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VOLUME 8 Summer 2016 NUMBERS 1-2

On the Cover: John B. Broster and his Career Achievement Award presented by the Tennessee Council for Professional Archaeology, January 26, 2013 (*Photograph, Kevin E. Smith)*.

EDITORS CORNER

We are pleased to devote the eighth volume of *Tennessee Archaeology* to a special double issue guest-edited by Jesse W. Tune and D. Shane Miller honoring the contributions of John B. Broster (for more background on John, see particularly Miller and Tune; Moore et al.; David Anderson, this volume). As always, we appreciate the contributions of the authors and extend our thanks to the reviewers who help make this peer-reviewed e-journal possible. We report several items of note on activities in Tennessee archaeology since our last Editors Corner.

Following the rediscovery of portions of the Mississippian-era salt manufacturing site in downtown Nashville in 2014, Dr. Rex Weeks, Museum Curator at the Tennessee State Museum coordinated the design and installation in August 2015 of a new permanent display about the site (see "Editors Corner," *Tennessee Archaeology* 7(2):103-104). State museum staff also assisted in the design of a series of "prehistory markers" installed by Metro Nashville/Davidson County on the greenway near the new Nashville Sounds Stadium. We are pleased to see this important aspect of Nashville's prehistory highlighted with the new exhibit and signage.

FIGURE 1. New permanent exhibition on the Mississippian salt industry at the Tennessee State Museum (*Kevin E. Smith*).

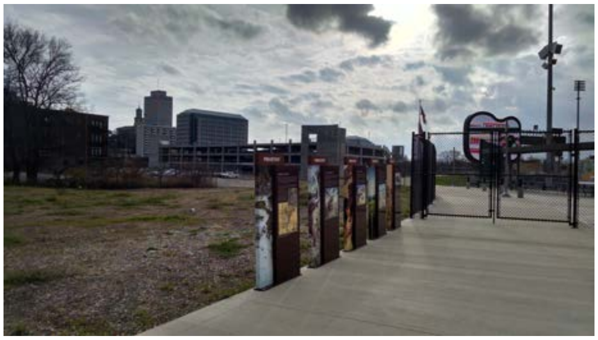

FIGURE 2. Five new "Prehistory" markers on the greenway system near the Sounds Stadium (*Rex Weeks*)

FIGURE 3. "Salt Industry" sign on the greenway (*Rex Weeks*).

During November 2015, the Southeastern Archaeological Conference met for the second time in 72 years at the Doubletree by Hilton Downtown Nashville. Hosted by the Tennessee Division of Archaeology, Middle Tennessee State University, and the Tennessee Department of Transportation, SEAC Nashville 2015 represents the tenth meeting of the conference in Tennessee: Chattanooga (2001); Knoxville (1950, 1968, 1978, 1995, 2007); Memphis (1973, 1982); Nashville (1986, 2015). Two well-attended excursions visited Old Stone Fort State Archaeological Park in Manchester and Wynnewood State Historic Site and the Castalian Springs Mounds State Archaeological Area in Castalian Springs. Bulletin 58, containing the papers and abstracts of the 2015 Nashville conference, is archived by the Southeastern Archaeological Conference:

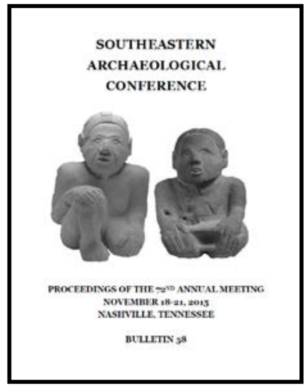

FIGURE 4. SEAC Nashville 2015 Conference Bulletin

http://www.southeasternarchaeology.org/publications/seac-bulletins/.

