COPPERHEAD HOLLOW (38C758): MIDDLE HOLOCENE UPLAND CONDITIONS ON THE PIEDMONT-COASTAL PLAIN MARGIN

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1992. Joel D. Gunn and John E. Foss. Copperhead Hollow (38CT58): Middle Holocene Upland Conditions on the Piedmont-Coastal Plain Margin. *South Carolina Antiquities* 24:1-17

Abstract:
Excavation during July and August 1992 at 38G758 east of Jefferson, South Carolina, revealed an active Middle Holocene sand dune with buried Morrow Mountain and Guilford components on the lee side. 77e site is located on the upland margin overlooking a tributary of the Lynches River. Although it is possible that the artifact stratigraphy represents lowering as described by Michie (1990), three lines of internal evidence suggest that the components are partially in place. The lines of evidence are artifact size analysis, distribution of components relative to sand dune topography, and coherence of features. 77w Middle Holocene climatic contest of the site is inferred from global scale climate variables which suggest that desiccated uplands are a reasonable hypothesis. A Guilford feature, a cluster of large fire-cracked rock, was found to contain small fragments of bone which dated to 5,350f60 B.P. 77e site was covered which dated to 5,350 ±60 B.P. 77e site was covered with longleaf pines during the subsequent 1,000 years. Site 38L15 southeast of Columbia appears to be a similar dune site with buried middle Holocene components.

Article:
Copperhead Hollow (38C758) is located about 10 miles south of the South Carolina-North Carolina border and about 50 miles southeast of Charlotte, North Carolina near Jefferson, South Carolina (Figure 1, Foss et al. 1993; Gunn and Garrow 1993; Gunn and Wilson 1993). Ii was excavated during July and August of 1992 for the South Carolina Department of Highways and Public Transportation in preparation for construction of the Jefferson Highway 151 bypass. The excavation encompassed 120 m of 4,200 m2. The site is situated on the upland margin overlooking Fork Creek, a tributary of the Lynches River. Physiographically it is within the Sand Hills region of the Upper Coastal Plain and within a few miles of the Piedmont fall line.

Sedimentological analysis, topographic landform observations, and investigation of horizonal and vertical artifact distributions led horizonal and vertical artifact distributions led to the conclusion that the site is a stabilized sand dime (Foss et al. 1993). Carbon dates on botanical and archaeological specimens indicated that the dune was active between approximately 7,500 and 4,500 years ago, the period defined climatologically as the middle Holocene. Background research further suggested that the presence of active upland sand dimes was not uncommon on the Atlantic Slope during the middle Holocene. The middle Holocene contains three cultural phases, Stanley, Morrow Mountain, and Guilford (Blanton and Sassaman 1989; Coe 1964). Morrow Mountain (7,500-5,500 B.P) spans the greater part of the period and is characterized by numerous small sites, relatively homogenous tool inventories between sites irrespective of landform location, and substantial preference for quartz for tool manufacture (Sassaman 1991). Morrow Mountain diagnostics occur over an extremely wide range of geographic space and elevation (Gunn and Wilson 1993). Guilford appears to be largely restricted to the northern Piedmont. The objective of this article is to suggest the context of middle Holocene climate of the Upper Coastal Plain at global, regional, and local scales, and derive a set of implications for landscape reconstruction and other future research questions.

LANDSCAPE RECONSTRUCTIONLANDSCAPE RECONSTRUCTION CONCEPTS AND METHODS

Landscape reconstructions have generally been scaled in areal to regional spaces and at time periods of thousands of years. Such landscape models encompassing geomorphic and biotic conditions provide a comprehensive synthesis of general changes at epochal time scales (e.g., glacial and Holocene), with some representation of sub- epochal periods. Delcourt and Delcourt (1987), for example, studied the Appalachian summit region and covered the time from 20,000 B.P. to the present in four panels each representing between 3,500 and 12,500 years (Figure 2). The antecedent heuristic device to landscape reconstruction panels was area wide vegetation reconstructions such as that offered by Whitehead (1965) for the Pleistocene and Holocene of Eastern United States.

While these landscape reconstructions provide an articulation of landscape attributes in broad temporal and spatial generalizes, they gloss over much of the probable and reasonable diversity of past environments at brief time and local spatial scales. As Dincauze (1992) points out, these broad generalities have limited value for the study of archaeological sites. On the other hand, both the impact of global climate change on regions, and

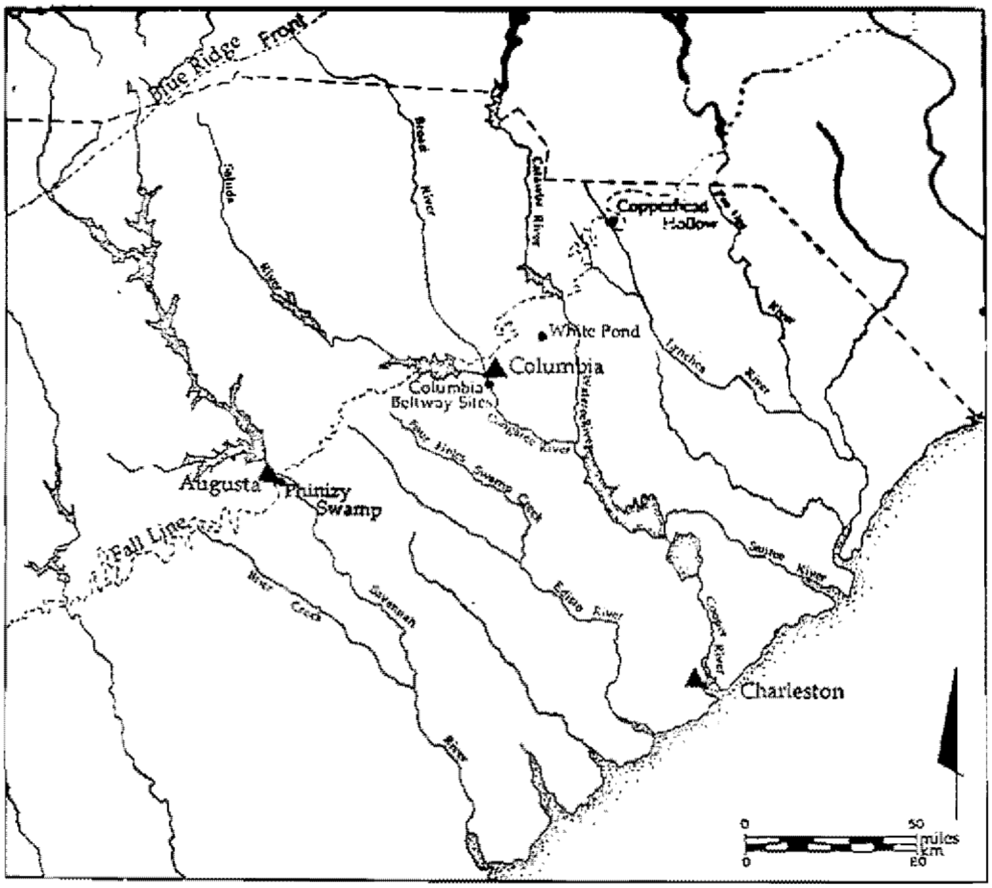

Figure 1. Map of South Carolina, showing location of Copperhead Hollow (38CT58) at the interface of the Piedmont and Coastal Plain provinces, and other sites mentioned in text.

river system geomorphology are now available to augment understanding of site context. Knowledge of the processes which govern climate change and empirical investigations of climate have burgeoned m the last decade thanks to significant increments of research by climatologists, glaciologists, archaeologists, solar physicists, oceanographers, geologists, and others (Broeker and Denton 1990; Bryson and Goodman 1980; Gunn 1991; Gunn and Crumley 1989, 1991; Rampino et al. 1987; Schneider 1987; Schneider and Londer 1984; Wendland and Bryson 1974; Williams and Wigley). A factor contributing ιο ιο this research direction is the concern scientists and policy makers have encountered for the effects of global warming, Detailed studies of global circulation and regional effects indicate that very significant climatic changes occur in quasi-cyclical periods ranging from years (e.g., EI Niño) to centuries (e.g., volcanism). In the perspective of regional cultural adaptations, each of these changes, whether it be a decade of drought or a century of exceptionally cold winters, must be addressed by regional cultures in order to insure survival and continuity (Gunn 1994). Regional context is also available from significant advances made by geoarchaeologists in river systems (Brooks awl Colquhoun 1991) and comparable upland geomorphololgy is being developed (Gunn and Poplin 1991; Johnson 1993; Michie 1990).

