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Evidence for Pre-Clovis Sites in the Eastern United States

Albert C. Goodyear

Truth is the daughter of time.

—John Trapp, 17th-century Puritan writer

Abstract

Over the past 25 years, a number of archaeological sites in eastern North America have manifested evidence of human occupations dating earlier than 11,500 RCYBP. These sites include Meadowcroft Rockshelter, Penn.; Cactus Hill, Va.; Saltville-2, Va.; and Topper, S.C. Except for Topper, pre-Clovis (earlier than 11,500 RCYBP) remains were encountered incidental to conducting normal research. Topper was intentionally tested for the possibility of pre-Clovis remains. This paper is a brief review of the geological contexts, dating, and artifactual evidence of these sites. Collectively, they indicate a late-glacial time range of approximately 12,000 to 16,000 RCYBP. Technologically, Meadowcroft Rockshelter and Cactus Hill are the most similar, with evidence of bifacial points, unifaces, and prismatic blades. Although probable bone and ivory artifacts are present, lithics at Saltville-2 are expedient and minimal, making comparisons difficult. Topper, which is a chert quarry, is distinctive in that it has no evidence of bifaces and is dominated by small flake tools with an emphasis on burin-like tools. More geoarchaeological fieldwork is needed to target landforms that possess sediments deposited from 18,000 to 12,000 RCYBP. The Southeast may be a good place to prospect for these sites, given its milder climate during late-glacial times.

The purpose of this paper is to present briefly archaeological evidence of human occupation of the eastern United States prior to 11,500 RCYBP, the conventional pre-Clovis temporal boundary. Four sites are reviewed for their artifacts, geological contexts, and dating. While questions, reservations, and rejections exist within the profession concerning some or all of these sites, nevertheless it

is believed that they sufficiently meet these criteria and thus constitute evidence.

Meadowcroft Rockshelter, Pennsylvania

The most long-standing case for archaeological evidence of pre-Clovis (earlier than 11,500 RCYBP) humans in the eastern United States is the famous Meadowcroft Rockshelter, located about 48 km southwest of Pittsburgh, Pennsylvania (Figure 1). Meadowcroft Rockshelter is within the Cross Creek drainage, a tributary of the Ohio River, located about 12 km away. The site is situated in a sandstone rockshelter with an area of about 65 m² under the overhang. Altogether, 11 distinct strata have been defined, with Stratum I (culturally sterile shale) at the bottom followed by artifact-bearing strata II–XI. Cultural material was recovered within a 4.6-m-deep deposit formed by attrition, roof fall, and sheet wash accumulation. Within this 4.6-m deposit, a remarkably complete string of 52 ¹⁴C dates in nearly perfect chronological order has been obtained, spanning nearly 20 millennia (Adovasio et al. 1998).

Multidisciplinary excavations at the rockshelter, directed by James M. Adovasio in cooperation with other scientists and sponsored by the University of Pittsburgh, started in 1973 and continued variously through the 1970s and 1980s; the last major excavation, sponsored by Mercyhurst College with which Adovasio is associated, was conducted in 1994–1995. Some 75 publications have been produced for the site, ranging from articles to monographs (Adovasio et al. 1999).

Evidence of pre-Clovis occupation lies within the lower and middle portions of the lithostratigraphic unit called IIA. Enough lithic artifacts were recovered to define the Miller complex. This complex consists of thin bifaces, including one lanceolate point, the Miller Lanceolate (Figure 2); small prismatic blades; retouched flake tools and blades (Figure 3); and debitage related to late-stage core and biface reduction and tool kit maintenance. Overall, the stone tools and debitage constitute a highly curated tool kit. It is significant that the lithic raw materials are representative of subsequent fluted-point tool kits, including exotic cherts

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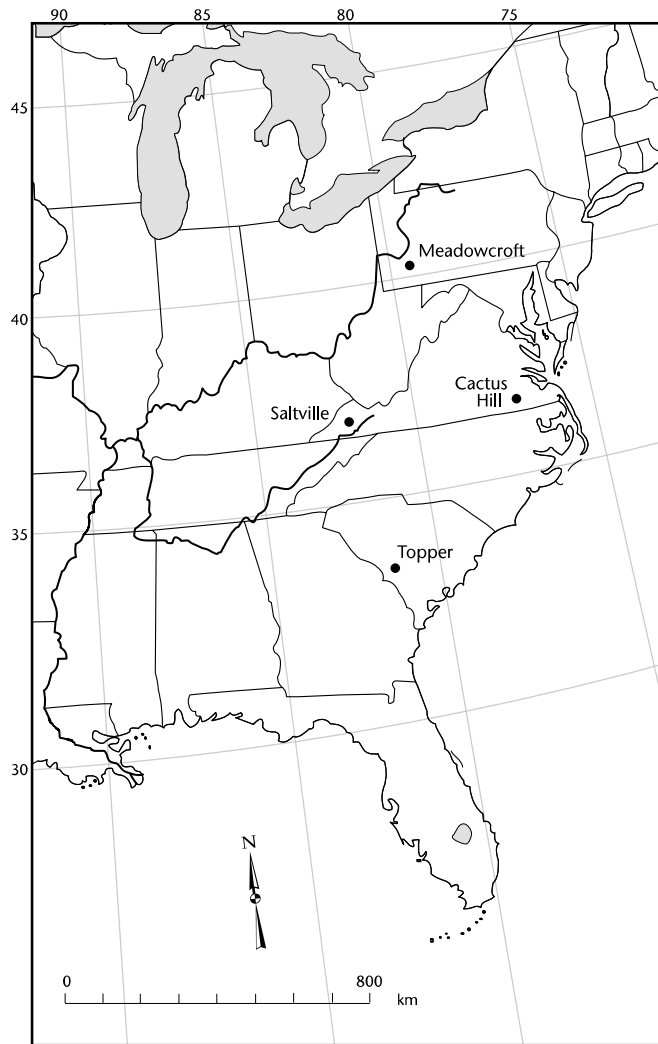


Figure 1. Sites in the eastern United States with evidence of pre-11,500 RCYBP occupations.

such as found in Flint Ridge, Ohio, Kanawha cherts of West Virginia, Pennsylvania jaspers, and local Monongahela chert (Adovasio et al. 1999). The Miller complex is further defined by surveys done in the Cross Creek watershed, where other lanceolate points, small prismatic blades, and small polyhedral blade cores have been recovered. According to Adovasio et al. (1999:418), this complex has a Eurasiatic and Siberian appearance. These authors also note that small blades and polyhedral cores are absent from subsequent Paleoindian fluted-point assemblages in this region, reinforcing the technological distinctiveness of the Miller complex.