FIGURE 5. SEAC Reception at the Tennessee State Museum (*Phillip Hodge*)

A memorable conference event was the Thursday evening reception at the Tennessee State Museum attended by an estimated 500+ southeastern archaeologists. On display was the temporary exhibition "ANCESTORS: Ancient Native American Stone Sculptures of Tennessee" (31 Oct 2015-15 May 2016). ANCESTORS was the first major temporary exhibition of Tennessee's prehistoric artifacts by the state museum in recent years. Curated by Rex Weeks of the Tennessee State Museum with assistance from guest curators Kevin E. Smith (Middle Tennessee State University) and Robert V. Sharp, the exhibition assembled 28 of the Tennessee-Cumberland style statuary – including 14 from the Smithsonian Institution, two from the Metropolitan Museum of Art in New York City, two from the McClung Museum of Natural History and Culture, five from the state museum's collections, and five that are held in private collections. A centerpiece of the exhibition was the assembly for the first time in the modern era of all four statues from Sellars Farm State Archaeological Area (40WI1). Sellars is managed by Long Hunter State Park and is open to the public during daylight hours for self-guided tours. The curators are planning to issue a post-exhibition catalog including updated information resulting from new and on-going research in the future.

FIGURE 6. Four statues from Sellars Farm State Archaeological Area greeting visitors to the exhibition (*Kevin E. Smith*).

We also take this opportunity to recognize the passing of two valued contributors to Tennessee archaeology. We extend our condolences to their family, friends, and colleagues. They will be missed.

Robert Ashley ("Bob") Pace (26 Oct 1953-4 Mar 2015) passed away in Charleston, South Carolina at the age of 61. Born in Knoxville, Tennessee to Blanche Davis Pace and Ashe Heath Pace, he earned a degree in anthropology from the University of Tennessee. Bob's professional archaeological career spanned over 30 years, much of it spent working on projects in Tennessee. While in Knoxville, he participated in some of the early archaeological surveys during the 1980s development of Big South Fork National River and Recreation Area. Also early in his career, Bob worked for the Schiele Museum in Charlotte, North Carolina, before locating to Franklin, Tennessee where he was employed for many years by DuVall & Associates as a field archaeologist. While working for DuVall, he met Nancy Tinker and the two were married on October 19, 2003. Bob is remembered as "a gentle thoughtful man with an acerbic wit" (Obituary, *Charleston Post and Courier,* 10 Mar 2015*).*

FIGURE 7. Bob Pace on a camping trip at Big South Fork in 1983 (*Jeffrey W. Gardner*)

Robert Phillip ("Bobby") Hulan of Ashland City, Tennessee, passed away on April 30, 2015 at the age of 62. Preceded in death by his parents Granville and Billy Z. Hulan, he is survived by his wife Janet and sister Cathi Brumley (Obituary, *Nashville Tennessean*, 6 May 2015). An avocational archaeologist, Bobby is best remembered for his many contributions to the Tennessee Paleoindian Projectile Point and Site Survey and particularly at the Widemeier site (40DV9) – cited directly in four of the articles included in this volume. Of Delaware (Native American) descent, Bobby attended Cheatham County High School and was subsequently a high-steel ironworker until a four-story fall in 1978 left him disabled: "The best ironworkers are Indians… they walk one foot in front of the other. This Indian fell… I'm doing o.k. now…. I have my own business called Broken Hand Art Works" (quoted in Howard West, 2011, *Last Grand Adventure*, published in eBook format by eBookit.com, accessed 1 Jun 2016). In Bobby's own words, he was interested in "Native American Living History, all aspects of ancient man and the ability to live and survive. My grandfather taught me at an early age to live with the deep forest, not against it. I was instructed [in] the medicinal plants, herbs, and trees that my ancestors used. I still gather and apply, what I learned as a young child" (Bobby Hulan. (n.d.) *LinkedIn* [Profile page]. Retrieved 1 Jun 2016, from https://www.linkedin.com/in/bobby-hulan-bb2b8a57).

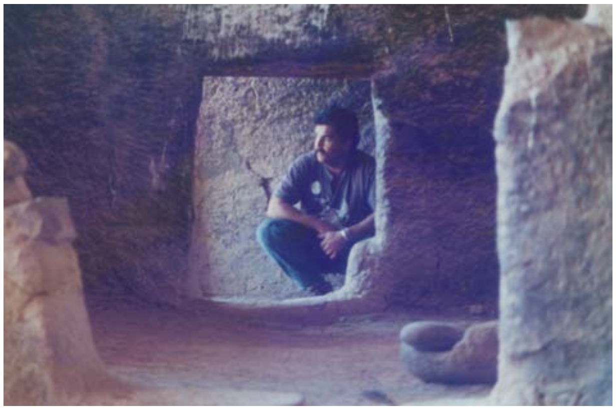

FIGURE 8. Bobby Hulan (*Photograph courtesy, Janet Hulan*).