Given the complex nexus of all of these lines of evidence, landscape panels composed of attributes will become increasingly a heuristic necessity. However, representing short term changes as time dependent panels would be an enormous task bath to prepare and to comprehend. A time panel for every 300 years since 20,000 years ago, would yield 67 panels; a panel for every decade would yield 2,000 panels. Such an array of panels would undo the heuristic value of landscape reconstruction leaving the student of landscape with a bewildering information stream. To set time and space ιo scales useful for the study of cultural change (see Wise and Crumley 1993 for investigation of effective scale), and at the same time retain the heuristic properties of landscape reconstruction panels, another approach should be followed for sub-epochal time periods.

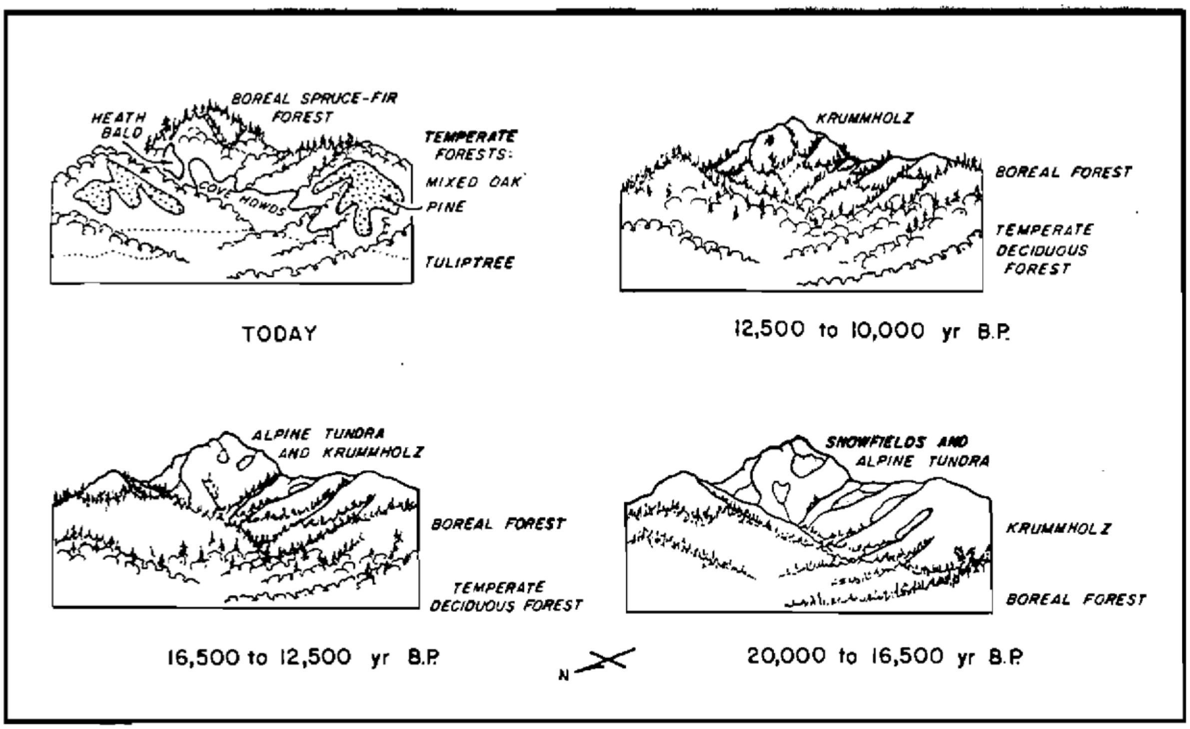

Figure 2. Appalachian Summit landscape reconstruction panels (Delcourt and Delcourt 1987).

One potential approach would be to construct panels which are not time dependent, but rather process dependent. Determining the nature of each panel would be a typological exercise not unlike typing artifacts by attributes (Figure 3, Attributes). Dzerdzeevskij (1968) found that global atmospheric circulation patterns could be classified into about a dozen types. The atmosphere changes suddenly from one type to anther about every 10 days because of the restraints imposed on air streams by mountain systems, bodies of water, and other factors (Reinhold 1987). Because regional climates are a function of the dominance of one or more of these global patterns over a number of annual cycles (Gunn 1982), it is likely that one or a few panels incorporating key types would be necessary to represent the important climates of a given locality or region. For the present, these key types can be represented by the more traditional Koeppen climatic classification system concepts of tropical, subtropical, temperate, and Arctic airmasses, although further research will probably refine airmass attributes. The climate patterns would then be combined with attributes of local vegetation, fluvial chronology, and cultural landscape modification to produce a suite of panels summing the findings of a landscape study. Rather than being temporally driven, the panels would be process driven thus limiting their numbers without limiting the scope of their implications. Each panel(s) would represent a number of periods during which relatively stable climate of a few decades or centuries generated comparable landscape attribute combinations.

The global circulation patterns as observed during the annual cycle are products of seasonal variation in the global temperature and atmospheric circulation patterns (Figure 3, Seasons). A typical temperate latitude winter in Seasons). A typical temperate latitude winter in the 1960s and 1970s (cool world) featured a dominant Arctic airmass characterized by dry and cold atmospheric attributes. This was followed by a temperate spring (warm and wet) and a subhumid summer (hot and dry). With the exception of the years following the 1982 El Chichon eruption, the 1980s were globally hot. Globally hot winters were dominated by circulation patterns which are more typical of cool world spring. The climatic attributes of a given panel are thus defined by the seasonal global average temperature or Global Energy Balance (GEB, Budyko 1977). The relationship between GEB and the climatic attributes of the landscape panels is repeated each time the GEB enters a given range (Figure 4 A-E). The wet-warm panel applies each time the global average temperature enters the warm range. Marine, fluvial, vegetational, and cultural attributes can take less nimble and less reversible trajectories thus requiring additional panel sets when combined with the atmospheric attributes.

