 1100 and possibly slightly later. During this time period the Woodland peoples conquered and displaced the late Miller III complex, to the Mississippian lifeway. Future mitigation and research along the Tennessee-Tombig-

bee Waterway should test this model.

Mississippian Stage

When and how the Mississippian stage began within the Tombigbee drainage is not well under-

stood, 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 re-
cangular structures appear, and are very similar to those being made during the Fairmount phase of the Cahokia area (Hall 1972).

We have a fairly detailed knowledge of Late Wood-

land ceramic development and we cannot document an evolutionary sequence from the late Miller III complex into an early Moundville complex. When the First Moundville complex appears at A.D. 1000, a new type of ceramic complex appears. A very large amount of shell tempered ceramics are added, and the Gainesville simple stamped and Evansville punctate forms disappear completely. Ceramically there is a much 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 streaming of Mississippian culture occurred and displaced the local late Miller III population. The most logical hypothesis is that the late Miller III population was quickly ac-

cultivated by an intrusive population which possessed a much more efficient technology. Such an accultura-
tion 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 Tombig-

bee 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 develop-

mental 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; Curten n.d.). (2) There is a long Woodland de-

velopmental continuum in the adjacent Tombigbee Valley, represented by a population that grows sub-

stantially 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

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late Miller III times plain ceramics start increasing in frequency 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 1P33. 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 1P33. Although there is not as much ceramic variability in the Kellogg cemetery, the ceramics are identical to those from 1P33 and Moundville.

At this point it seems appropriate to ask, "Do the 1P33 and Kellogg cemeteries belong in the Moundville phase?". It is clear that the answer to that ques-

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The data suggests that Moundville ceramics are present in the early Mississippian phase in the Tombigbee Valley, and that the Moundville component is similar to the ceramics found at the Kellogg site. This indicates that the Moundville culture may have influenced the early Mississippian phase in the Tombigbee Valley.

Figure 1.

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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 1Grlx1, 1Gzl2, 1P061 and 1P035. Pitos chosen for analysis were those which did not have discernable intrusions and which contained ceramics from predominately one cultural phase or subphase. Burials and postholes 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 underway 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 Whalen (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 anterior 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. Suirewe (1968) argued that a 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, Parmelee, Palomous 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 increased. 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 size clodronation 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. Fractional 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 sodium hypochlorite is used to separate the heavy fraction. This, however, was not effective—field 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 1 a 1% to 5% sample was analyzed. For one of these large features in which the estimated 1/16 inch bone weight was 1,890 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 undifferentiated). In the occurrences of fish and small mamal bones, the weight of each element of the faunal species is 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 were 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, the report will 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 subsophases.

For the purpose of this report, I have divided the features into two groups: primary and secondary pits. The primary features are those pits which I believe have a greater probability of containing faunal material that was not purposely thrown into them. In the case of the multicomponent sites, this means that bone from earlier periods could be unintentionally included in later pits. Of course, this could be said for all features, but I contend that it is 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 the secondary pits is generally characterized as undistinguishable 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 ref.
ence 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 analysed bone by count. Fifty-seven percent of all the features examined were classified 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 intentions pertaining to resource availability around the sites, the secondary features will be included.

Coarse to the understanding of prehistoric subsistence is a knowledge of the past physical and biological environment. Gladys Caddell has completed a map depicting the reconstructed prehistoric environment of the Tombigbee riverine area within a six mile radius around each site. Caddell’s (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 proportion 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 animal 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 80% 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 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 level. The majority at the undistinguishable bone probably consists of mammal fragments, primarily deer.

When comparing faunal remains between sites, a consistent pattern is discernable. Deer accounts for a little over 1/2 of the identified elements. Turkey bone represents about 27% and the remaining categories, mammal, other, bird and fish, each fall between 2% and 5%. 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. 1976 Blakemor 1975, 1956). Such an increase could have had an impact on the local resources and local resources. This imbalance is viewed as population pressure by Cohen (1975) who has identi-

fied several population growth indicators based upon changes in food resource 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 pattern from Miller II to Miller III.

There appears to be a trend from Miller II to Mill-
er 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, gray 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. Rabbits, raccoon, opossum and squirrel are the most frequently followed by gray fox, beaver, skunk, dog, mountain lion, mink, rac-

raus, 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 500% 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.

References Cited:


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, the evidence is the other way around. 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 because 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 Watershed will permit more certain identification of flint knapping techniques.

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 the steps in the process and, it is hoped, 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 hierarchical terms will be used in relation to manufacturing processes. Four 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 a 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 hands 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 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 pro-
posed for the bifacial 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/Ks. 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 were large and were composed of available Tuscaloosa gravels, or angular pieces of the fissillarous 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 bifacial manufacture, and the examination of the flaking qualities of chert. Though not usually classified as bifaces, cores are included here as being one potential step in the sequence of bifacial manufacture.

Preform 1. The Preform 1 category contains thick artifacts with rough, aoid 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, re-touched, ovoidal to triangular bifaces. Edges are regular and unflaked surfaces are rare.

Projectile Point/ Knife. The category Projectile Point/ Knife 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 (Potato 1977). The second group contains the PP/Ks without haft elements. They are separated from the bifacial 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, reouch flaking on the edges, probably done by pressure.

Drill. Drills are tools with a long narrow bit, suitable for boring and use in a rotary motion. Most are apparently reworked PP/Ks.

Hepia End Scraper. These artifacts are apparently reworked PP/Ks 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 a new cutting 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 mostly with the performs and biface blades. The two initial steps, production of cores and of Preform 1, can be inferred from the prior characterization 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 it 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/Ks 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 necessary.

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 tentative 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 9Pr11 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 class in each category was used, and is presented in Table 1. Summary statistics for the data are given in Tables 4 and 5.

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 classified 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 the selection of a particular range 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 Spence et al. (1968) using a program written
in the lab for use with a programmable calculator. It 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 this 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 1Fr590 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 1Fr591 are in the ranges of the length and width of the biface blades. This is due to the presence of a few unusually large biface blades.

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Table 6. 14PP11 perforated and biface blades, summary of waste area.

<table>
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<th>No.</th>
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<th>Mean</th>
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<td>Weight</td>
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<td>Biface Blades</td>
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<td>Biface Blades</td>
<td>21 184 26 61 75.8 22.8</td>
<td></td>
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</table>

reach significance, while the majority of the results were as predicted, and most were significant at the one per cent level of confidence. All in all, I think it 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 Perforated 2 from 1PP90, and the unusually long biface blades from 1PP31. 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 1PP31 increased total deviance as did one long Perforated 2 at 1PP90 where most were exceptionally short (Table 5). The other, smaller, increases in the standard deviation of the variables may or may
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 paper, which occurs in cobbles up to about 19 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 baking 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 1Fr310 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
ripped flake scars. This indicates that these artifacts have been heated, but not necessarily as part of the manufacturing process. The find class contains three 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 bevelage 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 being "heated" in the heated class. This class was used as a check mechanism to evaluate the possible occurrence of heating of chert either prior to the 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 indicates that nodules or cores were not being heated, and support was over gained for this. On the other hand, unheated projectile Point Knives of yellow chert are rare, two were found at F1551, and one at F1550. The same bifurcation of chert types by artifact type has been noted before for the Bear Creek Watershed and nearby areas using similar raw material (DeJarnette et al. 1973; Hooper 1968; Joselyn 1960; Myers 1970; 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 is Table 6 may be grouped in a four cell matrix for each site, heated and unheated, preforms and biface blades. At F1551, half of the 52 preforms are heated and half are not, but only one biface blade of the forty-four has not been heated. Two-thirds of the preforms from F1590 have been heated (19 of 29). The sample of biface blades contain only two specimens, both heated. (This low figure is caused in part by the large number of fissile/brittle biface blades on the site. 51% concentrated to 31% at F1551. The significance of this difference is not yet known.)

During the analysis, no invoice 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 removed after heating, from artifacts previously flaked before heating.

Considering all the data, it seems that the heat treatment of yellow chert was an integral part of the lithic technology in the Bear Creek Watershed. It enables the subdivision of sequence as an optional step after flaking the Preform 1. This option was apparently chosen in most cases. After flaking the Preform 2, heat treatment 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 treatment 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 change 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 specified. For example, the model as presented herein, considers only the primary product of each transformation. It would probably be possible to approximate the kind 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 of the artifacts and their relative abundance. Second, it has served as a source of stimuli for additional potential data, and pointed out areas where such research might be productive.

Acknowledgements

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References Cited


Smith, Barry C. and Eugene M. Furon. 1975. Archaeological investigations in the Little Bear Creek Reservoir, Opelika of Archaeological Research, Research Series No. 1, University, Alabama.

The purpose of this paper is to describe, evaluate, and present a discussion of the archaeologically significant prehistoric lithic technologies in the central Tombigbee Valley. These successions represent 16,000 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-ecology, 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 1909; Copeland 1968). Geologic processes of orogeny, subsequent erosion and deposition have created the major physiographic 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 (Cope land 1908). 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.

Plaquachoe 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

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

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 Llamar 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 of these chert outcrops 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 is 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 pitted 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 Gaines-
ville 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 hand 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 1 hour at temperatures of 250°C, 500°C, 750°C, and 450°C. The specimens were placed directly in an electric glass 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 Yannell 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. Color 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-browns to dark reds depending upon the degree of heat applied. Much of the material possessed lanuitic flame scan at 40°C. Table 2 shows the relative amount of luster occurring after each heat run. A numerical value of 1 was assigned to dull surface, 2 was designated as lustrous, and 3 signifies a highly lustrous flame scan. Most samples turned only a mottled yellowish-brown on the inside and yellowish-red on the outside where heated to 250°C. However the 300°C run produced marked changes from yellowish-brown to deeper yellowish-brown in most specimens. Subsequent temperature runs of 350°C and 450°C produced a opening to a red color. Minimal thermal explosion occurred during these tests. Some thermal cracking was noted at the 450°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 H phase groups: Late Woodland Miller III phase lithics were not so easily replicated. The majority of Miller III phase lithics are extremely fire cracked and crazed, exhibiting numerous pit lid fractures and discolored surfaces. In an attempt to replicate this phenomenon, unaltered cobbles taken from the Tomollee 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 spells produced by this technique were identical to those which literally cover many Miller III sites. The color produced at this temperature was a consequent dark red. Subsequent flaking experiments verified the highly lustrous quality of materials so processed. In addition, knapping experiments by the author show that hand hammer flaking quality is enhanced. Pressure flaking is also made much more predictable and efficient with the application of heat (Mike Wilson, oral communication, Oct 1978). As exported, point tensile strength is sacrificed with these improvements in flaking quality.

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*Color indeterminable.

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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 of this data 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, 1Grlx1, 1G2r and 1G50, 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 size of local cobble deposits, relied heavily upon bipolar percussion flaking. The extreme toughness of the local non-heated treated chert has been verified through knapping experiments. The tool kits present in the Archaic strata of the Gainesville Reservoir sites reflect this tendency. Specialized tool forms which are manufactured from local unaltered chert are rare.

The earliest evidence for this particular bipolar technique occurs at site 1Grlx1 and is associated with Dalton projectile points. In the Early Archaic zone, Dultons were recovered and cobbled and flake tools. These tools consisted of unifacially flaked side scrapers and hafted end scrapers, uniface cobbles scrapers, bipolar cores, bipolarly retouched uniface cobbles, and splintered wedges (pieces equiangles). All of these tools including the projectile points were manufactured from non-heated treated local chert.

