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The Early Holocene Occupation of the Southeastern United States: A Geoarchaeological Summary

Albert C. Goodyear

Abstract

The southeastern United States has long been of interest to students of the North American Paleoindian period because of the abundant and diverse lithic remains found there. Several thousand fluted and unfluted lanceolate points have been found throughout the southern states. It has been estimated that the dense number of lanceolates found in the river valleys of the mid-South surpasses those of the western United States. Generally recognized point types have been formulated that are thought to have time and space significance. Among the fluted forms are Clovis—virtually identical with those from western Clovis sites—Redstone; Ross County; and Cumberland. The basally thinned or unfluted types include Quad, Suwannee, Simpson, and Dalton. Based on stratigraphic work and radiocarbon dating done outside the Southeast, as well as refinement of early Archaic sequences within the region, these types are thought to span a time from 11,500 to 10,000 yr B.P.

Despite the high archaeological potential of this region, few concentrations of Paleoindian artifacts have been found that would lend themselves to archaeological excavation. Most Paleoindian points have been found on the surface, often as isolated finds. Geological conditions during the late Pleistocene—early Holocene did not produce deeply buried sites over much of the Southeast, particularly on the interfluvial surfaces. The greatest success in locating and excavating dense Paleoindian sites has been associated with chert quarries such as Thunderbird, Carson-Conn-Short, Big Pine Tree, and Harney Flats.

The bulk of knowledge for the Paleoindian occupation of the South comes in the form of typologies and geographic distributional studies. Fluted point recording surveys have been established for most states. However, until sites are excavated that possess sufficient stratigraphic depth and/or integrity to allow chronological and paleoenvironmental studies, it will be difficult to interpret these remains in terms of cultural systems. Fieldwork needs to be concentrated on identifying late Pleistocene—early Holocene depositional environments in order to obtain badly needed archaeological contexts.

Toward that end, this chapter reviews in detail the geoarchaeological situations of a variety of sites throughout the Southeast in the hope of discerning patterns that might yield criteria for recognizing early Holocene deposits. Excavations in the floodplains of major drainages in the southern Appalachians have demonstrated a high potential for deep alluvial burial of early sites. A pedosedimentary pattern is recognized where Dalton period and earlier lithics are found in early Holocene fluvial sands, often pedogenically unmodified, overlying argillic Bt paleosols. The geologic contact of the two is suggested to represent the Pleistocene—Holocene transition. The recovery of faunal and other organic remains in the rivers and sinkholes of Florida provide another encouraging context that should allow radiocarbon dating and subsistence reconstruction. There is a high probability that intact early sites exist in the drowned river valleys of the west coast of Florida, inundated by Holocene sea-level rise.

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A number of factors contribute to the paucity of knowledge about the cultures of the Paleoindian Era. First, the majority of fluted points occur as isolated surface finds, thus giving no information about the cultural matrix from which they were derived. Second, most Southeastern sites that have produced fluted points are shallow and multicomponent, so that stratigraphically defined or geographically isolated pure Paleoindian assemblages are very rare indeed (Williams and Stoltman 1965:673).

This paper is concerned with the earliest known peoples of the southeastern United States. The Southeast is of fundamental interest to the study of Paleoindians in the Americas, owing to its environmental position, especially considering latitude, and the fact that a good portion of this area is and was subtropical in climate. In addition, there is an extensive coastline present, including both the Atlantic Ocean and the Gulf of Mexico, which must be taken into account when considering the Paleoindian landscape. This ecological situation, plus the rather dense and impressive Paleoindian technology that is known for the Southeast, combine to pique our intellectual curiosity about ancient human life in this region.

Although the above quote by Williams and Stoltman was published more than 30 years ago, in many ways it remains an apt description of Paleoindian archaeology in the Southeast. Generally speaking, until recently, archaeological studies in the southeastern United States have not been very successful in developing chronostratigraphic frameworks for the period from 11,500 to 10,000 yr B.P., compared to the Plains and Southwest and now even the Northeast. This is illustrated in a compilation of \(^{14}C\) dates associated with fluted point sites in the East published a little over a decade ago (Haynes et al. 1984:Figure 2). All the \(^{14}C\) dates are for the Northeast, with none from the Southeast (cf. Meltzer 1988:Table 3). As often noted, the Northeast dates are generally contemporaneous with Folsom dates and not Clovis (cf. Levine 1990). There has been some modest improvement in this situation for the Southeast, however, which will be discussed in this paper.

At the time of earlier generations of southeastern Paleoindian summaries (e.g., Mason 1962, Williams and Stoltman 1965), the preponderance of data came from surface finds from non-alluvial land surfaces. Specifically, these were projectile point finds from plowed and eroded interfluvial landforms, which often occurred as individual finds, or from sites with multi-component occupational histories. In the ensuing 30 years, a great deal more work has been done in paleoenvironmental studies of the Southeast, specifically palynology and geoarchaeology, which allows some explanation as to the contextual condition of the archaeological record. Mitigation-phase excavations in cultural resource management studies beginning in the 1970s produced a great deal of important data related to late Pleistocene and early Holocene geological contexts, particularly alluvial situations.

Productive research utilizing data derived from surface finds of Paleoindian lanceolate points has continued using statewide surveys (Anderson 1990; Anderson et al. 1990; Brennan 1982; Charles 1986; Dunbar and Waller 1983; McCary 1984; McGahey 1987). Mapping of surface finds and the spatial analysis of projectile point styles has allowed the evaluation of models related to colonization (e.g., Anderson 1990; McGahey 1987), land use and site function (O’Steen et al. 1986), landscape reconstruction (Dunbar 1991), and measures of the scale of regional mobility as well as directionality of movement (Anderson et al. 1990; Goodyear et al. 1989).

As noted by Williams and Stoltman (1965) and confirmed by more recent lanceolate point surveys, the majority of specimens have occurred as isolated finds with multiple cases from a single site being something of a rarity (see Anderson 1990:Table 2; Meltzer 1988:Table 2). This pattern of low density, along with the marked tendency for Paleoindian sites to be reoccupied by groups from subsequent early Archaic and other later time periods (cf. Anderson 1990:176), has resulted in a dearth of shallow, single-component Paleoindian sites that provide the assemblage clarity seen in northeastern sites, such as Debert and Vail. Shallow, virtually single-component sites like Brand and Sloan, Dalton sites in northeast Arkansas, have proven to be exceedingly rare. Sites with an artifact density warranting excavation, such as Thunderbird, Williamson, Carson-Conn-Short, Big Pine Tree, and Harney Flats, are nearly always associated with a high-quality chert source where much of the artifact record is related to stone tool manufacture.

It is likely that the natural presence of chert affected the density of points and other shaped tools on quarry-related sites in two ways. First, Paleoindian groups
throughout the East were evidently dependent on high-quality lithic raw material for their tool kits (see Ellis and Lothrop 1989). This would have caused a high rate of reoccupation of quarry-associated sites, related to the need to continually re-provision portable tool kits (cf. Goodyear 1989). Second, in the presence of readily available chert supplies, some relaxation in the normally high degree of curation may have occurred. Because of the ease of replacement, artifact loss due to carelessness may have been more frequent, as well as the relatively premature discard of what would have been in other contexts normally useful tools. Even some complete tools at quarry-related sites may represent worn-out discarded implements imported from a previous locality (cf. Binford 1979; Gardner 1983).

Coupled with the lanceolate point surveys has been a strong interest in raw-material selection patterns represented in the various styles of lanceolate points. The pattern of cryptocrystalline utilization so frequently noted for North America has been well-documented for the Southeast, especially for fluted points (Gardner 1974a; Goodyear et al. 1989; McGahey 1987). Lithic raw-material identification studies of projectile points and searches for their geologic sources have been conducted sporadically (Daniel and Butler 1991; Daniel and Wisenbaker 1987; Goodyear and Charles 1984; Goodyear et al. 1983; Upchurch et al. 1981), but more are needed across the Southeast. The adaptive significance of cryptocrystalline utilization by Paleoindian groups has received differing interpretations, which include evidence of settlement restriction (Gardner 1974b) versus a technological strategy to facilitate mobility (Goodyear 1989).

At this point in southeastern United States Paleoindian archaeology, it would seem that little progress will be made in understanding these groups as functioning cultural systems until better stratigraphic contexts are obtained. Most of what is thought to be known is based on stylistic point typologies, themselves products of formal evolutionary assumptions, and comparisons with similar forms outside the Southeast. At issue is the identification of deposits that are likely to be of sufficient age (11,500–10,000 yr B.P.) to contain Paleoindian material and of adequate depth or integrity to preserve data critical to the isolation and dating of assemblages. Based on excavations conducted in recent years, it appears that floodplains and sinkholes offer the greatest potential for deposition in the Southeast. Caves and shelters, while containing substantial deposits in many cases, appear to have been occupied relatively late (ca. 10,500 yr B.P.) (Goodyear 1982) and often experienced disturbances from human and natural sources, complicating clear associations with 14C dates. An interesting exception to this latter problem is Dust Cave, located in northern Alabama, a deep deposit which exhibits unusual stratigraphic integrity (Driskell 1994; Goldman-Finn and Driskell 1994).

A fundamental problem in the Southeast is the recognition and dating of the Pleistocene–Holocene boundary and an understanding of the climatic, environmental and cultural events that accompanied this transition. Archaeological and paleoenvironmental studies conducted within the past two decades, particularly in two major areas of the Southeast, have provided a body of field data that allow synthesis to begin, which, in turn, should enable the development of criteria for recognizing and dating this transition. These areas are the Southern Appalachians, especially the major floodplains along the Atlantic Slope, and the drowned sites located in sinks and rivers in the karstic regions of Florida. The primary purpose of this paper is to review these field studies in order to document depositional agencies and events and their associated archaeological records for the period from 11,500 to 10,000 yr B.P.

By convention, the end of the Pleistocene has been set at 10,000 yr B.P. (Griffin 1967; Whitehead 1965). This is an arbitrary designation for purposes of worldwide periodization (Harland et al. 1982). However, in the lower latitudes like that of the Southeast, the floristic responses to warmer climate can be seen as early as 16,500 yr B.P., with vegetation at 12,500 yr B.P. being much more similar to modern forests than previous late Wisconsin communities (Delcourt and Delcourt 1985:18–19). Of great import to the study of Paleoindians in the Southeast, as elsewhere in North America, is the timing of the onset of Holocene aggradation so necessary for deposition and burial of Paleoindian remains (Haynes 1984). Accordingly, in this paper the early Holocene will be referred to as the period from 11,000 to 8000 yr B.P.

Last, there is the important problem of correlating radiocarbon years with that of sidereal or calendrical time. Historically, there have been no tree ring correlations as old as Paleoindian radiocarbon dates so the issue has been moot. Dates have been reported as radiocarbon years before present. Lately, based on research with Greenland ice cores and corals in Barbados, there is considerable evidence to show that major 14C plateaus existed during the critical period
of 12,000 to 10,000 yr B.P. (Feidel 1997; Ellis et al. 1998). In addition to making certain Paleoindian complexes older than currently thought, they may also provide more temporal room for one phase to evolve into another, i.e., eliminating what may appear to be temporal compression of projectile point types (cf. Morse 1997a).

The Southeastern United States

Paleoindian Sequence

To date, there exists no single documented stratigraphic deposit that can be said to empirically underwrite the following culture-historical sequence. Paleoindian projectile points occasionally have been excavated, but a pure assemblage has not been found. The main exception to this statement is the Thunderbird site (Gardner 1974a) in northern Virginia, located on the northern margin of the Southeast (Figure 1). At Thunderbird, however, the primary Paleoindian expression is Clovis, though it has not been 14C dated. Post-Clovis Paleoindian occupations here are less definitely represented. In terms of stratigraphic integrity, the Dalton horizon is perhaps the best defined, based on stratigraphy and assemblage analysis. The following, therefore, is a sequence widely recognized by many archaeologists, but which, to some extent, exists largely as a convention constructed on typological grounds and partially complete stratigraphic sequences.

Pre-Clovis Period (11,500–? yr B.P.)

Until recently, the southeastern U.S. has not fared much better than the rest of North America in terms of generating convincing evidence of a pre-Clovis occupation. While occasional claims for pre-Clovis remains have been advanced (Lively 1965; Purdy 1983a), compelling proof for their antiquity has not been forthcoming. With the advent of the acceptance of the pre-12,000 yr B.P. age Monte Verde site in Chile (Meltzer et al. 1997), such developments will no doubt cause North Americanists to search more diligently for pre-Clovis remains. In the Southeast, the recently documented site of Cactus Hill in Virginia (Figure 1) appears to have a radiocarbon dated archaeological manifestation temporally and stratigraphically below Clovis.

The Cactus Hill site (44SX202) is a stratified multicomponent site situated in a sand dune overlooking the Nottoway River in the interior Coastal Plain of Virginia (McAvoy and McAvoy 1997). The report by the McAvoys summarizes excavations conducted in 1993, a small excavation of a Clovis component in 1995, and a final salvage of a threatened portion in 1996. Archaic and Paleoindian lithic artifacts were found lying in a stratified manner within a sand dune which is approximately 1.8 m in maximum thickness. Occupations from the 18th century back to Clovis are located within about the upper 1 m of windblown sand. A Clovis occupation has been identified by chert tools of the typical Paleoindian form along with fluted points found in floors at the bottom of the sequence. Clovis materials are found stratigraphically in zones of heavy lamellae formation in the lower part of the dune that are pedogenic in origin. One Clovis hearth was radiocarbon dated at 10,920 ±250 yr B.P., based on a sample of hard southern pine charcoal.

In the 1993 season in an area where a Clovis floor was found, which included flake tools and two fluted points, about 7 cm below this level a feature-like charcoal concentration appeared, which contained seven quartzite flakes and three quartzite “core blades,” the latter also known as prismatic blades (McAvoy and McAvoy 1997:103). Wood charcoal from this feature consisting of white pine was radiocarbon dated at 15,070 ±70 yr B.P. In three other locations, prismatic blades made from local quartzite were found in excavations just below what are thought to be Clovis artifact surfaces. The pre-Clovis lithics are made from quartzite, the source for which was nearby river cobbles, while the Clovis levels have quartzite and significant numbers of chert artifacts imported to the site, much of the latter probably coming from the famous Williamson quarry site some 12 miles away.

The spring 1996 field season was conducted specifically to determine whether additional pre-Clovis deposits could be found. Six more clusters of quartzite prismatic blades were found. In one of these clusters, some evidence was found of two distinct layers of pre-Clovis lithics (McAvoy 1997). Clusters of quartzite prismatic blades were found superimposed over each other with the upper cluster containing smaller (<30 mm) blades with the lower cluster blades wider and thicker. A soil sample taken from a hearth-like concentration associated with one of the blade clusters yielded a radiocarbon date of 16,670 ±730 yr B.P. (McAvoy 1997).
The excavator of the site, Joseph McAvoy (1997), believes that the blade clusters found in the 1993 and 1996 seasons represent a pre-fluted point (pre-Clovis) occupation by groups making prismatic blades on prepared cores utilizing the local river cobble quartzite sources. He also believes there is a suggestion in the data that there is an earlier prismatic blade occupation followed by smaller blades. Two thin, basally thinned, trianguloid-to-lanceolate bifaces also were recovered in excavations that may be associated with the upper smaller blade clusters.

The finding of stratified, radiocarbon-dated Clovis remains at Cactus Hill is very significant for Paleoindian studies in the Southeast, and the radiocarbon date of 10,920 \pm 250 yr B.P. is concordant with traditional Clovis dates of the West. The discovery of one and possibly two blade industries coupled with an obvious raw material change immediately below Clovis surfaces is a major breakthrough in pre-Clovis archaeology. Both of the radiocarbon dates associated with these remains are substantially earlier than conventional \textsuperscript{14}C dating of Clovis, a fact that reinforces the claim for pre-Clovis antiquity. However, like any archaeological complex, to gain validity and general acceptance it must be confirmed at more than one site. At a minimum, the findings at Cactus Hill have given some concrete clues as to what to look for.

\textbf{Clovis Period (11,500–10,900 yr B.P.)}

The Clovis culture, or at least the Clovis form of fluted point as documented in the Plains and Southwest, continues to provide the basis for recognizing the earliest widespread human inhabitants of the Southeast. The classic Clovis point, as found among mammoth remains in the Southwest and in the Richey–Roberts site in Washington, tends to be a large
Southeast based on the sheer density of America points (Figure 2e, f). Others have a waisted base with point types (Quad, Suwannee, and Simpson) that are such as Cumberland, Redstone, and Ross County, were straightforward equations of fluted point densities and from the Williamson site (Figure 1), and in the about the extent and age of Clovis occupations in the Southeast, it is necessary to flaring ears also not typical of Western Clovis points criteria. Many southeastern fluted points have a deep defined in the Southwest (Figure 2a-d). However, do meet the formal criteria of the Clovis point as comment on the common practice of equating fluted points with Clovis or Clovis-contemporary cultures. At the time of his 1962 classic synthesis, Ronald Mason was able to state that the density of Clovis and other fluted points rapidly diminished from the central intervention years, this pattern has been verified.
Figure 2. Types of fluted points found in the southeastern United States: a, Clovis, Bladen Co., N.C.; b, Clovis, Williamson site, Va.; c, Clovis, Rowan Co., N.C.; d, Clovis, Suwannee River, Fl.; e, Ross County fluted, Laurence Co., Al.; f, Clovis-like, Humphrey Co., Tn.; g, Cumberland, Taylor Co., Ky.; h, Cumberland (cast); i, Redstone, York Co., S.C.; j, waisted fluted, Dodge Co., Ga.
Middle Paleoindian Period

(10,900–10,500 yr B.P.)