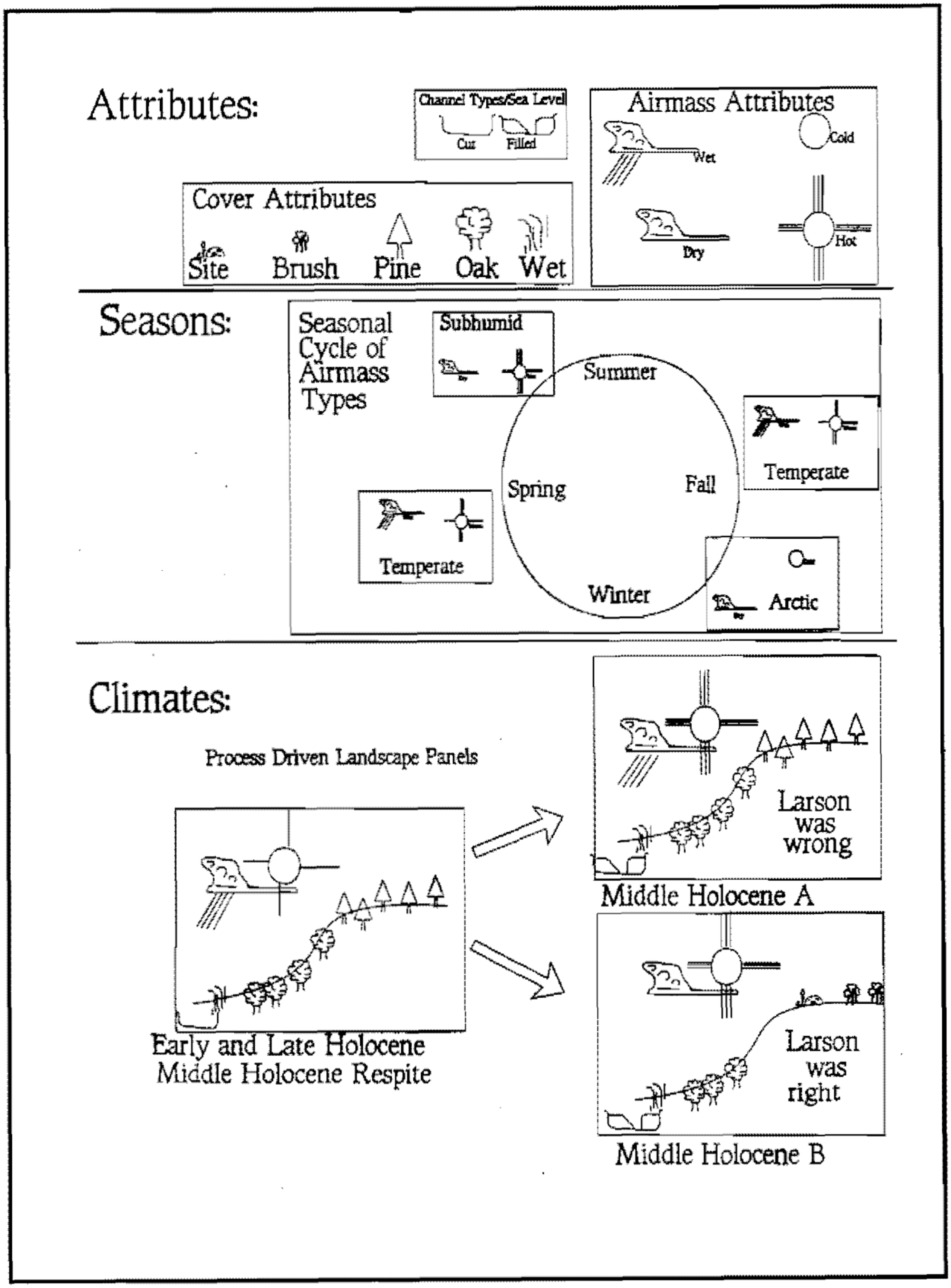

Figure 3. Attributes of landscape reconstruction (top), seasons of a Middle Global Energy Balance (middle), and alternative scenarios for Holocene climatic change processes of the Coastal Plain of the Atlantic Slope (bottom).

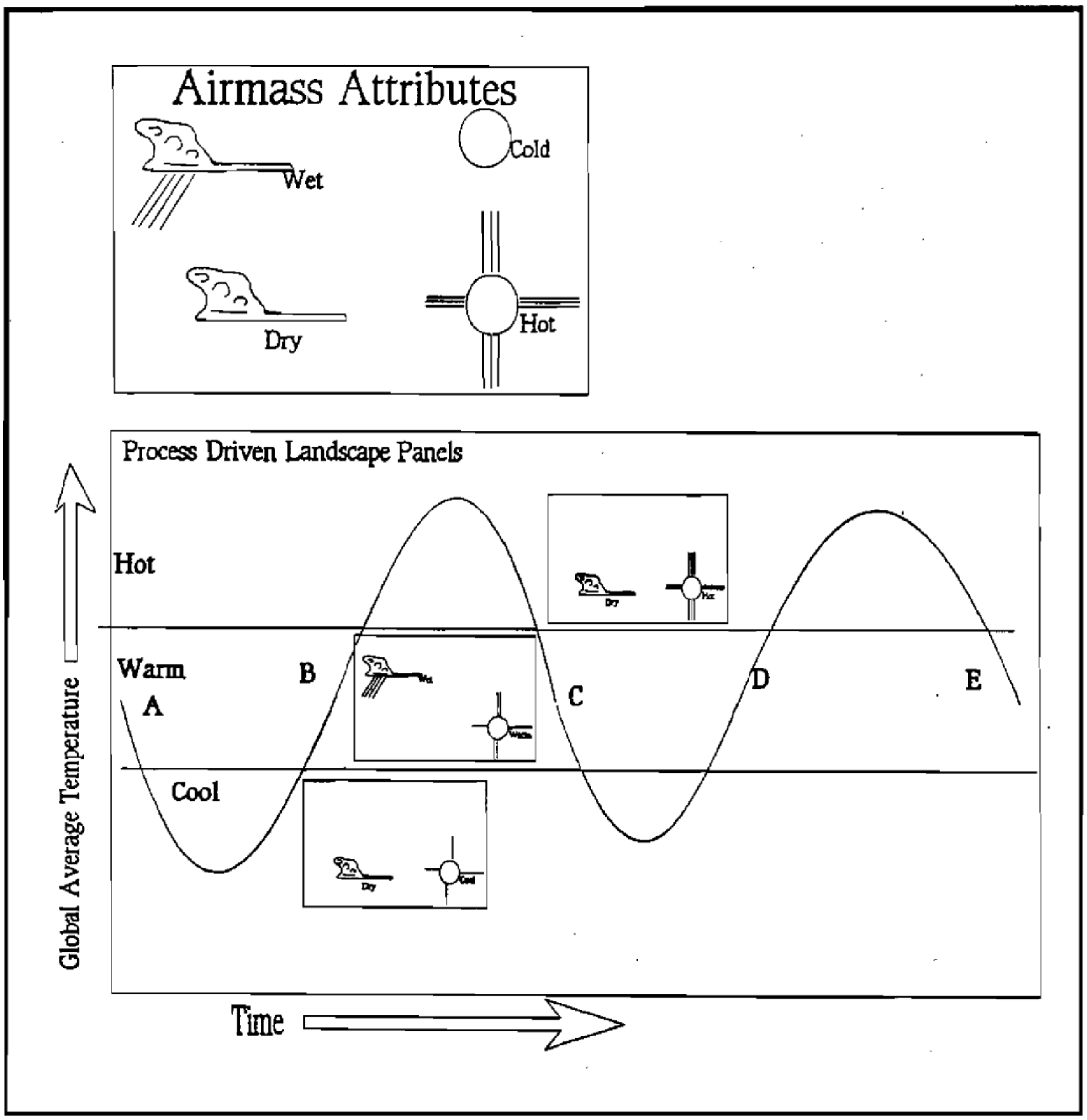

Figure 4. Process driven landscape panels.

In the South Carolina Coastal Plain. certain attributes of landscape composition have been under study for some time. Because of the proximity of the Atlantic Gulf Stream, sea level and coastal estuarian development influence the amount of moisture available at a given location. It has been found that sea levels rose to near present levels as late as about 6,000 B.P. Brooks and Colquhoun 1991). Following that time, the existing system of coastal shallows, barrier islands, and estuaries was established. The presence of a relatively high sea level in turn sponsored the filling of river floodplains. The development of stream floodplains is time transgressive from the coast beginning at about 6,000 B.P. and extending the upper reaches of the Coastal Plain by 4,000 B.P. Comparative studies of the Savannah (Blue Ridge) and South Edisto (Piedmont) rivers indicated that there are both common and unique attributes in the deposition records of their watersheds indicating that both global-regional climate and idiosyncrasies of the dyers catchments influenced deposition; thus, each river must be studied in detail to distinguish these two influences.