At site 1G2r Kirk and Bifurcate Base projectile points were found in the Early Archaic zone. There were associated with uniface cobbles scrapers (Jenkins 1975). Bipolar cores, bipolarly retouched uniface cobbles, and splintered wedges (pieces equiangles) predominated along with hammer stones and anvils. 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 cobbled 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

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<td>Early</td>
<td>?</td>
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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 treated flakes are products of either bifacial thinning or retouch. The predominance of non-heat treated local material at these sites during Archaic times further emplifies this basic adaptation to local chert sources. The use of exotic and heat treated 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 cobbles core scrapers, cobbles choppers, and splintered wedges (pieces equilibrated). Conversely, more delicate knapping tech-

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The Miller II peoples produced medium-large straight to contracting stemmed projectile points with tapered shoulders (see Fig. 1). These were manufactured from heated cobbles and large flakes drawn from cores. Although most of these points and small cobbles were not heated, over 95% of the debitage is heated and shows preliminary heating of cobbles prior to retouching. 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 the broad range of stone utilized and appearance, it appears that the Miller II peoples were heating their raw materials at temperatures ranging from 500°C to 600°C. This inference is based on the thermal alteration experiments. Although thermal spalls are common on the reduced faces of similar objects, 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 cobblical 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 close to that of whole projectile points and red alter experiment. The results of this practice produced an enormous amount of heat spalled material and appear 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 alteration 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 an identifiable object. 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 scarring 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 forms 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, Dalles points; 2nd row, Hardaway-Dalles points; 3rd-6th rows, Kirk points; 5th-6th rows, Archaic bipolar points and pieces esquillees.
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. 3).

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
excessive travel, had more than just technological sig-
ificance. The social significance of the Archaic exotic stone procurement is probably of much greater im-
portance 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 status: tier and aesthetic
preference (Goold et al. 1971). The presence of mu-
numerous exotic stone caches of preferens, blanks, and
artistic projectile points in Middle to Late Archaic
burials (DeJarnette et al. 1973; Webb and DeJarnette
1942) indicates social inequality. Likely, both tech-
nological and social factors are involved.

In order to answer these questions several lines of
research must be pursued: (1) What are the condi-
tions 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 fak-
ing, 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 tech-
nologies operating both synchronically and diachron-
ically throughout the prehistory of the central Tombi-
gbee Valley provides a basis for research into these
problems.

Interestingly, there appears to be a definite corre-
lation between Tuscaloosa gravel size and regional
lithic technologies. Furtano (1977) and DeJarnette et
al. (1973) have noted a distinct lithic reduction sequence
in the Cedar Creek and Buttsahacie drainage systems
of northwest Alabama. In this Archaic sequence, large
unadjusted Tuscaloosa gravels are bioclastically flaked
into preforms. Thermal alteration is applied to these
preforms and final reduction into finished implements
takes place. No such evidence exist in the Gaines-
ville Reservoir for such a practice. No bipolar materials
are associated with the Cedar Creek assemblages (Lu-
gene Furtano, oral communication, October 1978). This
sequence of convervative uses of structurally similar
materials appears directly related to cobble size.

Acknowledgments:
Special thanks is given to the U.S. Army Corps of
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photographic figures possible.

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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 distribu-
tion 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 data. The work beyond that required to identify
the components present at each site and make a de-
scriptive list of artifacts found. Blakeslee (1975, 1979)
attempted to correlate topography and soil types with
cultural components, but since the vast majority of the
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were the five assemblage types previously defined, while the variables were the lithic categories used in the classification. In the discriminant run, four functions were derived to separate the five groups (Table 2). The first three of these have a significant level of better than .001 and among them account for 98.15% of the cases. Cars, sandstone chucks, utilized flakes and pebbles/broken rock were the most important discriminating variables, with propyite 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 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 provided 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, 20 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 recognizable patterns in the data, their meaning was not clarified. The type definitions may help somewhat to suggest what the

<table>
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<th>Table 1: Assemblage type definitions.</th>
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Note: 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., 1975:834-407) was used with five groups and ten variables, the groups...
site functions may have been, although they are too generalized to offer detailed answers. All of the types collections contain fairly large numbers of untutored flakes, with the preponderance of such flakes being the distinguishing characteristics of Type I assemblages (Table 1). It seems likely that some specialized activity, perhaps tool finishing or resharpening or some kind of blade being done 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 the tool 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 1957:68). 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 artifact facts suggest that Type IV sites were used for habitation rather than for 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 recalcification (Table 5), it is apparent that the main discrepancies resulted

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Table 3. Prediction results, discriminant analysis of assemblages previously assigned to Type IV.

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PERCENT OF #GROUPED CASES CORRECTLY CLASSIFIED: 92.86%
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. (1975) for the Tombigbee Valley provided 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 rocks make up much of the upland vegetation, while the bottoms contain hickory, alder, and sweetbay. The second ecosystem is the Eutaw Hills, with fairly large riverine 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 oxbow lakes and meander scars. Farthest south is the Prairie with broad river meanders and rich calcareous soils. Natural grasslands inter-spersed with oak woods once occupied the area 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. 5-6). Relatively little of the Divide Hills was surveyed by Mississippi State University, so there were 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. 5-6), perhaps indicating that the Prairie was used during this time mostly for some special purpose that resulted in Type I assemblages, while the other areas were used for habitation and other activities as well. Blakeman (1975:109-113) 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
sites represent agricultural farmsteads; they did produce more ceramics, at average of 80 sherds per site, than any other assemblage type except Type IV.

Type IV assemblages were found in all ecosystems (Fig. 7), but the vast majority of them came from the Sand Hills (Fig. 8). The major 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 towns of Aberdeen, Mississippi, in an area with extensive and 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 utilitarian flask in Type III assemblages indicates its activity producing heavy wear.

While all other ecosystems contain some sites that produced Type III assemblages, the part of the Participant that was surveyed had none (Fig. 7). This supports the earlier suggestion that these assemblages, which contain a high proportion of cores and small flake, represent flask 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 II 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 cultivation use (Bickham 1975:107-108), since this might be expected to cause population to shift to the prairie or grow faster than in the mountains. 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 1976) that the development of sedentism 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. Hadien was noted as present at almost half the Type IV sites found in the intracrus, which tends to support the hypothesis that they were used mainly for habitation. They also averaged the largest number of postholes per collection. 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 common frequency peaks, with the first occurring in the Late Archaic in the Sand Hills and in Miller I in the Eutaw Hills (Fig. 6). This function is not clear; the collection contains inferior amounts of pottery with an average of 24 sherds per site, and it is present in 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 Missippian times in all ecosystems (Figs 5-6). 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 that the information to generate hypotheses regarding other processes can become apparent, 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.

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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 on 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 Archaeological 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. Fire of these approaches are examined in this paper: alternate methods of surface preparation for controlled surface collection, suggesting as a method of evaluating sub-surface stratigraphy, metal detector survey as a method of locating historic features, slope cuts versus deep test pits for obtaining information on deep stratigraphy, and box-scrapping 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 artifact density at the site was determined. 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 subsurface areas of cultural significance and to use that information as input 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 test area for purposes of cleaning. 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 spanned nearly 2200 m² 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 occupations starting around 1530 and continuing through late 1777. Special care needed to be taken not to destroy or obliterate shallow historic artifacts 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-scrapping alone versus box-scrapping followed by shallow dishking. The rationale for box-scrapping alone was that it would remove the cover vegetation but do little damage in terms of disrupting the historic deposits and their stratigraphy. On the other hand, the rationale for shallow dishking 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 their first phase. Three units (D, I, and K) were then shallowly dishked to a depth of 3 to 8 cm. A section of Unit B was left box-scrapped only and another section of the unit was lightly dishked. 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, four-end leader 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. Woodless 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 haggled and re-corded together.

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

### Table 1: Surface collection units and summary of surface preparations.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Box-scraped</th>
<th>Dishked</th>
<th>Hand-collected</th>
<th>Total a2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>176</td>
<td>130</td>
<td>137</td>
<td>443</td>
</tr>
<tr>
<td>B</td>
<td>735</td>
<td>22</td>
<td>740</td>
<td>2272</td>
</tr>
<tr>
<td>C</td>
<td>215</td>
<td>300</td>
<td>219</td>
<td>554</td>
</tr>
<tr>
<td>D</td>
<td>122</td>
<td>250</td>
<td>124</td>
<td>456</td>
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<tr>
<td>E</td>
<td>122</td>
<td>500</td>
<td>120</td>
<td>742</td>
</tr>
<tr>
<td>F</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>450</td>
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<tr>
<td>G</td>
<td>176</td>
<td>268</td>
<td>268</td>
<td>702</td>
</tr>
<tr>
<td>H</td>
<td>150</td>
<td>275</td>
<td>275</td>
<td>695</td>
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<td>I</td>
<td>150</td>
<td>275</td>
<td>275</td>
<td>695</td>
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<tr>
<td>J</td>
<td>150</td>
<td>275</td>
<td>275</td>
<td>695</td>
</tr>
<tr>
<td>K</td>
<td>250</td>
<td>300</td>
<td>250</td>
<td>800</td>
</tr>
</tbody>
</table>

*Total* a2: 2291 32 2904 49 1904 26 2712

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trollable and consistent disturbance appeared to be inconsequential. However, as the controlled surface collection was conducted case 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 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...
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 difference is noticed in Units 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 digging which produced the difference. 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 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 four 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 number of times that each category showed a significant difference out of the eight times it was used as a dependent variable. Ceramic 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.

The analyses of the data from the East Aberdeen site do not show a clear advantage for the effectiveness of either method. A slight advantage for digging is in evidence. However, the data do not show a decided disadvantage for either method. 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 sound basis for the presentation 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 that portion was a few inches in 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 depth 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 traverse in two of the surface collection units. After the truck equipment malfunctioned, a combination of a mechanical 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 excavatory 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 oper-
erator and approximately 30 crew person-hours.

Based on the results from the East Amsterdam site the use of augering as a part of site testing and even site surveys was deemed. Even though they yielded few artifacts at this site, the truck-dug 20 cm auger holes not only have the potential of providing a use-
ful indication of the subsurface stratigraphy but also excavate a volume of soil which can potentially pro-
vide a useful estimate of the artificial 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 signif-
ificance but also in estimating the overall extent of in-
vestigation 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 Amsterdam 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 last nineteenth-early twentieth centuries. The survey employed a U.S. Army metal detector and consisted of taking readings at 5 x 5 intervals midway between the gridded 4 m apart north-south and east-west transects covering three of the surface collection units. Un-
fortunately, the data may have to be used 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 evalu-
ating 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 oc-
cupation and/or had the blacksmith's shop both the only metal-intensive activity center at the site, it is likely that the survey would have been more produc-
tive. However, the East Amsterdam site was continuously occupied for nearly 150 years during which time there is evidence of several different active 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 detector 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 depots. Both of these capabilities would have been helpful in better defining the nature of the metallic depots present at the site. Therefore, while the metal detector survey did prove to be useful at the East Amsterdam site, the approach may be effective at other archaeological sites having historic components, particularly if more sensi-
tive 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 Amsterdam 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 Amsterdam 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 Amsterdam site, the excav-
ation 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 tradi-
tional 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 total unit depth. The unit was excavated in arbitrary 10 cm levels at m
atural and/or cultural stratigraphy was recorded. The only exception to this occurred when slope-cuts were encountered; they were excavated as complete sub-units. All soil excavated was water-screened through roughly 6.5 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. Since 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 appeared impractical and the remaining two slope-cuts began they were hand-shovel to smooth their surfaces and to remove debris that was washed down them after they had been mechan-
ically dug. Then 1 m wide strips were laid out dowy on the side of the bluff at the positions where the trans-

traversed, 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 exca-
vating the two slope-cuts differed slightly due to dif-
fences 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 excavations on Slope-Cut 1 consisted of excavating 1 m squares but the unit was not stepped until the rim 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 risers of between 50 cm and 1 m in height. Because it was longer Slope-Cut 1 required the excavations of 8.5 m squares to reach the top of the bluff while Slope-Cut 2 reached the top with the exca-
vation of 14.5 m squares. All soil excavated was water-
screened through roughly 6.5 mm mesh and the arti-
facts collected were bagged and recorded by squares. Floor plans from the units, 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 ap-
proach 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 in-
creased. In the slope-cuts it was due to the angular nature of the units' surfaces. Therefore, neither