INTRODUCTION TO THE SPECIAL VOLUME

THE OLD MAN AND THE PLEISTOCENE: JOHN BROSTER AND PALEOINDIAN ARCHAEOLOGY IN THE MID-SOUTH

D. Shane Miller and Jesse W. Tune

This double issue of *Tennessee Archaeology* is based on the symposium *Recent Research and Future Directions in Southeastern Paleoindian Archaeology* held in honor of John Broster during the Southeastern Archaeological Conference annual meeting in Tampa, Florida in 2013 (Figure 1). We were able to assemble a broad array of contributors that reflect the impact that John has had at a state, regional, and national level in regards to Paleoindian period archaeology. It is our hope that these contributions display our gratitude for the way in which John has conducted research, collaborated with colleagues, and helped dozens of students get their research off the ground. Moreover, over the course of John's career he has helped address some of the "Big Questions" in Paleoindian archaeology. We would argue that his ability to connect the archaeology of the Mid-South to broader research questions come from a lifetime of conducting fieldwork in a variety of contexts – from Oaxaca to Sante Fe to Pinson Mounds – as Moore et al. (this volume) discuss with a light dose of candid humor. Upon reading their contribution for the first time, I felt as though John's life was pulled from the pages of a novel by Ernest Hemingway, perhaps like "Santiago" from *The Old Man and the Sea* (1952) – a larger-than-life character who didn't back down from an even larger challenge. However, in John's case, his challenge wasn't reeling a 20-foot-long Marlin by hand. Instead, John went toe-to-toe with the Pleistocene and Early Holocene record of the Mid-South for a substantial portion of his career.

One of the lasting contributions from John's prolific career is that he set the tone for how Paleoindian period research should be conducted in Tennessee. First, John (and his colleague Mark Norton) have worked extensively with the public examining private collections, which led to a revitalization of the Tennessee Fluted Point Survey in the late 1980s and has since expanded to include nearly 5,500 artifacts (Broster and Norton 1992, 1996; Tune, this volume). As a result of this outreach and the lasting relationships he's built with private collectors across the state of Tennessee, John was able to locate, analyze, and publish information on several now famous sites like Carson-Conn-Short, Coats-Hines, Widemeier, Sinclair, and Puckett (Broster and Norton 1996; Broster et al. 2013). By publishing information on these sites and isolated finds through numerous journal articles and the Tennessee Fluted Point Survey (a version of which can be downloaded at http://pidba.utk.edu/tennessee.htm), John provided avenues through which Tennessee's rich Late Pleistocene and Early Holocene archaeological record could be available to a broader audience. The significance of this cannot be overstated, as it has facilitated research and collaborative partnerships across North America.

The areas where John has focused most of his attention is the lower Tennessee and middle Cumberland river

FIGURE 1. Jesse Tune, John Broster, and Shane Miller at the session in Tampa, Florida.

valleys, in particular at sites like Carson-Conn-Short (Broster and Norton 1993, 1996; Nami et al. 1996; Norton and Broster 2008; Stanford et al. 2006), Coats-Hines (Breitburg et al. 1996; Deter-Wolf et al. 2011), Johnson (Barker and Broster 1996; Broster and Barker 1992), Kirk Point (McNutt et al. 2008), Nuckolls Extension (Norton and Broster 1992), Pierce (Broster 1982), Puckett (Norton and Broster 1993), Trull (Norton et al. 1998), Twelkemeier (Broster and Norton 1990), Widemeier (Broster et al. 2006), and numerous private collections (Broster et al. 2013). It's largely because of his efforts that we now know that middle Tennessee has one of the richest Late Pleistocene and Early Holocene archaeological records in North America, both in terms of density and diversity. Parris and Finn (this volume) continue the tradition of public outreach and collections-based research with their analysis of the Jim Parris Collection in Hardin County. In addition to demonstrating where the early record is more prevalent, John's body of research has also helped us see where the early archaeological sites and Late Pleistocene fauna occurrences are rare to non-existent (Breitburg and Broster 1994; Broster et al. 2013; Lane and Anderson 2001; Maggard and Stacklebeck 2008). Consequently, we can now conclude that early sites are relatively rare at higher elevations, which makes sites like Rock Creek Mortar Shelter (Franklin et al., this volume) particularly unique and important, and allows us to begin formulating hypotheses about the spatial and temporal variability of the colonization process in the Mid-South and subsequent responses to climate change (Miller and Carmody, this volume).