The six oldest radiocarbon dates with artifacts unquestionably associated range in age from $12,800 \pm 870$ RCYBP to $16,175 \pm 975$ RCYBP (Adovasio et al. 1999:Figure 1). Given the large standard deviations of some of the dates, a conservative estimate would be from 12,000 to 15,000 RCYBP (Adovasio et al. 1990:352). These dates were obtained on charcoal from features such as fire pits, fire floors, and other charcoal concentrations. One ^{14}C date of $19,600 \pm 2400$ RCYBP was obtained on

carbonized simple-plaited basketry. Taking a conservative view, at two standard deviations, this date would come forward in time to 14,800 RCYBP, in line with the other pre-Clovis dates above.

Because of its antiquity and non-Clovis lithic assemblage, Meadowcroft had a dramatic impact on New World archaeology, one that has been surrounded by controversy ever since. Criticisms have focused on the lack of Pleistocene flora and fauna, the apparent absence of the Pleistocene-Holocene transition in the stratigraphy, and possible contamination of the ^{14}C dates. The presence in the pre-Clovis levels of bona fide artifacts as well as hearths and other human-related fire features has not been contested. With better paleoenvironmental and geoarchaeological data available since the 1970s for the late-glacial environments of eastern North America, criticism of the plant and animal remains and stratigraphy has abated (Adovasio et al. 1998). The most persistent questions address possible contamination of the ^{14}C dates by particulate and soluble humates from coal. Despite detailed microscopic searches, no evidence of particulate contamination has been detected (Adovasio and Carlisle 1988:713; Adovasio et al. 1990:351). As for soluble humates contaminating the lower levels, a recent soil micromorphology study by Goldberg and Arpin (1999:340) concludes:

We see no evidence of groundwater saturation of any strata nor do we see evidence of any other mechanisms by which particulate or non-particulate contamination could have been introduced into the sediments in general and into the charcoal samples in particular.

After 25 years since its first publication, Meadowcroft Rockshelter appears to be what the investigators originally claimed. In recent years other sites have joined a growing group of sites that also manifest evidence of people being in North America before Clovis.

SV-2, Saltville, Virginia

Saltville Valley is a well-known late-Quaternary fossil locality situated in the Valley and Ridge Province of the Appalachian Mountains of southwest Virginia (Figure 1). Paleontological and ar-

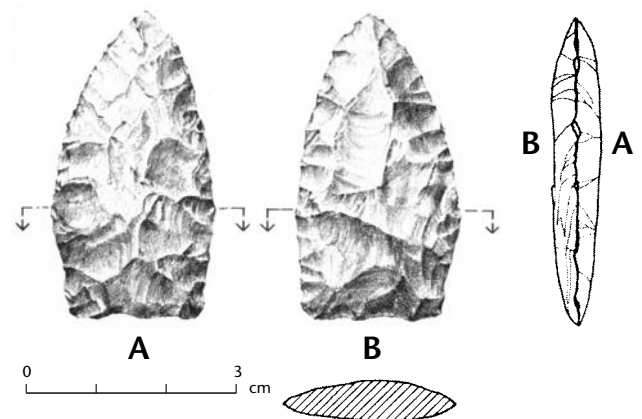


Figure 2. Miller Lanceolate projectile point from Meadowcroft Rockshelter (36WH297). By S. Patricia, courtesy of J. M. Adovasio, Mercyhurst Archaeological Institute, Erie, Pennsylvania.