A post-Clovis middle Paleoindian period is commonly recognized in the culture-historical taxonomies of the eastern United States (Gardner 1974b; MacDonald 1968, Williams and Stoltman 1965). The basis of this distinction is typological, with some supporting stratigraphic data (Walthall 1980). This period is essentially post-Clovis and pre-Dalton and should span the time from 10,900 to 10,500 yr B.P.

In the mid-South region of northern Alabama, Tennessee, and Kentucky, the Cumberland fluted point (Figure 2g, h) is found in relatively dense numbers. Its emphasis on full facial fluting is reminiscent of the Folsom point. The Cumberland point has a distinctive style and an equally distinctive regional distribution, providing strong evidence for regional stylistic patterning in the Southeast during Paleoindian times. It also appears to have been fluted using a “Folsom”-like nipple platform. The Beaver Lake point is similar to the Cumberland and is thought to be related, but lacks fluting. Another distinctive fluted point style is the Redstone (Figure 2i), which is characterized by a triangular, elongated outline with emphasis on long flutes. Redstones also are comparatively dense in the mid-South area but relatively rare outside this region.

An exception may exist in the South Atlantic region, perhaps related to a connection with the Savannah River, which originates in the Blue Ridge Mountains and provides a travel corridor to Tennessee (e.g., Goodyear et al. 1989). Another common projectile point type from the mid-South that is probably somewhat later in time is called the Quad (Figure 3d). These points have strongly incurvate basal margins, pronounced ears, and may or may not have fluting or strong basal thinning (Cambron and Hulse 1964). In technology and probably time, the Quad point is likely related to the Suwannee point (Figure 3a, c), a well-made lanceolate point with an incurvate base and slightly eared appearance (Bullen 1975). The Suwannee point and a related style, the Simpson, characterized by strongly incurvate basal margins with sharply projecting ears (Figure 3b), are abundant in the rivers, springs, and drowned coastal rivers of north and west-central Florida (Dunbar and Waller 1983). Most Suwannee and Simpson points are not fluted but are frequently finished on their bases by shallow basal thinning or through a technique of lateral thinning (Figure 4) (Goodyear et al. 1983:46). As a rule, Suwannee and Simpson points are made from Tertiary cherts, which are available in a belt of outcrops running from Tampa, Florida to Allendale County, South Carolina (Goodyear et al. 1985; Upchurch et al. 1981). Although specimens can be found in the lower Piedmont and Fall Line (Anderson et al. 1990:Figure 29; Goodyear et al. 1989), they are essentially coastal-plain artifacts.

The cultural significance of the diverse forms of fluted and unfluted lanceolate points assigned to the middle Paleoindian period would be related to the technological and stylistic variety represented in this group and the obvious regional patterns in their distributions. Much of the projectile point variety that is cited for the Paleoindian period in the Southeast can probably be ascribed to the forms just reviewed. The strong association of Cumberland, Beaver Lake, and Quad points with the mid-South region and the occurrence of Suwannee and Simpson points on the coastal plains indicate that demographic associations with certain regions were largely in place by at least 10,500 years ago, if not earlier. Occasional fragments of Cumberland fluted points, as well as Beaver Lake and Quad points, have been found in the highland rockshelters of Alabama (Driskell 1996; Futato 1980:115, 1982:32; Walthall 1980:31), but no Clovis-style fluted points have been recovered. The light occurrence of these point forms in rockshelters during...
the middle Paleoindian period presages the next period, characterized by Dalton points, which are found extensively in upland rockshelters throughout the South and Midwest (Futato 1980:117; Goodyear 1982; McMillan 1971).

Dalton Period (10,500–9900 yr B.P.)

The end of the lanceolate Paleoindian point tradition comes with the occurrence of what is called the Dalton point or the Dalton horizon. Elsewhere it has been argued, based on stratigraphic studies and limited $^{14}$C dating, that the Dalton period should date within a span of 10,500 to 9900 yr B.P. (Goodyear 1982). Recent $^{14}$C dates from a zone bearing Dalton points at Dust Cave, Alabama would tend to support this interval (Driskell 1994, 1996). Other researchers would extend Dalton to 9500 years ago (Morse and Morse 1983:42; cf. Wyckoff 1985). The primary radiocarbon-dated exception to the 9900 yr B.P. upper limit of the Dalton horizon comes from the Packard site, located in northeast Oklahoma (Wyckoff 1985, 1989). The stratigraphic context of the Dalton assemblage there, however, and its deviation from the rest of the southeastern United States stratigraphic sequence, suggest that it was redeposited (cf. Jeter and Williams 1989:77).
The chipped stone technology of Dalton assemblages is clearly Paleoindian in character (Goodyear 1974; Morse 1973; Morse 1997b), although significant additions such as serrated, resharpended blade edges on hafted bifaces and adzes are present. It probably is not realistic to speak of a single Dalton culture in the Southeast at this time. Considerable regionalism already was manifest in the preceding middle Paleoindian period and continued during the next 500 years. A number of Dalton point varieties have been recognized: Hardaway from the North Carolina piedmont (Figure 3g); Nuckolls, Colbert, and Greenbriar from the Alabama-Tennessee area (DeJarnette et al. 1962); and Sloan (Figure 3e, f) from the Arkansas-Missouri area.

In the central and western Gulf coastal plain, the San Patrice (Figure 3i) series appears to represent a Dalton manifestation (Ensor 1986), perhaps a late one. Within the San Patrice series there are two major point varieties: Hope, which looks like a small Dalton point; and St. Johns, which has oblique, incipient side-notches (see Figure 3i). At the Hester site in Mississippi (Figure 1), Sam Brookes (personal communication 1991) has found lanceolate Daltons with straight lateral margins and Hope-variety San Patrice-like forms spatially associated in discrete clusters, implying contemporaneity. Story (1990:Figures 27 and 28) has plotted the distribution of Dalton and San Patrice points and has shown that the two types basically have different regional distributions. San Patrice occurs throughout Louisiana, exclusive of river floodplains and coastal zones, and in east Texas. These are all heavily wooded regions. The San Patrice points tend to be made on small, local chert gravels. Dalton points, on the other hand, are made on a variety of lithic raw materials concentrated more to the north of east Texas and Louisiana, and occur in a wider range of environments “... including the wooded edge of the Gulf Coastal Plain” (Story 1990:202). The dating and identification of San Patrice assemblages have been hindered by the lack of well-stratified or single-component sites (e.g., Webb et al. 1971).

Available faunal evidence indicates that modern plants and animals were the focus of subsistence by Dalton times. In a real sense, Dalton technology appears to be a somewhat modified Paleoindian tool kit applied to modern or Holocene biota. In this respect, Dalton can be considered the beginning of the early Archaic period in the Southeast. There also is evidence of a substantial population increase during Dalton times compared with previous periods. Sites and points increase by a factor of five to 10 from the Clovis and middle Paleoindian periods (Anderson 1990:Table 3).

**Late Pleistocene–Early Holocene Environments**

Based on palynological studies performed in the past 30 years by William Watts, Don Whitehead, and Hazel and Paul Delcourt (Delcourt and Delcourt 1985), a fairly detailed floral and climatic reconstruction is available for the late Pleistocene and early Holocene periods in the Southeast.

From the period of about 12,500 to 8500 yr B.P., there existed a unique forest described as a cool, mesic, broad-leaved forest (Figure 5) dominated by beech and hickory (Delcourt and Delcourt 1979, 1985; Watts 1980). This mixed-hardwood forest had cooler summers than today, with abundant moisture available during the growing season. This species-rich mesic forest had definable latitudinal boundaries between 37° and 33° north latitude (Delcourt et al. 1983:164). Referring to previous statements on the distribution of fluted points, more of the Clovis and Clovis-like material comes from this area of cool, mesic forest.

South of 33° latitude during the same period, vegetation was very similar to that of today (Figure 5). The coastal plains were warm and tended to be droughty. Vegetation consisted of modern species dominated by oak, hickory, sweetgum, and pine (Delcourt and Delcourt 1983). In Florida, surface water was severely restricted as a result of lowered sea level on the karst-controlled hydrology and by reduced rainfall.
Figure 5. Late Pleistocene and early Holocene vegetation communities at 14,000 and 10,000 yr B.P. in the eastern United States. From Anderson et al. (1990: Figure 2) adapted from Delcourt and Delcourt (1981).
It should be noted that the Southeast was not in any sense glaciated or glacially influenced during this time period. These basic floristic differences above and below 33° latitude were controlled by the position of different weather systems. The Pacific air mass dominated the area of the mesic deciduous forest and the Maritime Tropical air mass controlled the coastal plains (Delcourt and Delcourt 1983). Thus, the first Clovis populations in the Southeast encountered a hardwood or mixed hardwood and pine forest (Figure 5).

According to paleontological reconstructions by S. David Webb, there was a similar faunal distribution by latitude. In his important synthesis, Webb (1981) identifies three distinct faunal regions (Figure 6): a northern Boreal zone covering the mid-Atlantic states; a Temperate zone positioned at about the latitude of South Carolina; and a Subtropical region situated from about 33° latitude southward into peninsular Florida. A great deal of biotic variation occurred within the Southeast, with the middle Temperate and Subtropical zones being very ecotonal and diverse. Some species from the Temperate zone ranged south into the Subtropical region, making the Subtropical region one of the richest and most diverse in terms of late Pleistocene vertebrate remains (Webb 1981:1-77). Webb, as well as Edwards and Merrill, agree that "... during the late Pleistocene the region from Florida to the Carolinas approached optimal conditions for the earliest Americans" (Edwards and Merrill 1977:35).

The Pleistocene end dates for these zones are not well established and it is difficult at present to precisely relate them to human populations (Goodyear et al. 1989). It seems probable at this point that the megafauna of the Pleistocene did not survive as long as some radiocarbon dates have suggested.

The analysis of published radiocarbon dates by David Meltzer and Jim Mead (1985) is relevant here with regard to defining the end dates of Pleistocene megafauna. Their studies, based on strict criteria of date reliability, have indicated that these fauna were very likely extinct by 10,500 yr B.P., and there is a strong suggestion that they were gone by 10,800 yr B.P. This parallels the archaeological findings for Clovis versus Folsom in the West, where mammoth, horse, camel, and other economically useful megafauna were last used by Clovis peoples, and only now-extinct bison were associated with Folsom. Based on the stratigraphy of the Pleistocene–Holocene transition and the lack of extinct megafauna in post-Clovis sites, Haynes (1984) has argued that extinction took place during Clovis times and was complete no later than 10,500 yr B.P. To some extent this argument is supported by data from the Southeast, where the available faunal remains associated with Dalton indicate only modern animals were used (Goodyear 1982).

The dating of the extinction of proboscideans and other economically important North American megafauna is critical to the explanation of why so little archaeological evidence of megafaunal exploitation has been discovered in the East (cf. Meltzer 1988). If these species were essentially gone by 10,900 or 10,800 yr B.P., particularly if the Clovis occupation of the Southeast lags behind the West by a century or two, we are searching for a very narrow window in time within which such an association was possible. This scenario needs to be given more serious thought in modeling Clovis-age subsistence studies in the Southeast.
The final paleoenvironmental condition that must be mentioned is that of lowered sea levels. At the end of the Pleistocene, world sea levels began to rise. However, for the period from 12,000 to 9000 yr B.P. more subaerial landmass was available for human occupation than today and no doubt all coastal sites have been inundated. In Florida, lowered sea levels and an apparently drier climate had a pronounced effect on surface water availability (Brooks 1972), which is reflected in the utilization of famous early sites such as Warm Mineral Springs and Little Salt Spring. This was what Wilfred Neill (1964:20) called the “water-hole” effect on both animal and human populations, resulting in a geographic concentration of archaeological remains in springs and rivers. As can be seen based on the work of Dunbar and others (Dunbar and Waller 1983:Figures 1–2), most of the Paleoindian points in Florida have been recovered from the karst region, which provided more reliable freshwater resources.

Evidence of Extinct Pleistocene Fauna Utilization

Evidence of human utilization of Pleistocene fauna is present in the Southeast, especially in Florida freshwater springs, sinkholes, and rivers. The best-known examples are the ivory “foreshafts” and points (Figure 7), which have been compared to similar pieces from Clovis sites (Cotter 1962; Jenks and Simpson 1941). Amateur divers have continued to find worked ivory artifacts in the Aucilla and Ichetucknee rivers of north Florida (Dunbar 1991:Table 1). The presumption here is that the ivory was worked while fresh. Neill (1964:23) states that “in Florida, fossil ivory is chalky, inclined to split into sheets, and unsuitable for manufacture into points.” Haynes (1982:389–390) has offered evidence, based on the modification of proboscidean tusk structure, that ivory probably was worked while green.

In the early 1970s, underwater excavations were conducted at the Guest site, located east of Ocala, Florida (Figure 1), which has been interpreted as a mammoth kill site (Hoffman 1983; Rayl 1974). A bone deposit was found eroding out of the bank of Silver Springs Run about 3 m underwater, located several kilometers downstream from the main springs (Silver Springs). An apparently in situ mammoth was discovered during excavation (Hoffman 1983:Figure 1), which yielded “a small stemless point . . . in the vicinity of the proximal end of the right femur close to the ilium. Chert flakes were [also] found in the area of the ribs and vertebra” (Hoffman 1983:84). Hoffman (1983:Figure 2) provides a photograph of this point, which appears lanceolate and basally thinned or fluted, but with an excursive rather than concave base. With the exception of Rayl’s (1974) master’s thesis, no published report is available to allow scientific evaluation of this excavation and geohydrological context. This is an unfortunate situation, as the Guest site appears to be a possible example of Paleoindian extinct megafauna utilization.

The famous underwater site of Little Salt Spring in southwest Florida (Figure 1) produced an association of a sharply pointed stake apparently driven into an extinct species of tortoise (Geochelone crassiscutata), found lying on its back. The tortoise was 26 m below the present water surface of a cenote on a formerly dry
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ledge. The investigators believe the animal was killed with the stake and cooked where it was found. A 14C date on the stake was assayed at 12,030 ± 200 yr B.P. (Clausen et al. 1979:609). No other organic artifacts or diagnostic chipped stone tools were reported that date to this age. Other wooden artifacts were recovered in the spring that have been 14C dated between about 9500 and 9000 yr B.P. (Clausen et al. 1979:Table 1). Assuming no contamination of the 12,030 date, this 14C value could be pre-Clovis in age.

Based on their underwater excavations at nearby Warm Mineral Springs (Figure 1), Cockrell and Murphy (1978:1) report a combined 14C date of 10,310 yr B.P. based on 16 assays taken from the general area of what they describe as a flexed human burial. The burial and dated material were collected from a ledge 13 m below water surface. Worked bone from the site is all from modern fauna. The earliest stone projectile points are side-notched in form following the Greenbriar and Bolen types (Cockrell and Murphy 1978:Figure 6), which should date about 10,000 yr B.P. The work of Clausen et al. (1975) at this same site produced similar results. Two human bones were found in stratified organic deposits that had accumulated on the 13-m ledge. A date of 10,260 ±190 yr B.P. was obtained on wood from the same level as one of the human bones. Four radiocarbon dates ranging from 9880 to 10,630 yr B.P. were obtained from four 10-cm levels. All fauna recovered were modern species.

This same situation applies at the Cutler Fossil site, a dry sinkhole located near Miami (Figure 1). Here the earliest firm archaeological evidence of occupation occurs at about 10,000 yr B.P., based on Dalton-like projectile points and 14C dates (Carr 1987:62-63).

Although late Pleistocene fauna occur abundantly at Little Salt Spring, Warm Mineral Springs, and the Cutler site, with the exception of the extinct tortoise at Little Salt, a good association between people and extinct fauna has not yet been made. This could imply that the earliest penetration of humans into south Florida, as witnessed by these three sites, may be the Dalton time period (10,500-10,000 yr B.P.). The preservation of organic remains at the spring sites, including human brains, is nothing short of extraordinary (Clausen et al. 1979:203-204), suggesting that a Clovis or even pre-Clovis occupation, if present, could be easily dated and determined.

The most unequivocal evidence of human use and contemporaneity with extinct megafauna is that of a Bison antiquus skull with a broken chert projectile point embedded in its fronto-parietal bone (Webb et al. 1984). This specimen was found by a hobby diver in the Wacissa River in Jefferson County, Florida (Figure 1). The point base was missing, thus precluding any typological identification. Radiocarbon dates of bison bone indicate an age of about 11,000 yr B.P.

In riverbeds of the karst region of north and central Florida, including the Suwannee, Santa Fe, Ichetucknee, Wacissa, Aucilla, Withlacoochee, and Oklawaha, numerous finds of late Pleistocene mammal bones and Paleoinidan-age artifacts are practically legendary (Mason 1962; Milanich and Fairbanks 1980:35-48; Neill 1964; Purdy 1981; Waller and Dunbar 1977; Webb 1974; Webb et al. 1984). With the exception of the well-described find of a butcher-marked vertebral mammoth spine (Bullen et al. 1970) and the recently published description of six obvious bone and ivory tools (Dunbar and Webb 1996), this modified faunal material has not been systematically described and published. Brief references in the literature to other worked or butcher-marked megafaunal specimens curated at the Florida Museum of Natural History and in private collections (Dunbar et al. 1989a:453-498; Webb et al. 1984:390) indicate that a substantial body of faunal data now exists which merits systematic study. Use of the scanning electron microscope is offering new avenues for distinguishing between human and natural agencies in the modification of archaeofaunal remains (Johnson and Shipman 1986; cf. Dunbar et al. 1989a).