Vegetation during the Holocene has been studied at White Pond (Watts 1980) and in several studied at White Pond (Watts 1980) and in several river systems (Brooks and Colquhoum 1991). The riverine studies show a constant vegetation cover. At White Pond, which is a natural lake, there is possible indication of desiccation and interruption of the pollen record during the middle Holocene. The vegetation records of these two environments, riverine and upland pond, are potentially quite different River floodplains, as well, may be different from watershed to watershed because their headwaters vary between the Blue Ridge Mountains, the Piedmont, and the Coastal Plain (Brooks 1990:22; Goodyear eta]. 1979; Gunn and Wilson 1993:21-24). Because mountains capture quantities of moisture under most climatic conditions, rivers with mountain sources could have been continuously well-supplied with water. On the other hand, the dominance of either the subtropical or the Arctic dry airmass diminishes precipitation in the Piedmont and Coastal Plait; Piedmont and Coastal Plain rivers could experience periods of restricted rainfall when these airmasses are prevalent over the year. Upland ponds would be a special case resembling the Piedmont-Coastal Plain rivers, but more dependent on local precipitation because of their restricted catchment Upland ponds are common in the Piedmont because of tilted bedrock formations providing reservoirs (Gunn and Poplin 1991), although these sources of vegetation information have been exploited little if at all for paleoclimatic data. Work on a range of these environments is ongoing (Mark Brooks, personal communication 1993).

Seasonality of precipitation is critical to the character of vegetation. Information on orbital wobble (or precession, see Broeker and Denton 1990) lends some new insights into this parameter during earlier phases of the Holocene. While it has been generally acknowledged since the 1940s that the middle Holocene was warmer than current conditions (Antevs 1948), the cause and nature of that climate has only recently emerged. The middle Holocene global average temperature appears to have been about two degrees (centigrade) higher than at present However, causes of that global climate suggest a very different set of conditions than one would envision by simply warming the world by two degrees while retaining current atmospheric processes. Studies of the effects of orbital precession have indicated that local environments adjusted to substantially different distributions of annual radiation budget (Davis 1984). During the early and middle Holocene, the radiation budget was radically different from that at present (Figure 5); radiation was about seven percent higher during the summer and seven percent lower during the winter (Kutzbach and Guetter 1986). This would have reformatted the seasons in the middle latitudes to extremely hot summers and extremely cold winters. The season of mixed tropical and Arctic airmass movements that we recognize as spring would have rushed northward through any given location in the temperate zone during a brief period of a week or so. In other words, following a long, cold, and dry winter, there would be almost no spring frontal precipitation; winter would have been followed immediately by the ballooning of the Bermuda subtropical high over the Southeast A long, dry, cold winter would have been followed by a long, hot, dry summer.

On the Piedmont and Coastal Plain, these droughty conditions would create a thermal inversion precluding presipitation except at points of uplift such as the fall line, Piedmont mountain remnants, and Blue Ridge front. Since the hot world atmosphere would be more laden with moisture, however, the Blue Ridge might be almost permanently enshrouded in clouds, thunderstorms, and moisture. Thus, rivers originating in the Blueand moisture. Thus, rivers originating in the Blue Ridge would carry much runoff and might have favorable discharge-to-sediment load ratios. With little vegetation to hold upland sediments on the Piedmont and Coastal Plain, and little precipitation, Piedmont and Coastal Plain rivers would become sediment choked. This condition would be aggravated by torrential tropical storms, which increase with the length of the hot season (Wendland 1977), streaming down on a denuded upland landscape. Under these conditions, only sand bodies with their inherent resistance to erosion would remain intact in the uplands.

UPLAND CONDITIONS IN THE UPPERUPLAND CONDITIONS IN THE UPPER COASTAL PLAIN AT COPPERHEAD HOLLOW

Copperhead Hollow is located at the west upland margin of Fork Creek about 3.9 miles above its confluence with Lynches River. It is on one of a series of ridges that extend southeastward from the upland proper which forms the interfluve between Lynches River and Fork Creek. A once- active stream curls around the west side of the ridge. The sandy terminus of the ridge is visibly arcuate in shape with the arms of the arc pointing to the west (Figure 6). The relief from the interior of the arc to the top is about 1.5 meters. This topographic feature is recognizable as the form taken by sand dimes. Analysis of sediments from profiles across the dune (Figure 7) indicated that the surfacial sediments were eolian in grain size and surface texture (Foss et al. 1993).

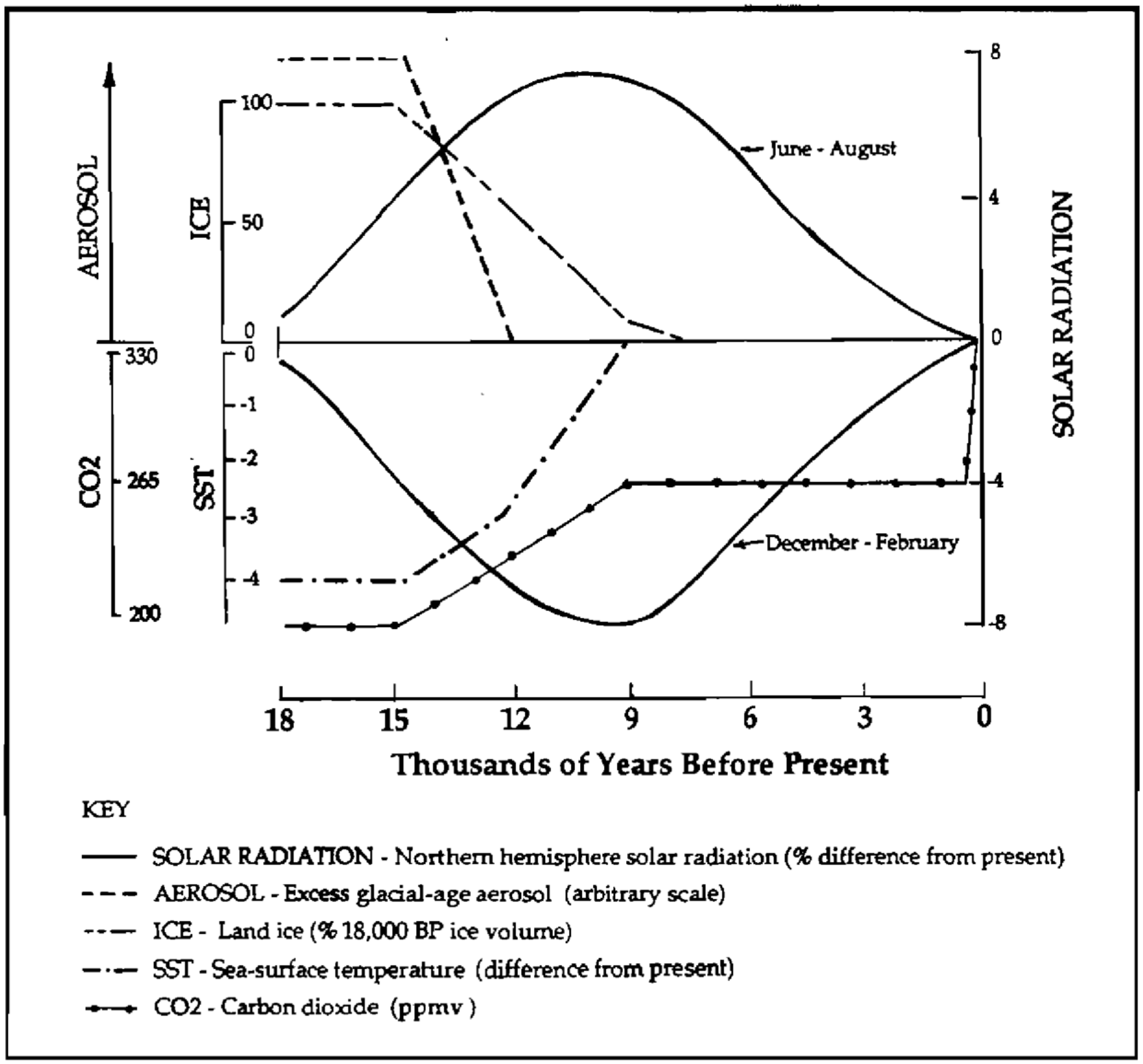

Figure 5. Winter and summer radiation budgets for Holocene (Kutzbach and Guetter 1986).