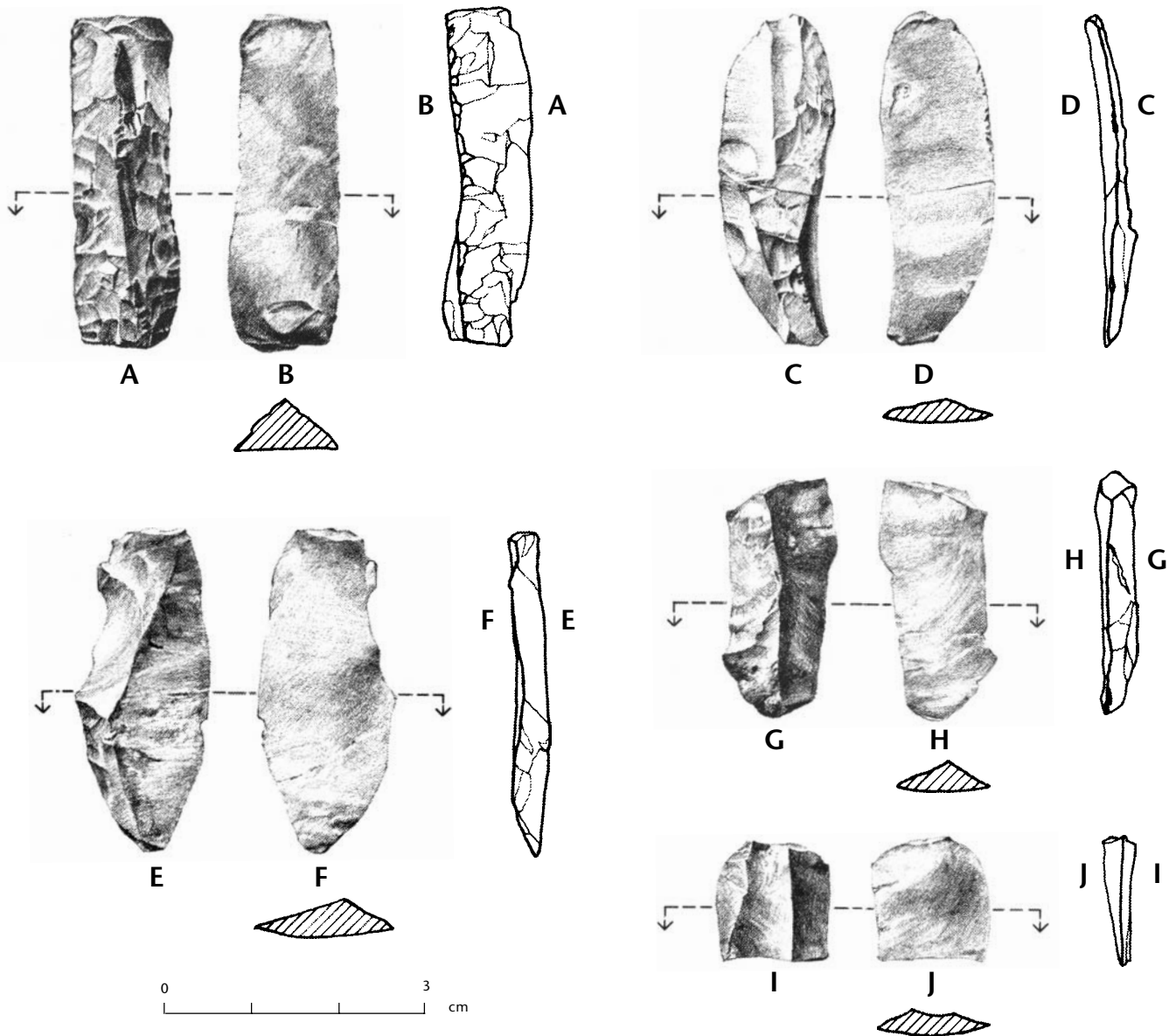


Figure 3. Examples of small prismatic blades from Meadowcroft Rockshelter (36WH297). By S. Patricia, courtesy of J. M. Adovasio, Mercyhurst Archaeological Institute, Erie, Pennsylvania.

archaeological excavations have been conducted there over the past 20 years by paleogeographer Jerry McDonald, a research associate with the Smithsonian Institution and the Virginia Museum of Natural History. The valley has an unusual history: about 13,500 RCYBP the river became a lake and the valley bottom was sealed with mud, yielding excellent preservation of late-glacial plant and animal remains. Excavations have revealed a detailed, finely resolved biostratigraphic record well supported by ^{14}C dates back to 15,000 RCYBP (McDonald 1995, 2000; McDonald and Kay 1999:196; Wisner 1996).

The critical area of interest for archaeology at SV-2 (44SM37) lies within an approximately 1-m-thick alluvial, colluvial, and lacustrine deposit spanning some 5,000 radiocarbon years, which

overlies a pedestal of resistant bedrock. In the lower part of this deposit, at least three discrete radiocarbon-dated horizons exist, ranging in age from 14,510 to 13,000 RCYBP, each bearing archaeological evidence of human occupation.

The oldest horizon, which extends over most of the bedrock pedestal, is integrated by skeletal and dental remains of what may be a single proboscidean individual. This horizon is dated by a single AMS bone collagen date of $14,510 \pm 80$ RCYBP on what is considered to be a bone tool (McDonald and Kay 1999:196). The bone is a tibia, probably of musk ox (*Bootherium bombifrons*). This specimen is intriguing because of its percussion shaping and microwear patterns (Figure 4). Based on his independent microwear study, Marvin Kay (pers. comm. 1999) is convinced the "tibia was intentionally fractured, was hand-held, and was used as a mattock hide beaming tool." Other objects and unusual spatial concentrations of bone were also found in the lowest horizon in a distribution that implies human agency.

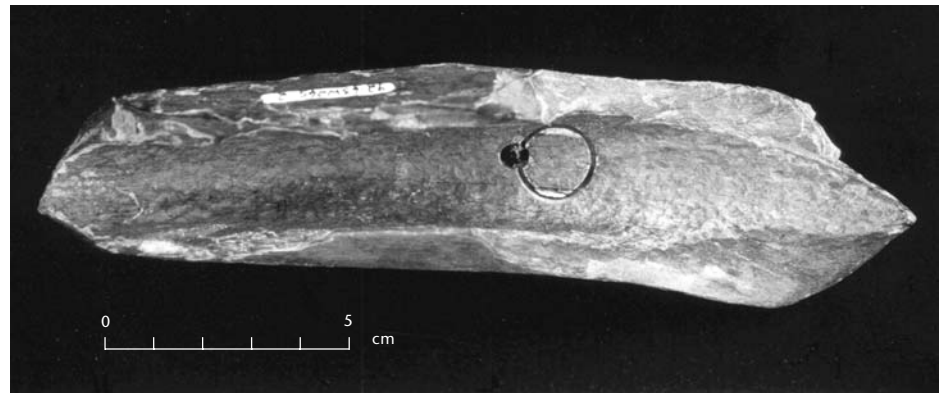
The unusual condition and distribution of proboscidean bone suggests to McDonald that a single mastodon was butchered and burned (McDonald 2000). Also found were two hand-size sandstone objects that could have served as hand axes or wedges, together with what appears to be an artificially grooved piece of bone broken after the groove was made. A partially worn chert flake (Figure 5A) and a thin chunk of chert with flaking and possible wear damage from use as a wedge (M. Kay, pers. comm. 1999) were also associated with the mastodon layer.