At the very least, the Kimmswick mastodon site (Graham et al. 1981) in southeastern Missouri (Figure 1) and the Wacissa River bison kill (Webb et al. 1984) both show unmistakably that humans were present in the Southeast at a time early enough to be contemporary with late Pleistocene megafauna and in fact incorporated them into their subsistence base. It should be obvious that the underwater sites of Florida demonstrate enormous potential for elucidating this poorly known aspect of the earliest human inhabitants of the Southeast (cf. Dunbar and Webb 1996).
Late Pleistocene–Early Holocene Depositional Systems

Based on the work of C. Vance Haynes and others, it is evident that over much of North America south of the Wisconsin ice, there was a marked period of erosion at the end of the Pleistocene dating between 12,500 and 11,500 yr B.P. (Haynes 1968). This was a broad geologic and probably climate-related event where stream regimens were dominated by net degradation and channel incision. Clovis sites, whether in the West, Midwest (Kimmswick), or East (Thunderbird, Shawnee-Minisink), exhibit initial human occupation at the contact of the previous erosional surface and the first episode of Holocene aggradation (Haynes 1984:350). Based on radiocarbon-dated geological stratigraphy of Clovis sites in the West and comparable stratigraphic contacts in the East, Haynes (1984:350) estimates that the first episode of fluvial aggradation began about 11,000 yr B.P.

Contemporary environmental scientists have focused on the role of floods and their capacity to move floodplains away from states of depositional equilibrium by erosion or aggradation (Knox 1976). Climate has emerged as the macro-determinant of floods mediated regionally by the effect of vegetation (Delcourt 1985; Knox 1984). Based on historic flood records, J. C. Knox has shown that it is during periods of extreme climatic shifts rather than average climatic conditions that floodplains move from depositional regimes to those dominated by incision or degradation. He has speculated that severe storms, especially those occurring temporally in clusters, are most responsible for causing rivers to incise and erode their floodplains (Knox 1976, 1984). For the eastern United States, Knox hypothesizes that when weather patterns are dominated by zonal atmospheric movement across the Midwest, violent storms are less frequent and floodplains tend toward equilibrium and aggradation. Weather patterns dominated by meridional airflow, on the other hand, produce frequent, severe thunderstorms and concomitant major floods resulting in floodplain degradation. This occurs as a result of the Arctic air mass flowing southward in the winter and the movement of the Maritime Tropical air mass moving northward during the summer (Delcourt 1985:22; Knox 1984).

As previously mentioned, palaeovegetation reconstructions based on radiocarbon-dated fossil pollen assemblages have demonstrated the prehistoric reality of the now-extinct mesic hardwood forest which existed from 33° to 37° north latitude (Figure 5). The climate represented by this forest is interpreted by Delcourt and Delcourt (1984:276) as “cool temperate” with abundant moisture during the growing season. The Delcourts (1984:280) attribute the presence of this forest to the interaction of the Pacific air mass dominating during the winter and the Maritime Tropical air mass in the summer. The climate during this time (12,500–8500 yr B.P.) is also regarded as exhibiting maximum seasonality compared to climates before this and afterward (Delcourt and Delcourt 1984:280). Sometime during the 12,000 to 11,000 year interval, the Arctic air mass must have made its presence felt in the southern latitudes, owing to the separation of the Cordilleran and Laurentide ice sheets (Bryson and Wendland 1967; Delcourt and Delcourt 1984:278). This would have caused strong meridional airflow, supporting Knox’s (1984) storm hypothesis.

For the southeastern United States, Paul Delcourt, following Knox (1984), has shown the effects of climate and vegetation in determining the rate of overland surface runoff of precipitation and the resultant capacity for erosion of the landscape (Delcourt 1985). At Anderson Pond in Tennessee (36° latitude) and at Cupola Pond in Missouri (37° latitude), the onset of the mesic deciduous forest markedly reduced the amount of mineral sediment flowing into the basins compared to the previous full-glacial boreal forest (Delcourt 1985:20–21). In other words, closed canopied hardwood forests protected land surfaces from erosion, reducing the sediment available to river valleys.

To the south, palynological and sedimentological studies conducted on lakes in the southern Atlantic and Gulf coastal plains have revealed similar low rates of mineral sedimentation during the full-glacial to early Holocene periods (i.e., from ca. 20,000 to 8000 yr B.P.). Forests situated on the interfluves were dominated by oak, hickory, and southern pine, indicating a temperate climate with drouthy summers. Mature forests, coupled with low precipitation during the summers, would be responsible for minimizing overland flow of sediment into ponds and lakes and into the watershed (Delcourt 1985:21). After 8000 yr B.P., summer precipitation increased, owing to the influence of the Maritime Tropical air mass, causing ponds to deepen, coniferous trees to increase, and mineral sedimentation rates to increase (Delcourt 1985:23).
Delcourt’s (1985) sedimentological and palynological work with non-riverine, interfluvial pond sites helps explain the minimally stratified condition of many upland or inter-riverine Paleoindian sites throughout the Southeast. Vegetation cover was sufficient to prevent soil movement by both colluvial and eluvial agencies. As discussed below, a different climatic and floristic situation existed in peninsular Florida, whereby sediment was moving and accumulating on Paleoindian sites.

Largely owing to federally funded mitigation projects of water reservoirs, geologists and archaeologists have worked together to study the paleohydrology and alluvial histories of southeastern United States river valleys. In general, alluvial features containing clear representations of archaeological assemblages began to consistently appear at about 9500 yr B.P. with what is called the Kirk phase or Kirk corner-notched cluster, so named for a corner-notched projectile point (Broyles 1966; Chapman 1976; Claggett and Cable 1982; Coe 1964). With the onset of Kirk-phase lithics, typically seen is an unbroken alluvial and archaeological series of depositions through the Holocene, indicating floodplain sedimentological regimes dominated by aggradation with minor episodes of erosion in the late Holocene.

Prior to the Kirk phase there is often recorded in the geological record an erosional hiatus like that discussed for the rest of the United States at the end of the Pleistocene. Recognizing and dating this erosional contact are critical for understanding the Holocene aggradation that was so necessary for burying and preserving Paleoindian remains. Geoarchaeology, or the application of geological techniques to aid in solving archaeological problems, has been conducted extensively in field studies throughout the Southeast in recent years, yielding an interesting database of case studies that can be examined profitably. The rest of this section will review and evaluate a number of these studies in an effort to summarize the state of knowledge regarding geological contexts and depositional environments of the Paleoindian time period (12,000-10,000 yr B.P.).

Owing to special geomorphic, and thus depositional, properties related to each, the review will be broken down by floodplain studies in the southern Appalachian Mountains and Piedmont, and floodplains and other depositional situations occurring on the coastal plains. As will be seen, the rivers of the southern Appalachians are rockbound with narrow floodplains, which tends to produce deep alluvial deposits conducive to archaeological stratigraphy and preservation. The non-rockbound rivers of the coastal plains, on the other hand, permit greater lateral channel migration and thus develop thinner deposits. Further south in peninsular Florida, the coastal plain is underlain by limestone, resulting in special depositional features such as springs and sinks, which have facilitated unique geological and archaeological deposits. Finally, when considering coastal-plain landforms, those that have been inundated by sea-level rise must also be considered, such as those that are known to exist in the Gulf of Mexico.

The Southern Appalachians

Little Tennessee River, Tellico Reservoir Project

Extensive deep-site excavations, directed by Jefferson Chapman during the 1970s, were conducted by the University of Tennessee in the Little Tennessee River valley (Figure 1) as mitigation measures for the Tellico Dam. Using a backhoe, deeply buried alluvial sites were systematically searched for as deep as 7.01 m below the floodplain surface.

No in situ alluvially buried Paleoindian remains were encountered, although surface finds of fluted points have been made on older adjacent terraces and hillsides (Chapman 1985:145). One obvious fluted point with a resharpened blade was found at the Bacon Farm site in an early Archaic Kirk-phase level, but was evidently redeposited (Chapman 1978:55). Two Dalton points in redeposited contexts also were found, one from Stratum H at Icehouse Bottom, which was a late early Archaic Kirk level, and another from Rose Island from a late early Archaic St. Albans horizon (Chapman 1977:49). The earliest in situ buried alluvial sites were dated to early Archaic Kirk corner-notched horizons beginning at 9500 yr B.P., based on several radiocarbon dates (Chapman 1985:146). Holocene-age sediments were present as much as 3 m deeper than the Kirk-horizon materials but produced no artifacts.

Geological and archaeological studies of the lower Little Tennessee River valley have provided the data for a model developed by Paul Delcourt (1980) of erosion and alluvial deposition, which can explain the lack of buried pre-10,000 yr B.P. sites. Chapman has summarized this model as follows:

From 1979 surveys and backhoe trench profiles, Delcourt has identified nine Quaternary alluvial terraces. These surfaces were created through valley incision by the Little Tennessee River in response to
the progressive downcutting of the Tennessee River. Quaternary glacial/interstadial cycles modulated the mechanical production of rock debris under periglacial conditions on mid-to-high elevations in the Great Smoky Mountains, which resulted in reworking of sediment downslope and valley aggradation during late glacial and interglacial times. During the early Holocene, increased precipitation caused sediments derived from the exposed rock debris on mountain slopes to accumulate rapidly in the valleys, thus forming a thick series of first terraces (Delcourt 1980b) [Chapman 1985:144].

Chapman (1985) surmises that Paleoindian sites, if preserved, would be present in T1. Available radiocarbon dates from T2 range from 27,595 to 32,330 yr B.P., indicating that these terraces were formed prior to Paleoindian occupations. The possibility exists that fluted point sites might exist on remnant point bars within T1, although site discovery will be difficult. According to Chapman, the greater likelihood is that any 10,000 to 11,000 yr B.P. cultural occupations would have been eroded by the highly dynamic floods at the end of the late glacial period. The increased precipitation at the beginning of the Holocene evidently resulted in the extremely rapid formation of T1. To illustrate, radiocarbon dates of non-archaeological sediments located from 6.1 to 6.7 m below surface are contemporary with dates from in situ early Archaic Kirk horizons 3 m higher (i.e., 9000 to 9500 yr B.P.), indicating something of the speed with which T1 was formed (Chapman 1985:144–145).

**Duck River, Tennessee, Columbia Reservoir Project**

The Columbia Reservoir Project (Figure 1) combined archaeological and geological approaches in the study of the depositional history of the middle Duck River during the course of the Holocene. Extensive backhoe trenching allowed a reconstruction of the alluvial stratigraphy of the river valley beginning with the late Pleistocene and continuing to the present (Brakenridge 1984). “Severe bedrock and flood-plain erosion occurred near the end of the Pleistocene, and a major erosional unconformity was created” (Brakenridge 1984:9). The early Holocene aggradation was identified and dated to approximately 9000 yr B.P. based on diagnostic artifacts. Several pre-Dalton fluted points were found at or near the surface of the T2 Armour soils, which were the most stable land surfaces nearest the river (Turner and Klippel 1989:61). Deeply buried Archaic occupations were found in T1 sediments, with radiocarbon dates as old as 8885 yr B.P. Sediments of T1a1 (early Archaic) and T2b (Paleoindian) ages were penetrated but not well sampled by backhoe and bulldozer cuts, owing to their great depth and unstable trench conditions (Klippel, personal communication 1991).

**Nashville Basin, Cumberland River, Tennessee**

As part of their statewide Paleoindian projectile point and site survey, staff of the Tennessee Division of Archaeology discovered several alluvially buried and stratified Paleoindian and early Archaic sites along the Cumberland River within the Nashville Basin. The Johnson site (40DV400) (Figure 1), found eroding from the south bank of the Cumberland River, yielded diagnostic projectile points spanning Clovis through bifurcates (Broster et al. 1991). Total archaeological depth is on the order of 8 m, with culturally modified horizons of burned clay, charcoal, and organic matter evident in the cutbank profile. From the lowest cultural layer (Stratum IV), wood charcoal was obtained from a generally gathered sample yielding a date of 11,700±980 yr B.P. A fluted preform base was found 30 cm away. A shallow basin feature, 33 cm deep and 62 cm wide, was recorded in the upper portion of the lowest cultural unit. The bottom of this basin contained “dark gray ash mixed with charcoal, burned bone, and numerous bifacial reduction flakes” (Broster et al. 1991:9). A radiocarbon date of 12,660 ±970 yr B.P. was obtained on this feature (Broster et al. 1991:9). A second basin shaped feature in Stratum IV known as Feature 6, produced a date of 11,980 ±110 yr B.P. on unidentifiable charcoal (Barker and Broster 1996:103). Stratum IV is thought to be Clovis in age. Some 26 fluted preforms have been recovered from the site, 20 of which were in situ within Stratum IV (Barker and Broster 1996:112). Three Clovis points have been found washed out on the lower beach below the profile.

Another alluvial site found eroding into the Cumberland River was the Puckett site (40SW228). This site also has produced the full range of fluted, lanceolate, and early Archaic projectile point types. Test excavations revealed “... an intact level of Dalton projectile points overlain by a substantial Kirk corner-notched component. A radiocarbon sample from the Dalton component has produced a date of 9790 ±160 yr B.P.” (Broster and Norton 1996).
Published information in an expanded form is limited at this point for these sites, as well as for the important Kentucky Lake site of Carson-Conn-Short on the impounded Tennessee River, discussed below. However, the density of early diagnostic artifacts, including fluted points, the presence of visually apparent natural and cultural stratigraphy with charcoal and bone surviving, plus the great depth of burial, together provide an encouraging situation for establishing the geological context necessary for Paleoindian studies in the South. The three radiocarbon dates from the Johnson site seem comparatively old and in two cases their large standard deviations prevent precise cultural association. At two sigmas, both dates are within the North American Clovis range. The 11,980 date with the sigma of 110 yrs seems earlier than western Clovis dates even at three standard deviations. The radiocarbon date associated with the Dalton component at the Puckett site seems right for late Dalton.

Kentucky Lake, Tennessee River, Tennessee

Of several fluted point sites found in surveying the Kentucky Lake region of the Tennessee River by the State of Tennessee’s Division of Archaeology, the site of Carson-Conn-Short (40BN190) (Figure 1) has received the most fieldwork. The site was recorded as part of the survey conducted by John Broster and Mark Norton (1993). It is comprised of seven distinct areas exposed at the surface on partially flooded terrace ridges located near the old Pleistocene channel of the Tennessee River.

One of the seven areas, A has received intensive mapping and testing with 1-m-square units. Area A is 50 by 300 m and has produced nearly exclusively Clovis fluted preforms, points, and related unifacial tools, along with a minor Cumberland occupation. Testing has indicated intact Paleoindian lithic material located from 30 to 55 cm below surface associated with two distinct soil strata. Several clusters of firecracked chert were found throughout the area of the Paleoindian artifacts, suggesting deflated hearths.

Subsequent radiocarbon dating of one cluster indicates late Archaic usage, although late Archaic artifacts are not found on the site (Broster and Norton 1996).

With approximately 1,700 tools recovered as of 1994, only a minor quantity are post-Paleoindian in age, indicating a rather dense fluted point site. Carson-Conn-Short is defined as a “quarry-workshop” by Broster and Norton (1996), as it is situated within a few hundred meters of high-quality chert. The site is dominated by fluted preforms and prismatic blades, which probably indicate the primary manufacturing activities. The site is significant because of its stratigraphic integrity and the domination of the lithic assemblage by what is apparently a Clovis-related technology. According to the authors, this may be one of the largest Clovis sites ever found in the Southeast (Broster and Norton 1996).

Carson-Conn-Short, like the sites discussed above for the Cumberland River in the Nashville Basin, has enormous potential for solving basic problems in southeastern Paleoindian studies, not the least of which is the age and origin of Clovis culture. Sophisticated field studies employing techniques of fluvial geology and soil morphology will be needed to fully document what appears to be excellent stratigraphic context.

Middle Tennessee River Valley, Alabama

Recent publications on the famous Quad site and geographically related sites, such as Pine Tree and Stone Pipe (Figure 1), allow some geoarchaeological interpretations to be made of these important Paleoindian sites.

Although these sites have enjoyed a certain prominence in eastern United States Paleoindian studies because of the exceptional quantities of Paleoindian and early Archaic artifacts they have yielded, full-scale intensive archaeological excavations by professional archaeologists never took place. The sites have remained largely inaccessible as they are covered by the waters of the Wheeler Reservoir and have sustained much damage due to water erosion from lowering and raising the reservoir level. Test excavations were conducted by amateur archaeologists who reported on the stratigraphic conditions (e.g., Cambron and Hulse 1960; Hulse and Wright 1989). These test excavations, conducted in the backwater areas of the floodplain away from the contemporary river channel, indicated that the early lithic material was not deeply buried nor clearly segregated stratigraphically from Archaic remains.

Based on recent visits to these sites by Charles Hubbert (1989), some clarification is available for the geological situation of the floodplain in the vicinity of the Quad site. Hubbert (1989:151) reports there are from three to four “levees” present on either side of
the river. The first of these is along the present riverbank. Artifacts recovered from the bank indicate the levee is only 7,000 to 8,000 years old. Paleoindian and early Archaic bifaces are not found here. Up to 4 m of alluvial sediments have accumulated since 8000 yr B.P. Levee 2 is about 180 m back from the channel, is from 90 m to 180 m wide, and runs nearly continuously for several miles along the floodplain. Paleoindian and early Archaic artifacts are found that have eroded from Levee 2. Pea-gravel deposits often can be seen exposed on this levee. Levee 3 occurs from 90 m to 180 m away from the river and like Levee 2 produces numerous clusters of Paleoindian and early Archaic lithic materials. It exhibits no pea gravel. Hubbert (1989:154) reports that Levees 2 and 3 have yielded about equal quantities of Paleoindian and early Archaic artifacts, as well as sporadic occurrences of later Holocene cultural occupations. The fourth levee is above the lake level and is essentially uneroded (Hubbert 1989:155).

On Levee 2, Hubbert (1989:156) measured the distance from the highest lateral root scar of 11 tree stumps to the present ground surface to estimate the amount of modern soil loss due to erosion. Based on these measurements, he determined that about 48 cm of sediment have been lost. This sediment is described as silt that covered the artifacts after lowering of the lake level. “Beneath the dark silt, the surface upon which the artifacts rest is a yellow/orange-to-yellow/blue mottled clay which appears to be sterile” (Hubbert 1989:156).