John Broster's influence on Paleoindian archaeology also extends beyond Tennessee. For example, researchers in other areas of eastern North America use the record from Tennessee as an important baseline for comparison. For example, Anderson et al. (this volume) and Sain and Goodyear (this volume) are two studies focused on the Lower Atlantic Coastal Plain, and the Savannah River Valley in particular. Because buried, stratified Late Pleistocene and Early Holocene sites are so rare in the southeastern United States, sites in middle Tennessee like Carson-Conn-Short on the Lower Tennessee River and the Johnson site on the Cumberland River provide some of the only data points to begin examining the regional variability in the early record, which can then be used to evaluate models for the colonization of North America (e.g., Smallwood 2012). More broadly, Anderson (this volume) discusses in greater detail the lasting impact of John Broster on the Late Pleistocene and Early Holocene record of eastern North America. Finally, unlike Santiago from *The Old Man and the Sea*, John did not return to port empty-handed. Instead, all of the contributors to this volume would like to congratulate John on a long and fruitful career. He truly is a larger-than-life figure in the archaeology of Tennessee.

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A RETROSPECTIVE PEEK AT THE CAREER OF JOHN BERTRAM BROSTER

Michael C. Moore, Kevin E. Smith, Aaron Deter-Wolf, and David E. Stuart

This work presents an overview of the life and archaeological career of John Bertram Broster. Few people have equaled John's diverse experiences in archaeology, from his initial exploits on Mississippian sites in the Nashville area, through his graduate and early professional work in New Mexico (with side stints in Mexico, Europe, and Colorado), and concluding with his long and distinguished service with the Tennessee Division of Archaeology. John's legacy to Tennessee archaeology, aside from side-splitting tales, includes his seminal research on the Paleoindian record through explorations at such sites as Carson-Conn-Short (40BN190), Coats-Hines (40WM31), and Johnson (40DV400).

The authors were privileged to be a part of the 2013 Southeastern Archaeological Conference symposium honoring John Broster. Each one of us, as well as many of the folks reading this article, has obtained prolific insight and knowledge through working with John over the course of our own careers. We might add that a reasonable percentage of this insight and knowledge is actually related to archaeology. A variety of subjects arise in one's mind when it comes to John, including (but not limited to) guns, coins, boxing, hockey, and Mexico. This article will attempt (but not always succeed) to focus on the outstanding archaeological career of John Bertram Broster.

Early Years

John was born May 17, 1945 in Tallahassee, Florida to Roy and Mary Anne Broster. Roy served as a fighter pilot in Italy during World War II, and later enjoyed a successful career in banking. Mary Anne was a homemaker with a passion for painting. John's family moved to Tennessee when he was very young, and he lived for a time in his grandfather's house in Lewisburg as his dad commuted to work in Nashville. The family eventually moved to Nashville, where it didn't take John long to blend in with the neighborhood children. For example, he showed one kid how effective a hangman's noose can be, although the boy's mother saw what was happening and ran to the rescue. Yet, John's childhood could not be considered all fun and games. When John was eight years old, he was hit by a delivery truck and suffered a concussion along with other severe injuries that put him in a body cast.

It's possible that accident goes a long way towards explaining John's future actions and behavior. Undoubtedly other events served to influence John's outlook on life. For example, John and the senior author shared a common experience endured by select Nashville children. That would be attending Fortnightly Club, a charm school where 5th and 6th grade boys and girls from upstanding families were taught social dance and manners. Although John and senior author Moore are twelve years apart in age, we discovered the instructor (Hank Fort) and teaching methods had remained the same. An alleged highlight of the

Fortnightly experience was the formal dance held every other month. All students had to wear their Sunday-best, including white gloves for girls. The girls also had dance cards around their wrists with a line for each of the evening's 10 dances. Boys would have to approach the girls and ask for a dance, and sign the card if there was an opening. Usually by the fourth or fifth dance, none of the boys could remember whose card they had signed. However, the authors are still trying to imagine the look on each girl's face when John Broster approached to sign their dance card.