A middle horizon bearing evidence of human occupation consists of two feature-like arrangements situated on or within a

microdebitage, including a small number of chert flakes. Some of the flakes appear to be biface reduction flakes (Figure 5C). Based on stratigraphy, McDonald (2000) interprets the date of the faunal concentration at 13,500 to 13,000 RCYBP; it was apparently deposited during a low-water stage that occurred soon after the lake formed. The faunal contents suggest people were harvesting burrowing clams and collecting fish and amphibians in ponds during times of lowered lake waters.

The compelling aspect of the SV-2 pre-Clovis evidence resides in the two unusually modified bone objects and the chert flakes. These bone objects and the unusual spatial array of re-

Figure 4. Tibia tool (VMNH 721) from lowest pre-Clovis horizon at SV-2 (44SM37). Photo courtesy of Jerry McDonald.



stratigraphically discrete fluvial sand layer. The first is an unlikely assortment of large pebbles and cobbles of lithics that would be suitable for use as tools or the production of stone tools. These materials were found in a small depression about 15 cm deep and 70 cm in diameter. This depression is thought to be natural, since other similar depressions were observed set into the surface of the sand layer. This shallow basin was rapidly filled by fluvial puddling, with at least five stages evident. All objects thought to be related to humans lie in or partly within the upper stratum of the fill. In addition to fish skull bones and a piece of charcoal, 12 pieces of microdebitage were found, 3 of which were morphologically similar to flakes of bifacial retouch. Wood twigs found in the upper stratum of this depression were radiocarbon-dated at $13,950 \pm 70$ RCYBP (McDonald 2000). The second featurelike manifestation consists of seven concretions and one prismatic column of weathered bedrock found in an unusual orientation in a maroon mud-filled depression within the sand lense. Five of the concretions and the section of weathered bedrock are elongate; all are oriented vertically with their upper ends at the same depth. Moreover, the five concretions were formed of gray mud, which strongly indicates that they were intrusive into the maroon mud. McDonald (2000) is of the opinion that these geologically anomalous objects indicate intentional human placement.

The latest horizon is represented by a single unusual middenlike concentration of bivalves at least 2 m in one dimension, which was found within a rill eroded into the colluvium. The middenlike mass contains over 200 shells of clam, over 500 pieces of small vertebrate bones and teeth, charcoal, and 125 pieces of

duced proboscidean bones have not been observed in the Saltville Valley paleontological excavations except on the bedrock pedestal. The chert material is exotic to the Saltville Valley. Microdebitage has not been found in river channel sediments, nor are there naturally occurring tool-quality chert cobbles from which the chert flakes could have originated. SV-2 possesses extraordinary geological stratigraphy, with temporally discrete depositional units of high integrity and resolution. The corresponding ^{14}C dates also bear witness to the integrity of the stratigraphy.

Cactus Hill, Virginia

Cactus Hill (44SX202) is a stratified multicomponent site in a sand dune approximately 1.8 m thick overlooking the Nottoway River in the interior coastal plain of Virginia (Figure 1). The site

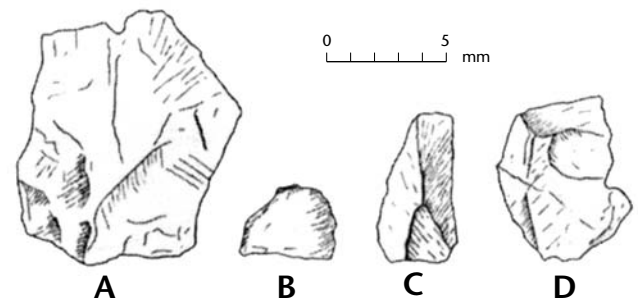


Figure 5. Microflakes of probable human origin from pre-Clovis horizons at SV-2 (44SM37). Courtesy of Jerry McDonald.

has been excavated concurrently by two groups, one led by Joseph McAvoy of the Nottoway River Survey, the other by Michael Johnson, an archaeologist with Fairfax County, Virginia, working with the Archaeological Society of Virginia. The primary publication on the site is authored by Joseph and Lynn McAvoy (McAvoy and McAvoy 1997), and Johnson published a report in the same year (Johnson 1997).

Based on several hundred square meters of excavation, a well-documented and -dated archaeological sequence has been established, beginning with Clovis and ending with the 18th century. This sequence is based on numerous projectile points and other diagnostic stone tools in correct stratigraphic order, plus ^{14}C -dated features. This conventional sequence is contained within the upper 1 m of the site. At about a meter below surface, a bona fide Clovis occupation has been recovered, including several fluted points, typical Paleoindian unifaces, and prismatic blades. One Clovis-age ^{14}C date of $10,920 \pm 250$ RCYBP on hard Southern pine charcoal has been obtained from a hearth. The lithic raw materials associated with the Clovis horizon consist of quartzite from the Nottoway River and familiar Paleoindian cherts, such as that from the famous Williamson site located nearby.

In the 1993 excavations, about 7 cm below a Clovis surface that produced two fluted points, a hearth-like concentration of charcoal was found that contained seven quartzite flakes and three quartzite prismatic blades (Figure 6) (McAvoy and McAvoy 1997:103). White-pine charcoal from this concentration yielded a ^{14}C date of $15,070 \pm 70$ RCYBP. In three other areas of the site, prismatic blades of quartzite were also found underneath what are suspected to be Clovis surfaces. During the 1996 field season, which was undertaken to determine whether additional sub-Clovis artifacts could be found, six more lithic clusters were found consisting of quartzite prismatic blades. Another hearth-like concentration of charcoal from one of these clusters produced a ^{14}C date of $16,670 \pm 730$ RCYBP (McAvoy 1997). Including all the quartzite artifact clusters found below the Clovis level, McAvoy (1997) believes two separate sub-Clovis lithic horizons are present; the lower horizon consists of large prismatic blades, followed by a zone of smaller blades. Two thin, basally thinned trianguloid-to-lanceolate bifaces that were also found may be associated with the upper smaller blade clusters (Figure 6, A and B).