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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 165 person-hours to excavate and Slope-Cut 2 took 312 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 subjected 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 cutter 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 was the box-scraping method. This technique 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 provide 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-scraping 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 been scraped away in this manner, crew members re-gridded the units into 4 x 4 m squares, collected the surface within the squares, and bagged and recorded the materials accordingly. This procedure continued until a total depth of roughly 20 to 30 cm in both units was reached. The box-scraping was then to be continued to the units on 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 several pieces of glass were found in two units. Even 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 at the East Aberdeen site either left few features behind or the effects of 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 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 hr of mechanical equipment time was required to take both units to a depth of 30 to 35 cm. Additionally, roughly 10 men-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 inspired 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...
Jeffrey L. Ottinger and Robert H. Lafferty II

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, 1979 under contract sponsored by the Nashville District of the Corps of Engineers and the Missisippian Transportation and Recreation Service—Atlanta (Contract, CX 5899-8-0001). In addition, several units were strategically placed within the areas where the test excavation 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 test excavation. If little or no evidence of shallow, subsurface features has been found, it may be more expedient and economical to use faster types of mechanical equipment, such as a roadheader or small bulldozer, for this type of investigation. Another factor to be considered in a decision to use the approach is soil compaction and texture. The high compaction of the soil at the site and the presence of features at the site resulted in less movement of artifacts but necessitated several hours of mechanical work. It also required extensive use of the removable teeth on the excavator, which resulted in greater disturbance of the soil and its contents. In the outer units, 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 Riverway. The project also stimulated an opportunity to examine the effectiveness of various methods of data recovery. While the data from each 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.
slightly rounded bottom. The maximum and min-
imum depths of the structures were 0.85 m and 0.22 m, respectively, with a mean depth of 0.65 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: 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 45.25°-
45.25° inward (off vertical), but no continuous ar-
range ment of posts was found. This suggests that the deposition of the ledge was directly related to the sequential events: construction, occupation, and col-
lapse 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.

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 the 8 of the 11 defined structures. No silftation bands were found within Zone 1, which indi-

cates 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 con-
siderably 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 ex-
cavations of the structures.

Table 1 shows the densities of selected materials per volume of dirt and is standardized to show rela-
tive 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) had the most dense midden deposit, which was the upper level of the midden located 5 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 1 (which was determined to be a tree tip-up) indicates that the density was half as high as one would expect in the general midden. This was the result be-

cause of the milled 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. Impressionist data suggest that this was also true for nut shells, though this portion of the analysis it now 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 strati-

ography) and natural conditions (i.e. gravitational pull) limit certain kinds of deposits from the (archae-

ological) record, imply that certain things have hap-

pened, and preclude the possibility that other events caused the observed deposits in Zone 2. In all of the structures there was a dark zone on the bottom of the deposit which was overlain by relatively homogeneous sand. This occurred stratigraph-

ically 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 (silftation bands were observed in only one case). A tree

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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 sap, 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 insulating 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 flocc 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.

Near the ledge and/or postholes for the emplace-
### Table 1. Debitage of burned sandstone in structures compared to the adjacent midden, Brinkley Midden (227A729). For derivation of these statistics see LaFlurey (1977:appendix II).

<table>
<thead>
<tr>
<th>Units</th>
<th>Level</th>
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<th>Expected</th>
<th>Sandstone</th>
<th>Deviation</th>
<th>Maxmax Scores</th>
<th>Volumetric Relative Density</th>
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</thead>
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<td>Meter</td>
<td>Preconcealed</td>
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<td>A</td>
<td>B</td>
<td>C</td>
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<td>6.29</td>
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<td>10.84</td>
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<td>.068%</td>
</tr>
<tr>
<td></td>
<td>6-10</td>
<td>0.315</td>
<td>14.89</td>
<td>588.7</td>
<td>3.58</td>
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<tr>
<td></td>
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<td>31569.2</td>
<td>71.02</td>
<td>14.71</td>
<td>.33%</td>
</tr>
<tr>
<td></td>
<td>Ledge</td>
<td>0.316</td>
<td>14.94</td>
<td>3659.3</td>
<td>8.23</td>
<td>-6.71</td>
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</tr>
<tr>
<td>Structure 4</td>
<td>0.023</td>
<td>1.09</td>
<td>1077.6</td>
<td>3.77</td>
<td>2.68</td>
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<td>4459.4</td>
<td>100.00</td>
<td>0.0</td>
<td>N/A</td>
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</tr>
</tbody>
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**Model of Zone 1 if House**

- **Midden**
- **Sand**
- **Dig Out**

**Tree Tip-Up**

- **Tree Trunk**
- **Soil Profile and Roots**
- **Water Deposited Lignite 35.6%**

**Mother Zone**

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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 1961: 157-145), a similar structure was dated to 5500 ± 120 B.P. (UCLA-66). 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 (1961: 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, 6.5 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-floor 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 these structures implies a placement directly above the whole pit which could not have happened by any natural means known to the authors of this paper.

References Cited:


ARMOREL: A VERY LATE PHASE IN THE LOWER MISSISSIPPI VALLEY

Stephen Williams

Some thirty years ago (1948) James B. Griffin composed a manuscript on "Presidential Cultures of the Central Mississippi Valley" for the Cole volume in which he corresponded to the Museums of the area and said that "in the lower St. Francis area such sites as the Rose Mount 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 1957:130)

At a later date, but published earlier, Griffin (1951: 137, 165, 275) 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 teats were considered very late indeed (ca. A.D. 1700).

Still later as a Southeastern Conference meeting at Mountville, (1954) I gave a paper on the "Mountville Horizon in Northeast Arkansas" based on trench work that I had carried out in that region. I published a portion of that paper (Williams 1956) referring to certain "Engraved Shell Buttons" which seemed to be good candidates for marking a late horizon in the Lower Walls and other sites.

At this time I was quite familiar with the Cairo Louviers region in Southeast Missouri. However, while I was researching the collections at Nodena Plantation, north-east Arkansas, in the fall of 1953, I had been struck that some of the sites around there had quantities of smoothed scrapers as did a few of the late sites in southern Missouri (Williams 1954:190-194) in contradistinction to Cairo and other more classic Mississippian sites as Matthews, Libbourn, and Beckendorf's Fort. I even did a few rough distribution charts of a series of sites with help from some of the local collectors such as Kenneth Beausum who seemed to know such disparate sites as Parkin, Rose, Big Eddy and Middle (not Upper) Nodena, not to mention Menast and Oliver nearby, and the Murphy site at the mouth of the Washb. I became convinced that the culture which was a "washed over" the differences that were evident earlier in separating the regionally distinct Parkin (Griffin 1952c: 231-233; Phillips 1970:290-293), Nodena (Phillips 1970:349-396; Morse 1973) and Walls phase (Griffin 1952a:233-236; Phillips 1970:396-388), Phillips (1970:929) discussed his notion and incorporated some of this thinking in his 1970 review of Lower Walls phase.

Returning recently to the scenes of my earlier peregrinations in Northeast Arkansas and Southeast Missouri, I was again struck by the recurring data which seemed to urge a revision of these late complex. This summer (1978) while visiting Don Moré's laboratory in Jonesville, Arkansas, and while discussing Parkin and Nodena relationships with Don and Phyllis, we both shown collections from the Armorel site (Q-93) east of Bythervale (Moré et al. 1974) and decided to try to use that material as the linchpin of a construct to true a rather oldish obscurity.

As fate would have it, just at this moment of decision, I saw, at Jim Price's Naylor lab, a copy of the Arkansas Archeological Society 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 Parin Punctuated vessel of Armorel phase affiliation in association with late (Oquaw) Lower Arkansas River materials (Hoffman 1977: Fig. 6-54c), and Timothy Klinger published a final term of some of my "Shell Buttons" from the Campbell site (Klinger 1978b), further strengthening, as if it were needed, that site's terminal ties with Middle Nodena and the Oliver site.

A visit to Leo Anderson's museum in Vass 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 socialization and dispersion by strong European contact. It is the terminal Mississippian phase with some significant iconography to the north into Oneota, and to the south toward the Natchez. Eastern links are with the mouth of the Washb. locality and even with eastern Tennessee. Certain specific artifacts of short-term duration serve to fix these connections in very strong fashion.

Distribution: Southern Missouri, along the Mississippi, south of New Madrid, and in North-east Arkansas both along the Mississippi and on the St. Francis as well as far south as just below Memphis (see Fig. 1). Some exist in single components, but also as late components on sites with considerable time depth, such as Rose. See (Phillips 1978:292, 933) for brief discussion of some of them.

Previous Terminology: Late Nodena phase and late Walls phase (by all previous writers).

Type Sites: Armorel (Q-93, 5) chosen for its central location in known distribution (Moré et al. 1974); best published single component is Campbell (Chapman and Anderson 1955, 1953) LMS site no. Armorel is 3M625 in the Arkansas State Survey.
and Anderson 1955; Moore 1910, 1911; also Hathcock 1976; White 1976 for Field Museum collection).

Lithics: Sinuous notched scrapers—large and small (thumb nail); Nodena (willow leaf) projectile points; "pipe" drills; basalt groundstone adzes; catlinite, especially Siouxan disk pipes.

Special Horizon Traits: Square engraved shell buttons (Williams 1956) and non-repoussé copper eagles (Moore 1911:Plate 10; Hamilton et al. 1972:160-168).

Historic Trade Goods: Some of Spanish origin: Parkin (Klinge 1974); others at Campbell (Anderson collection); Rhodes and Bradley (Moore 1911); Clay Hill—a Clarksville bell (personal communication, John House).

Dating: AD 1500-1700


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River Quapaw (Dickinson and Dellingler 1963; Hoffman 1957); Caborn-Welborn (Green and Mason 1978); Ocmulgee-Winnsboro (Hall 1969). Some post-Knoxville research in the LMS sites at Peabody did reveal very interesting additional data—especially from the Hampson Collection photos. Four additional sites were added to the photo list: Richard- son Landing (104-29); Bishop Place (56-R-1); Shelby Place (10-R-12) and Fringer's Mound (11-R-1). Unusual low bowls (Fig. 2, K) with arrowed handles, car-facing rims and curvilinear incising (Rhodium-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, was the very non-Mississippi Valley character, was the burial which was dis- covered by Dr. Hampson at Bishop 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 heading toward the Alabama River where this lack trait is most common and associated with some vessels not unlike Armorel phase ceramics (Hollingsworth 1945; Fig. 386; Fig. 386; 406) and the extraordinary Hal's Point, Tennessee, pottery cache (Hollingsworth 1846:581-582, Fig. 387; Thurston 1897:29-30, Fig. 1) encountered by Capt. W. P. Mall not far to the north, may well be from an Armorel phase component in other vessels (Hollingsworth 1846: Fig. 404; Thurston 1897:161, Fig. 65) from the site (NO-4-1) seems 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 the complex and some of its more widespread traits with Siouan-speaking; for ex- ample Winnebago (but see Mason 1929) 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 prehistoric data may be related in some of that archival interpretation (Giffen 1920b:364), turning from an historical in- terpretation to a functional one.

2) What about those "shrub-nodled 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 buff- lapses. In the Lower Valley—"it's a question, but where are the bones?"