John attended Hillsboro High School in Nashville, although he actually lived outside that school zone. Hillsboro offered Spanish classes whereas his zone school did not, so John was able to attend this more prestigious institution. His activities at Hillsboro were no different than any other student, as he lingered in the school parking lot, played football, and visited the school library. Well, perhaps a little different, but decorum prevents further elucidation of his high school career. Just suffice it to say that John managed to graduate on schedule.

Post High-School Activities

Following his high school graduation in 1963, John received an appointment to the United States Merchant Marine Academy (USMMA) at Kings Point, New York. His Merchant Marine experience was short-lived, however, as John and the academy commandant agreed (for a number of reasons) that one semester was plenty of time to discern that John should follow a different career path. While John boasts of setting the all-time record for demerits, that particular statistic is not available for review on the USMMA website. He did manage to make a few memories during his brief stint. Perhaps the most lasting was sustaining a serious knee injury while playing for the USMMA football team. This particular injury could be interpreted as the proverbial "glass half-full" as it kept him out of the Vietnam War.

Upon John's return to Nashville, he spent the next several years attending Middle Tennessee State College (MTSC) and Peabody Demonstration School, and eventually received a BA degree in Sociology/Anthropology from Vanderbilt University in 1968. It was during these years that John began working on archaeological sites in the Nashville area in concert with Vanderbilt and the Southeastern Indian Antiquities Survey (SIAS), an organization founded by local amateur archaeologists that included Bob Ferguson, Buddy Brehm, and Roy Broster (Dowd and Smith 2008). This organization is better known today as the Middle Cumberland Archaeological Society (MCAS). John worked on several significant Mississippian period sites in the Nashville area (Figure 1) including Ganier, Arnold, and Sandbar Village (Broster 1972, 1988; Dowd and Broster 2012; Ferguson 1972; Smith and Moore 2013).

During this period of time, John also worked several seasons in southern Mexico on archaeological projects directed by Ronald Spores of Vanderbilt (Figure 2). The summers of 1966 and 1967, and winter/spring of 1970, were spent in the Nochixtlan Valley of Oaxaca. John recounts many fine memories of his time in Mexico, although modesty prevents any of these memories to be repeated in this work, with the exception of John contracting hepatitis and returning to the United States weighing about 130 lbs.

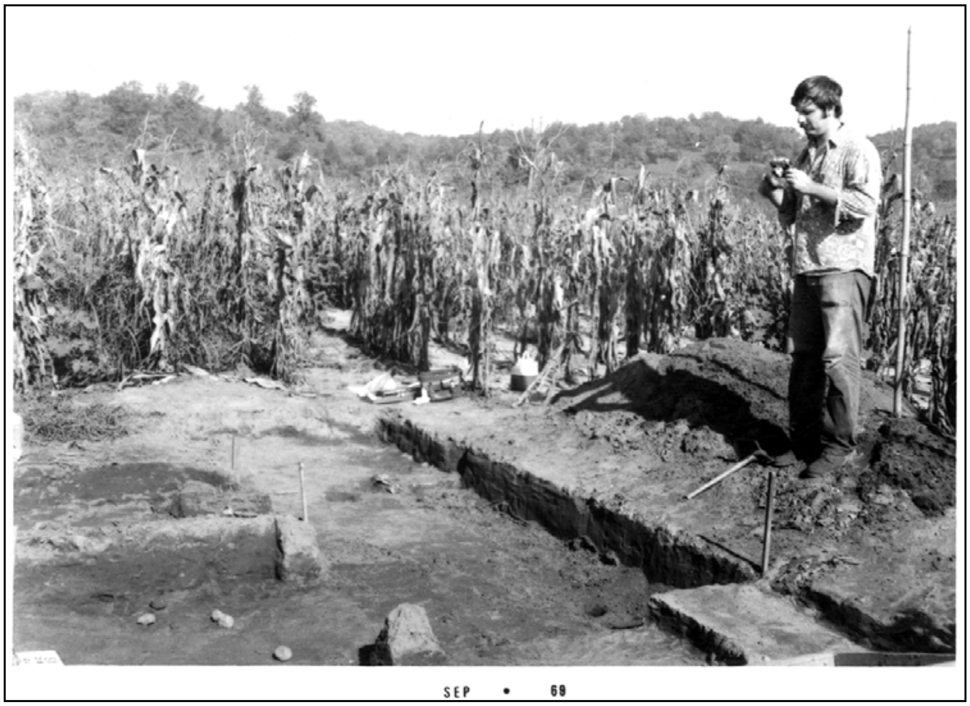

FIGURE 1. John Broster in 1969 at what would later be known as 40DV36, Sandbar Village.