Questions about the integrity of the intricate but shallow stratigraphy led to a follow-up field and laboratory study in 1997–1998 (McAvoy et al. 2000). Sedimentological analysis showed that all the sands are eolian in origin; the dune is a “border source” type known to have formed during full- and late-glacial periods along the Atlantic coastal plain (cf. Ivester et al. 2001). Additional charcoal samples were sought in the dune below the artifact-bearing levels to determine whether ancient natural charcoal sources may have contaminated the site. Even though flotation was used, very little charcoal adequate for radiocarbon dating was found in the lower portion of the dune. One sample, collected about 2 cm below a hearth, dated $16,940 \pm 50$ RCYBP, very close in age to the previous date of $16,670 \pm 730$ RCYBP from charcoal also collected from a hearth. About 70 cm below this hearth, near the base of the dune, a single piece of conifer

charcoal dated $19,700 \pm 130$ RCYBP. This charcoal, which is well below the lowest artifact zone, is thought to be from a forest fire.

In sum, Cactus Hill has a number of archaeological and stratigraphic characteristics that lend credibility to a pre-11,500 RCYBP human occupation. A well-documented Clovis occupation is present, including a Clovis-age ^{14}C date. At 10–15 cm below this zone in several places in the site, a distinctive quartzite industry is found, typified by prismatic blades, polyhedral cores, and trianguloid-to-lanceolate bifaces. Three ^{14}C dates from late-glacial plant remains recovered from hearths range from 15,000 to 17,000 RCYBP. Radiocarbon dating of known arboreals, sedimentology, and optically stimulated luminescence (OSL) dating of quartz sands all show an in-place stratigraphic sequence (McAvoy et al. 2000).

Topper Site, South Carolina

The Topper site, 38AL23, is a stratified multicomponent site situated on a Pleistocene terrace of the Savannah River in Allendale County, South Carolina (Figure 1). The site complex includes a terrestrial chert outcrop and quarry (38AL139) exposed on the hillside and in an adjacent creek bed, which is mantled by sands (Goodyear 1999a; Goodyear and Charles 1984). The artifact-bearing sediments on the terrace below are represented by two different geologic deposits. The upper 1.0 to 1.4 m of sands, which are colluvial (slopewash) in origin, contain an essentially complete Holocene archaeological sequence beginning with Clovis and ending with the 18th century. Below that, continuing to about 2.2 m below surface, are Pleistocene-age sands that are alluvial in origin. These dual-deposit sands more than 2 m thick lie unconformably over a scoured gray silty clay Pleistocene terrace, which is about 2 m thick. The pre-Clovis lithic assemblage lies on this Pleistocene terrace and within the overlying alluvial sands (Figure 7, 2d). The pre-Clovis-age levels have been excavated yearly since 1998, the year of discovery. As of the 2002 season, a total area of 146 m^2 of the pre-Clovis occupation had been excavated.

The upper colluvial artifact-bearing sands are dated by diagnostic prehistoric ceramics and projectile points. Time-sensitive artifacts are in order by depth, indicating a gentle burial of the Holocene record with minimal human and natural disturbances. Features with charcoal associated are rare. Small dispersed charcoal fragments present in the upper meter have been translocated down the profile through bioturbation and are thus unreliable for ^{14}C dating. Clovis has been recognized at the site by the presence of typical transversely flaked “rowboat”-shaped bifaces (cf. Morrow 1996), with end thinning or early-stage fluting (Goodyear 2000:Fig. 2). The base of one Clovis point has been excavated in its proper position as well as a possible second one (Goodyear and Steffy 2003). OSL dating at the base of the colluvium produced a date of $13,500 \pm 1000$ CALYBP (Forman 2002, 2003), close to the accepted date of 13,000 CALYBP of Clovis (Taylor et al. 1996).

Proceeding downward (Figure 7), the contact of the colluvium (3b1) and the alluvial sand (2d) below has been dated by OSL at $15,200 \pm 1500$ CALYBP (Forman 2002, 2003). Below