It appears that during the Paleoindian time of occupation of the Quad site locality, the primary occupations were situated on Levees 2 and 3. Hubbert (1989:154) suggests that Levee 2 would have been the nearest riverbank for human occupation. In any event, little or no sediment was accumulating on these land surfaces to afford burial and stratigraphic separation of Paleoindian artifacts from subsequent Archaic occupations. In this regard, they are like the T2 terraces described for the Little Tennessee River and the middle Duck River, which produced Paleoindian artifacts at or near their surfaces.

**Dust Cave, Alabama**

**Dust Cave** is located in the karstic uplands north of the Tennessee River near Florence, Alabama (Figure 1). In 1988 it was tested by a team from the Alabama Museum of Natural History under the direction of Boyce Driskell and found to have deeply buried Archaic deposits. Subsequent excavations have revealed nearly 5 m of artifact-bearing sediments ranging in age from an estimated 10,500 to 5200 yr B.P. (Driskell 1996). The site is noteworthy for its deep stratigraphy, preservation of faunal and floral remains, and undisturbed deposits, indicated by a long string of radiocarbon dates in chronological order by depth (Driskell 1994:20; Goldman-Finn and Driskell 1994).

Two naturally defined archaeological horizons are of interest here. First is the early side-notched component corresponding to what is called “Big Sandy I” or Bolen side-notched elsewhere in the Southeast. Radiocarbon dates place this between 9000 and 10,000 yr B.P. Nearly a dozen side-notched points have come from an approximately 40-cm-thick layer, along with other typical early Archaic flake tools (Driskell 1994). The sediments associated are local colluvium in origin. Faunal remains from this side-notched horizon and the earlier one below are all Holocene and indicate a diverse biota (Grover 1994).

The lowest horizon is referred to as “late Paleoindian” (Driskell 1996). Radiocarbon dates indicate an age spread between 9990 ± 140 yr B.P. and 10,390 ± 80 yr B.P. Sediments in the lowest artifact-bearing layer possess muscovite (mica), indicating alluvium deposited by the Tennessee River (Goldberg and Sherwood 1994). Sediments above this zone are nearly free of mica, indicating local, colluvial sources. Diagnostic projectile points include one each of Cumberland, Quad, and Hardaway side-notched, two Dalton-like fragments, and three Beaver Lake points (Driskell 1996).

Compared to other cave and shelter sites of the Southeast, Dust Cave is exceptionally well preserved and exhibits great clarity in its stratigraphy. The early side-notched component is essentially typologically pure, with later Kirk corner-notched points lying above it and earlier Dalton and pre-Dalton projectile points below it. Clovis-type points and related artifacts are missing from the sequence, a fact Collins and his colleagues (Collins et al. 1994) attribute to a late Pleistocene, pre-10,500 yr B.P. flushing out of alluvial sediments deposited by the Tennessee River when it was flowing at a higher level. The quality of geoarchaeological and biological data preserved at Dust Cave and the interdisciplinary work being undertaken there (Goldman-Finn and Driskell 1994) guarantee that this site will form a benchmark in the study of the Pleistocene–Holocene transition from an archaeological perspective.
Smith Mountain, Virginia

SMITH MOUNTAIN is a deep, stratified, alluvially buried multicomponent prehistoric site within an ancient levee of the Piedmont portion of the upper Roanoke River (Figure 1). The levee is located in and adjacent to the flood pool of upper Leesville Lake, which is an artificial impoundment of the Roanoke. Due to heavy shoreline erosion from water level fluctuations, numerous early Archaic and some Paleoindian bifaces have been found along the beach (Childress 1993, 1996). Two loci have produced artifacts, an area designated 44PY7, located at the head of the levee, and 44PY152, which is located at the foot. The two loci are about 300 m apart and together are considered the Smith Mountain site (Childress 1993). Because of site loss due to erosion, investigations were undertaken to assess their stratigraphic integrity by the William and Mary Center for Archaeological Research, with the aid of the Roanoke Chapter of the Archeological Society of Virginia (Blanton et al. 1996). Owing to logistical problems of fluctuating water levels and extremely hard soil, 44PY152 received most of the field investigation.

Site 44PY152 was subsurface tested by the William and Mary team in 1994. Ten bucket auger tests were dug over a length of about 70 m along the levee crest with nine of 10 tests producing artifacts. Two 1 x 2 m test units were excavated to evaluate buried deposits. Auger testing indicated a relatively homogenous deposit with no distinct stratigraphic breaks, except a cobble layer encountered between 1.95 and 2.85 m below surface. A buried artifact deposit was found from 120 to 180 cm below surface consisting of quartz and chert flakes (Blanton et al. 1996:37). Test unit 1 was placed on the beach in an area of high artifact density and dug in six 10 cm levels. Only debitage and undiagnostic biface fragments were recovered, most of these in the first 0.5 m. Based on absolute elevation below the levee surface, the first level corresponded to Stratum V, a deeply buried artifact-producing horizon in the levee. Test unit 2 was placed on the levee top. A backhoe was used to remove soil down to 1.4 m below ground surface to Stratum V, at which point eight 10-cm levels were excavated (Blanton et al. 1996:45). Artifacts were recovered in the first seven levels consisting of debitage and projectile point fragments, one suggestive of a side notched point. Based on depth and lithic raw materials, Stratum V is thought to be Paleoindian-early Archaic.

Geoarchaeological studies were conducted in test unit 2 because of maximum profile depth. Schuldenrein (1996:99) identified three major alluvial cycles and their associated paleosols within 2.4 m of alluvium. Alluvial unit 3, the deepest and oldest horizon, began at about 1.4 m below surface and was observed in profile to about 2 m. The upper 0.5 m of unit 3 corresponded with Stratum V, the buried Paleoindian-early Archaic deposit. It was capped by a fragipan which is thought to have helped preserve its archaeological integrity. Schuldenrein (1996:102) classified the soil morphology of the upper portion of alluvial unit 3 (Stratum V) as a 3AB and attributed the high degree of humification to human inputs. This interpretation is bolstered by geochemical analysis that showed high values of potassium and phosphorous. Two radiocarbon dates were obtained from Stratum V, 8810 ± 130 yr B.P. and 9863 ± 130 yr B.P., confirming its early Holocene age. Subsequent to this fieldwork, Childress (Childress and Blanton 1996) obtained a 14C date of 10,150 ± 70 yr. B.P. on carbonized wood fragments excavated in an exposed layer of the eroding bank profile further west of the William and Mary excavations. This layer was about 0.8 m in thickness and is thought to correspond by depth and archaeological content to Stratum V. The date of 10,150 would further corroborate the early Holocene age of this stratum.

The lower portion of alluvial unit 3 (Stratum VI) was archaeologically sterile. Significantly, however, a 3Bt paleosol was present which Schuldenrein (1996:102) describes as “...the most deeply weathered and only argillic solum identified.” Only the upper 0.2 to 0.3 m of this paleosol was observed. Auger testing below that for about 1.14 m encountered the cobble zone detected elsewhere in augering.

Although deep subsurface testing of this site was limited, there is a rather clear expression of an early stable Holocene surface with presumably Paleoindian and early Archaic artifacts associated. One fluted point and three other weakly fluted or basally thinned points have come from the adjacent beach surface implying some type of pre-Dalton occupation. Underneath the 3AB paleosol was a deeply weathered argillic soil (3Bt) that appears to be archaeologically sterile. Assuming the 3AB surface contains the Paleoindian material, this would appear to match the geoarchaeological stratigraphic sequence of the Thunderbird site where a Clovis occupation overlay the “Clovis clay” which Foss (1974) showed to be a buried argillic horizon.
The Haw River Project, North Carolina

Archeological and geological investigations at two stratified sites (31Ch8 and 31Ch29) located on the Haw River floodplain in the Piedmont of North Carolina (Figure 1) provided an unusually clear stratigraphic picture of the Pleistocene-Holocene boundary and documented the presence of a late Paleoindian Dalton component. The fieldwork was conducted as part of cultural resource management mitigation studies in advance of the B. Everett Jordan Reservoir (Claggett and Cable 1982).

Within a 2-m-thick Holocene alluvial deposit, successive prehistoric occupations were recovered, beginning with Dalton and terminating in the Woodland period. The underlying geologic structure of the Haw River along this stretch is the Indian Creek fault zone, which causes the river to pond during floodstage, resulting in a depositional basin. During the early and middle Holocene, deposition dominated the floodplain primarily through overbank deposits, which effectively buried archaeological remains (Larsen and Schuldenrein 1990:178).

Artifact-bearing Holocene T1 sediments immediately overlie an eroded and weathered Pleistocene surface (T2) consisting of sandy silts. It is estimated that the late Pleistocene surface was exposed to erosion and weathering for as long as a millennium. “This is based on the occurrence of Paleoindian/early Archaic (Hardaway-Dalton and Clovis) projectile points within the buried stratum” (Larsen and Schuldenrein 1990:178). The contact between the lower T1 and the Pleistocene surface was very sharp, suggesting that any pre-Dalton occupation may have been scoured away. Selected excavations into this surface revealed sporadic finds of debitage thought to be fortuitous intrusions from Dalton and early Archaic occupations above (Cable 1982:317). No pre-Dalton diagnostic artifacts were encountered in the Haw River site excavations.

Immediately overlying the eroded late Pleistocene terrace were fine- to medium-grained sands from overbank deposition, which marked the onset of the Holocene aggradation of the Indian Creek fault zone. This is referred to as the Hardaway–Dalton occupation, as revealed at 31Ch29, Block A (Cable 1982:317). Within an approximately 18-cm-thick medium-sand layer, two Dalton points were found, referred to locally as Hardaway–Daltons, as described from the Hardaway type site (Coe 1964). Other associated lithic artifacts include a unifacial “adz”-like tool, end scrapers, and flake blanks. No organic remains were recovered, which eliminated radiocarbon dating. Early Archaic corner-notched Palmer and Kirk points were found above the Hardaway–Dalton layer. No organics were preserved in this layer either; thus radiocarbon dates are unavailable for the early Archaic levels.

The Haw River Project provides critical data toward the study of the Paleoindian period in the Southeast. First, the well-preserved occupational sequence revealed in the T1 terrace indicates that, at least in the remnant area represented by 31Ch29, Holocene sedimentation began at Dalton times (10,500–10,000 yr B.P.). The Holocene sediments formed a clear stratigraphic and textural break with earlier eroded Pleistocene sediments. These excavations also document, using the best geological contexts possible, the stratigraphic separation of Dalton points from later early Archaic notched points (cf. Goodyear 1982).

The Baucom Site, Union County, North Carolina

This alluvially stratified Archaic site was originally dug by artifact collectors from the Piedmont Archaeological Society. It is located on the south bank of the Rocky River in Union County, North Carolina (Figure 1). A published report described several Dalton points and early Archaic notched points, a reconstruction of excavation levels and features, and radiocarbon dates (Peck and Painter 1984). One date in particular, 11,100 ± 1530 yr B.P. (AA-351), based on charcoal, was exceptionally old but had a very large error (Peck and Painter 1984:37). The date was said to have come from the Hardaway side-notched level (Peck and Painter 1984:23). This date also was noted by Haynes (1987:Figure 1) but was not discussed. Sample AA-351 was subsequently rerun, yielding a new date of 8170 ± 110 yr B.P. (Vance Haynes letter to Rodney Peck, 1987). According to Haynes, the latter value is the more reliable, owing to its greater precision.

Given the existence of alluvially buried Dalton and other early Archaic diagnostic lithics, plus reports of hearths and the presence of early Holocene charcoal as witnessed by the 14C dates (Peck and Painter 1984), Goodyear and Haynes (1987) tested the site using backhoe trenches to document the stratigraphy and to obtain new 14C dates. Preliminary results indicate that the Dalton and early Archaic occupations have experienced some vertical mixing, an interpretation supported by small sample AMS 14C dates that also do not appear to be temporally in order by depth. The 14C dates from this work also indicate a possible
depositional hiatus at the Pleistocene–Holocene transition. Although final interpretations have not been developed, fieldwork did indicate a Holocene deposit at least 2.7 m deep bearing evidence of continuous prehistoric occupation from Dalton to Woodland times.

**Upper Savannah River, Richard B. Russell Reservoir, Georgia and South Carolina**

Beginning in the late 1970s and continuing through the early 1980s, extensive cultural resource management mitigation research was conducted in the upper reaches of the Savannah River and its tributaries in the central Piedmont of Georgia and South Carolina related to the building of the Richard B. Russell Reservoir (Figure 1). A multidisciplinary program of environmental reconstruction was undertaken prior to much archaeological excavation in order to set an ecological perspective for archaeological studies (Anderson and Joseph 1988; Carbone et al. 1982). Geological and pedological fieldwork was oriented toward identifying and mapping late Pleistocene and Holocene sediments and landforms, in part, to discover buried Paleoindian and Archaic period remains (Foss et al. 1985; Segovia 1985).

Based on geological and archaeological fieldwork, Segovia (1985) reconstructed the evolution of the Savannah River valley in the project area. During the late Pleistocene (probably Sangamon age), a period of pronounced deposition occurred, resulting in a thin gravel deposit overlain by up to 6 m of reddish medium- to-fine sands. At the end of the Pleistocene this deposit was effectively removed from the valley by downcutting, leaving only a few terraces along valley walls or remnant islands protected on bedrock highs. Strong runoff of the Savannah River continued during the early Holocene, including scouring of the bedrock perhaps as late as 10,000 yr B.P. based on 14C dates of organic matter lying on bedrock. Sometime between 10,000 and 9000 yr B.P., heavy channel-related aggradation began, resulting in the rapid accumulation of up to 4 m of relatively sandy sediments during the early to middle Holocene.

Because of their stratigraphic integrity and preservation, two alluvially buried sites, Gregg Shoals and Rucker’s Bottom, received extensive geological and archaeological study, yielding data relevant to the Pleistocene–Holocene transition. These two sites form the primary empirical basis for the broader reconstruction of the late Quaternary evolution of the Savannah River valley.

Gregg Shoals (9Eb259) (Figure 1) was located on a high terrace/levee at the junction of Pickens Creek and the Savannah River on the Georgia side of the river. The site was unusual for the entire reservoir area in that ca. 6 m of Holocene alluvium were deposited over bedrock. The upper 3 m of alluvium contained an unbroken archaeological sequence beginning with the late Kirk phase (9000 yr B.P.) and continuing on through the Mississippian (Tippitt and Marquardt 1984). No Dalton or pre-Dalton diagnostic artifacts were excavated from the site. Over a 30-year period, the site experienced considerable erosion from the raising and lowering of an upstream dam. Several private collections obtained from the beach contained diagnostic artifacts from all periods, beginning with the early Archaic Kirk phase. Three Dalton points were alleged to have been found on the beach but there were doubts by the principal investigators concerning the artifacts’ provenience (Tippitt and Marquardt 1984:1–4). Because of its unusual depositional thickness and its exposure revealing the Pleistocene–Holocene contact, the site received considerable geoarchaeological study.

Two terrace segments at Gregg Shoals were preserved enough to provide data on the onset of Holocene aggradation. About 200 m north of the site proper, in an area of the terrace protected from late Pleistocene erosion by bedrock exposures, a potentially complete sedimentary section was observed. Upchurch (1984a:A-14) detected two basic depositional regimes, a “back levee swamp fill” followed by a “valley fill closely akin to levee and high-energy terrace deposits.” The lowest bed (A16) consisted of coarse sand and cobbles, interpreted as thalweg material indicating lateral movement of the river over this spot. It is possible that these coarse sediments are Pleistocene (Upchurch 1984a:A-23). Above this layer was a bed of gray clay with lenses of organic matter (A14, A15), including what appears to have been large cedar logs. These peat lenses also were found in the immediate vicinity lying directly on bedrock (cf. Segovia 1985). Three radiocarbon dates, 10,370 ± 140 yr B.P., 10,170 ± 140 yr B.P., and 10,000 ± 140 yr B.P., were obtained for the peat material (Segovia 1985:5). Overlying the clay and peat bed was a clay-sand layer, indicating a “classic example of back levee swamp fill” (Upchurch 1984a:A-22). Above this began beds dominated by fine- and medium-sized sand, indicative of levee building characteristic of the modern river.
The second terrace segment was observed in the riverbank at the site itself. Here the section rested on bedrock with little evidence of back-levee fill and talus deposits. This is attributed to the fact that this portion of the terrace was not rock defended and was washed out by Pickens Creek. The lowest bed above the water line, B18, was a sandy gray clay, which Upchurch correlates with the clay-peat layer upstream that produced the 10,000-year-old 14C dates (Upchurch 1984a:A-24). Clay-rich sediments above this bed suggest crevasse splay deposition in a back-levee swamp. After this occurred, sand-dominated levee material reflecting regular Holocene terrace building was deposited.

Archaeological excavations adjacent to this exposure recovered artifacts as deep as 3.1 m below surface. Kirk corner-notched and other late early Archaic points (9000–8000 yr B.P.) were the earliest cultural manifestations encountered in excavations. Bedrock was contacted about 3.2 m below the early Archaic level (Tippitt and Marquardt 1984:6-2).

Gregg Shoals is significant for its lack of pre-Dalton and probably even Dalton remains. The geology indicates that prior to the Dalton period, Gregg Shoals was represented by a scoured bedrock surface, an active channel of the Savannah, and perhaps the beginning of a levee. The clays and organics from the bottom of the terrace are interpreted by Upchurch as related to the back swamp of a levee. The 10,370–10,000 yr B.P. 14C dates obtained on peat should be contemporary with the Dalton horizon. The fact that some of this organic matter was resting on bedrock suggests that it dates the beginning of a levee, itself a product of the onset of Holocene aggradation. Thus, the transition from the Pleistocene to the Holocene as recorded at Gregg Shoals would indicate that alluviation necessary to bury and preserve archaeological remains did not begin until nearly 10,000 yr B.P., too late to provide sedimentation necessary for Paleoindian site occupation and burial.