FIGURE 2. John (second from left) in Mexico with Ronald Spores (far right).

Graduate School

Following his graduation from Vanderbilt, John headed west to attend graduate school at the University of New Mexico. It was there that John met two fellow grad students destined to become lifelong friends: most notably co-author and co-conspirator Dave Stuart who most recently served as interim director of the School for Advanced Research in Santa Fe (Stuart 2005), and some dude named Dennis Stanford. John took a number of classes from the infamous Lew Binford but never worked under him in the field. John did, however, help Binford build an adobe house for Binford's father-in-law. In 1971, upon receiving his MA in Anthropology, John traveled to Europe and spent four months on the crew of a University of Michigan excavation in the Netherlands.

By 1973, John had completed all coursework toward his PhD, but was looking for other opportunities. He spent the spring and summer of 1973 working with Stanford on the Smithsonian-sponsored excavation of the Jones-Miller site in northeastern Colorado (Stanford 1974, 1978), as well as excavating the Ranch 6 site in northeast New Mexico (Figure 3). The Jones-Miller excavation can't be mentioned without relating an event that should have killed a number of the field crew. The crew had dug a very deep trench outside the bone bed to conduct a geomorphological analysis. Everyone had just gotten out of the trench and was making their way to lunch when a loud rumble got their attention. It turns out that one entire wall of the trench had collapsed, twisting the ladder left in the trench like a pretzel. While perhaps just another day in the life of John Broster, sheer dumb luck had averted what would

FIGURE 3. John (at left) during 1973 work at the Jones-Miller site, Colorado.

have undoubtedly been a fatal accident.

Back to Tennessee

John had arranged to return to Tennessee by September 1973 to begin work with the Tennessee Division of Archaeology. The Division was legislatively established in 1970 under the Tennessee Department of Conservation, but did not begin hiring staff archaeologists until 1972 (Conservation merged with the Department of Environment in 1991 to create the current Department of Environment and Conservation). Division director Mack Prichard hired three regional

FIGURE 4. Three original Tennessee Division of Archaeology regional archaeologists, circa 1974. From left to right, Carl Kuttruff, John Broster, and Brian Butler.

archaeologists in 1973, with one to serve each grand division of the state. John was hired as the West Tennessee regional archaeologist, with Carl Kuttruff and Brian Butler brought on board as Middle and East Tennessee regional archaeologists, respectively (Figure 4).

John was eventually stationed at Pinson Mounds State Park, living in a small farmhouse on park property (Figure 5). He performed a number of surveys across west Tennessee, and directed the 1974 and 1975 Memphis State University (now the University of Memphis) archaeological field schools at Pinson. He also conducted investigations at the Pierce site, a Paleoindian occupation just east of Pinson in Chester County (Broster 1982). In addition to his regular Division duties, John was able to practice his pistol marksmanship on occasion, whether targeting prowlers up to no good or rats on his bedroom dresser.

Back to New Mexico

John's service with the Division of Archaeology ended in December 1975 when he returned to the University of New Mexico to work with the Office of Contract Archaeology. While a 200-mile pipeline survey consumed much of John's time, it was the 1976 Cochiti Lake project in northern New Mexico where John encountered perhaps his closest brush with death. During Thanksgiving week, John and a female co-worker had stayed to man the project field camp when an unexpected snowstorm dumped several feet of snow and dropped the temperature that had been around 60 degrees down to 25 degrees below zero. They were trapped in the camp for several days, and did everything they could to survive. Well, maybe not everything they could. When John stated they should remove their clothes and huddle in a sleeping bag for warmth (a perfectly reasonable suggestion given the dire circumstances), the co-worker replied something to the effect that she would rather be found frozen to death than get in that sleeping bag with John. Fortunately, brave colleagues risked their own lives in treacherous conditions to rescue John and the co-worker. Both suffered from hypothermia and frostbite but eventually recovered.