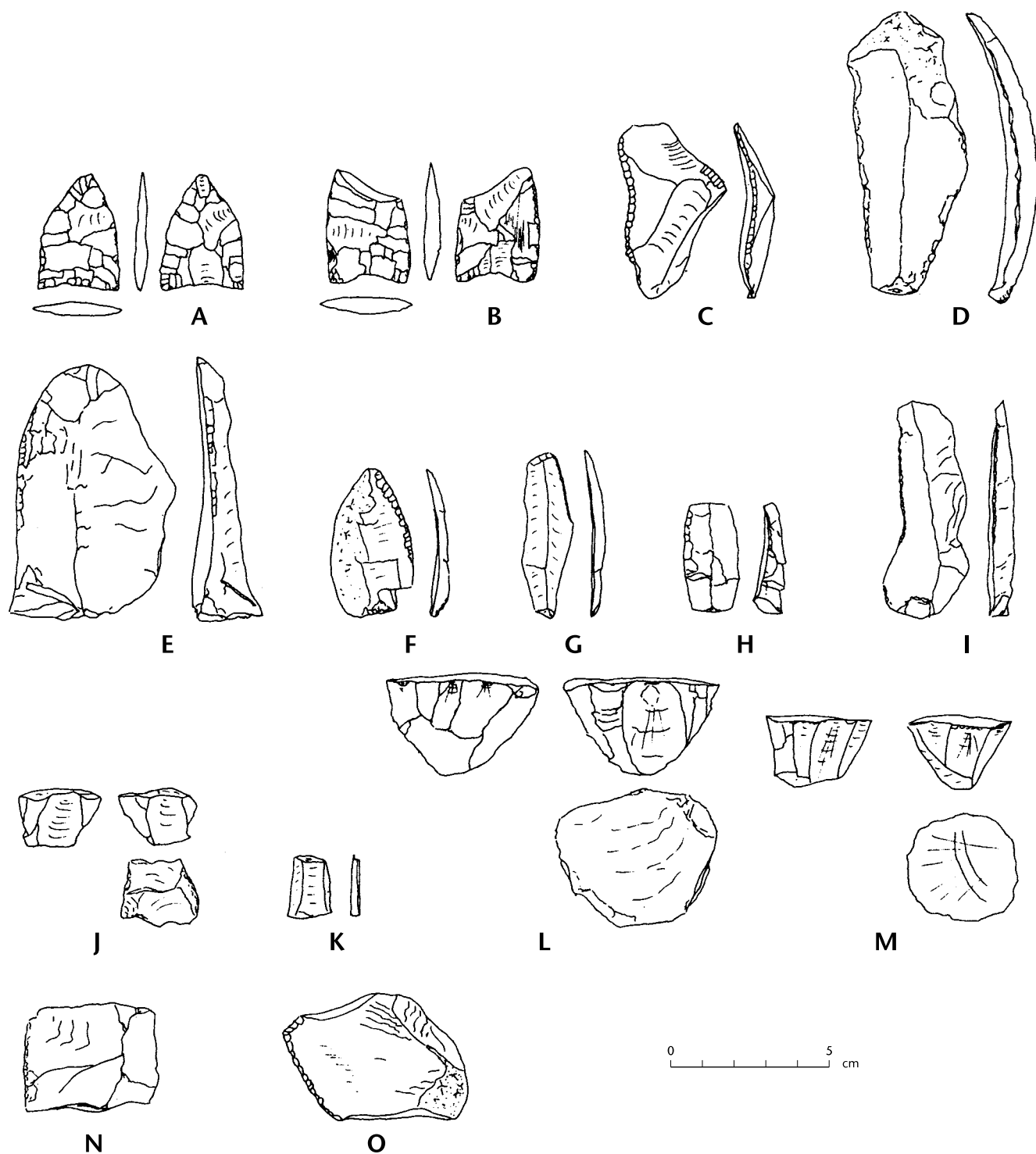


Figure 6. Various projectile points, prismatic blades, blade cores, and utilized flakes from pre-Clovis levels from Cactus Hill (44SX202). Courtesy of Joseph McAvoy.

this, in the upslope area of the site, lies a paleosol (3a) formed in colluvium that separates Clovis from the Pleistocene alluvial sands below. Project soil morphologist John Foss (pers. comm.) estimates it would take 2000 to 4000 years for this soil to develop

(cf. Foss and Segovia 1984). These data indicate that the pre-Clovis artifact-bearing alluvial sands below are at least 16,000 to 20,000 years old. Since no organic materials suitable for radio-carbon dating have been observed in the Pleistocene sediments, we cannot fix a maximum time constraint for the pre-Clovis occupation. Underneath the Pleistocene terrace, infinite ^{14}C dates in excess of 50,000 yr B.P. have been obtained on plant remains (Figure 7:2a).