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, in- cluding shell mask gorgets, narrow copper headbands, perhaps speculate retouched pierced (Halston, Kean- head, Moore's sites in Alabama), Pecan Point head vessels, maybe even sherds disks (Fig. 2, J). I had the same in Arm with long Nosed Goji complex nearly 29 years ago; where to stop.

Indeed the question is really one of categories: complexes, phases, traditions, and horizons. The diffi- culty may well be with the use of the term "com-plex." After outlining the specific distribution of the Long Nosed Goji mask, I felt it worthwhile to add to it with a complex of other traits (Williams and Gog- gen 1956:51), which has not proven too useful. I must confess Phil Phillips tried to dissuade me from build- ing up such a complex, but I was not amenable to his suggestion then, nor have I ever learned.

In the earlier version of this paper I merely defined the Armorel phase and discussed the distribution of certain widespread traits: engraved shell gorgets and plain copper earrings. I did not use the term "horizon" at all. That omission was a mistake which I hasten to correct now, although the use terminology may not win too many adherents. This horizon is currently marked by the two traits: shell gorgets and copper pendants and may be termed "Marked." It dates within the historic period, probably A.D. 1540-1630, although some correlations may be achieved earlier. Thus the Armorel phase of Missouri and Arkansas is tied very precisely into the late chronologies of Mississippi and Alabama by the distribution of Marked horizon.

Distribution of Special Traits of the Marked Horizon (Fig. 2, A, D, H)

Engraved Shell Gorgets:

- Campbell (Klinger 1972a)
- Middle Norfolk (Hampson collection, Wil- liam, Arter, Ginge 1979)
- Parkins (Stanley Mound 4, Arkansas; Put- nam 1882:585)
- M.S. 18, near Tupelo, Miss. (Jennings 1941:172; 1942:Fig.141)
- LeFlore, (45-P-3), Grenada Co., Mississippi (Canfield's Crescent Collection, some Bird's Cove photo)
- OLS, near Providence (Bird's Cove 1941:57-59)
- Durant Bend, 3, Alabama (Moore 1989:51), Fig. 29
- Charlotte Thompson, Alabama (Moore 1899:320-321, Fig. 90)
- French's Island, sb. River, Mac- Cludy 1917:33, Fig. 10
- Chickasaw, Tennessee (Meirier 1944:Fig. 3)

Shaped gorgets with a single perforation in center and no incising visible.

Plain Copper Engraves:

- Rose Mound, Arkansas (Moore 1911: Plate 10)
- Scott site, Arkansas (Adams 1927; Hamilton et al. 1974:165-168)
- Clay Hill, 15N-7, Arkansas (John House, personal communication)
- Henry Farm, Tennessee (Chubb 1975)
- Nancyville, Tennessee (Chubb 1975)
- Onoora, Wisconsin (Hall 1862: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. Parkins 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 component, not muddied by other materials. Giffen (personal communication) has given his support to such a construct. Also there seems to me to be enough

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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 earrings: horizon markers) that were still in existence even at this late time level as the European bovines arrived (Griffin 1952b:564).

That some time is encompassed by this construct is perhaps best seen in the distribution of the fistulae: for example the cluster of shell buttons in the Valley and the near Southeast constraint with changes in form of somewhat similar button-shapes showing up to the north in Fort Ancient sites like Fox Farm. Similarly, four of the proper southeastern shell species, Scott, Clay and Hall Henry retain high formal similarity (Fig. 2, A-D) until one gets north to the Winnebago occurrences (yet 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 Monon eagle and its mates “look” earlier than the Winnebago ones, as do the more Elongated eggshell conoids.

Other traits found in the Armored phase heartland, but not yet installed as horizon markers, have a very widespread distribution too, from the Red River in Oklahoma where a red-filmed teapot (Quapaw type) is known from the Kaufman site (Petrie, personal communication) to east Tennessee and a Sitovan 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 horizons (Williams and Goggins 1956:6041) and it also is evident later (in my chronological view) when some of the Elongated eggshell conoids are present in the North Carolina ceramics. Thus, some of these seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region. That the Sitovan disk pipe seems to form a transition to the north in the Fort Ancient region.
Avery Island is one of a series of five salt domes located along the coast of southwest Louisiana (Fig. 1). The Lower Mississippi Valley Pleistocene and Holocene, Harvard University, conducted archaeological investigations on this salt dome in 1977 and 1978 (Petrie and Petrie 1978). The archaeological work has revealed considerable temporal gaps in the island's occupation. Stemmed artifacts, mostly dated to the late prehistoric period, have been found on the surface. The absence of Pleistocene material on the rest of the island and in the surrounding marshes suggests that Gagnon was the only prehistoric period of the Medora phase from the Lower Mississippi Valley for the sole purpose of producing salt at Avery Island (1976:25).

In the original proposal for our research (Brown 1977), we argued that any interpretation of the role of Avery Island in Southeastern prehistory was tenous without the support of extensive archaeological survey and excavation. It did indeed seem curious that early and middle Mississippian cultures like Tchefuncte, Marksville, Treméville, and Coltes 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

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Ian W. Brown

ARCHAEOLOGICAL INVESTIGATIONS ON AVERY ISLAND, LOUISIANA, 1977-78
archaeological investigations. A secondary goal of the project concerned the late prehistoric Mississippian component. We first had to determine if materials of this culture were actually just confined to Salt Mine Valley. (25.1–5). 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 move-
tively 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 contiguous areas of Salt Mine Valley. Trench B was placed on the ridge south of the recent valley deposits. This ridge had earlier been shown tested, as the area lies directly under a thick forest cover. A total of 96 shovel tests were excavated at 8 m intervals over the ridge, opening a maximum north-south distance of 108 meters and an east-west distance of 102 m. All tests were excavated to subsoil, the contents were taken through 1/2 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 northsouth 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 tumbles 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 remained 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 and was found elsewhere in the Lower Valley was younger than Plaquemine, there was naturally the suggestion of disturbance. The three trench and nineteen 2 m squares were exposed and the cemetery at the base of the excavations supported the interpretation of a Ceremonial mound. This soil 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 sizable collection of Plaquemine culture pottery. Except for the thin veneer of Mississippi material lying against the subsoil, the deposits appear to have resulted from a single component.

Finding an area where ground surface is undisurbed 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 still needed to find shell tempered Mississippi material in an undisturbed context. As the surface survey had revealed a heavy concentration of such pottery in the valley itself, our next move was into the recent deposits. We knew of the problem of water seepage when excavating within the valley (Gaglio 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 less than 50 cm below ground surface. In order to get down to the pottery-bearing level reported by Gaglio (1967: 14), we dug through more than 2 m below ground surface, we erected a plywood cordell 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 Gaglio's pit V (1967: Fig. 8), as we felt the probability of penetrating the recorded pottery level was much greater in this area. Thin layers of sterile mulched sand were encountered in the first 5 cm, then the first water. A cordell was erected to get us down to the desired depth, but with disappointing results. A thick shell midden, excavated to a depth of over 3.5 m in the cordell 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 was a blanket of midden at a specific level. Rather, it poses a series of mounding terraces which supported aboriginal occupation. (Roger Stagler, personal communication). The Indians, when producing salt, natural salt, used 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 Sheswood Gaglio, we found just such a location as the end of the summer field season. Along the southern edge of the brine pit embankment between Antilis 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 Gaglio fortunately remembered having seen it in an earlier visit to the site. We excavated eight 1 m squares in this area and the quantity of material recovered was phenomenal. Over 20,000 fragments of pottery were removed from each square, even though the middle 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 excavation, and all but a handful of the ceramics were shell-tempered. Included were large quantifies of N. C. C. sherds, but none were classified by specific (Brown 1977). Lenard Incised, var. Williams (William and Brown n.d.), Barton Incised, var. Williams, Old Town Red, var. Unspecified, Owsley Buena Vista, var. Owsley, and Mexianized, PONCOURT Ridge Pinto, var. Owsley, and Mexianized, PONCOURT Ridge Pinto, var. Owsley, and Mexianized, PONCOURT Ridge Pinto, var. Owsley.

Although only miniature vessels were found intact, many of the larger vesels were represented in the ceramic assemblage, but almost all of the vessels were large shallow bowls. The Indians obviously evaporated their brine, but 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 excavation 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 unmix Plaquemine and Mississippians components in horizontal stratification. The More Indian and early Noquimian Era 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 Leen 1978). This area was believed to have been

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 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 evident 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 (53-L-15), produced a fairly large lithic assemblage.

BANANA BAYOU MOUND (33-3-6) 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 depression resulting from his T-shaped pit being clearly apparent in the center of the mound (Gagliano 1967:16-19). Gagliano observed two construction mounds, the primary mound having been composed of a dark gray to black clay, derived from a nearby buried midden. The upper mantle was lighter in color, and the top of the clay was characterized by only artifacts recovered in the primary mound were a few fired clay objects of amphoroid shape. A radiocarbon date of 2,490±200 B.C. was obtained for the secondary mantle, which, if true, would have made Banana Bayou Mound 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 examine the archaeological history of the mound, and to determine when and why it was built. (Brown and Lamont-Brown 1979b). We confirmed Gagliano’s interpretation of two principal stages of mound construction (Fig. 6). The mounds were quite symmetrical; the secondary mantle was somewhat thicker than the primary deposition. A sub-phase 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 clay seal 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 using the interface between the two mounds. There was
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 amorphous-shaped fired clay objects and numerous lithic tools found within the primary mantle, argue for a late Mesolithic 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, shell, 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 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 (33-1-6) and the pepper fields are located on the island periphery adjacent to the marsh. Salt Mine Valley (33-1-5) 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 do not doubt...
missed a number of sites as a result of this sampling procedure, but we believe many more sites were found that 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 thereafter 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 Vaughan's Clearing (53-1-12) (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-permanent sites with considerable amounts of ceramics were found, however, three of which were partially excavated in the sumac field section. As illustrated in the Hayes Pond Ridge (53-1-8) site plans (Figs. 8/9), the plow strip survey was instrumental in designing our excavation strategy (Brown and Lambert-Brown 1978e). A 40 x 4 m trench was laid out at both Hayes Pond Ridge and Middle Gate Bottom (53-1-33), and ten 2 x 1 m sections were excavated in each trench. At Vaughan's Clearing (53-1-12), 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 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. Vaughan's Clearing produced meager results in terms of ceramics, but a significant quantity of lithics was collected. A Marksville component was observed at Vaughan'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, these are indeed major temporal gaps in the cultural history of Avery Island. Gagliano's research demonstrated the presence and importance of Paleo and Mesolithic peoples (1965, 1970), but little evidence of their activity can presently be detected on the upland 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
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 (33-1-8), Middle Gato Bottom (33-1-35), Vaughan’s Clearing (33-1-12), and Deer Run (33-1-11),
as well as at a number of smaller sites. These people generally seem to have settled around depressions in

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the salt dome which were, in prehistoric times, either small ponds or marshy areas. There is no evidence of major village occupation, but the Cole 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-E). 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.

Survival and migration at Salt Mine Valley (33-E) 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 parallel to the Mississippian component of Salt Mine Valley occur in the southernmost portion of the Yaxoo 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 in 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 sources were considerably closer is a problem which needs resolving. It could be that other factors, such as those in northern Louisiana, Arkansas, Illinois, and Missouri (see Rock 1925; 154; Breck-}

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Caddoan Prehistory: Some Relationships to Lower Mississippi Valley Prehistory

T. K. Pettitula

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 1973) Coles Creek ceramics occur in abundance along the middle Red River (Fig. 1), the Arkansas River Valley, the middle and lower Sabine (jenos 1964, Jones 1952, Webb and others 1969), and as far west as the upper-Southpor and Cypress Creek Valleys of East Texas (Doehler and Larson 1972; Stearns n.d.; Dec 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 1976; Wylezof 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 developments in the area as well as in stylistic interaction and cultural contact between Caddoan and Lower Mississippi Valley cultural systems.