FIGURE 5. John and best buddies at Pinson Mounds residence, 1974.

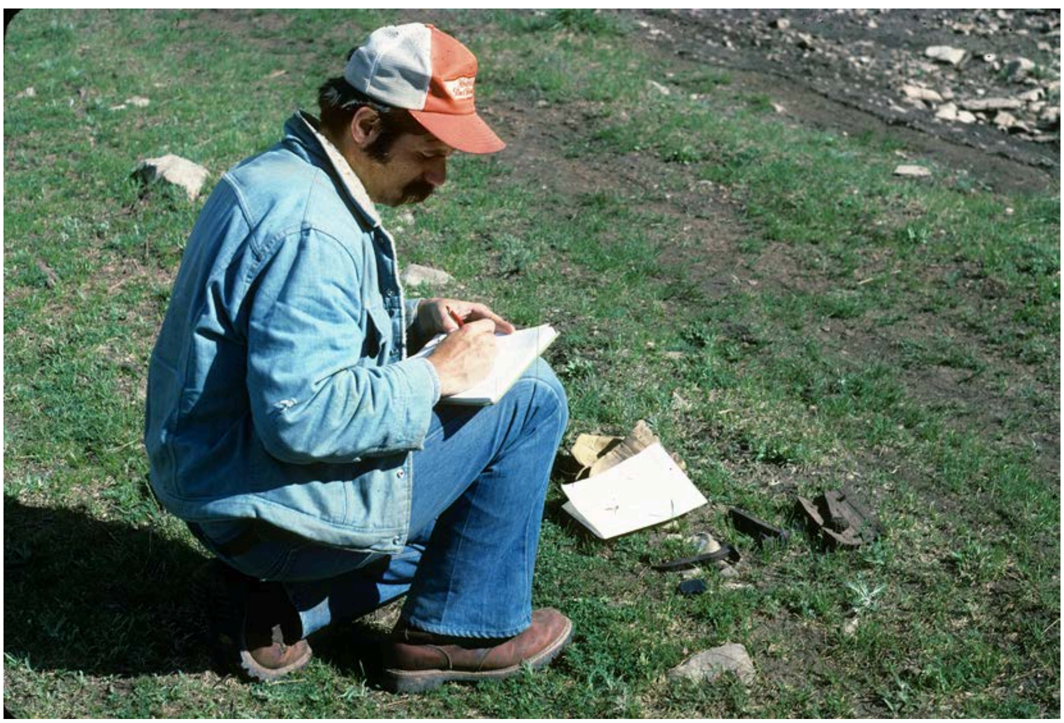

FIGURE 6. BIA survey on Mescalero Apache Reservation, 1979.

FIGURE 7. 1980 School for American Research seminar, Santa Fe, New Mexico. Top row (left to right): Ed Ladd, Bruce Harrill, Fred Plog, Linda Cordell, Dee Green, Evan DeBloois. Bottom row (left to right): John Broster, Dave Stuart, Joseph Winter, James Mueller, Richard Hevely.

In late 1977, John joined the Bureau of Indian Affairs Forest Archaeology program. His work on tribal reservations during this time included three surveys above 8000 ft. elevation (Figure 6). This particular research was the focus of an October 1980 School for American Research (SAR, later renamed the School for Advanced Research) seminar titled *High Altitude Adaptations in the Southwest*. Participants in this seminar, in addition to John and co-author Dave Stuart, were (in alphabetical order) Linda Cordell, Evan DeBloois, Dee Green, Bruce Harrill, Richard Hevely, Ed Ladd, James Mueller, Fred Plog, and Joseph Winter (Figure 7). The results of this seminar were later published by the Forest Service (Winter 1983). John was promoted to director of the Forest Archaeology program in 1981, and served in that capacity until the program was discontinued in 1983 under President Reagan's administration.

Soon afterward in 1984, John partnered with several individuals to form a private consulting firm called San Juan Basin Archaeological Consultants. The firm conducted several pipeline surveys over the next year or so, but in 1985 John left the company to again return to Tennessee.

Back (Again) to Tennessee

John and his wife Diane moved back to Tennessee, and John rejoined the Tennessee Division of Archaeology staff

FIGURE 8. 1985 Fernvale excavation, from left to right: Bob Jolley, John Broster, and Carl Kuttruff.