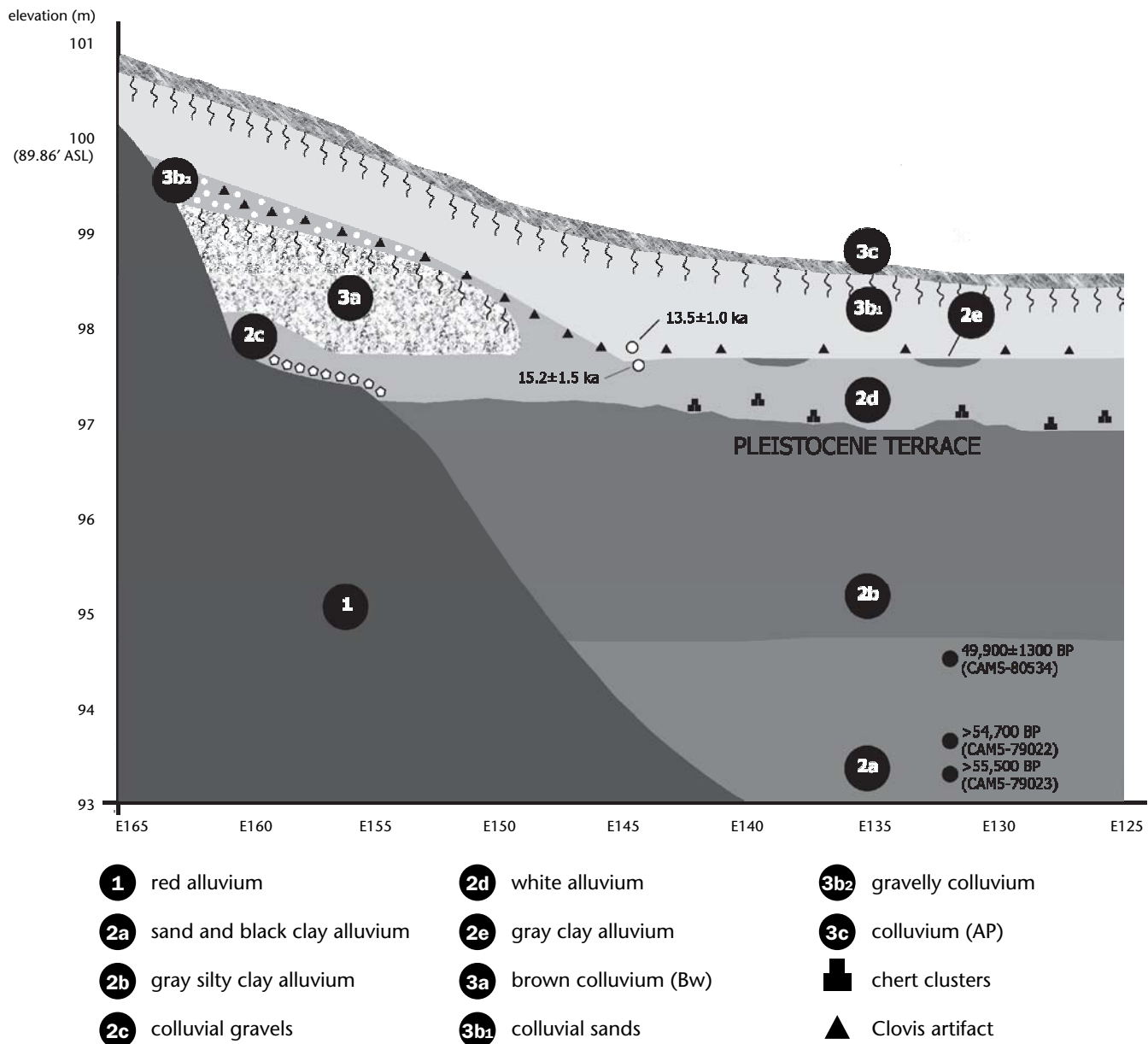


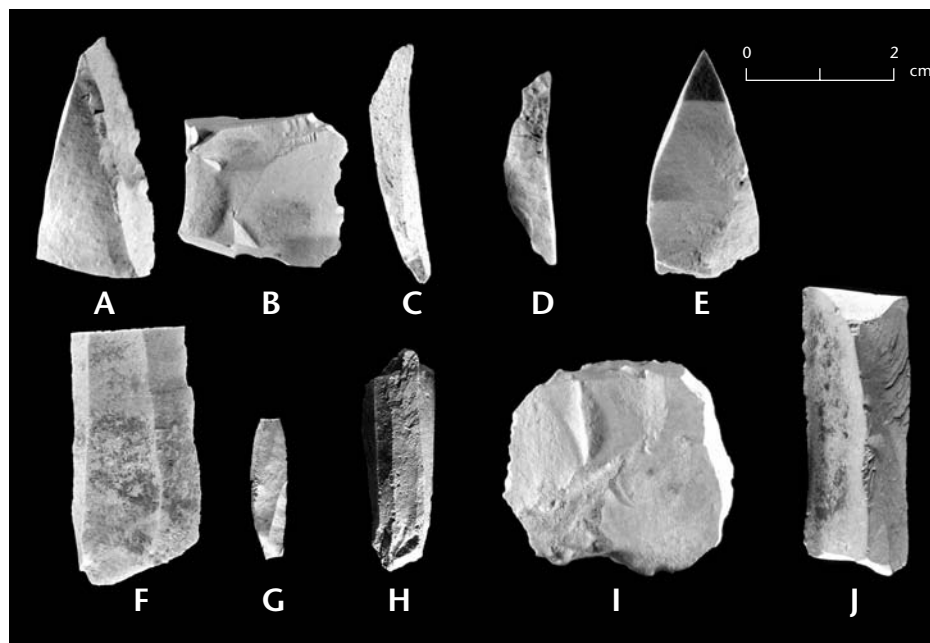
Figure 7. Stratigraphic profile of the Topper site showing relationships of geological units and archaeological components. (Based on Michael R. Waters et al. 2003.)

The unusual chert artifacts (Figure 8) said to be pre-Clovis occur stratigraphically primarily in the lower half of the Pleistocene sands (Figure 7, 2d). In one area of the site these lithics are associated with what appear to be loci where chert cobbles were processed. These concentrations (Figure 9) are found on the terrace, away from the natural source of the chert cobbles at the base of the hill. They appear as clusters of broken chert, some lying in discrete piles on common surfaces (Figure 9). They are neither fluvially formed nor deformed by water action. Because they have no negative bulbs, the broken chert cobbles are interpreted as cores made by smashing, probably one cobble against another, since no hammerstones large enough to break these

cobbles have been recovered thus far. Small quartz cobbles (less than 8 cm) are present on the hillside associated with older alluvial deposits. These were also gathered and used as hammerstones and cores for quartz flake tools. The fractured chert cobbles have marked force lines in multiple directions with hard terminations often resulting in hinges. Some have been retouched bifacially and unifacially on their margins for use as cobble tools such as choppers and spokeshaves. Numerous small flakes (less than 2 cm) recovered among these chert clusters, with striking platforms and bulbs of force, are a by-product of retouching cobbles for tools as well as uniface production on flakes.

Flakes created by smashing the cobbles were modified into a variety of small tools, many of which may even be described as microlithic (Figure 8). A few steeply chipped unifaces have been found, some retouched on all edges (Figure 8I), others on the end or side of a flake. Some flakes have been unifacially retouched

Figure 8. Lithic artifacts from the pre-Clovis occupation at the Topper site; **A,B,E**, bend-break tools; **C,D**, bend-break spalls; **F,G**, blades; **H**, possible microblade core; **I**, scraper; **J**, blade-like tool. (SCIAA-USC photo by Daryl P. Miller.)



to form spokeshaves. No bifaces or the distinctive reduction flakes from biface manufacture have been recovered. Numerous utilized flakes are present as well as flakes that have been modified by the bend-break method of fracture. The bend-break pieces, numbering in the hundreds, appear to have been created for burin or chisel use (Figure 8A,B,E). Bend-break manufacturing yields trihedral and quadrahedral spalls that mimic burin spalls (Figure 8C,D). These spalls do not have striking platforms or bulbs of force created by burinating a flake. Furthermore, although the bend-break pieces morphologically resemble classic burins (e.g., Figure 8A,E), no burins have been recovered with the diagnostic negative bulb. Such burin-like implements are often classified as expedient or pseudo-burins in Holocene-age assemblages in North America (cf. Crabtree 1973:49). However, bend-break tools on flakes are known for Clovis (Ferring 2001:155–156; McAvoy and McAvoy 2003:195) and for Folsom, especially the radial-break type (Root et al. 1999:146–151). Topper is unusual, however, in that bend-break artifacts constitute a primary component of the technology.

Blades and even bladelets, although few in number, have been found at Topper. Figure 8F is a midsection of a well-made prismatic blade with three prior detachments. A few small blades have been found, notably Figure 8G, which is a whole blade with a bulb of force and three parallel blade scars. Figure 8H may be a microblade core, although what would be the platform end is missing and the chert is very weathered. Figure 8I, a scraper chipped around its circumference, gives the strong impression of being a core tablet from rejuvenating a small blade core. A detailed analysis will be necessary to segregate what may be small blades from the numerous bend-break spalls.