The second major site studied that was related to the Pleistocene–Holocene transition was Rucker's Bottom (9Eb91) (Figure 1) (Anderson and Schuldenrein 1983, 1985). This was an extensive multi-component site that contained a complete prehistoric cultural sequence beginning with the early Archaic (9500 yr B.P.) and probably Clovis period, and ending in the Mississippian, all within a 1.3-m-thick deposit. The site is located on a linear terrace-levee formation parallel to the Savannah River on the Georgia side immediately upstream from Van Creek. The 1.3-m Holocene deposit was lying on an eroded, weathered, relict Pleistocene terrace. The terminal Pleistocene terrace surface was marked by an argillic B horizon in coarse-medium sands (Anderson and Schuldenrein 1983:197). Excavations 0.8 m deep into this unit produced no artifacts. Within a 160-m2 excavation unit, an extensive early Archaic deposit was encountered some 0.8 to 1 m below surface, characterized by ground side-notched and Palmer-like corner-notched points (Anderson and Hanson 1988). These are estimated to date between 10,000 and 9500 yr B.P. A single Clovis fluted point (Anderson and Schuldenrein 1983:Figure 2j, k) was recovered at the same depth as the notched point assemblage, in an area with a dense cluster of Palmer points. No definite association could be made between the Clovis point and any other tools or features. The fluted point was made of a fine black chert characteristic of cherts native to the Ridge and Valley province. Three of the early Archaic notched points recovered were made of a similar material.

It is not clear whether the fluted point was in situ or had been culturally redeposited (i.e., scavenged by early Archaic groups and left on the site). Several small black chert flakes also were found in the 160-m2 excavation area, suggesting tool finishing or maintenance activities. It is not known whether this debitage relates to the Clovis point or the Palmer corner-notched points (Anderson and Schuldenrein 1985:296). If the fluted point was in situ, which it may well have been, it indicates a conflated stratigraphy (Anderson and Joseph 1988:107).

The presence of a Clovis point stratigraphically at the transition of the Pleistocene to the Holocene does fit the erosional situation so often cited for the Southeast. The first well-documented cultural assemblage buried by Holocene alluvium at Rucker's Bottom is the side-and corner-notched early Archaic material. Some 28 notched points were found within a 0.2-m-thick level of alluvium. (The single “Hardaway Dalton” point described for this site [Anderson and Schuldenrein 1985:Figures 10, 11B) appears to be a heavily resharpened side-notched point). If the onset of Holocene aggradation dates to 10,000 yr B.P. in the central Savannah River valley, as suggested at Gregg Shoals, Clovis-age occupations on the relict terrace, such as that found at Rucker's Bottom, would have little or no sediment to separate them from succeeding Archaic components.

Two other fluted points from two different sites also were excavated from the Russell Reservoir sites. A waterworn black chert fluted point was found in a
culturally redeposited context in a Mississippian-period midden immediately south of Gregg Shoals at Clyde Gulley (9EB387) (Tippitt and Marquardt 1984:8-5, 8-10). A Clovis-like fluted point was excavated from Simpson’s Field (38AN8) while searching for subplowzone Woodland features (Wood et al. 1986). The site was situated on the floodplain of the Savannah River on a long Pleistocene terrace bounded by two creeks and a low area. The excavation unit that produced the fluted point was located on a slight ridge of the floodplain, which is an eroded Pleistocene terrace. The fluted point was found just below the plowzone, embedded in light reddish-brown sandy clay (Wood et al. 1986:55–61). An early Archaic corner-notched point and two unifacial flake tools also were found within 20 m of the fluted point. Thus, like at Rucker’s Bottom, Paleoindian and early Archaic artifacts were found lying at a common level on the surface of the eroded late Pleistocene surface.

In summary, the Richard B. Russell Reservoir archaeological field studies tend to confirm Segovia’s (1985) reconstruction for the Savannah River valley floodplain at the end of the Pleistocene. Because of greater discharge during the terminal Pleistocene, the river moved laterally, removing Pleistocene deposits and scouring the channel bottoms to expose bedrock. The surviving Pleistocene terraces would have stood some 5 m above the river bottom, providing stark relief between the river and its banks. These elevated Pleistocene terrace remnants, according to Segovia, would have provided the best floodplain features for human habitation, although easy access to the river may have been limited. During the initial period of Holocene aggradation, these terrace remnants would have been too high to receive much flood sediment, a fact born out by the minimal sediment thicknesses at sites such as Rucker’s Bottom and Simpson’s Field. Very early Holocene deposits (11,000–10,000 yr B.P.), if preserved, would be on or near bedrock, as revealed at Gregg Shoals.

The site is located on the floodplain of the Savannah River at the fall line between the Piedmont and the coastal plain within the city of Augusta. A series of shoals lie immediately to the north of the site. Rae’s Creek is located on a trianguloid landform, 400 m long and 175 m in greatest width, parallel to the Savannah River, which occurs some 200 m from the site. To the south, the broader end is bordered by Rae’s Creek. Geological and archaeological analyses indicate that the landform is a Holocene point bar which rises some 4 m above the surrounding floodplain (Crook 1990:22, 23).

Grain-size analysis indicated that the 4.6-m-thick accumulation of alluvium are all sands formed by a migrating point bar (Mathews 1990). An early Archaic Kirk midden, defined by a Kirk corner-notched point, an unfinished point preform, and unifacial flake tools and debitage, was found from 3.9 to 4 m below surface. A single 14C date of 9060 ± 110 yr B.P. was obtained from this midden. About 0.6 m below this layer was a “sterile dense sandy clay zone (Stratum R)” (Crook 1990:116). A bucket auger was used to test this zone for another 0.6 m, revealing that the clay content increased with depth (Crook 1990:116). The profile drawing indicates that Stratum R was a “Mottled Orange and Tan Sandy Clay” (Crook 1990:Figure 16).

Although no geological opinions are offered in the report (Crook 1990) as to the age of Stratum R, it seems likely that this zone represents the top of the late Pleistocene terrace. The high clay content of this zone relative to the known Holocene sand beds above, plus the increasingly clayish character of Stratum R with depth, suggest a weathered argillic horizon. The orange color indicates oxidation related to weathering. The contact between Stratum R and the immediately overlying bed is described as scoured (Mathews 1990:189). A total of 18 m² was excavated down to the R level, but no artifacts were found associated with that surface.

The contact of the overlying point-bar-related sands and the underlying sandy clay (Stratum R) provide a tantalizing situation for the discovery of in situ Paleoindian remains, if not scoured away. Because of the sands overlying an argillic horizon, the contact of T1 and probably T2 here is reminiscent of the Pleistocene–Holocene contacts as seen at the Haw River and Rucker’s Bottom sites.
Oconee River, Wallace Reservoir, Georgia

Surveys and excavations conducted by archaeologists from the University of Georgia in the late 1970s related
to construction of the Wallace Dam on the Oconee River in the lower Georgia Piedmont resulted in the
discovery of 91 Paleoindian sites. Of this number, 67 sites had Dalton components, with the remaining
containing fluted points and other early lanceolate point forms, such as Suwannee. Three of these 91 sites,
9Ge309, 9Ge534, and 9Ge136, were found in alluvial contexts. The rest were found on the surface and not
in alluvially active depositional situations (O'Steen et al. 1986).

The most impressive of the floodplain sites was
9Ge309. This site was located on a levee of Richland
Creek near where it joins the Oconee River. A total of
three fluted points was found—two in excavation levels
(O'Steen et al. 1986:Figure 11a, b) and one in the
backhoe spoil. Approximately 0.95 m of light-colored
Holocene sands bearing a full Archaic through
Woodland sequence of occupations overlay a sterile
“compact reddish brown sand” (O'Steen et al.
1986:16). A 4-by-6-m unit was excavated in 0.1-m
levels next to a backhoe trench that produced a fluted
point in the initial site testing. The lowermost 0.6 m
of sand contained early Archaic notched points and
tools. Two fluted points also were found in the lower
portion of the unit, one in the 0.75–0.85-m level and
one in the upper portion of the 0.85–0.95-m level.
There appears to be some mixing at the site, as a Dalton
point, two side-notched early Archaic points, and two
fluted points were all found between 0.75 and 0.95
m. A third fluted point, found in spoil from an initial
backhoe trench, very likely came from this depth as
well. No hearths or other features were reported for
the lowest levels of the site.

This site would appear to be situated at the base of
a shallow Holocene levee overlying an eroded, probably
Pleistocene terrace. The contact between the artifact-
bearing, light-colored sands and the reddish-brown
compact sand is illustrated as sharp (O'Steen et al.
1986:Figure 9). The red, compacted condition of the
basal sterile sands should indicate an oxidized,
weathered B-horizon soil. Within the excavation unit,
this terrace was described as sterile of artifacts, and the
fluted points were said to be in the Holocene sands
rather than lying on the surface of the terrace. O'Steen
et al. (1986) classify the fluted points as Clovis and
illustrate two basal portions of fluted points (O'Steen
et al. 1986:Figure 11a, b).

Site 9Ge534 was discovered on the surface of a
moderately elevated, alluvial feature within a back
swamp of the Oconee River, after the ground had been
disturbed by clear-cutting machinery. The base of a
fluted point, made of unidentified chert, and some
quartz flakes were recovered at the time of initial
discovery (O'Steen et al. 1986:24–25). Two 10-m-
long backhoe trenches dug to 1 m in depth were
subsequently excavated. No hand excavations or
screening were conducted. The trenches revealed a
shallow alluvial deposit to a depth of 0.6 m, with
artifacts apparently restricted to the upper 0.2 m. The
sediments were said to be light brown sand (Ledbetter
1978; O'Steen et al. 1986:24). Although
interpretations are limited, based on the nature of
fieldwork and contextual descriptions, this site does
not appear to have been deeply buried.

The third fluted point site, 9Ge136, was located on
a levee of the Oconee River. It was found during
reservoir construction when portions of the floodplain
were bulldozed to bury tree stumps. A quartz fluted-
point base and a reworked fluted point of unidentified
chert were found to indicate a Paleoindian occupation.
Woodland and late Archaic occupations also were
evident (O'Steen et al. 1986:26–27). Apparently no
other information is available for the site.

The Oconee Reservoir study seems significant for
two reasons. First, an unusually large number of
Paleoindian points were recovered both from alluvial
sites and from adjacent uplands. “Ninety-one Paleo-
Indian sites that produced nine early Paleo-Indian, 14
late Paleo-Indian, 67 Dalton, and three indeterminate
Paleo-Indian components were identified in the
surveyed areas” (O'Steen et al. 1986:2, 3). Compared
to other reservoirs surveyed in the Southeast, this is
an exceptionally high density (cf. Anderson and Joseph
1988). O'Steen (1983:73) points out that about 63
percent of the surface area of the Wallace Reservoir
was exposed by clear-cutting, which certainly would
enhance site detection compared to reservoirs where
clear-cutting did not precede site survey (e.g., Taylor
and Smith 1978). Nevertheless, a number of fluted
points were discovered through subsurface testing and
ground disturbance on the floodplain. The presence
of quartz quarries and nearby Piedmont chert quarries
also may have attracted Paleoindian groups to this
locality (O'Steen et al. 1986:50, 52). The fact that
three fluted points came from such a small area (4 by
6 m) from 9Ge309, along with probable associated
tools, indicates a relatively dense Paleoindian site, one
which would qualify as a “site” in the conventional
sensethe word, as opposed to the more usual isolated
fluted point find.

Second, based on the data available from 9Ge309,
it would seem that fluted points were found in
Holocene alluvium and above, rather than on what is
suggested here to be a weathered Pleistocene surface
(compact reddish-brown sand). The implication is that
Holocene aggradation may have taken place in the
Oconee River as early as 11,000 yr B.P. On the other
hand, the fluted points lying in physical association
with Dalton and early Archaic notched points may
represent another example of conflated stratigraphy,
as suggested at Rucker’s Bottom (Anderson and Joseph

Coastal Plains

Savannah River Site, Aiken and Barnwell
Counties, South Carolina

GEOARCHAEOLOGICAL RESEARCH has been conducted
early continuously on the 485 km² Department of
Energy’s Savannah River site for the past decade. This
research has focused specifically on the Holocene
depositional history of the Savannah River (Brooks et
al. 1986, 1989). The role of eustatic change in sea
level and its effect on changing river gradients has been
explicitly modeled to explain the evolutionary changes
of the Savannah River in the Atlantic coastal plain
during the last 10,000 years (Brooks et al. 1986;
Colquhoun and Brooks 1986). Geoarchaeological field
studies of the Savannah River site, which is located on
the upper coastal plain (Figure 1), have concentrated
on how and when alluvial terraces and point bars were
formed, relying on chronologically diagnostic artifacts
to date their formation (Brooks and Sassaman 1990;
Brooks et al. 1989).

Three alluvial terraces have been recognized on the
Savannah River site that are related to downcutting
and lateral migration of the Savannah River. Adjacent
to and elevationally above the active floodplain (To) is
T1, which is divided into two subphases: T1a and T1b,
based on an escarpment that separates them, which
ranges from 36 m to 43 m amsl. A second-older terrace,
T2, is located above T1, beginning at 43 m to 46 m

As yet, no pre-Dalton Paleoindian points have been
found in situ in a subsurface context on the Savannah
River site. The few Dalton points that have been
evacuated were found about 1 m in depth in point-bar
deposits within the T1a terrace. The Dalton period
(10,500–10,000 yr B.P.) occupations are the earliest
verified human presence on T1a landforms. Based on
geological and archaeological data gathered to date,
Brooks et al. (1989:58) believe that Dalton and pre-
Dalton remains will be found on T1b or the toe of T2,
since lower-elevation landforms were formed too late
or were scoured by lateral migration of the Savannah.
Alluvial deposition of point bars on T1a and T1b
terraces is thought to be a result of lateral migration of
the Savannah River during the early Holocene when
the river flowed as a more braided-like stream or
possibly in multiple channels during floodstage. Some
T2 and T1b landforms may have been stranded,
receiving no further point-bar deposition when the
Savannah migrated toward the Georgia side of the
valley. Paleoindian artifacts in these situations may be
relatively shallow, less than 0.8 m (Brooks et al.

The site of Pen Point (38Br383) has thus far received
the most thorough geoarchaeological study on the SRS
facility. It “is a point bar located at the toe of T1a at
the confluence of Pen Branch and the Savannah River
swamp” (Brooks et al. 1989:59). Archaeologically, the
site is significant as it manifests an unbroken prehistoric
cultural sequence beginning with Dalton and
terminating with the late Woodland period, all
contained within 1 m. The sediments are dominated
by sands that are visually azonal with respect to
depositional structure. Grain-size analysis verified four
point-bar, sediment-fining-upward depositional
sequences.

One Dalton-like preform or point was recovered
from the 0.85–0.90-m level, which is the earliest
archaeological diagnostic recovered from the site. Flake
tools and debitage were found as deep as 1 m, including
a side-notched Taylor point from 0.95 to 1 m (Brooks
and Sassaman 1990:189; Sassaman 1985). Brooks and
Sassaman (1990:189) relate the Dalton occupation to
the top of the first point-bar depositional sequence,
which ranges from 1 to 1.6 m below surface. Below a
depth of 1.6 to 3.4 m, grain-size distributions are highly
erratic from level to level, an indication of channel sands
related to lateral migration of the Savannah. The pre-
Dalton sediments are considered to be initial T1a
subphase terrace development (Brooks and Sassaman
1990:191). No charcoal or other organics were
recovered from the lower portions of the site suitable
for 14C dating.
Taylor Hill, 9Ri89, Richmond County, Georgia

This multi-component site produced Paleoindian and Archaic artifacts during a testing project related to the proposed relocation of a railroad near Augusta, Georgia (Elliott and Doyon 1981). The site is in pure alluvium and is located about 0.5 km west of the present Savannah River channel. Two Dalton points were found in a controlled surface collection of 18,100 m², and three were excavated within multiple test units totaling 45 m². One complete fluted point and the base of a fluted preform were excavated in subplowzone soil. The total depth of the archaeological deposit is about 0.8 m.

Eleven 2-m² and one 1-m² excavation units (45 m²) revealed a generally stratified preceramic deposit normally reaching maximum depths between 0.7 and 0.8 m below surface. Evidence of middle and early Archaic components, as well as Dalton and fluted point occupations, is well-documented based on recovered projectile points. It is clear from the distributions of diagnostic artifacts by levels (Elliott and Doyon 1981:Table 12) that considerable mixing of the various Paleoindian and Archaic components has taken place. A total of 565 stone tools was recovered from below the plowzone in the preceramic zone, most of which are probably Paleoindian and early Archaic in age. These include various end and side scrapers, retouched microblades, gravers, flake tools, and multifunctional uniface forms (Elliott and Doyon 1981:Table 15).

Compared to other sites in the Southeast, the nonbiface tool assemblage of Taylor Hill is remarkably dense (Meltzer 1984:212). Accordingly, it has been interpreted in various settlement models of the early Holocene as a habitation site (Elliott and Doyon 1981) or specialized logistical camp (Anderson and Hanson 1988; Anderson et al. 1990:29–30). Furthermore, the stone tool collection bears a strong resemblance to that of the Brand site in northeast Arkansas (Elliott and Doyon 1981:152; cf. Goodyear 1984).