Buried artifact distributions show there to be two areas (Figure 8) of the site in which artifacts occur in coherent distributions of levels and features, one on the lee side of the dune to the southeast (Locus A [Unit 5]) and the other on the northeast (Locus B [Unit 6]). There is a corridor northeast (Locus B [Unit 6]). There is a corridor between the two loci that is relatively free of artifacts (Unit 15).

Locus A contained artifacts in coherent patterns to about 40 cm below the surface. The deepest of the occupation levels contained fire-cracked rock, a prismatic blade fragment (Figure 9), a scraper on a crest blade, a teardrop scraper, and a quartzite hammerstone. Though no late Paleoindian or early Archaic diagnostics were found in this level, three were found in the level above (two Hardaway and one Kirk). This second deepest occupation level contained predominantly Morrow Mountain points (n=6). The level immediately below the plowzone, and mostly between plow scars, contained a Guilford point and a Savannah River point. Several fire-cracked rock features were defined, as well as carbon features that proved to be longleaf pine roots (Shea 1993). A carbon sample was submitted for dating from one of the longleaf pine tree roots which returned a date of 3,49Q.+70 B.P. (Beta 56172).

Locus B contained fewer artifacts per unit of Locus B contained fewer artifacts per unit of excavation. Tie sediments were distinctly more eolian than in Locus A. The diagnostics were exclusively of Guilford age (n=4).

A carbon sample was taken from a longleaf pine tree root for dating which returned a date of 3,790±60 B.P. (Beta 56174). Small pieces of large mammal bone

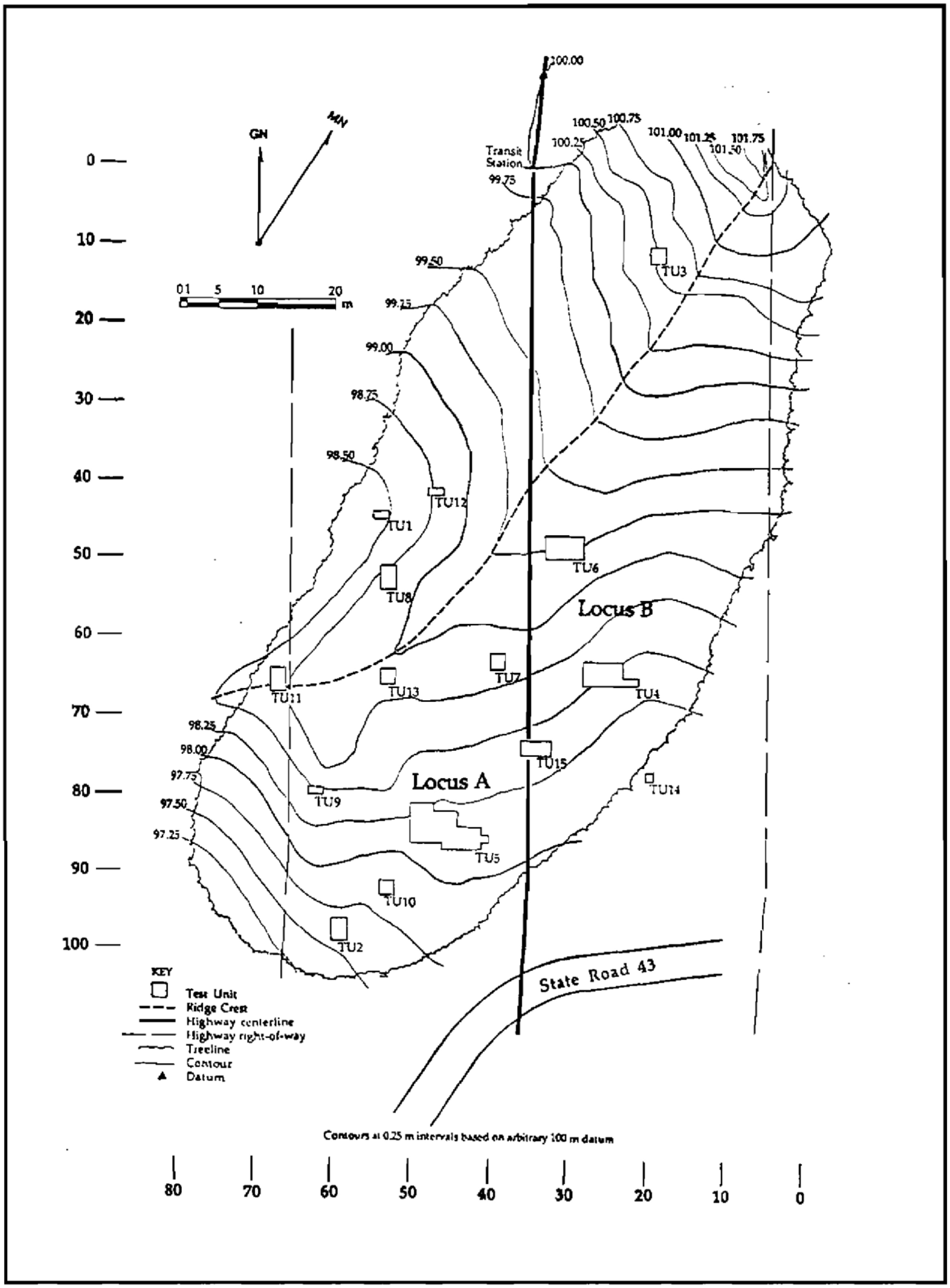

Figure 6. Contour map of Copperhead Hollow (38CT58), showing excavation units (Gunn and Wilson 1993).

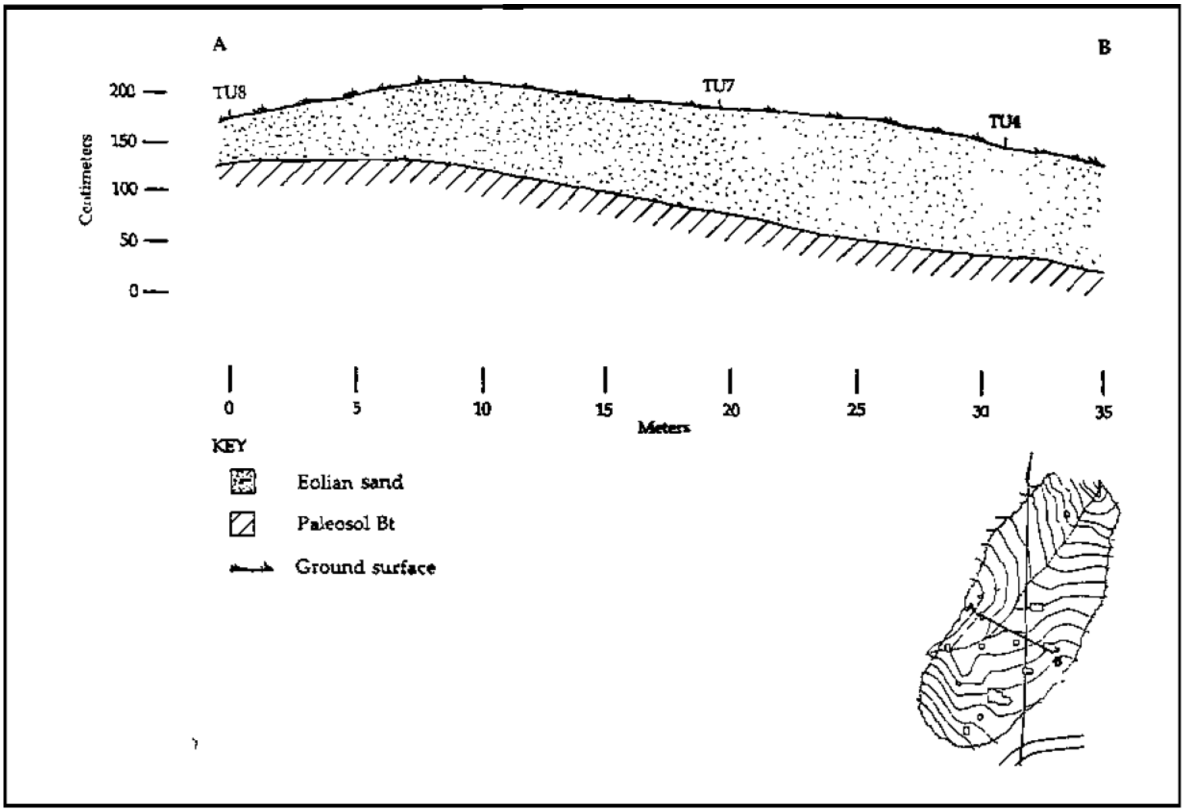

Figure 7. Sediment profile across 38CT58 (Foss et al. 1993).