The chert artifacts from both the pre-Clovis and Clovis levels at Topper are heavily weathered, a characteristic widely noted

for Tertiary-age South Atlantic coastal plain cherts of marine origin (Clark and Purdy 1979; Hurst and Kelly 1961; Upchurch 1984). Chemical weathering can be so severe that in some cases superficial landmarks such as force lines and *erraillures* are eroded off flake surfaces, thereby also removing microwear traces. A preliminary examination of 50 of the less severely weathered pre-Clovis chert artifacts from Topper found only six with possible use striae, with one having micropolishing (Kay 2002). Despite weathering, however, some pieces show macroscopic nibbling and edge damage. A comprehensive, experimentally based study of use wear will be needed to determine the full analytical potential of microwear at Topper.

In sum, unusual microlithic artifacts associated with a smash-core technology have been found in a stratified deposit underneath Clovis-age sediments and Clovis-related lithic technology. OSL dating alone indicates these artifacts are in excess of 15,000 calendar years old; the paleosol lying between the Clovis materials and the Pleistocene alluvium would add 2000 to 4000 years to that age. This technology is remarkable for its non-bifacial character and its emphasis on microlithic-sized artifacts, specifically bend-break burin-like tools. Although this evidence is clearly associated with chert quarrying, it seems clear that more than just lithic extraction was taking place there. The emphasis on microlithic tools, as well as core choppers, suggests some type of craft activity. The presence of microliths may imply the manufacture of organic artifacts from bone, antler, wood, and ivory.

It is also significant that the artifacts are associated with Ice Age Savannah River alluvium, deposited when the river was able to flood at the Topper site elevation. Sometime prior to the arrival of Clovis people, the Savannah River bed was scoured and cut down to near its present elevation. Scouring made available for the first time river cobble chert, which was heavily exploited

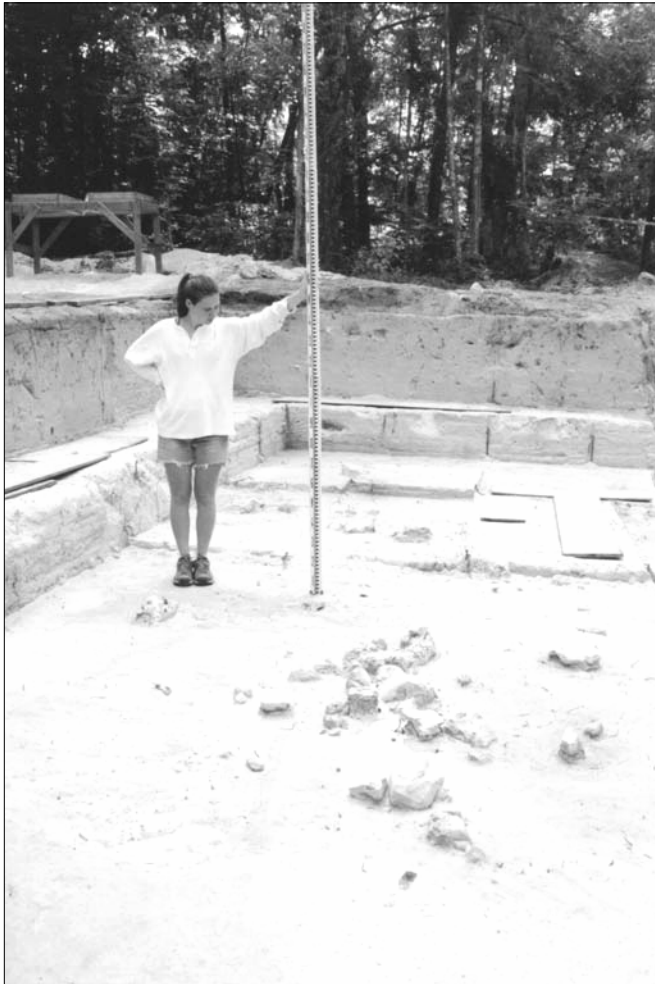


Figure 9. Example of pre-Clovis chert clusters from the 2002 block excavation at the Topper site (SCIAA-USC photo).

by Clovis people and all succeeding prehistoric populations during the Holocene.

Conclusions

Four sites located in the eastern U.S. have been briefly reviewed for evidence of human occupations prior to 11,500 RCYBP. In each case, credible evidence of artifacts in deposits that predate that age has been recovered. Given the presence of bifacial projectiles at Meadowcroft and Cactus Hill and perhaps Saltville (SV-2) based on debitage, it is not difficult to see Clovis emerging from these technologies. Even the lithic raw materials at Meadowcroft are typically Paleoindian. The Topper site, based on evidence recovered thus far, makes a strong break from these sites. Although Topper is unmistakably a quarry site, there are too many small tools requiring hafting for effective use to interpret it simply as that. The microlithic-size flake tools, many of them apparently expedient, are in a real sense non-Clovis. Located at 33° N latitude, Topper is also the southernmost of these sites. It lies on the late-glacial ecotone, between the temperate and climatically stable Southeastern coastal plain, with its near modern flora, and the glacial-influenced mixed conifers and

northern hardwoods of the North (Delcourt and Delcourt 1981).

The acceptance of Monte Verde in Chile as a pre-12,000 RCYBP site and other sites of similar age in North America should cause an acceleration in field investigations of Pleistocene landscapes. Since full- and late-glacial rivers were flowing at higher elevations, Pleistocene river banks on T2 terraces should be targeted for testing. In the Southeast, many alluvial terraces underneath Clovis and other Paleoindian manifestations experienced scouring, which would obliterate evidence of pre-Clovis occupations (cf. Goodyear 1999b). It seems clear that for open, non-rockshelter sites, the context will be essentially geological. The work of interdisciplinary teams is essential to prove conclusively the age and reality of such sites.

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