Little data are available to assess the geological situation of the earliest occupations of Taylor Hill. The Dalton points, the fluted point, and the fluted preform, as well as side-and corner-notched early Archaic points, occur in a brown sand some 0.5 m in thickness overlying a “sterile light brown sand” (Elliott and Doyon 1981:Figure 53). Excavations did not extend deeper than 1 m. Sediments from the site were shown by granular analysis to be alluvial in origin, with more sand in the lower portion of the profile (Elliott and Doyon 1981:192). The sandy knoll-like condition of the field today suggests a series of point bars deposited during the late Pleistocene and early Holocene when the Savannah was flowing in a more braided-like channel configuration, as suggested by Brooks et al. (1989), based on the situation in the eastern side of the valley. Unfortunately, the total deposition over a several-thousand-year period is not very thick. Nevertheless, the existence of a site such as Taylor Hill is encouraging in that the Savannah or its floodstage channels were flowing in diverse places on the early Holocene floodplain and accordingly, if channels such as this were cut off rapidly and associated landforms stranded with no subsequent reoccupation, some spatially isolated Paleoindian sites could be present less than 1 m below surface (cf. Brooks et al. 1989:58–61).

Smith’s Lake Creek, Allendale County, South Carolina

Two early lithic sites located about 300 m apart have been studied in Allendale County, South Carolina. The sites are buried in the east bank of the floodplain along Smith’s Lake Creek, a small tributary of the Savannah River as it flows through the middle coastal plain (Figure 1). It is known that the Savannah River flows through Smith’s Lake Creek during times of flooding. The sites represent quarry/workshops related to chert processing of river cobbles found nearby in the bottom of the creek. Each site exhibits a basal Paleoindian lanceolate component sealed by river alluvium and bounded by a characteristic set of paleosols (Goodyear and Charles 1984; Goodyear and Foss 1993; Goodyear et al. 1985).

The Paleoindian occupation of the Charles site, 38AL135, is represented by an as yet undefined early lanceolate point assemblage characterized by basally thinned and fluted biface preforms (Figure 8). Typical Paleoindian unifacial flake tools are present, indicating other activities besides quarrying and biface manufacture. The Paleoindian component exists as a stratigraphically discrete unit (Figure 9) situated just above the Pleistocene terrace. Weathered coastal-plain chert artifacts occur from 1 to 1.25 m below surface, housed in pedogenically unmodified fluvial sands (C) or slightly weathered sandy loam (BC), and immediately overlie a similar but archaeologically sterile fluvial sand. These sands and sandy loams probably represent the first floods of the early Holocene. They overlie two argillic horizons (4Bt, 5Bt2), which,
according to John Foss, based on heavy argillic development, are Pleistocene in age (Foss 1986; Goodyear 1992; Goodyear and Foss 1993).

Based on test excavations, bucket augering, and backhoe trenching, it is known that the Paleoindian horizon extends some 30 m back from the bank into the terrace (Goodyear 1992). Given the flood-sealed condition of the discrete buried layer as observed in the cutbank (Figure 9), it is possible that it represents a single Paleoindian occupation. The cultural identity of this material is yet to be determined. Surface collections taken from in front of the eroding bank profile have only yielded biface preforms in their early stage of reduction. A fluted preform came from the profile (Figure 8c), as well as other basally thinned and fluted lanceolate fragments (Figure 8d). Lithic material dredged from in front of the site has yielded other lanceolate preforms (Figure 8e). One rhyolite Dalton and a chert Simpson-like point (Figure 8a, b) were found some 50 m downstream where they had eroded from the terrace, indicating a later Paleoindian presence. No finished Paleoindian points have come from the bank profile or from test excavations behind it, nor have any been recovered from underwater dredging of the creek. The preform shown in Figure 8c, the closest to being finished of all the examples, came from the creek in front of the buried layer in the bank. It was found in two pieces and reconstructed. Its final intended state is ambiguous, although it appears to be post-Clovis in that it is a non-fluted, well-thinned bifacial lanceolate.

Extensive excavations of the remaining material in the terrace are planned for the Charles site. Hopefully, large block excavations will result in some diagnostic lanceolates associated with chert processing of the creek quarry. The apparently rapid burial of the Paleoindian layer offers the potential for feature preservation and charcoal for radiocarbon dating.

The Big Pine Tree site, 38AL143, is located some 300 m upstream from the Charles site and is very similar in terms of its occupational history and geoarchaeological context. Unlike the Charles site, it has recently received extensive excavations, as well as underwater data recovery, resulting in a sharper picture for the occupational history.

Backhoe testing in 1992 and 1993 to evaluate the geoarchaeological context has resulted in a good understanding of the pedosedimentary history of the site (Goodyear and Foss 1995). In 1994 and 1995, a total of nearly 50 m² was hand excavated, providing
information on the archaeological sequence (Goodyear 1995).

The basic geoarchaeological sequence is as follows. Woodland period artifacts dating from ca. 550 yr B.P. to 3000 yr B.P. are found from 30 to 60 cm below surface in a sandy loam with a weakly developed B horizon (Bw). A preceramic middle Archaic midden exists from 60 to 90 cm, known locally as MALA (Sassaman 1985). In terms of soil morphology, this midden is classified by John Foss as a Bw/A. From 90 to 100 cm there exists a transitional zone of fine sand (BC) with diagnostic bifaces spanning 9500 to 6000 yr B.P. This is likely a time of minimal sedimentation by the Savannah River. From 100 to 115 cm there is an early Archaic occupation typified by Taylor side-notched points and numerous well-made unifacial flake tools. Dalton points have been found in this zone too. There is abundant evidence in the form of river smoothed cortical debris that a chert source in Smith's Lake Creek was being exploited. Easily recognized, spatially discrete lithic features are present, indicating core reduction, biface manufacture, and flake tool utilization. Soil morphology at this depth is a BC in a sandy loam.

From about 115 to 135 cm below surface exists a Paleoindian lanceolate complex dominated by bifacial preforms which exhibit strong basal fluting (Figure 10a, b, d, e). These preforms indicate that large flake flakes (ca. 50 mm) were removed prior to final pressure flaking and manufactured into projectile points. Several of these fluted preforms have been excavated (e.g., Figure 10b, e) and many more recovered from underwater dredging in the adjacent creek. In all cases, fluting was accomplished from a beveled striking platform. No nipple-type preparations have been observed here or with the Charles site preforms. The soil morphology of the Paleoindian level is that of a BC or C in a loamy sand. The Paleoindian material exists in a clear horizontal floor, as can be seen in the photograph of Figure 11. Only lithic artifacts have been recovered; no bone is preserved. This basal lithic horizon is resting on a layer of sterile fine sands (Figure 11) immediately above a scoured Pleistocene terrace. Thin lamellae have formed in the sterile sands above the terrace or, as seen in Figure 11, rather thickly in sterile pre-cultural alluvium. Foss has classified two Bt paleosols at the Pleistocene terrace surface: an upper 4Bt1b over a 4Bt2b. The terrace is sterile of artifacts (Goodyear and Foss 1995).

The cultural identity of the lowermost artifact zone has not yet been established based on completed projectile points. There is a strong emphasis on percussion fluting of blanks in the early stage (Figure 10a, b, d, e), a trait that would seem linked to Clovis. The absence thus far of nipple-type fluting platforms would seem to reinforce this. That fluting or massive basal thinning would take place so early in biface reduction seems unusual, although it is not rare (cf. Goodyear et al. 1989; Morrow 1995; Painter 1974). However, it is possible that these flute scars were left on at least one face of the finished preform and incorporated unchanged into the final design. Percussion fluting that yields scars up to 50 mm in length would be less risky on thick blanks than thinner preforms more prone to shatter. A total of 10 Dalton points have been recovered from the site (Figure 10c, f). The four that have been excavated in situ all came from the 100–115 cm level. Their recovery in the zone above that of the fluted blanks reinforces the antiquity of the latter.
Figure 10. Lanceolate points and preforms from the Big Pine Tree site, 38AL143, Smith's Lake Creek, Allendale County, S.C.: a, fluted preform; b, fluted preform; c, Dalton point; d, fluted preform; e, fluted preform; f, Dalton point.

Figure 11. Photograph of Pleistocene-Holocene transition stratigraphy exposed on south profile of BHT 1, E 94-E98, from the Big Pine Tree site, 38AL143, Allendale County, S.C.
Based on the numbers of tools recovered from both land excavations and underwater, it is clear that other activities were taking place at the site besides chert processing. Numerous unifacial flake tools such as side and end scrapers, flake knives, and gravers have been found, as well as prismatic blades and cores. Like the Taylor side-notched occupation above, the Paleoindians were exploiting chert from the creek, and several core-reduction features have been mapped. Feature-like concentrations of bifaces and unifaces have also been mapped, indicating some structured in-site use. The number of prismatic blades is remarkable. Many of the blades are microblades in that they are very thin and less than 20 mm long. Core fragments with multiple blade detachments also have been found.

AMS-sized charcoal samples have been taken from key locations within the terrace excavation for radiocarbon dating. Charcoal samples large enough for conventional dating have not been found. Two AMS dates from early contexts returned values of 7810 ±80 yr B.P. and 4720 ±70 yr B.P., dates which indicate bioturbation of small charcoal fragments down the profile.

In sum, the Big Pine Tree site, like that of the Charles site, holds great promise for resolving some of the substantive issues of southeastern U.S. Paleoindian archaeology which have remained intractable due to poor archaeological context. The hydrogeological conditions in Smith’s Lake Creek at the end of the Pleistocene and onset of the Holocene were conducive to deposition and thus archaeological preservation. Various periods of landscape stability on the floodplain also were amenable to soil development, providing another factor which enhanced geoarchaeological context. Continued excavation, analysis, and radiocarbon dating should shed considerable light on the period from 11,500 to 10,000 yr B.P.

Finally, it is worth noting that the geoarchaeological situation at both sites on Smith’s Lake Creek is like that of other alluvial sites reviewed for the Southeast. That is, there is a Paleoindian lithic assemblage associated with the first Holocene fluvial sands overlying a weathered terrace with argillic B-horizon paleosols.

**Theriault Site, 9Bk2, Burke County, Georgia**

The Theriault site is located on the eastern bank of Brier Creek, a coastal-plain tributary of the Savannah River (Figure 1). It is a multi-component site that witnessed frequent flintknapping as well as other activities throughout the Holocene. This portion of the Brier Creek locality is known for its sources of high-quality chert (Goodyear and Charles 1984; Waring 1961) and a high incidence of Paleoindian points (Anderson et al. 1990; Waring 1968).

Because of its richness in lithic artifacts, the site received a great deal of uncontrolled digging by relic hunters. One professional report is available for the site by Brockington (1971), which is based on excavations done by William Edwards in 1966. The following is summarized from Brockington (1971). Edwards excavated 62 1.5-m squares in three different areas using 15-cm levels. The quantity of lithic artifacts from these excavations was truly remarkable, as over 2,425 kg of debitage, 973 bifaces, and 120 identifiable projectile points and fragments were recovered, spanning 11,000 years of prehistory. The artifacts were found in “medium, well-sorted sand about 36 inches [92 cm] deep, overlying a sterile clay matrix. Ground water was encountered three to four inches [7 cm - 10 cm] into the clay” (Brockington 1971:25). There were no discernable natural stratigraphic units within this sand. One unusually large (120 mm) Clovis-like fluted point (Brockington 1971:Figure 10a) was found between 76 cm and 86 cm, immediately above the clay. Two Dalton points were found, one at 91 cm on top of the clay and one in the 46-cm–61-cm level. One lanceolate biface, which is compared to a “Hardaway Blade,” was found in the 46-cm–61-cm level. The latter would appear to be some type of post-Clovis preform.

Although the Theriault site is generally stratified, the archaeological deposits appear to have undergone some mixing. Early Archaic notched points as well as middle Archaic stemmed points were all found in the lowest 30 cm of the site, along with the Paleoindian points (Brockington 1971:Figure 5). The origin of the sand overlying the clay is unknown; however, Brier Creek, a medium-sized stream over 125 km in length, is a likely source. No geologic analysis was conducted on the sediments. James Michie (personal communication 1991), who visited the site during Edwards’ excavation, has described the basal clay as having an orange color. This should indicate that at some point the clay horizon was weathered or received oxidized sediments.
Muckafoonee Site, Dougherty County, Georgia

The Muckafoonee site is located on an alluvial terrace of Muckafoonee Creek, about 700 m upstream from its confluence with the Flint River near Albany, Georgia (Figure 1). The site was discovered during the testing phase of a cultural resource management project related to the use of the site for borrow material (Elliott 1982). Excavations were limited to two deep backhoe trenches, two 1-m squares, and a single 2-m square. Chert outcrops are present in the nearby vicinity and the site appears to have been a quarry-related workshop during Paleoindian and Archaic times. The site contained lithic material up to at least a depth of 0.9 m and a single fluted point was found between 0.7 and 0.8 m. Artifacts were dominated by bifaces manufacture and related flakes, with some Paleoindian-type unifaces found in the lower levels. Some mixing is evident, but the Paleoindian material is concentrated in the lower 0.3 m of the site.

Profile descriptions of the backhoe trenches and test squares give a good indication of natural stratigraphy up to a depth of 1.5 m (Elliott 1982). Archaic and Paleoindian-age artifacts in temporal order by depth were found consistently in a light brown sand of medium-coarse texture varying from 0.6 to 1 m in thickness. The upper 0.3 to 0.5 m of this unit possessed dark brown mottles over a light brown sand, which is probably the result of pedogenic influence from humic zones above (Elliott 1982:21). Underneath this artifact-bearing light brown sand, from about 1 to 1.5 m in depth, were three culturally sterile horizons. These were a “mottled light brown and reddish brown clayey sand,” overlying a “compact reddish brown clayey sand,” which overlay a “coarse light, almost white sand” (Elliott 1982:22, 23). The reddish-brown colors of the clayey sands and the compactness of the second horizon suggest these are Bt paleosols. The lowest coarse, nearly white sand layer may be unpedogenically modified sediment. No radiocarbon dates were reported from this testing phase of fieldwork.

Given that the site is situated on a terrace of Muckafoonee Creek near its juncture with the Flint River, alluvial burial seems most probable for these layers. Within the first meter, some significant portion of the deposit may be cultural in origin, given the density of debitage in the site.

The Hester Site, 22Mo569, Monroe County, Mississippi

The Hester site is located on the east bank of the Tombigbee River floodplain in northeast Mississippi (Figure 1). Standifer Creek runs into the Tombigbee just southeast of the site. The original proximity of the creek to the Hester site is undetermined due to modern rechannelization (Brookes 1979).

The Hester site was excavated by archaeologists from the Mississippi Department of Archives and History in 1973 and 1974, and again in 1978. Previous uncontrolled amateur excavations from one area of the site (Beachum-Harrison) yielded a number of Dalton points and early Archaic notched points and related unifacial tools, prompting subsequent professional investigations in 1973 and 1974. The available report for this site is based on the fieldwork of these two seasons (Brookes 1979). The site was excavated more extensively in 1978 by Samuel Brookes. Although the results of this third season are not yet available in a published format, Samuel Brookes (personal communication 1991) has provided me with relevant information concerning this latter excavation, which he has graciously allowed me to summarize here.

The original excavation was that of a trench ~1.5 m wide by 45.7 m long, excavated in 1.5-m squares in 6-cm arbitrary levels. The single published report for the site (Brookes 1979) is based primarily on data recovered from this trench (67.5 m²). The 1978 excavations expanded both sides of this trench, resulting in a total excavation of 135 m².

The stratigraphy of the site can be described as five visually distinct zones:

Zone 1, from ground surface to ~0.4 m deep, is a plow-disturbed, black humus zone consisting of Historic to late Archaic fiber-tempered ceramics.

Zone 2 is a dark, red-brown sand extending to ~1 m below surface. It has a hard, cemented consistency. No visual stratigraphy is present within this zone. However, based on diagnostic projectile points, there are definable occupational horizons within the zone, occurring in temporal order by depth beginning with the middle Archaic and ending with early Archaic. Early Archaic Big Sandy side-notched points were found in the lower portion of the red-brown sand.

Zone 3 is a yellow sand occurring from ~1 m to 1.3 m below surface. The contact is very sharp between zone 2 and zone 3, as the former lies unconformably on the latter. The yellow sand is powdery when dry and very unstable, scarcely permitting artifacts to be
were made from exotic cherts in the Quad zone. was said to have been found, as well as the base of another Clovis point, also made on exotic chert. No excavated by Brookes and associates. Hard-packed dark zone 2 and 3. Zone 4 begins at about 1.3 m and continues to about 1.7 m below surface. It is a white powdery sand of the same loose structure as the yellow sand above. The boundary between the white and yellow sands was not as sharp as between zones 2 and 3. Zone 4 contained no artifacts. Zone 5 consists of a yellow-white mottled clay that was sterile of artifacts. Based on bore tests, this clay unit is at least 1.2 m thick in this portion of the site. Gravel was encountered from -3.7 m to 4.6 m below surface.

There were originally three sandy “rises” on the Hester site floodplain: one destroyed by gravel mining; one destroyed by amateur digging and now designated 22Mo1011, Beachum-Harrison; and the third, designated 22Mo569 or the Hester site proper, excavated by Brookes and associates. Hard-packed dark gray clay with no cultural occupations associated occurs between the sand rises.

Evidence also exists for fluted point occupations of the Hester site. On the adjacent sandy rise dug by amateur excavators (22Mo1011, Beachum-Harrison), one complete Clovis point made of an exotic chert was said to have been found, as well as the base of another Clovis point, also made on exotic chert. No Quad points were discovered during the amateur excavation. In the rise destroyed by gravel mining, a collector found a fluted Cumberland point of exotic Ft. Payne chert on the surface. In the 1978 excavations, Brookes recovered a fragment of a Ft. Payne-chert Clovis point reworked by bipolar flaking from the Dalton zone, as well as a reworked Ft. Payne-chert fluted Cumberland point.