were collected from a fire-cracked root feature; they were accelerator dated t0 5,350±60 BP. (Beta 56174). This is the first date on Guilford age deposits. A date of 4,805±139 was obtained on a gedeposits. A date of 4,805±139 was obtained on a stratum containing Brier Creek points at Phinizy Swamp (Elliott et al. 1993:164, 191, 355). Brier Creek points are relatively large and thick Guilford-related points that are frequently made on chert.

Material collected from the surface included 174 lb (79 kg) of fire cracked rock and diagnostics from all cultural phases of the Holocene. Relatively few of the Morrow Mountain diagnostics—so prominent in the subsurface (n=10)—were found on the surface (n=6)- Guilford diagnostics, however, were more abundant on the surface (n=10) than in the subsurface (n=7); this reflects the near-surface stratigraphic position of the Guilford component and perhaps more stability of the dime during the Guilford occupation.

Over 10,000 fragments of fire-cracked rock from the subsurface were quantified as to size. Analysis of these data suggested that fire-cracked rock fragments of less than 4 cm were moving down the sediment column (Figure 10, see Gunn and Wilson 1993; Johnson 1993; Michie 1990 for discussion). The rate of movement varied with sediment texture and area of the site (Figure 11); course sandy areas of the site experienced less movement, fragments in finer grained sediments experienced more movement

The topography, artifact analysis, analysis of artifact movement, and radiocarbon dating suggest the following interpretation of the site. The dune may have been active during the late Paleoindian and/or Early Archaic, an exceptionally dry and hot early Holocene period (Gunn 1992a, 1992b). The dune was clearly active during the Morrow Mountain phase (ca. 7,500 to 5,500 B.P.). The prevailing winds, presumably during dry winters, with westerly to northwesterly directions, buried the Morrow Mountain component. Conditions on the dime limited occupation to the southeast area of the site, perhaps by unstable surface conditions on the dune proper which was represented by the unoccupied area to the east and northeast. During the subsequent Guilford phase (ca. 5,500 to 5,000 B.P.) the dune was stable enough to allow occupation over the whole of the lee and top side of the dune as evidenced by the distribution of

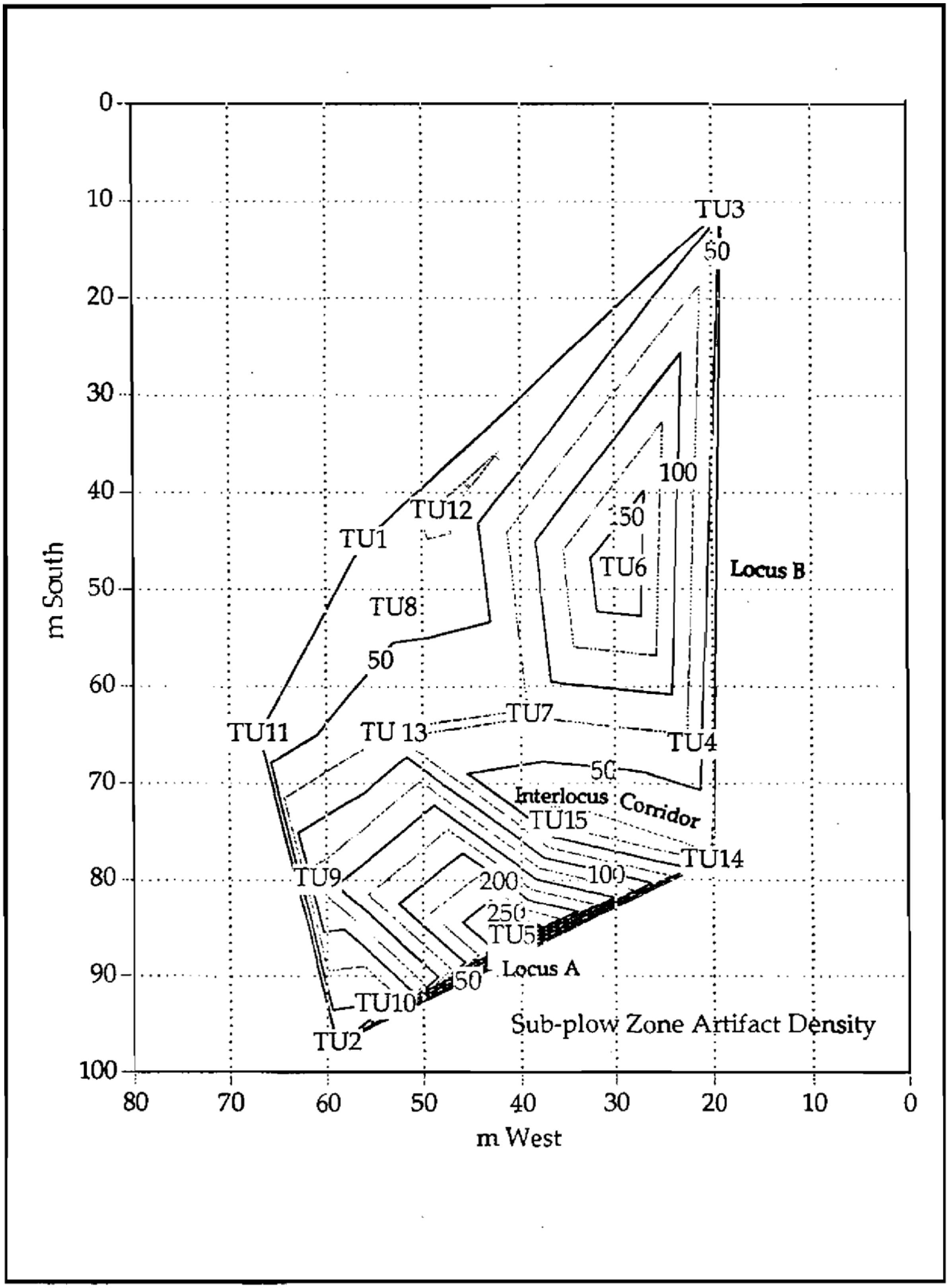

Figure 8. Contour map of subsurface artifact densities in Locus A and Locus B at 38CT58 (Gunn and Wilson 1993).