Ford to Krieger

In 1956 James A. Ford established a number of Lower Mississippi Valley ceramic complexes or horizons based upon co-cauging surface collections (Ford 1956). One of these complexes, a Caddoan ceramic complex, was placed on the same temporal level as the Twinke and Notch complexes, i.e. Horizon III or historic.

Ceramic material begun 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 keraestratigraphically below Caddoan components in burial and midden contexts (Dickinson 1936; Dickinson and Lemley 1939; Lemley 1956).

When Alex D. Krieger came on the late 1950s 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 1976:59). 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 Development in the Southeastern States" (1955) 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 Southeastern Archaeological Conference Bulletin 25, 1960 Coles Creek components occurring in the middle Red River Valley to different stages (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 Puebla period; and b) ceramic influences seem to be flowing from east to west. Certain decorative motifs, such as meander and repetition of curvilinear incision, serrated punctation, and horizontal incisions were thought to have originated in the Florida Gulf Coast in Weeden Island periods (Wiffley 1919), spread to the Lower Valley throughout the Caddoan period, then on to the Caddoan area (Ford 1952). Caddoan developments, therefore, were diffusions out of a Coles Creek period in the Lower Valley. Krieger, however, had aligned Early Caddoan (Alt 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 calibration date of A.D. 938±123 from Mound A at George C. Davis (Krieger 1951). Krieger did not follow Ford's conclusions. and, in fact, suggested that flat-topped mounds and mazer at Davis represented one of the earliest known "Mississippi" sites in the east, certainly earlier than Coles Creek. Marksville components were present (Fulton and Webb 1955) but Coles Creek components did not exist "at all in Texas, Oklahoma, or Arkansas within the Caddoan area they are found only in the Shreve- port area" (Krieger in Davis 1961:111).

The primary burden of the arguments presented above, once the radiocarbon date from Davis was summarily rejected (Keltin and Yarnell 1968), was ceramic only and here Ford and Krieger would not budge.

Western Coles Creek

It was not until the 1960s and 1970s that some additional work was carried out at the above-mentioned sites and in the area in general. Sites were examined in detail, chronology established, and the problem 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 (Bennet and Davis 1957; Durham and Davis 1975; Durham and Kizzio 1964; Hoff- man 1971; Wood n.d.); Mounds Plantation, Louisiana (Webb and McKinsey 1973); George C. Davis and Scurry Kauaman in Texas (Skinner and others 1969; Story 1952; Story and Valastro 1957), and Spence and Harlan in Oklahoma (Bell 1972; Brown, 1971; Brown et al. 1974) 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,
minor centers with haphazard mound and smaller villages predominantly located along the Red River in Louisiana also have Coles Creek ceramics (Webb and McKinney 1975:135).

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...the 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 prosses are generally lacking in Coles Creek varieties both with pigment present in the decoration lines (Webb 1961: 16), while the paste and temper (high percentages of bone tempering) characteristics are local to Lower Mississippi Valley (Hoffman 1971; Webb and McKinney 1975). The ceramics thus a Coles Creek 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 (Sollon and Jr. 1961), he is now apt to classify them as Coles Creek Incised (var. Davis)...

While the stratigraphical and classificatory problem 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 the Coles Creek Alto. At the far western margins of the Caddoan area in the oak-hickory grassland 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 (Mallory 1976; Rorhbaugh 1975).

The Western Coles Creek complex occurs in primary context prior to diagnostic (engraved) Coles Creek ceramic wares in the middle Red River. Where information is best, namely at Crenshaw, Mounds Plantation, and Spiva, this Coles Creek ceramic complex is predominant prior to A.D. 1000. Early Caddoan components at Crenshaw and Mounds Plantation, radiocarbon dated A.D. 1000-1450 (Valastro et al. 1975; Webb and McKinney 1975), overlie this material, while its occurrence during the Evans phase at Spiva and Harlan suggest an A.D. 700-1090 occupation.

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Along the middle sections of the Red River, the mortuary behavior in the Western Coles Creek components, as with the ceramics, has 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, stylistic innovation, and change within a relatively individual (Burial 6, Mound 5, Mounds Plantation) and retainers seem extended rectangular burial pits, are known from the Western Coles Creek component at Crenshaw (Durr and Davis 1975). These alone have few burial goods.

Summary

The differences and similarities in ceramic ware, mortuary behavior, functional differences in mound usage, and settlement distributions between Coles Creek of the Lower Valley, early Caddo [see 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 here an independent and contemporaneous cultural adaptation within a specific region or habitat of the Red River floodplain. It is separated from early Caddo and a distinct variation in 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 the Gahagau area 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 more and more divergent as Coles Creek complex, otherwise similar to Lower Valley ceramics, are sufficiently different to preclude inclusion 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 proximate may not be the sole limiting factor. Nevertheless, if interactions between cultural groups is relatively constant, then it is to be expected that the amount of interaction would be increased by greater cultural divergence 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 (Brazi 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 (see A.D. 1000) range from the Fulton Bend to the Samlers 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 positions along the Red River floodplain.

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Montary behavior, and related mound construc-
tion and utilization, suggest that it is worthwhile to
discuss this Western Gola Creek area as a separate, but
eventually Caddoan, entity within the Trans-Missis-
ippi South. Caddoan occupations on major streams
such as the Ouachita and Little Rivers (the Texarkanas,
McCurtain, Mid-Ouachita, Belcher, and Halsey foci or
phases), as well as post A.D. 1000 Caddoan occupations
in the mid-Gola Creek drainage, are characterized by
one or more major nucleated center, usually containing a
number of plaza type, low, ceremonial, earth mounds, with
a network of minor ceremonial centers and smaller
dispersed habitands (Wyckoff 1974). This is the general
pattern for Caddoan occupations on major streams up
to A.D. 1700. The conclusion of elaborate ceremonial
behavior and attendant mound construction in the
middle Red River would suggest that the develop-
ment trends in this area are part of a broad based
interaction among the major rivers of the Caddoan
area with weakening developmental relationships with
the Praeplumine cultures. This interaction is further
sug-
net to have increased over time as the Caddoan
cultural system stabilized. Why platforms 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 ac-
tivities (e.g. Brain 1976), possibly the result of
new in the productivite of the maize varieties
adapted to the area.
The vast majority of exchangeable items in pre-
historic eastern Caddoan 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 discontinuous patterns of exchange evi-
denced in Caddoan and Lower Mississippi Valley pre-
history would be reflective of climate trends (Brain
1976) where exchange was a highly pattemed and
predictable activity, pursued by adjacent (though not
always) cultural groups with similar adaptive strategies.

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Introduction

Considering the amount of archaeological investigation in Kentucky over the last 50-60 years, one might conclude that portions of the state are 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 accounts which perhaps account for the fact that this portion of Kentucky has been almost ignored by prehistorians (Nance 1974a).

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 understated or ignored. 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 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 southeastern extension of the Gulf Coastal Plain (Mississippi Embayment). The Southeastern Archaeological Conference Bulletin 22, 1990

Figure 1. The Cumberland area: an archaeological perspective. Garrett Press
this region (McFarland 1913), 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 outside 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 surgical 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 0.8-1.5 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 later) 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.

Put Archaeological Research

The earliest references to archaeological remains in west Kentucky may be found in the writings of Ruffin (1824), Meade (1814), Collins (1874), Lomax (1884), Lowery (1893), and Thompson (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 focused almost exclusively with hydroelectric and flood control projects in the late 1980s and early 1990s (Webb 1992) and late 1990s and early 2000s (Shortridge 2006; Coe and Fischer 1995; Ott and Schwartz 1993; Schwartz and Sloan 1993) and highway construction from the late 1990s to the present (Robinson et al.; Allen 1973; 1977; Mabry 1975; Schock et al.; 1977; Schock and Wyse 1979). Early on Webb and Funkhouser undertook investigations in the area (Webb 1929, 1952; Webb and Funkhouser 1929, 1931, 1955; 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, 1976, 1977) 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., Louis and Kneberg 1955; Draper 1973; Caldwell 1954; among others). The project reported here is generally founded upon the idea that these small, unspectacular sites could 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 a small portion of the annual cycle of the group using the site (see also Talmage and Chester 1977; Musley 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 distributional (geographic) type and (sort) type occurrences among the members of systems of such sites may well contribute to an understanding of cultural formation processes. 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 archaeologically occurring "patterns".
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 it relates to Archaic materials.
2. Accurately through regional sampling methods estimates of the relative density of prehispanic 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 intensity, 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. Initiate sites research studies including geochemical studies to identify potential availability of lithic sources, and technical and non-technical examination of various chert resources aimed at characterization of aboriginal quartz sites.
5. Inaugurate paleoenvironmental studies by exploring for potential pollen-bearing sediments and other means.
6. Develop "small site" archaeological methods which will aid the investigation of cultural formation processes.

Below I shall briefly comment on some general considerations of the site prehistory. Archaic chronology and extra-regional 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 artifacts (mainly projectile points) which are useful in relative dating, such items are often missing in small, limited occupation/sediment sites. We are therefore seeking timesensitive variation in "non-diagnostic" 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 debits 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 Paleoindian/Archaic phases are known from the area. For example, Rollington and Schwartz (1966) have reported Dalou, 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 1965; Allen 1973) suggest that most Archaic remains in the area represent later Archaic components (e.g., Ralls and Wallace sites [Coe and Fischer 1969]). 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) groups (see Thomas and Lanza, 1973; Clay and Schwartz 1965; Coe and Fischer 1969; Allen 1973). However the absence of mid-Archaic components is probably more apparent than real, and a result of a lack of systematic research. Mosca (1977), for example, has reported on a component (known as site T1973) yielding abundant Kirk materials with associated radiocarbon dates clustering around 5,000-4,700 B.C. On our final day in the field, we visited a large site, with deep deposits and massive fireplaces eroding from flood, Silt deposits of the Tennessee River. Several collectors have gathered copious amounts of Kirk material from this site. Similarly, our limited excavations at LCAP site 52 revealed a component yielding pre-dominantly Big Sandy (fine-pitted) projectile, incised and finely polished points 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 contain 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.

Relationships with "Classic" Archaic

Successfully relating west Kentucky Archaic to Archaic manifestations in surrounding areas is a task that may take years to accomplish. Our impressions, however, some speculations are 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 closely to early 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 (Swarm, Swann, Sirmans 1936; Coe and Fischer 1966; Nance 1972, 1975, 1976a, 1979; Schock and Wyss 1970; Schock et al. 1977) differ remarkably from contemporaneous components nearby in Tennessee (Lewis and Kneberg 1967; Lewis and Lewis 1961) and farther east in Kentucky (Wells 1950a, 1950b, 1951). Later Archaic "shellmound" and other protruded-habitat sites appear to be absent. The later Archaic manifestations 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 "Sunrise"... it infrequent so far. In short, small highly mobile groups with a transitory settlement pattern are indicated; all artifacts remain so that are portable and/or expendable" (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 (Marguarit and Watson 1976; Panch 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 substratum domination. 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 late 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 (Finn 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.L.'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 1975 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 (GQ). Stratum 1 repre-
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 600 or 600 m units employed in archaeological sampling excises reported elsewhere (e.g., Dye 1977; Thombs 1980; Judice, Ebert, Hitchcock 1975; Masson 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.