Although it is clear that fluted points, particularly those made of exotic chert, have been found at the Hester site, their stratigraphic position is not clear. The two examples found by Brookes “in situ” in the Dalton zone were reworked pieces that appear to be examples of points scavenged by Dalton people. The other examples were obtained by collectors who originally dug the site.

Although the final analysis and report of the Hester site are yet to be completed, these preliminary data do allow some tentative interpretations to be made.

First, there appears to be a good stratigraphic separation of the early Archaic notched points associated with the dark red-brown sand zone from the Dalton material in the yellow sand zone. The presence of “notched” varieties of Daltons may indicate a late Dalton (ca. 10,000 yr B.P.) time period. The positing of a Quad occupation immediately beneath the Dalton level in zone 3 is highly probable but requires published documentation.

Second, the presence of fluted points from the three different sandy rises on the site implies an earlier Paleoindian occupation of the Hester site. According to Brookes, the lower portion of the yellow sand zone manifests a higher proportion of exotic lithics, such as Ft. Payne chert from Alabama. When coupled with the fact that all fluted points known from the site are made from exotic cherts, the lower portion of the yellow sand zone is strongly implied as the stratigraphic location of one or more fluted point occupations. The fact that the white sand of zone 4 beneath the yellow sand thus far has been sterile of artifacts reinforces this possibility.

Additional studies of the site, including sedimentology and pedology, are needed to understand something of the origin and physical condition of these zones. The sharp boundary in structure and color between the dark red-brown sand and the yellow sand zones implies a depositional or erosional event or both. The yellow color of zone 3 may be simply iron leached from zone 2. The loose, powdery consistency of the white sand in zone 4 suggests that this was rapidly deposited, pedogenically unmodified flood alluvium. It would be useful to have a profile study of the contact
between the sterile white sand (zone 4) and the basal clay unit (zone 5), as well as 14C dates to determine the onset of aggradation indicated by what are probably channel-related sands.

Florida Silver Springs Site (8Mr92), Marion County, Florida

As originally described by Wilfred Neill (1958), the Silver Springs site (Figure 1) was a Stratified multi-component site situated within a windblown hill deposit. It is located on the south side of Silver Springs Run, on the edge of the uplands above the floodplain. The Silver Springs site (8Mr92) is not to be confused with the actual head springs of the river, also known as Silver Springs. This commercial attraction, which also was apparently an inundated subterranean cave, is referred to by Neill (1964) as the Cavern site. The head springs are about a half-mile upriver from 8Mr92. The Silver Springs site also is somewhat famous in North American archaeology according to Mason (1962:240), since it was at that time one of the few documented cases of fluted points found stratigraphically below Archaic occupations in the eastern United States.

The site, which was originally a wooded hill borrowed for its sand, was discovered to contain Paleoindian material when two fluted lanceolate points were discovered in the removed sand. Neill conducted excavations in the flattest portion of the remaining hill surface, recovering fluted points and Suwannee-like lanceolates and related tools in the lowest occupation level. Neill (1958:35-37) excavated 11 units totaling about 500 ft², using a trowel and measuring the depth of artifacts below ground surface. Artifacts were few in density but occurred lying flat in relatively undisturbed horizons that were interpreted as occupational surfaces.

Neill reported Woodland through Paleoindian (Suwannee) occupations in good stratigraphic order within approximately the first 2.4 m of sand. Neill (1958:46) believed the artifact-bearing sand was colian in origin. This sand lay conformably over another sand unit, sterile of artifacts, which possessed roughly parallel bands of clay that he referred to as "lamellae." These are now known to be lamellae, repeatedly found in sandy sediments of the early and middle Holocene in the Southeast and which are largely pedogenic in origin (cf. Foss et al. 1985; Larsen and Schuldenrein 1990).

Below the Archaic levels, between 1.9 m and 2.2 m below surface, was a nearly sterile zone possessing few flakes and very little charcoal or staining, unlike the site above this level. At the 2.2-m–2.4-m level and from 2.5 cm to 10 cm above the clay lamellae, Neill encountered obvious Paleoindian artifacts. These included two lanceolate bases (Neill 1958:Plate 3J, K), which are possibly preforms; two Suwannee point bases (Neill 1958:Plate 3D, G); and one fluted point missing its base (Neill 1958:Plate 3A). Recovered from the spread sand borrowed from the hill were one whole fluted point with lateral waisting and ears (Neill 1958:Plate 3B) and one point that resembles a Western Clovis (Neill 1958:Plate 3C). Other associated artifacts included nine utilized flakes, two sandstone abraders, a chopping tool, a crude uniface, and a possible worked piece of fossil shell. No bone, shell, or other organic remains were found, with the exception of scattered grains of charcoal, which Neill described as relatively plentiful throughout the site.

In 1973, Thomas Hemmings (1975) of the Florida State Museum partially excavated the Silver Springs site and described the geology. Hemmings placed two excavation units against the face of the borrow pit near Neill's A and F units. These excavations totalled 102 m³. For the most part, Hemmings was able to replicate Neill's stratigraphy and post-Paleoindian archaeological deposits. However, very little was found in the lowermost level, aside from a few weathered flakes that were lying flat. One midsection of a fluted point was recovered 1.5 m below surface, well above the 2.1 m–2.4 m Paleoindian level (Hemmings 1975:148, Figure 6.1). Hemmings states that the differences between his results and those of Neill are attributable to sampling error. Neill (1958:44) reported that nine-tenths of the hill had been removed by workmen prior to his excavation, so it is possible that not much of the Paleoindian occupation was left.

Hemmings (1975) basically confirmed Neill's stratigraphic interpretation of the site. He describes the upper 2.4 m of stratified archaeological deposits (Unit A1, Upper Sand) as a "homogenous colian sand without cross-bedding or other structure" (Hemmings 1975:144). A1 grades into Unit A2, the Lower Sand, which has both sand and clay (in the lamellae) and minor elements of limestone gravel. Hemmings believes Unit A2 was formed by both wind and slopewash from higher elevations to the south. In some places Unit A2 is 2.1 m thick. Based on the archaeology, Hemmings suggests that the Lower Sand is pre-10,000 years in age.
The Silver Springs site, now largely gone, is an important datum point in southeastern Paleoindian archaeology. As Mason (1962:240) pointed out, it was (and still is) one of the few examples in the East of Paleoindian lanceolates occurring stratigraphically beneath Archaic assemblages. Furthermore, the assemblage purity of the Paleoindian zone of Silver Springs is worthy of note. Only Suwannee and what may be Clovis points were found in the basal zone. This zone was separated from subsequent Archaic occupations by a relatively sterile zone about 0.3 m in thickness. The frequent situation of reoccupation by early Archaic peoples with chipped stone tools virtually identical to those of lanceolate point-making Paleoindian groups is fortunately absent, adding to the integrity of the Silver Springs Paleoindian assemblage.

Harney Flats, 8Hi507, Hillsborough County, Florida

The Harney Flats site, prior to its destruction by excavations and the construction of the Interstate 75 Bypass, was located about 10 km east of the city of Tampa (Figure 1). It originally was situated on a scarp overlooking a low swampy locality known as Harney Flats, for which the site was named. The multiphase testing and excavation projects were summarized by Daniel and Wisenbaker (1987). In all, 967 m$^2$ were excavated, making this one of the largest Paleoindian site excavations in the East. The total number of Paleoindian artifacts recovered from the excavations also is remarkable, as nearly 1,100 chipped stone artifacts were found, including 28 examples of Suwannee and Simpson points and their preforms. Some early Archaic notched material is included in the assemblage, as 13 Bolen side-notched points were recovered from the same matrix as the Suwannee points, along with an unspecified number of associated unifacial tools (Daniel and Wisenbaker 1987:42–62).

The geological and archaeological stratigraphy of Harney Flats is summarized as follows from Daniel and Wisenbaker (1987:Figure 12, 28–29). Zone 1, from ground surface to 0.15 m, was a humus-rich gray sand sterile of artifacts. Zone 2, from 0.15 to 0.75 m, consisted of a white sand. Occasional Woodland-period sherds were found at about the 0.4-m level. Beginning at 0.6 m and extending to 0.9 m, middle Archaic Newnan stemmed points were recovered. This point type is known to date from about 5,000 to 7,000 years ago. Zone 3 was a dark brown hardpan soil ranging from 0.75 to 0.85 m in depth. It is believed that this hardpan kept middle Archaic and later artifacts from intruding downward into the Suwannee–Bolen horizon. Newnan points were found in and above this hardpan. Zone 4 extended from 0.85 to 1.05 m and was a yellow-brown sand, probably stained by iron leached from the hardpan above. Two possible Kirk points were found in this zone from 0.9 to 1 m below surface. Zone 5 occurred from 1.05 m to its arbitrary termination at 2 m, where water appeared in the profile. It is characterized as a pale brown sand. The upper portion of this zone, from 1 to 1.6 m, produced the Suwannee–Bolen concentration, with most of the material found in the upper 0.3 m. Below 1.3 m, artifact density decreased significantly. Zone 6, located several meters below surface in most areas of the site, is a bluish-green clayish sand that overlies the Tertiary limestones and is presumed to have formed during the Miocene. The area from 1.6 m of Zone 5 to and including Zone 6 was sterile of human occupation.

Zones 1 to 5 were basically pedogenic manifestations of a homogenous soil type, that of Leon fine sand, rather than separate lithologic depositional units (Daniel and Wisenbaker 1987:28). Sedimentological studies of the sands were done by Upchurch (1984b) in an effort to reconstruct the stratigraphic formation of the Harney Flats site.

Upchurch (1984b) has noted the existence of sand-dune systems in this central west-coast Florida locality that ultimately originated from Pleistocene marine transgressions. Toward the end of the Pleistocene, sand was reworked into dunes from sands available in sediment-choked floodplains, marine terraces, and eolian sand sheets (Upchurch 1984b). Sands in the Harney Flats locality reflect two primary depositional regimes. First, there are marine-deposited sands that dominate the basal sections and have received little eolian reworking. Overlying these basal sands are surficial dune trains formed during the late Pleistocene and early Holocene. Phi analysis of grain-size distributions from excavation profiles at Harney Flats revealed unimodal, lognormal distributions typical of eolian transport. The grain size was unusually homogeneous regardless of vertical or horizontal location in the site, indicating bioturbation of an already homogenous dune source (Upchurch 1984b). Palynological studies for the Paleoindian time period in Florida indicate that climatic conditions still were dry (Watts and Hansen 1988:316–317), which would have allowed wind erosion and deposition on the
landscape. Given the moderate slope of the Harney Flats site, it is likely that some of the eolian material migrated downslope as colluvium.

Like the Silver Springs site discussed above, there is evidence of burial of Paleoindian material from 11,000 to 10,000 yr B.P. in central Florida from windblown sediments. Because of the dry and permeable nature of the sediment matrix, other items of material culture made from bone and wood are not likely to be preserved. Nevertheless, sufficient eolian activity was present to bury Paleoindian sites, allowing excellent preservation of lithic assemblages. In the case of Harney Flats, however, sedimentation of the hillside during the Suwannee and Bolen occupation was not sufficient to separate these two phases stratigraphically. As discussed below, radiocarbon dates of Bolen side-notched assemblages elsewhere in Florida indicate they date from 10,000 to 9500 yr B.P.

**Page/Ladson Site, 8Je591, Aucilla River, Jefferson County, Florida**

**Page/Ladson** is one of several inundated river sites in the Aucilla River basin and is located approximately 80 km southeast of Tallahassee (Figure 1). Multidisciplinary work featuring archaeology, geochronology, and paleontology has been ongoing in the Aucilla River since 1983, generating a variety of significant data relevant to the late Pleistocene-early Holocene transition (Dunbar et al. 1988, 1989a).

Dunbar et al. (1988:443) note that freshwater-inundated sites in Florida are of two types: stillwater sinkholes, such as Little Salt Spring and Warm Mineral Springs; and those sites located in the bottoms of slow-moving rivers common in the karst region of central and north Florida. River bottom sites have produced many of the Suwannee points and worked ivory artifacts for which Florida is famous (Mason 1962; Milanich and Fairbanks 1980; Purdy 1981). Since Paleoindian artifacts found in these rivers are in the same deposit or at the same surface as late prehistoric and even modern artifacts, little interpretive value has been accorded them because of poor context. However, the recent work of Dunbar, Faught, and Webb (Dunbar et al. 1988) at the Page/Ladson site has shown that there are in situ, stratified late Pleistocene and early Holocene artifact-bearing deposits in drowned sinkholes within formerly dry riverbeds.

The Aucilla River is unusual in that it runs both above and below ground through karstic limestone. Water originates in the massive Florida aquifer system, ultimately draining into the Gulf of Mexico. The longest aboveground stretch of the river is Half Mile Rise, nearly 1.5 km in length. Within this segment of the river are a number of sinks filled with alternating layers of peat and marl containing Paleoindian artifacts of stone and bone, and extinct Pleistocene fauna (Dunbar et al. 1988:443). It has been established that there was a general lowering of the water table in late Pleistocene in Florida due to a drastically lowered sea level and a drier climate (Brooks 1972). Under such conditions, what are now flowing riverbeds would have been subaerial arroyo-like features. It is thought that when the rivers were not flowing, some of the sinks still contained water in perched ponds. Radiocarbon dates ranging from 9540 to 13,130 yr B.P. (Dunbar et al. 1988:449) on peats, wood, and bone indicate enough water was present to allow organic preservation in the sinkholes. The general trend is “preserved wood and other organic remains in the sink bottoms (which) indicates a late Pleistocene sequence of generally shallow water sediments followed by a sequence of early Holocene generally deeper water sediments” (Dunbar et al. 1988:443). After 4000 yr B.P., increased water flow caused erosion of sink deposits, creating stratigraphic deflation whereby artifacts of all ages are found together in “blowout” features.

Page/Ladson consists of two contiguous inundated sinks that have undergone underwater excavation. Test pit B is a 4-m-deep unit located on the northern lip of the southernmost depression. Test pit C, located on the western edge of the same sink, began as a broadside but soon was confined to a small area and finally excavated to 7 m in depth. A series of common stratigraphic horizons, labeled zones A through E, have been observed in the test units (Dunbar et al. 1988:446).

Zones A and B represent redeposited late Archaic and Woodland-related sediments dating within the past 3,400 years. They overlie zones C and D, which are of interest here. Zones C and D are comprised of peats and calcareous clays with a very minor sand component. Preservation of wood and bone (even insects) in the calcium-rich layers is very good. Bone found in situ in these zones is colored light tan or off-white, which Dunbar et al. (1988:444) believe represents rapid burial. In contrast, bone and ivory artifacts customarily found in Florida river bottoms are dark brown from tannin staining (Figure 7), indicating to Dunbar and his colleagues that they have been eroded from their original sinkhole deposits.
Zone C has been radiocarbon dated at 9450 ± 100 yr B.P., 9730 ± 120 yr B.P., 10,000 ± 120 yr B.P., and 10,280 ± 110 yr B.P. (Dunbar et al. 1988:Table 1). In test pit B, side-notched Bolen beveled projectile points, unifaces, adzes, and other lithic tools were associated with the 14C date of 9730 yr B.P. Preserved organic materials, such as desiccated bone, wood, and fern spores were found, but not pollen, indicating a dry land surface prior to inundation (Dunbar et al. 1988:444). Only modern fauna have been associated with zone C.

In zone C of test pit C, Dunbar and others exposed a 6-m² area of level A horizon soil development at a depth of 4 m in the pit and 6 m under the water. Limestone, lithic debitage, broken adze bits, and a Bolen Plain corner notched point were found with what appeared to be an activity surface [Dunbar et al. 1988:444].

This humic horizon has been referred to informally as “The Dirt,” owing to its high organic content. Two radiocarbon dates were obtained from this horizon on charcoal (10,000 yr B.P.) and wood (10,280 yr B.P.). A date of 10,600 ± 70 yr B.P. was obtained just below this A horizon in unaltered zone D deposits (Dunbar et al. 1988:444).

Zone D is the oldest human-related horizon. This zone is the first to contain extinct fauna, including mastodon, camel, horse, and giant armadillo. The sediments of this zone are described as a lime-sand. Artifacts include a bolo stone and chert flakes. As yet, no Clovis or Suwannee points have been recovered in situ from any of the natural zones including zone D. Six 14C dates for zone D range from 10,520 ± 90 to 13,130 ± 200 yr B.P. (Dunbar et al. 1988:Table 1).

Zone E is characterized as “Woody Peat” and identified by Lee Newsom as cypress. One 14C date is available for this zone assayed at 18,430 ± 220 yr B.P. (Dunbar et al. 1988:Table 1). Compared to zones C and D, which were rich in calcium, zone E has less calcium carbonate, implying less breakdown in local limestone (Dunbar et al. 1988:444).

Dunbar et al. (1988:450) believe there are earlier in situ occupations of Page/Ladson than those indicated by early Archaic Bolen side-and corner-notched occupations. Paleoindian lanceolates, such as Clovis, Suwannee, and Simpson, as well as worked ivory are present at the site in river-eroded blowouts. Given the 14C ages of the stratified sediments in zone D, there is good reason to think they will be in situ.

In sum, the work of Dunbar, Webb, Faught, and others at Page/Ladson has demonstrated the existence of stratified in situ late Pleistocene-early Holocene archaeological deposits in well-dated contexts. Contrary to previous results and opinions regarding the contextual integrity of Florida river sites, they have shown that, at least in some places, utilization of dry riverbeds was related to sinkholes with standing or quietly flowing waters, as evidenced by the presence of peat. These peat and marl-filled sinks evidently are stratified archaeologically and geologically and offer remarkable preservation of normally absent organic remains, including artifacts of bone, ivory, and wood. The presence of flowing water apparently was a later Holocene event, which caused the deflation of geological and archaeological deposits. Numerous chert outcrops in the Aucilla riverbed that show evidence of quarrying also are an indication that the river channels were dry at an earlier time (Dunbar et al. 1989b:27).