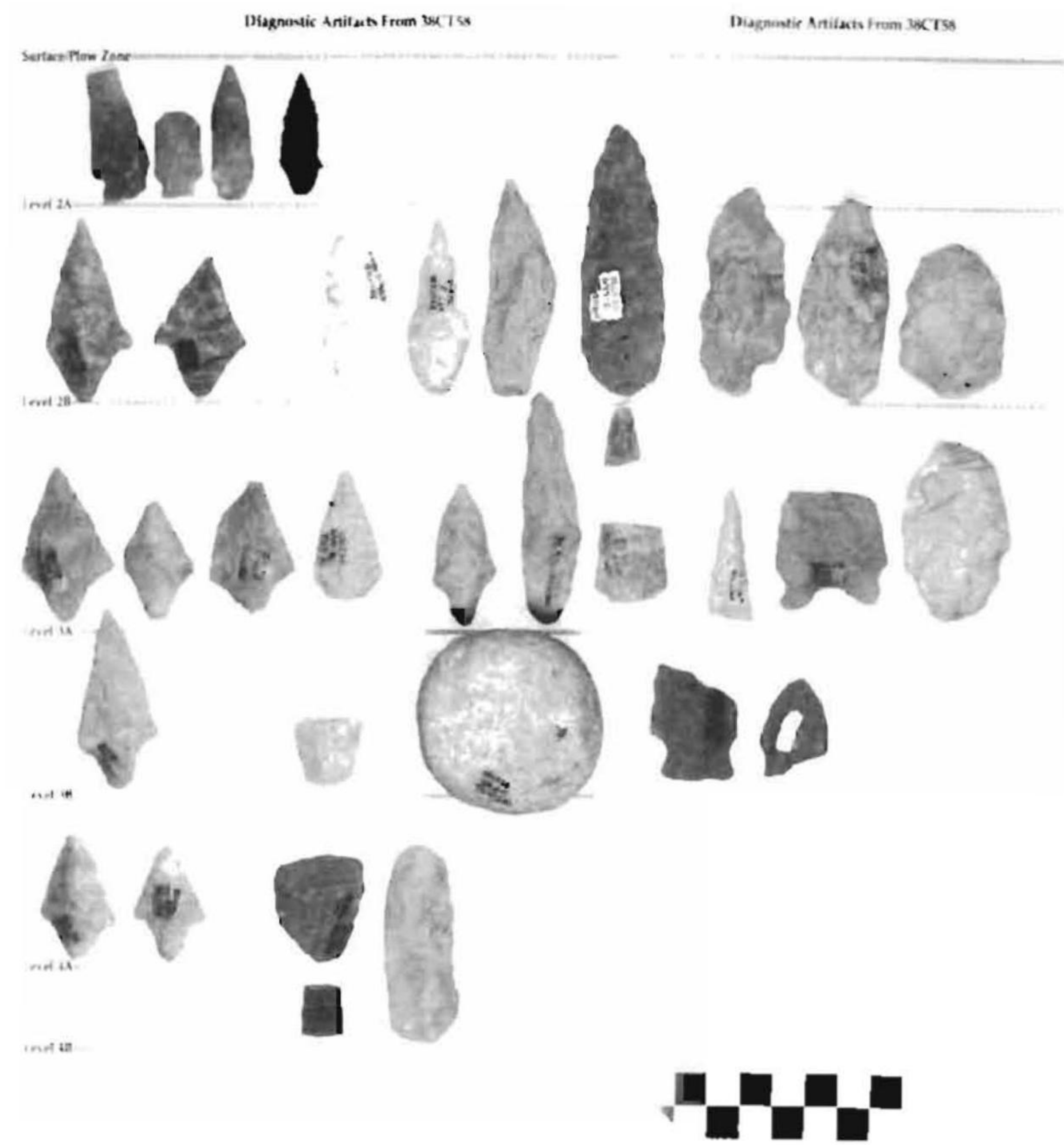

Figure 9. Diagnostic artifacts from Copperhead Hollow ordered by strata
(Gunn and Wilson 1993).

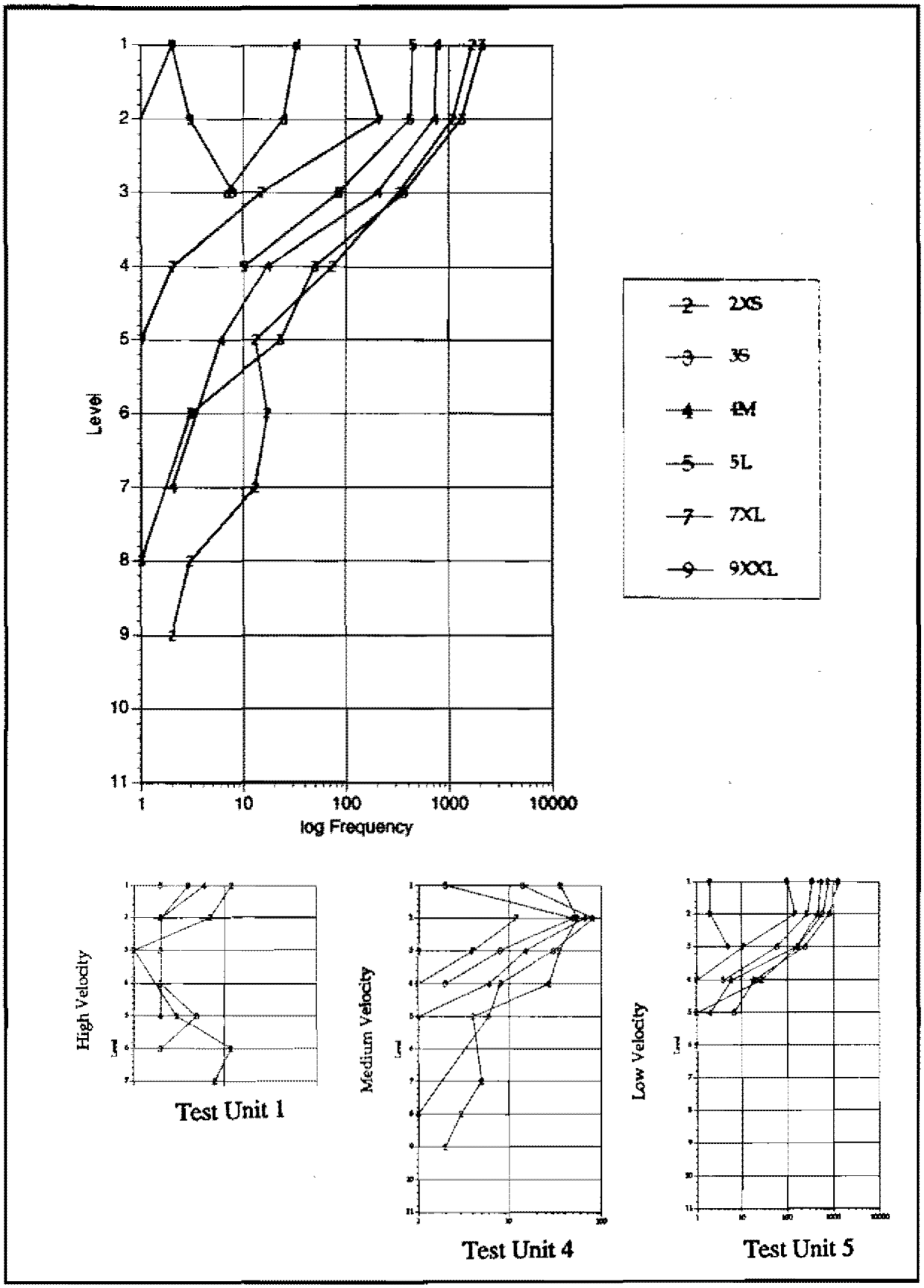

Figure 10. Site-wide fire-cracked rock size class velocity diagram and examples from low, medium, and high velocity excavation units (Gunn and Wilson 1993).