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Pop.</th>
<th>Units</th>
<th>Sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floodplain</td>
<td>60</td>
<td>8</td>
<td>.20</td>
</tr>
<tr>
<td>Elevated Alluvia</td>
<td>195</td>
<td>20</td>
<td>.09</td>
</tr>
<tr>
<td>Uplands</td>
<td>277</td>
<td>19</td>
<td>.65</td>
</tr>
</tbody>
</table>

Search Strategy

Quadrat corners were located on the ground by taking distances and bearings from landmarks (buildings, etc.) on U.S.G.S. 7.5 minute maps and employing compasses and 100 m tapes to establish datum points in the field. Each quadrat was divided into three sections (Fig. 8): 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 evidence, 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 1.5 m depth and the proceeds of those units were passed through a 6.4 mm screen; 3) the southwest 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 labeled 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 labeled 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
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 (e.g., 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 transect 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 informant 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 character.

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 indexes of similarity using the Nearest Neighbor Matching Coefficient (Samuel 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 SÜNY, Stone Brook (Kohls, Kishbaugh, 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.

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 homogeneity 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 85% of the variance 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 5 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 unforested 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 among 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 unfortified counterpart 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 (fooldlains). (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 located in flat areas under cultivation within units containing a permanently-flowing stream or where the quadrant was in proximity to some permanent water source.

3. Undulating to hilly upland areas, permanently forested or in pasture with intermittent streams most often failed to yield evidence of prehistoric activity.

4. Small campites and thin scatters of culture items occur on alluvial surfaces along creek (stream) banks, at locations higher than large sites (fooldlains). Large sites do not occur in the undulating to hilly upland area or in the forested and cultivated. Modern cultural features tend to occur in this zone.

5. Equivalent areas around intermittent streams reveal prehistoric material only infrequently.

None of these findings are remarkable or even surprising. What may be surprising, however, is that 68% of the units in stratum 1 yielded prehistoric remains; 80% 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 not double 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 clusters; 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 1960:64-70; Kish 1965:148-175) 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 use 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 and therefore introduces bias into site frequency estimates. Expressing density in terms of the proportion of test units intersecting the loci of cultural materials avoids this source of bias.

It must be explicitly understood that the subsampling plan described here is an example of "non-site" sampling (Thomson 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 archaeologiclal 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 given away when owners cease to till the land. Small family farms have always been the rule in western 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 "agricultural assistance" has arrived on the scene so that not only must one approach owners for permission to enter land, but also land lessees 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 lessee had to be tracked down and

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Proportion of Subunits Yielding Cultural Remains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flatland Plains</td>
<td>.32</td>
</tr>
<tr>
<td>Elevated Alluvium</td>
<td>.37</td>
</tr>
<tr>
<td>Uplands</td>
<td>.41</td>
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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 indispensable 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 was a matter of time and a reasonably simple procedure. Landowner boundaries from A.S.C.S. photos were drawn onto 7.5 minute topographic maps and this served admirably to let us know upon whose property a randomly selected quadrant 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 resulted 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 fluor spar; [Hook and Clark 1962] in the region. On occasion our purposes could have been, or rather were, misunder-

stood. In several instances it was necessary to dispel the idea that we were surveying for oil, fluor spar, 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 appears 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 material 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 not provide equivalent, limited kinds of information about the sites in a given region. As such, this procedure is an integral part of the 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 labeled. "This procedure permitted adequate, rapid coverage of sites of small to moderate size with less than moderate densities of materials, at the expense of maintaining control over exact intrasite 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 proportional maps using a data conversion program and SYMAP (Douglas and Shearman 1976).

The analyses of these surface collections are only preliminary, therefore conclusions are unjustified presently. However, it is clear from the preliminary results that the spatial distribution 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.

T. Peckner of the SFU Geography Department, has also developed a program which will permit us to superimpose a grid of variable size over sites surfaces and study the behavior of various statistical quantities when site surfaces are sampled using collection units of different dimensions. One ultimate purpose is to define a variance function describing the relationship between site size, albeit small, and statistical results (Cochran 1963:244-245). We will also compare ob-
served spatial distributions with several hypothetically derived statistical distributions. Examination of departures from the hypothetical distributions should permit us to assess the effects of cultivation, site use, and site size on the spatial distributions and develop a general model which can be used to characterize surface distributions on small sites.

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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) Description of outcrops;
3) Macroscopic/thin-section examination of samples from various outcrops and quarries;
4) Characterization testing 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 Gatun (Gatun 1979) of the Kentucky Heritage Commission. This survey may be seen as part of a larger-scale, statewide project (Gatun and Murnihan 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, Gatun 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 belchow or residual samples collected. In addition, periodicity 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 present 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.

Gatun's findings are provided elsewhere (Gatun 1979). Here I shall 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 fracture quality, size of nodules or chunks occurring absence of extensive weathering/fatigue 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, quadrant ranges to the south show a consistent (almost invariant) association between some young chert-bearing units (Cretaceous and Tertiary deposits) and older than Mississippian chert, while lacking outcrops of younger Mississippian rocks. In contrast, the northernmost quadrangles exhibit a diverse and variable array of chert of different ages. This situation is no doubt a result of faulting which occurs from Edsville northward toward the Ohio.

The significance of this variability to the study of aboriginal utilization of chert is not immediately clear.

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survey two definite quarries were located in Credentia 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.

Gatin (1978) has generally characterized the material collected in the study area. In addition, at 8FU 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 thousand 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 chert has in(lplications (Luedke 1978a, 1978b) recent studies suggest that success in characterizing chert by neutron-activation analysis is a realizable possibility (Sieck et al. 1972; Ives 1972; Luedke 1975a, 1975b, 1976). In particular, because of the heterogeneity inherent in chert deposits it may be necessary to utilize larger samples than has commonly been true (Lane 1975) and statistical techniques such as discriminant functions (Devlin 1973) which lend themselves to the objective of defining sets of variables which do not discriminate between sources. We hope to be able to use the results of such techniques in the 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 some visually resembling the distinctive material are observed in artifacts assembled over a wide area of the Southeast, identification is routinely made as "Dover chert." Such distinctions are useful in characterizing and identifying of chert sources is west Kentucky.

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To this end a visit was made to the Dover quarry to assess 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 of the total range of variation in the source would be represented in the sample. By systematic collection along 6 transects 56 samples were obtained from the Dover quarry. These samples are currently undergoing trace element analysis at the University of Tennessee.

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 hardest material most characteristic of this source, to dark visually homogeneous clasts not exhibiting the "tipped" burning 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 palaeo-environmental, climatic factors associated with the prehistoric sites being studied. Although archaelogical studies to date suggest that climatic variation in the mid section of the U.S. may have been minimal for the last 4,000 years (Watson and Yarnell 1966; Asch and Asch 1972; Atkinson and Haubert 1966; Chomick and Crawford 1970; Watson 1974; Yarnell 1966; Byroos and Wendorf 1967; Paranza 1969; Moses 1977, among others), there is a paucity of palaeo-environmental data for the study area. In an effort to remedy this situation we have undertaken the search for materials which may yield useful palaeo-environmental 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 millennia. Because pollen is not inherently well-preserved in archaeological sites in this region, our activity was restricted to water-tipped, 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 26 locations using a 1/2-inch sampler from a small aluminum boat. Along the river only lakes distant from the water channel (that is, near the floodplains/uplands interface) were sampled in an attempt to avoid those subject to periodic or annual flooding. Sediments ranged from 1.0 to more than 4.5 m in depth. In some cases, due to sediment compaction and limitations of the collecting device, the section of the sediments was not reached. Twenty-two samples have been processed and currently 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 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 unaltered conditions, basically because of an absence of Ambrosia. This does suggest that recreation 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.

Cenomination of the search for usable pollen re-

formation 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 cer-
tain that flotation of archaeological deposits will be critical to extraction of data which may be useful in suggesting palaeo-environmental conditions. During this year's field work we located a deep mid-Arkansas deposit on the Tennessee River which no doubt con-

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heaths 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 sites for further investigation. In an attempt to facilitate construction of an Archaeological chronology, survey must be continued and our excavation program must be expanded. I am currently attempting to secure funds to undertake examination of the extensive materials collected during the Kentuckiana survey. These collections apparently contain substantial amounts of Archaic material and a regional beginning at building a cultural chronol-

gy can probably be made through analysis of these research.

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 bey-

ond the lower Cumberland area.

Our regional sampling program will be continued in tributary valleys of the Cumberland in addition to Hickory Creek. Both these 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 investiga-

tions and will contribute to a more precise under-

standing of biasing factors in archaeological survey in the region.

Similarly, the search for chert quarries and tech-

nical analyses of chert samples will continue as will exploration for waterlogged and other deposits which may yield older polities. Excavation and flotation of archaeological deposits discovered in 1978 will be undertaken. Carbonized vegetal remains recovered from flot data will aid in assessing past paleoenvironmental conditions.

New areas of research should include geomorpho-

logical 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 potential of the rivers to support populations of various species of shellfish in an era predating modern modification of streams. Similar information may be gathered 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

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vided invaluable assistance. Tim Thompson permitted us to excavate on land which he had cultivated 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) pro-

vided aid in the form of continuing interest in our work and loan of various pieces of field equipment. George Halley (Southern Illinois University) was helpful in providing chert specimens from southern Illinois.

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ustrations.

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Kent A. Schneider

A CLUTTERED NATIONAL REGISTER: USE, ABUSE, AND LOOPTHES 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 finds (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 National Register. I reached western North Carolina, the sunken ships wholly out of archeological "reach" due to deep water, and the kudzu of Kentucky. From the shadows I watched front linesmen eagerly nominate—in their own minds if not in practice—a single-site point 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 pointed in the National Register as "eligible for inclusion" 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 funds were corroborated by 5 uninformant consultants). It was while reading the latest edition of Advisory Council amendments to existing regulations (part 800)—I had obtained it by work¬ing copy, legitimately—that my reactions to certain trends in today's procedure 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 the outcome be? In light of all the cultural resource regulations enacted 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 concern among archeologists which is "managers managing cultural resources". While we do have our researchers, the dichotomy between pure and applied is widening, perhaps 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 than 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 acquired "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 "uninventoried" areas (nor should there be) but no metric limit to future additions. While we recognize the problems inherent in qualifying a site for Register status, we do not question the blessings but in fact refer to these often as absolute.

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 ship-board work? Are we taking clients "to the cleaner"? 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
to understand and correct these before we become the reaction rather than the catalyzer. Permit me then to define what we mean and then address some problems.

Reactions: substance which enters into a reaction and is used up.

Catalysts: substance which speeds up or retards a reaction but is not, itself, consumed.

1. The Big Stick. Those are amongst us (I know, in every business) who, for their own interests, have to "hit 'em on the head" to get their point across, regardless of current cultural and economic regulations permit such shrillness and provide no escape 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 16th centennial process to be invoked and close a project expeditiously. They 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 or may not be as archeologist), the project may be held up. Many archeologists are prone to use such phrases as "they'll learn to knock out faster" or more directly, "you will do the survey and you will pay for it or I will stop your project." I suspect that tactics such as these—and these are widespread—encourage the fishbowl image of archeology. We need sanctions against the Big Stick approaches.

2. Insatiable Data-Insatiable 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 "bas" requires surveys and mitigation where necessary. What kinds of tools can be brought to bear upon "values." Are these values for archeology only? The bottom line is archeological data, but of what order or magnitude? We can not predict the amount of an archeological site as physics does the 1/sub N, yet we allow 3% samples of 89mile roads, and 3% samples of 10,000 acres of land. We conduct "100% surveys" of one hundred acre tracts, call these "protection" 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 be in your eyeballs again!" I submit that our lack of precision instruments to locate the target of our field investigations (compass, linoleum, metal fasteners, principally) is indefensible and can not pass even the weakest hie of social criticism. The lack of these tools needs bad work (insatiable results).