It also is clear that zone D is the provenience of Paleoindian remains dating 10,500 years ago and earlier. Based on the spread of the six 14C dates (10,520–13,130 yr B.P.) and the abundance of preserved organics, including late Pleistocene megafauna, zone D is a prime candidate for further Paleoindian research at Page/Ladson. It also should be remembered that the lower Aucilla River has the highest density of Clovis points and ivory foreshafts known for all the rivers in Florida (Dunbar et al. 1988:451), heightening the possibility that such remains might be studied and dated in situ.

**Drowned Sites in the Eastern Gulf of Mexico**

**Tampa Bay, Florida**

Beginning in the early 1960s, Suwannee points, bone pins, Bolen points, and related unifacial flake tools, as well as later Archaic artifacts began to regularly appear in dredge spoil from private and federal dredging in Tampa Bay (Goodyear and Warren 1972; Warren 1964, 1970). The origin of these artifacts was two basic sources. The most common were shallow (<4 m) water-inundated late Pleistocene and early Holocene land surfaces now a few hundred meters from the present shore (Goodyear et al. 1983:42). On fills and spoil islands that produced early artifacts, there usually was a contemporary freshwater drainage nearby, suggesting that the artifacts were from sites associated with former
creeks. The other source of artifacts was oyster shell deposits commercially mined for use as surface material for streets and parking lots (Goodyear and Warren 1972; Warren 1964). The latter deposits were estimated by private dredgers to be between 3 and 15 m thick and were substantial enough to allow commercial mining for several decades. The possibility that some of these shell deposits were related to human exploitation has been considered (Goodyear and Warren 1972; Warren 1964), although no demonstration that they were middens has been attempted. Dredge operators reported that the oyster shell deposits followed the old river channels in Tampa Bay, as well as modern ship channels, which are deepened natural channels (Goodyear and Warren 1972:52). The oyster shell deposits, located 2 and 3 km offshore and in the deepest portions of the bay, produced Paleoindian and Archaic stone tools but few examples of pottery. Evidence of occupation by humans appears to have ceased in the late Archaic period (ca. 4000 yr B.P.), which is also the approximate time of modern sea-level position. The fills, on the other hand, were comprised of sediments dredged from a few hundred meters offshore and often produced prehistoric artifacts from all time periods (Goodyear and Warren 1972:60).

At least 26 Suwannee points are known to have been recovered from inundated contexts either dredged from the periphery of Tampa Bay or recovered from relict oyster shell deposits (Goodyear et al. 1983). In all probability, these artifacts have been dredged from in situ inundated sites with little natural alterations from Holocene sea-level rise. Tampa Bay and the west coast of Florida in general is a zero- to low-energy marine environment with little sedimentation except in riverine settings (Sam Upchurch, personal communication 1991). The projectile points are sharp and unweathered, as are associated unifacial and bifacial tools and debitage. Suwannee points and later projectile point types were not found as isolated items but rather in dense concentrations with other lithic tools, forming meaningful assemblages. This indicates the dredge intercepted in situ sites and redeposited them on land nearby.

Tampa Bay and its upper reaches, Hillsborough Bay, is the Holocene-drowned portion of the Hillsborough River valley. The other major lobe of the bay is Old Tampa Bay, which is considered to have been formed by a large karst depression (Sam Upchurch, personal communication 1991). Given the known late Pleistocene-early Holocene reduction in surface water in Florida due to lowered sea level, it is likely that many prehistoric sites, particularly those of the Paleoindian period, are tightly associated with former river channels and tributaries. The waters of Tampa Bay, and indeed the entire Gulf of Mexico along the west coast of Florida, are relatively shallow, a situation that would facilitate underwater data recovery of what must be an extraordinarily rich early archaeological record in the former Hillsborough River valley. Serendipitously, the dredging activities of the 1960s in this region have given strong clues as to this underwater archaeological material.

Apalachee Bay Region, Florida

Based on the predictability of underwater sites in the Apalachee Bay on the land portion of the river, marine surveys are underway to project similar site locations in submerged river and karst-related features in Apalachee Bay (Dunbar 1988; Dunbar et al. 1989b; Faught 1988, 1990). The Apalachee Bay area is the northernmost reach of the Tertiary Karst Region, a Tertiary limestone shelf with little sediment accumulation, which runs continuously offshore southward to Tampa Bay (Dunbar et al. 1989b). Because of its karstic nature, this entire region is suspected to contain drowned Pleistocene and Holocene aboriginal sites on the Outer Continental Shelf in geologic situations similar to that observed onshore.

Michael Faught and his associates James Dunbar and Richard Anuskiewicz, in cooperation with both public agencies and private groups, have examined a number of potential underwater site targets in the Apalachee Bay region, including freshwater springs issuing from sinkholes in the Gulf, limestone and chert outcrops, and old river channels of the Aucilla and Econfina. To date, no definite Paleoindian or early Archaic artifacts have been encountered, but preceramic Archaic lithic sites and quarries appear to be common. These range in distance from 1 to 10 km offshore in a maximum water depth of 5.5 m (low tide) (Faught 1990:27). One particularly interesting geologic feature known as Ray Hole Spring was tested by Anuskiewicz of the Minerals Management Service and James Dunbar of the Florida Bureau of Archaeological Research. This spring is within a sinkhole located 38.6 km offshore and lying 11.6 m underwater (Anuskiewicz 1988:181). The sink measures 7.6 m in diameter and possesses a cave at the
18- to 30-m depth. At the time of the 1986 visit by Anuskiewicz and Dunbar, it was discovered that the sink had filled up with recent (since 1976) sand and shell, leaving only about 3 m of relief. The thick recent fill defied testing and coring; thus, the outer perimeter of the sink was test excavated. A crevice 0.15 m wide in the limestone was excavated with the hope that artifacts might be trapped in it. Excavation of the crevice from 0.15 to 0.2 m deep produced a number of chert flakes of probable human origin. At the 0.75-m level, a lens of oyster shell was encountered. At 1 m, waterlogged wood was found, below which the crevice ended on bedrock. A piece of wood recovered on the bedrock was identified as live oak and produced a $^{14}C$ date of 8220 ± 80 yr B.P. An oyster shell located above the wood dated 7390 ± 60 yr B.P. These organic remains imply a terrestrial environment subsequently inundated by brackish water (Anuskiewicz 1988:184).

The prospects for finding drowned, well-preserved Paleoindian and Archaic sites on the Tertiary karst shelf of the west coast of Florida are very good. Current research strategies by Dunbar, Faught, Webb, Anuskiewicz, and others include development of an absolute sea-level curve which can be used to stratify the shelf into probable late Pleistocene and early Holocene site locations by water depth. Based on a number of eustatic sea-level curves for the Gulf of Mexico, the earliest sites (12,000 to 8000 yr B.P.) would range from 56 to 177 km offshore and in water depths of 15 to 53 m (Faught 1990:30).

**Conclusions**

The late Pleistocene large-scale erosion described by Haynes (1968) for much of North America can be detected in the Southeast as well. The geological evidence for this erosion is most prevalent within the floodplains of the southern Appalachians (Brakenridge 1984; Larsen and Schuldenrein 1990; Segovia 1985). By examining palynological and sedimentological data from ponds and sinks in the interfluvial zones of the Southeast, Paul Delcourt (1985) has shown that little sediment movement was taking place outside the floodplains during the critical period of 20,000 to 8000 yr B.P. The erosion within the floodplains may have been the result of floods related to intense storm clusters rather than drought, according to the model of floodplain erosion developed by Knox (1984). The infrequent presence of fluted points at the contact of basal Holocene deposits and the eroded upper surfaces of Pleistocene terraces suggest that this period of erosion took place in the Southeast sometime prior to 11,000 yr B.P.

Critical to the preservation and dating of Clovis and other Paleoindian sites is the matter of site burial by sedimentary processes. The preceding review of buried Paleoindian sites has largely focused on alluvial contexts, since floodplains were the most geologically dynamic environments at the beginning of the Holocene. Particular sites were chosen that might illuminate the timing of burial related to the onset of Holocene aggradation. Some trends in the data are worth highlighting here.

In some watersheds, the onset of the Holocene aggradation was so energetic and rapid that it is likely Clovis and other Paleoindian sites were swept away. The Little Tennessee River, reported by Chapman (1985), qualifies here as a situation worsened by the proximity to intensive wasting of the Great Smoky Mountains, which provided huge quantities of sediment and a steep river gradient (cf. Schuldenrein and Anderson 1983). In some cases, the early Holocene deposits may be extraordinarily thick, rendering access even by backhoe difficult and dangerous. This was the case with the Duck River region, where the earliest Holocene sediments were very deeply buried and never completely reached (Klippel, personal communication 1991; cf. Broster et al. 1991).

On the Atlantic slope side of the southern Appalachians, there is some evidence, based on archaeology and limited $^{14}C$ dates, that the onset of Holocene aggradation took place after the Clovis period. At the Haw River site in North Carolina, a Hardaway Dalton assemblage was found in fine- to medium-grained sands, representing an initial pulse of Holocene alluvium. This zone overlay an archaeologically sterile, weathered, late Pleistocene terrace surface characterized by clayish silty sands. Based on the projectile points, this initial deposit of sand likely dates around 10,500 yr B.P. At Gregg Shoals on the Savannah River in Georgia, $^{14}C$ evidence indicates that the levee on which the site was occupied did not begin to build until sometime around 10,000 yr B.P. The radiocarbon dates were from lenses of peat lying on bedrock. These peat lenses indicate they formed in quiet water and subsequently were buried by flood-deposited sands. At nearby Rucker's Bottom, a Clovis point was excavated at the same level as a substantial early Archaic Kirk occupation, the deepest occupied zone of the site. In this case, it is likely that alluvial deposition did not effectively occur on the
Rucker's Bottom terrace until after 10,000 yr B.P. A similar situation was found at Simpson's Field, where a Clovis point and other early Archaic artifacts were found lying together in the same alluvium. The one exception to this trend where the earliest Paleoindian artifacts in Holocene alluvium are post-Clovis is 9Ge309, located on the Oconee River in Georgia. Here, two fluted points and a probable third were found in the lower portion of a shallow (1 m) sandy Holocene levee. However, the site was multi-component, not very deep, and evinced some mixing from bioturbation. The question here is, were the fluted points truly buried in the sands, or were they disturbed upward from the surface of what is suspected to be a weathered Pleistocene terrace surface?

Regarding the timing of the Holocene aggradation on the coastal plains of the Southeast, the picture differs from the Piedmont. There is some evidence that the Savannah River was flowing in a braided pattern at the beginning of the Holocene, as indicated by point-bar deposits at Pen Point and probably at Taylor Hill. Dalton period artifacts are clearly buried in each case, with probable pre-Dalton fluted bifaces at the latter site. In circumstances such as these, it does not appear that burial will be especially deep (ca. 1 m), creating problems of stratigraphic integrity where there is a strong pattern of reoccupation by later Archaic groups. However, in instances where a channel is cut off and buried by later overbank deposits, the chances are good that one might find a relatively pure expression of a Clovis-period occupation.

Smiths Lake Creek (38AI135) may represent such a situation, where changes in the hydrology of either Smiths Lake Creek or the Savannah River itself removed the chert source from use by subsequent aboriginal groups. In the case of the Big Pine Tree site, the initial human occupation may well be Clovis, situated as it is in the first surviving deposit of Holocene sands overlying an eroded and weathered Pleistocene terrace. A similar situation occurs downstream at the Charles site, although it is more difficult at this point to diagnose the earliest occupation there. It is not clear yet whether the two sites on Smith's Lake Creek were buried from sediments contributed primarily from the Savannah River, Smith's Lake Creek, or both. More work is needed to establish sediment sources. There may be differential sedimentation rates related to whether a stream originates on the coastal plain, usually possessing a small watershed, versus one that begins in the southern Appalachian Mountains, involving a much more extensive drainage basin.

At the Theriault site on Brier Creek, Georgia, a single Clovis-like fluted point was found at the base of probable fluvial sands just above what is described as a clay matrix. However, a Dalton point was found on the clay matrix. As previously pointed out, mixing of occupational zones has taken place at this locale, so the question of whether the fluted point was originally in the sand or resting on the clay surface is moot. Relatively shallow, sandy, heavily reoccupied sites do not tend to lend themselves to resolving such stratigraphically sensitive questions.

The Muckafoonee Creek site in Georgia and the Hester site in Mississippi share two common traits that bear on the timing of the Holocene aggradation. First, both are in alluvium from rivers that originate on the coastal plains. Second, both have Paleoindian artifacts, including possible Clovis components, which are obviously within sands as well as overlying sands. At Muckafoonee Creek, although the backhoe only penetrated to a depth of 1.5 m, the artifact-bearing level that produced a fluted point overlay at least three sterile horizons. These are a reddish-brown clayey sand, overlying a compact reddish brown clayey sand, which was underlain by a basal coarse, light, almost white sand. The first two probably are B-horizon paleosols. At the Hester site, Dalton, Quad, and probably Clovis points were buried in alluvial sands that lay atop a clean, alluvial sand unit that, in turn, overlay a sterile clay unit.

With only two sites to generalize from, strong conclusions cannot be drawn. However, the fact that at both sites coarse sediments underlay the fluted point zones indicates the potential for rapid deposition and burial of Paleoindian sites, including charcoal for 14C dating. These data, like that from Smith's Lake Creek, suggest the possibility that Holocene aggradation on the coastal plains was contemporary with Clovis occupations and perhaps somewhat earlier. Where possible, archaeologists need to 14C date the alluvium underlying early occupations. With the advent of AMS dating, even small particles of charcoal can be dated reliably from alluvial beds. As things stand now, fluted points and other diagnostic Paleoindian artifacts are being used to indirectly date geological horizons, and the artifacts, for the most part, have not been dated themselves by associated 14C.

There is a clear stratigraphic pattern present at nearly all of the sites where Paleoindian and early Archaic bifaces have been recovered in alluvium that pertains to the recognition of the Pleistocene–Holocene boundary. At Haw River, probably Baucom, Rucker's
Bottom, Simpson’s Field, Rae’s Creek, Smith’s Lake Creek, Theriault, and Muckafoonee, the Pleistocene–Holocene contact is indicated by basal Holocene sands overlying an alluvial terrace surface that has been modified by the formation of B-horizon paleosols. These B horizons are well developed (Bt) and more argillic than B horizons found in the Holocene alluvium. They invariably are sterile of artifacts in their primary position. The basal Holocene sands often are marked by lamellae if the grain size is not too coarse. The Bt horizons which have formed in the Holocene alluvium are not as argillic as those on the older Pleistocene terraces. Because of landscape instability accompanying the Holocene aggradation, which provided both erosion and the addition of new sediments, it is unlikely that pedogenesis could proceed to the point of mature argillic B horizons (cf. Foss and Segovia 1984; Foss et al. 1995).

Archaeologists and geologists should be aware of this contact and continue to excavate until conclusive evidence for archaeologically sterile Bt horizons, gravels, or bedrock is reached. In the case of the Bt horizon, it is on or just above this weathered surface that Clovis and other pre-Dalton materials should be located stratigraphically. A classic illustration of this is the “Clovis clay,” a strongly pedogenically modified IIB2 horizon underlying the fluted point deposit at the Thunderbird site in Virginia (Foss 1974). The abrasive sand-bearing floods of the initial Holocene aggradation may, in many cases, have scoured away fluted point assemblages, such as seen in the sharp, undulating contact at Haw River and Rae’s Creek. In any event, greater areas need to be excavated on these late Pleistocene terrace surfaces before it can be concluded that there are no buried fluted point sites present in the Southeast.

Further down the coastal plain and into Florida, climate and the karst topography were sufficiently different from higher latitudes that this region requires separate consideration. Because of relatively recent marine transgressions, sediments from dunes have been readily available for deposition. The Florida climate was arid at the end of the Pleistocene and, when coupled with reduced surface water from low rainfall and depressed ground water due to a lower sea level, conditions were prime for eolian deposition. Paleoindian sites may be buried at significant depths, judging from the Silver Springs and Harney Flats sites. Sites such as Page/Ladson in the riverine-drowned sinkholes are unique geologically and archaeologically, as are cenotes such as Warm Mineral Springs and Little Salt Spring. In addition to providing abundant, reliable organic materials for 14C dating, excellent faunal preservation in the sinks should allow unassailable substantiation of human exploitation of extinct fauna in the Southeast.

Saltwater inundation of river valleys and the continental shelf itself no doubt has provided some form of burial and preservation of a substantial Paleoindian archaeological record. The artifactual evidence from Tampa Bay alone, the largest embayment on the west coast of Florida, is impressive, an occurrence that is likely repeated within the other bays along the Gulf coast. The existence of drowned river channels, sinks, and other karst features on the continental shelf, though logistically complicated by their distance offshore, also offer as yet unrealized potential for Paleoindian studies, including the possibility of preserved evidence for marine-resource exploitation.

While archaeologists always are wise to consult with scientists in other disciplines, given the geological conditions that prevailed in the southeastern United States at the time of the transition from the Pleistocene to the Holocene, research teams employing geologists and soil scientists are absolutely necessary. The work of William Gardner and his earth science colleagues at the Thunderbird site provided an early (and still admirable) model of such an approach. It is clear that the floodplains were the most geologically dynamic environments from about 11,000 yr B.P. onward, and thus the most amenable to deposition so needed for Paleoindian research. The fact that so many of these river valleys are now underwater reservoirs in the Southeast should cause the archaeological profession to regard the remaining undammed streams as a rare and endangered habitat. Floodplains need to be prioritized for both preservation and research before they are totally removed from scientific scrutiny.
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