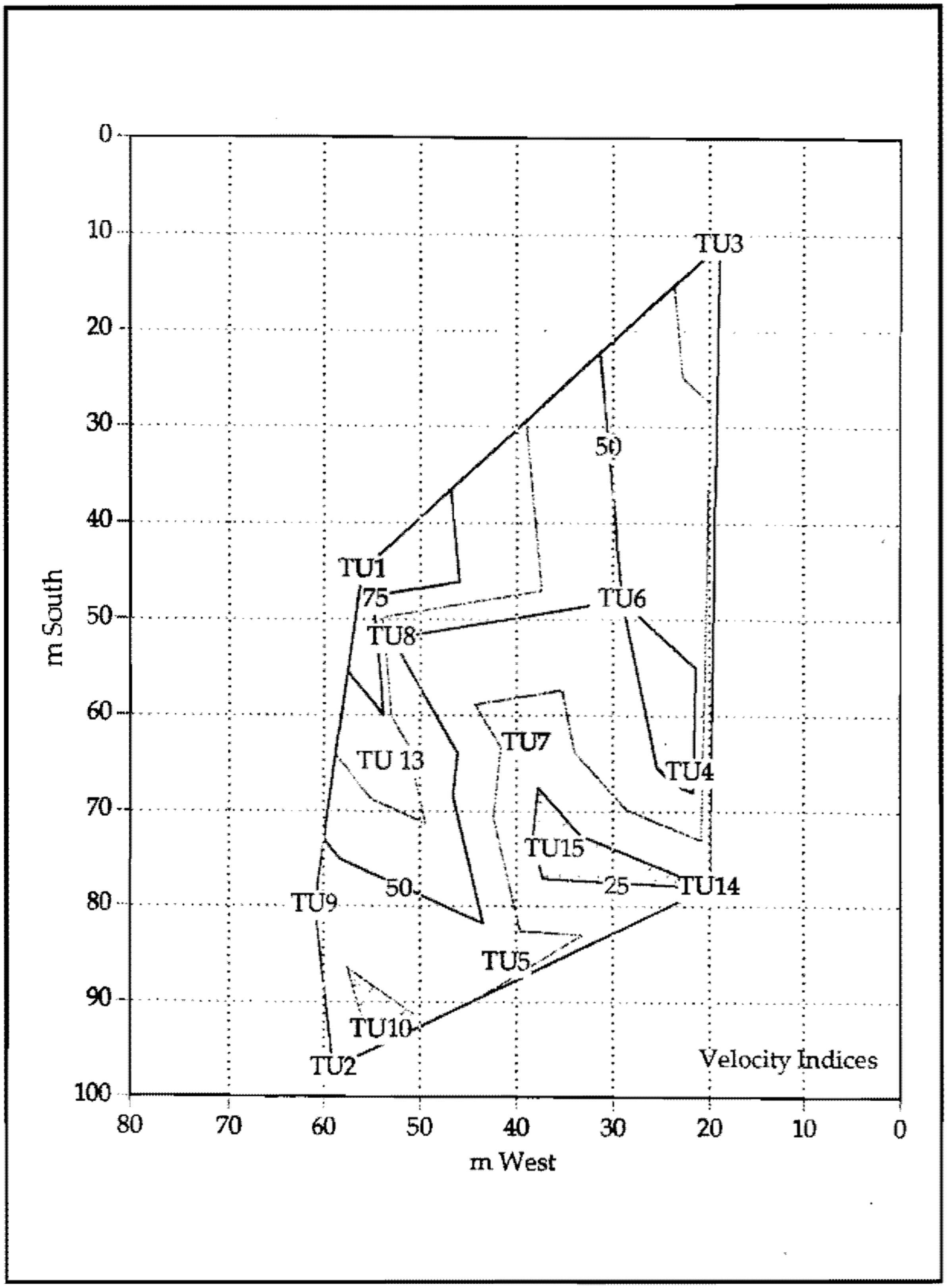

Figure 11. Contour map of artifact velocity indices (Gunn and Wilson 1993).

Guilford points. It remained, however, active enough to bury the Guilford component(s), particularly on the northeast side of the site. This may indicate that the prevailing (winter?) winds were from the southwest. (Was this due to changes in prevailing winds caused by the establishment of coastal shallows? By 4,000 to 3,500 B.P. the dune was stabilized and longleaf pines had had time to grow old and die (hundreds of years). The surface has been stable since that time as artifacts from following periods were confined to the surface.

Upland Conditions in the Upper Coastal Plain

This scenario implies that the uplands of the Sand Hills were denuded of vegetation capable of restraining eolian transport at least during some sub-epochal intervals of the middle Holocene (Figure 3, Middle Holocene B). An important research question at this point is whether Morrow Mountain occupants inhabited Copperhead Hollow during periods of active eolianization or during intervening periods of relative surface stability. In the Guilford case, there is sufficient evidence to the Guilford case, there is sufficient evidence to raise this question. There is at least one period of generally recognized middle Holocene global cooling, or respite, at 5300 B.P. Since this corresponds to the date on the Guilford horizon, was Guilford occupation limited to a relatively brief episode, perhaps a century, of moist cool climate in an otherwise hot and dry period? Because there is only one date on the Guilford occupation, this study offers no resolution of this question although coincidence flags the event for intensive research.

The uplands were attractive to Middle Archaic peoples for occupation. We suggest that, given the sedimentary evidence of forest denudation and open cover, perhaps grasslands, occupants of the Morrow Mountain and perhaps the Guilford phases were present as big game hunters. Bison and elk might be considered as potential targets, although the more usual whitetailed deer would also be possible depending on whether the vegetation was grassland (grazers) or scrub oak savanna (browsers).

In addition to the apparent sand dime at Copperhead Hollow, there are other indications of middle Holocene dune activity in the Coastal Plain. The topography of 38LX5 southeast of Columbia. The topography of 38LX5 southeast of Columbia (Anderson 1979) resembles that of Copperhead Hollow with as arcuate western edge; it also possesses a buried Morrow Mountain component on the southeast side. Sand dunes have also been identified in the Cape Fear drainage and dated to the middle Holocene between 7,700 and 5,720 B.P. (Sollers and Mills 1991).

Pollen evidence specifically defining the vegetation of the uplands on the Atlantic Slope is generally lacking; the only hint is the possible middle Holocene hiatus at White Pond. However, at the B. L. Higbee oxbow on the Tombigbee River in Mississippi in a somewhat similar fall line situation, the vegetation of the adjacent uplands during the middle Holocene was judged to be scrub oak woodland (Whitehead and Sheehan 1982). Can a similar cover be documented for the Atlantic Slope?

The current consensus appears to be that uplands were under a forest cover during the middle Holocene (Sassaman 1991). However, presuming that a grassland (bison and elk) or a scrub oak savanna (whitetailed deer) was the middle Holocene upland cover, resolves at least one question. Larson (1980) proposed that upland pine barrens such as those observed in the Southeast during the Colonial Period, were essentially dead in terms of foraging potential. If a continuity of upland pine barrens (cool and wet climate) is assumed through the middle Holocene (Figure 3, Middle Holocene A), the presence of middle Holocene archaeological sites on the uplands calls into question Larson's pine barrens hypothesis. If grasslands (and dunes) and/or scrub oak savanna or mosaic are assumed (Figure 3, Middle Holocene B), there is no conflict, and Larson's pine barren hypothesis could still be correct. The dunes at 38LX5 and Copperhead Hollow argue for an open upland cover. Also, if there was filling of rivers on the Atlantic Slope, as there was during the middle Holocene generally over the Southeast (Brakenridge 1980), this argues for grasslands, even sparse grasslands (Schumm 1965). During the historic period, Lawson (1967) suggests that at least some part of the upper Piedmont near Yadkinville, North Carolina was in grasslands in the 1700s although he did not visit them. He indicated that these people specialized in bison hunting. Globally, the early 1700s was a relatively warm period.

CONCLUSIONS

Middle Holocene conditions at the Copperhead Hollow site, the presence of another dune site of similar configuration (38LX5), and other dunes and negative pollen evidence, argue for desiccation of upland in the upper Coastal Plain during the Middle Holocene. Global climate during this period, driven by extremely variant insolation regime, probably would have fostered an open vegetation cover, most likely grasslands or scrub oak. River drainage systems originating in the Piedmont and Coastal Plain would be expected to be sediment chocked if uplands were poorly covered. A grassland biome may have been favorable to reliance on large game.

Acknowledgements

An earlier version of this paper was presented at the Annual Conference of the Archaeological Society of South Carolina on April 3, 1993. Wayne D. Roberts, Mark J. Brooks, Daniel F. Cassedy, and Paul A. Webb read a preliminary draft of the paper.

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