3. Loopholes in the Laws. I was disappointed when reading the latest amendments to the Advisory Council regulations. Once again, our protestation is "vulnub" on itself: this needs to be changed. The National Register is not a place for "garbage" sites, yet with the provisions for "eligible" sites I 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 pinned in the Register for purely political reasons, they are not there because they are significant. If there are checks and balances on the caliber of sites included in the National Register, these are subjective and the result is costly in every respect. These political sites are the result of work in the State where an inspection of the kind of work accomplished—the benefits of the work to the archeology and to the public—are astounding. I submit that when we close 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 899 as "eliminated" sites when virtually nothing needs to be known; why there are no provisions to insure that a client paying for the high cost of an archeological survey about which he knows nothing can not be assured a fair and just return.

The Archeologist, just what is the person who manages, researches, observes, salvages, mitigates and surveys cultural resources? We have, first of all, too many unimaging managers. These persons are unimaging because they know nothing about management. "Cultural Resource Management" is a skin to cantaloupe... 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 feel of exploring the imprints. The rest—conservation, salvage, mitigation, survey—fall into place by extension. We have not yet made the commitment to insist 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 commenced with our product.

Summary
My tangent point is one shared by many of you and is often voiced but talked of quietly. The quality of archeological reports written varies entirely too grossly; our public conduct is "puffy" for such a soft discipline. Our tools for search independently anticipated. In our rush for "reognition," our archeological tradition is being skewed and we are exposing our flank to a suspecting public. We can not continue to encourage, let alone condone, such as inventorying all federal land by 1965, 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 leave to and introspect, we are going to get the rubber back.

Note: This paper was prepared by the author in his private capacity. No official support or endorsement by the Forest Service or any other agency of the Federal government is intended or should be inferred.
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, current archeological practice continues to be carried out largely in the absence of any definitive information as to what exactly will happen to these 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 concerns 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 Southeast 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 Southeast Regional Office should become the headquarters for this study (Levi-Law 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 United States are now being inundated whenever they contain material applicable to the general problem of the impacts of freshwater inundation on archeological remains.

Reservoir Impacts on Archeological Sites

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 (Ratl et al. 1976). 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 those 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. Short erosion can quickly cut into archeological deposits. Erosion may be so severe that mortars 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 context 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-burial for sites 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, tomato plants fix salts in the soils beneath them and thus alter the subsurface chemistry. Most chemical impacts, however, involve the dissolving of materials in contact with unsaturated reservoir water. In Lake Powell, Utah, the iron cements in undated sandstones have been completely reduced out of the rock after seven years under water (Ratl et al. 1976). 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 silicate content. Thus, one sees abundant evidence that even so-

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called "non-perishable" items, such as lichens, are in
deed 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 microbial activity
within inundated sites may be one of the most im-
portant factors contributing to the breakdown of cul-
tural materials. Bone, vegetal matter, wood, and
leather deteriorate rapidly in most aqueous environ-
ments. Within a few months, these categories may be
completely destroyed by aerobic and anaerobic mi-
creaers.

Macroinvertebrate fauna also affect cultural re-
 mains. Freshwater clams, attracted by the texture of
ceramic sediments in basaltic floors or middens, will
often seek out these features to burrow in. Such activity
can severely distort the stratigraphic position of ma-
terials located within those cultural features. Further
destruction to the integrity of these features can occur
during drawdowns when sediments dug for clams surfaced
in the middens or house floors.

Of course, the single greatest danger to archeologi-
cal sites from biological agents comes from man him-
self. 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. Pioneers may camp out directly on
top of archeological sites. Sites have also been turned
into picnic areas, parking lots, or boat ramps and their
wall alignments have been converted into heaths. In
other cases, historic sites have been completely de-
molished by campers or pioneers seeking to reutilize
structural building materials. It is important to re-
iterate 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 con-
struction can have on cultural materials. The National
Reservoir Inundation Study's mandate, however, in-
cludes more than merely documenting the possible
range of effects impacting archeological sites as a result
of dam building. There remains an obligation to at-
tempt to predict what the mechanical, chemical, or
biological impacts of flooding might be, given the
physical, geologic, and chemical setting of a site, the
material it contains, and the river being im-

pounded.

To fulfill this obligation, the Inundation Study
published its Preliminary Report (Lemhan et sl). 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
impoundment will have on cultural materials, analytical
techniques, and dating methods.

Data Collection

The confirmation or rejection of these many hy-
potheses will be based on information gathered either
from library research, field work, or experiments. Li-
brary 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, at-
tempts are being made to avoid duplication in research
by utilizing data obtained from other disciplines on
material types commonly 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 rele-
vant 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 aildades, data collection, and sampling both be-
fore and after sites go under. The primary criteria for
justifying a field session is the existence of good pre-
inundation controls. Through surveys or excavations
must have documented what the condition of a par-
ticular site was prior to immersion. Sufficient samples
of archeological materials must have been collected to
run analytical tests on comparable materials retrieved
after the site has been flooded. It can then be determined
what physical or chemical changes have occurred.

Over the next year and a half, an increasing pro-
portion 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 mechan-
ical 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, flooding and drying might have on material
on particular materials in a site, given its soil type
and consistency. Clearly, one must be able to anticipate
the physical dislocation of a site that immersion will
cause, since complete erosion may render other
questions academic.

Another major experiment already underway is a
project designed to assess the impact of water chem-
istry on the preservation of common archeological mat-
terials. This laboratory experiment is taking place
at the University of New Mexico. There, thirty can-
tainers have been filled with chemical solutions. Based
on USGS data, fifteen buckets will hold median con-
centrations of the major chemical constituents in re-
sevoir 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, sul-
phate, chloride, carbon, and bicarbonate. The arti-
facts being tested include various types of ceramics,
lichens, 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 the end of twelve months, artifacts will be removed
and measurements taken of their rates of decay. They
will all be photographed or weighed on sophisticated ana-
srlytical balances. Their physical deterioration will be
measured on densimeter machines and chemical changes
documented 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 found 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.

Lithologists from Virginia Polytechnic and State University are working with the Immedium study on the project. Archaeologists will place three containers of identical artifacts to those used in the laboratory experiment at each sampling location in the reservoir. Each 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 artificial degradation 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 archaeological, chemical, and biological variables can begin to be understood. It is hoped that the results will allow for the prediction of what physical-chemical 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 still exist enough relevant information to evaluate them. These conclusions will be published in a final report to be issued in 1986.

Given the myriad of hypotheses in the Preliminary Report, the limited amount of time available for this 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 archaeologists 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 archaeology 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 completed archeological field work planned to utilize these limited resources. For example, in certain reservoirs, given a particular range of water chemistry conditions and biological activity, some materials might deteriorate beyond recognition in five years. Given such a prediction in the Immedium Study's Final Report, a research design that ignores this class of data, because of a researcher's bias toward 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 modeling 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 the work of this study. Such research will be both original and influential. This additional research coupled with our Final Report will allow reservoir managers to anticipate and effectively mitigate the effects of inundation when archeological resources are flooded in any section of the country.

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Michael Trinkley

SURVEY METHODOLOGY: A PERSPECTIVE FROM THE CAROLINA PIEDMONT

Or at least if there were sites to study, they were few in number and so elaborate and or unusual that only a blind mind could miss them. I suppose that at least portions of this characterisation 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 stake peaks at James Griffin's site files, or that for the past three years there has been a clamor 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 flake answers can question, perhaps even important questions, it is the larger site 2JrB1 that 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, Hoane, 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 Anthropology and Archaeology, at the University of North Carolina at Chapel Hill. For survey purposes, the South Carolina Department of Highways (Cable, Cauley, and Sexton 1978). This survey, on a new location right of way for a large U.S. 195 interchange at Parcel, was conducted primarily during February and March of this year, at a cost of $10,000. The topography of the survey area was determined using LIDAR, a technology developed by the South 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, 58% of the ground is in open land—either under cultivation or in pasture. The remaining 42% 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 that 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—8LKrU1, 28 and 54—were felt by the field investigators to be important.

The Parcel project began with a 15 month reconnaissance of the corridor, during which 9 sites were found. The only areas of investigation were road cuts, plowed fields, powerline trenches 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 35% of all sites eventually to be recovered were located. Sites 2 and 3 should 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 a purely personal 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 unproxpiable to Aboriginal occupation" or you may be saying, "So what?" I know both questions if you will bear with me a bit longer.

The second and place of the Union to Parcel survey was a 55 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 95% of the corridor was surveyed, and suggest that the 15% not surveyed falls primarily into the category of dissected drainages, accounting for 48% 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, Cauley and Sexton 1978:59) state, "we feel that a representative sample of sites was located."

Exactly what was found as a result of this intensive field survey? Twelve additional sites were recorded, and one site—8US941—was to the field investigators to be "important." But of the 12 sites—5 (25%) were found in cleared area, 5 (25%) were found in road cuts, 3 (25%) were found in wooded areas, 1 (5%) was found in a fallow field, and 1 (5%) was found in a wooded area, all sites 90% of the intensive survey sites, were found in cleared areas—areas which should be visible during a reconnaissance survey. During the 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 examinations of the wooded uplands and dissected drainages, ranking very high in terms of density of time and labor investment, located 1 site, having on it a quartz chank and 2 flake.

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 Parcel intensive survey was expensive—from $10,000 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 should have eliminated 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 be found in cleared areas, even after a detailed examination, 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 "site survey" sites in the Carolina Archaeological Council initiated a series of
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 visibility areas" (Cable, Cateley and Sexton 1972:8). Leland Ferguson (1970:15) utilized posthole diggers to obtain subsurface information in another survey conducted by the Institute of Archaeology and Anthropology. Of the 105 holes dug, material was recovered from only 34 or 33% of the total. While 17 of the 25 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 "soilview tests" as a 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 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 overlook 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 resolution, identification and data recovery; and (2) to discuss the status of investigation on small, open sites. While the two purposes do not mesh into a cohesive topic for discussion, it is the first that directly influences the type of complex, 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

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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 Test; (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 et al. (1973); Aitken and Conaway (1973); Allen and Griffin (1974); Allen and Pollack (1978); Auray (1977); Barber (1977a, 1977b, 1977c, 1977d); Collins, Glover and Glover (1977); Collins and Griffin (1977, 1978); Coon (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, 1976a, 1976b, 1976c); Schock and Foster (1973); Turnbow and Allen (1976a, 1976b, 1976c, 1976d); Turnbow, Allen and Mayfield (1977); Turnbow, De Lorenzo and Allen (1977); Turnbow and Driskill (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); Bozarth (1978); Collins, Biskill and Lockenback (1979); Granger and DiBlasi (1975, 1977); Maynard and Gutn (1976); Robinson, Turnbow and Allen (1977); and Schock and Foster (1976). The latter examples is considered a variation on this technique for the purpose of organizing this paper. In this report three "pewl tests" consisting of 55 ft long strips of sand 100 ft apart were plowed and checked for artifacts.

Systematic shovel testing requires that 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 and McComas (1976); Jansen (1976); McHugh (1953, 1956). In one instance the backhoe front end loader was utilized (Collins 1975, 1976). In 1970 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 (1970) 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 hayed 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 (1976:72). Due to the occasional 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 measurement 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 (Leedlecker 1978) reports the operationalization of this data collecting strategy in Kentucky. Transects measuring 100 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 7222 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 collected would have a much higher interpretative power.

Apparantly transect interval sampling coupled with shovel testing and raking is a fairly productive invesigatory technique.

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Flag and Bag

In a recent survey by Granger and Di Basi (1977) artifacts and concentrations of artifacts were identified with flagging tape 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 delineate 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.

Chenek's (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 1.5 m iron re-inforcing rod was set in the ground over the datum with a 30 cm tape attached to it by means of a short nylon cord. A tripod was erected over the datum and a theodolite fitted. 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, bifacial fragments etc.). This method was followed until a 400 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 variances 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

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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.

Implementation of the Flag and Map technique is best initiated in freshly tilled or diked 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 interpretation of the data to rough estimates of site type and relative chronology. Also, since no intensive 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 in- crease our efforts at innovative methodologies that will allow us to track information down from such data sets. Finally, the distribution of bifaces and lack of flakes in the central portion of Figure I may represent one of the most intriguing phenomena. On one hand, these artifacts may represent a pattern of human behavior we are aware of and are therefore worth the time needed to investigate and understand them.

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Collins, Michael. 1972. Site 150: Borei Drakell and Al Luckemeyer. 1975. An archaeological survey of a portion of the area and testing of several archaeological sites within the area to be affected by mining activities of Texas Gas Transmission Corporation, Henderson County, Kentucky. A report for the Texas Gas Transmission Corporation by the University of Kentucky Department of Anthropology, Lexington.
In the spring of 1976 a brief note was published which described one aspect of cantorial serendipity in archaeological research (Schick 1976: 5). 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 beemewood and three cob and kernel fragments of probable 8-10 row Eastern Corn. These ethobotanical remains were associated with wooded dunes, marsh land, and 35-75 below sea level, 1.000-9.05 = 25 (CWRU-172) and with a note which implied that these Mississippian vessels in this container had been given to the Museum by a Mr. Smith who reported that they had been collected by a Mr. Jones in either 1857, or 1867, from the Rose Mound, Cross County, Arkansas in its levels, overlying a Baytown-like component.’

Investigation suggested that the mound ported by this Mr. Jones had already been visited by Clarence Bloomfield Moore, a figure of some significance in Southeastern Archaeological Conference Bulletin 22, 1930 Southeastern    

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1979h. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.

1979i. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.

1979j. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.

1979k. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.

1979l. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.

1979m. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.

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1979o. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.

1979p. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.

1979q. An archaeological survey of the proposed drill hole locations and access roads in southwestern Kentucky, Report No. 11, Archaeological Services, Inc. of Kentucky, Lexington, Kentucky.
Wyman's opinion about the relative ages of the shell middens was indeed true (1892:195) (Stot- 

While Moore's inspiration has always remained somewhat of an enigma, his methods have usually been clear, and his real 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 he would lead a small party, usually consisting of one of the major Southeastern streams, seek-

ing excavatable sites and obtaining permission to dig. Beginning typically in November, Moore embezzled in his 'hundred-foot-long, low- 

nighted, stern-wheel steamer, the Gopher, ac-

panied by a personal friend, five to ten ex-
cavators, 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 the next year while Moore studied the artifacts and pre-
pared his reports. To be truly significant, after 1894, Moore's work can be characterized as that of a sophisticated gadfly. He focused nearly all his attention upon mounds and flat meadows where burials accompanied by rich mortuary offerings were most likely to be found (Stetman 1973:150-31).

While a large extent, considerable information can be extracted from Moore's published reports and his unpublished maps and fieldnotes (e.g., Willey 1949; Peabody 1971; Rose 1970) it is often difficult to reconstruct the context of the recovered ma-
terial 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 shr. Shaw whose heirs later donated them to the Cleveland Museum of Natural History. Mr. Shaw, in the words of his son, was quite interested in prehistoric South-

ern ceramics. So was Mr. Moore, and it is regretable

is to the fact that after 1896 his work demonstrates that he had acquired from the path upon which he had first embarked, the path which had been so carefully marked by Thomas, Pottsway, Wyman, Nelson, and other pioneers of Southeastern archaeology. As in Newman's physics, we may suspect that some external force was present to alter Moore's initial trajectory toward his final notorious direction. We may even be able to identify it.

Back in Ohio in late 1877 the last of the uncata-

gned Cleveland Museum of Natural History anthro-
pological accessions from the 1930s were being un-

packed and entered into the systematic collections. Among limestone fragments from an Egyptian Hieroglyphic inscription and cartouche of Ohio Flint Ridge chalcedony I came upon a taped cardboard box identical to that in which the Rose Mound Mississippian vessel were found in 1974. With considerable anticipation, I opened the box to find, to waddled newspaper packing, four shell-topped Mississippian vessels within one of which (Figure 2) were two fragile folded-

letters. The flat-bottomed jar with loop-handles (Fig-

ure 4) had no catalogue number or accession number on it. The other three (Figures 2, 3, and 5) all had the Cleveland Museum accession number 9678 written upon them. They also had the crossed out number 2952 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 loopy handle pot (Figure 5, 6) were far more informative.

The first letter dated January 1894 clearly indi-

ated that an A. B. Shaw of Oshmet Falls, Ohio had purchased at least the three vessels marked 2952 from a C. W. Riggs who had exhibited them at the 1897 Columbian Exposition in Chicago. Riggs had excava-
ted them from a grave in a mound located near the bank of the St. Francis River on the southeast 1/4 of Section 5, T8N, R3E in Cross County, Arkansas. Riggs stated that his field records were preserved in a fire-

proof building. A directory check of the address listed in Chicago revealed that a Captain G. Riggs of Phila-
delphia and Washington had been occupying an office at 617 Edward Avenue from 1883 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 publica-
tion "How We Find Relics" which, for 50¢ illus-

trated frontier life while collecting, gave value of spec-

iments, 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. M. Holmes of the Smithsonian Institution authen-
ticating the Riggs collection of Arkansas ceramics. Oddly enough, the original ceramic reports by Holmes (1905) made no mention of Riggs. Nor was there any mention of Riggs in The Official History of the 1893-1893 World's Columbian Exposition in Chi-

cago (Truman et al. 1989) although the Ethnology section on, that report did state that the ceramic col-

clections of Mound builder relics from Mavetia, Ohio which were on display, had been purchased by Ward's Scientific Institute 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 waddled newspapers in which the Cleveland Museum's ceramics from Mr. Shaw had been tucked were interesting in their own right. They were from the October 10th, 1891 edition of the Illus-

trated 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 stoneware jar. With the assistance of Ms. Mary Baum, Librarian of the Cleveland Museum of Natural History I obtained from the Buffalo Express mag of, a copy of the October 10th, 1891 issue of the Illustrated Buffalo Express. On the first column 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 Science Buy it?

Ancient pottery seems to interest pretty nearly everyone. The deep-leamed wistful stalks to it to 

discover what manner of people they were who made it, and thereby draws deductions which, however much they differ from the de-

ductions of everybody else, he is willing to de-

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fend with his life. The simple housewife, un
sophisticated 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 every-
thing 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 de-
duction from the two extreme cases is that Buf-
talo, 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 archae-

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ology, calls it the best collection of mound-
builders' pottery in existence—better even than
that of the Smithsonian Institute or of the Pea-
body Museum. Can it be wondered at that the
Society of Natural Sciences, as a body, covets
this collection for its own? Like most unreal
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 uninteresting, and when it is con-
sidered 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 car-
tied him thousands of miles and through many
hardships. It is as essentially a part of him as
his skin. The story of his wanderings in search
of the precious pottery is righ as interesting as
is Jason's voyage in search of the golden fleece.
Moreover, there is just one point wherein these two voyages 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 all the pictures on our page.

Mr. Riggs looks to be the sort of man not inclined towards the conventional—and his books 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 24 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 'shabby boats,' as they are sometimes called. They are usually run by a boy, good-for-nothing Joe 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 bridge 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 already ready to follow, and in springtime, when the beast 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 roses have about quit blossoming, 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's river 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 considerable. E. 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 houseboats...

"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 1881, some of 'Emerson's Nature' 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 pap, plate holder, and the hundred other things necessary for developing photographs."

The method "Cape." Riggs (as he is usually called) follows in hunting pottery is to explore the land adjacent to the river banks where much the greater part of it is found, and when he discovers what he believes to be well-stored mounds, delves with spades and what might be called a "felling rod"—a long iron bar about the thickness of a lead pencil. The pottery is very soft when it is found, and it 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 likely to contain what to him is as "good as gold." Mounds of sepulture are more 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 cord, 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 funeral 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 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—of which matter it might be the skeleton of an elderly matron. The Siouneh twin water vessel which appears around our illustrators today is made of clay and powdered gold, as are nearly all the pieces in the collection, and it is preserved in Casesay, Arkansas. As it is far too precious for there were Siouneh 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 the twin breasts, but Frank Church doesn't accept that view. Of the two bowls with it, the one to the right can scarcely represent a man 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 merely shaped by hand. To protect it, and to assist in carrying, the clay vessel was encased in a plaited straw or grass or willow 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 stomped 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 narrow 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 tools to help me in my digging," said Capt. Riggs. "And I have read about the pottery writers 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 am running 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 unadulterated 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 horse-back represents Mrs. Riggs as she traveled over the continental divide on a brontosaurus. Pottery-collecting in the West was attended by many disheartening difficulties, for oftentimes it had to be carried in the hand over 15 or 20 miles of roads leading between abysses teeming down to "eternity," as Mr. Riggs expressed it, on either side of which daschund could be sworn liable to一经 by blasting on the other. Whether the pottery was in a dozen fragments or in a single large piece, this equerntian circus was probably no more than the freezing of water vapor and sunshine materialized. Pointing to a fine "olla"—a water vessel shaped somewhat like an inverted pear—Mr. Riggs told of the "eternal custodianship of certain types of mankind—partially commoner. For an unknown number of years—perhaps centuries—this magnificent specimen of the cliff-dwells had used 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 commoners 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 these 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 nonmad ship, but the life suited the gypsy-like family, and they crossed the Continent and 150 miles of Kansas before they took to a railroad.

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It is apparent from this extensive report that Riggs, who was indeed unconventional in looks had begun collecting aboriginal ceramics in 1870 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's ideas of ceramic chronology are of some historical interest they detract from the major influence in Southeastern archaeology appears to have been being somewhat less theoretical line.

Between 1884 and 1895 Riggs was in the Philadelphia and Washington area where he met with W.H. Holmes. In 1885 and 1894 he was in Chicago where he exhibited his wares and his methods at the Columbian Exposition. Between 1884 and 1890 Riggs returned to the Southwest to collect fabrics. By 1889 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 Wamakers Department Store, Broadway and Tenth Streets (Figure 1). After exhausting 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, groveliers, and smoking-rooms, and particularly for country houses and sea-side cot.


Appendix

A Typological Analysis of the
Mississippian Artifacts a
in the Cleveland Museum of Natural History

The three stratial types new to the Cleveland Museum of Natural History, were collected by Rigs from the Neely's Ferry Phase (previously known as the Neely's Ferry Phase). The two vessels were the part of the Shaw collection. These three vessels represent three distinct technological styles.

The first vessel (Figure 1A) is a small globular vessel, with a conical foot, a short straight neck, and a flattened base. The body of the bowl is decorated with a series of small and regularly spaced pendants, each of which is approximately 0.5 mm in diameter. The surface of the vessel is smooth, with a slight glaze. The vessel is approximately 7 cm in height and 10 cm in diameter.

The second vessel (Figure 2A) is a small globular vessel, with a slightly flared rim, and a rounded base. The body of the bowl is decorated with a series of small and regularly spaced pendants, each of which is approximately 0.5 mm in diameter. The surface of the vessel is smooth, with a slight glaze. The vessel is approximately 7 cm in height and 10 cm in diameter.

The third vessel (Figure 3A) is a small globular vessel, with a slightly flared rim, and a rounded base. The body of the bowl is decorated with a series of small and regularly spaced pendants, each of which is approximately 0.5 mm in diameter. The surface of the vessel is smooth, with a slight glaze. The vessel is approximately 7 cm in height and 10 cm in diameter.

In all three vessels, the necks are considerably thick, and the body is decorated with a series of small and regularly spaced pendants, each of which is approximately 0.5 mm in diameter. The surface of the vessel is smooth, with a slight glaze. The vessel is approximately 7 cm in height and 10 cm in diameter.

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