FIGURE 9. John and Mike Moore during 40DV35 site visit, fall 1986.

as a crew member of the Fernvale excavation project (Deter-Wolf 2013) co-directed by Carl Kuttruff and Bob Jolley (Figure 8). By January 1986, John had been promoted to SHPO Archaeologist, a position he held until June 1986 when he became the Middle Tennessee Regional Archaeologist. It was at this time the senior author was hired as SHPO Archaeologist and received his first introduction to John (Figure 9).

In October 1986, John traveled to England to present a paper titled *Paleo-Indian Use of High Altitudes in the American Southwest: Unique Training for Cultural Resource Management Archaeologists* at the 11th World Archaeological Congress in Southampton and London (Broster 1986). This presentation marked one of the last southwest-related activities of John's career.

FIGURE 10. Mark Norton and John during early years of the Tennessee Paleoindian Projectile Point and Site Survey.

During the late 1980s, John and fellow Division archaeologist Mark Norton (Figure 10) launched their seminal project known as the Tennessee Paleoindian Projectile Point and Site Survey (Breitburg and Broster 1994, 1995; Broster 1989; Broster and Norton 1990a, 1996; Broster et al. 1991a, 2013). To date, this project has successfully recorded and reported on many of the significant Paleoindian sites known in the state, including Johnson, Coats-Hines Mastodon, Carson-Conn-Short, Widemeier, Trull, Twelkemeier, Nuckolls Extension, Sinclair, and Burgess-Mabry (Barker and Broster 1996; Breitburg et al. 1996; Broster and Barker 1992; Broster and Norton 1990b, 1993, 1999, 2009; Broster et al. 1991b, 1994, 2006, 2008; Norton and Broster 1992, 2006, 2008; Norton et al. 1998, 2011). The results of this project have been disseminated through numerous journal articles, book chapters, and conference presentations. Also, in the roughly 30 years since this project first started, nearly 5500 projectile points across the state have been documented, with the information made available through the Paleoindian Database of the Americas (PIDBA) maintained at the University of Tennessee in Knoxville (Anderson 2013). Former Division archaeologists Emanuel Breitburg and the late Gary Barker deserve special recognition for their collaborative efforts on select site investigations during the course of this project.

The grand success of the paleo survey can be summed up in one word, trust. John and Mark have managed to develop lasting relationships with the amateur and collector communities through an honest approach as well as lots of hard work at society presentations and artifact shows (Figure 11). These relationships have provided countless leads regarding previously unknown Paleoindian sites and artifacts. A fact that should not go unnoticed is many of these leads had been closely guarded secrets until shared with John. In addition, John insisted on sharing the credit for discoveries and excavation results with the amateur archaeologists and collectors. Whether coming up with site names or publication authorships, John made sure to acknowledge the folks who trusted him enough to part with their information or

FIGURE 11. John with Aaron Clement.

FIGURE 12. John assisting with documentation of Mississippian structure floor exposed in road cut trench at 40DV620 (Ganier Tract site), fall 2012.

provide valuable assistance. These folks include (in alphabetical order) Richard Anderson, Dennis Burgess, Kit Carson, Aaron Clement, Gary Conn, Bobby Hulan, David Johnson, Larry Mabrey, Rex Moore, Hal Short, and Ross Sinclair.

John's archaeological work in Tennessee has not been limited to the Paleoindian period. He's not particularly motivated to highlight the fact that he has as much experience on Mississippian sites as anyone around (and more than most). In addition to his early work at Ganier, Arnold, and Sandbar Village, John assisted with Division investigations at Gordontown, Rutherford-Kizer, Sogom, Moss-Wright, Brentwood Library, and most recently the Mississippian component at the Ganier Tract site (Moore 2005; Moore and Smith 2001; Moore et al. 2006; Norton and Broster 2004). Perhaps adding insult to injury is that John's work with the senior author in October 2012 to document the exposed Mississippian features at Ganier Tract comprised one of John's last field projects (Figure 12).

Despite John's best attempts to make us believe otherwise, he was always willing to share his knowledge and interpretations with students, professional and avocational archaeologists, and anyone else with an interest in prehistory. One special example is that of a young Vanderbilt graduate student named Kevin Smith that was interested in Middle Cumberland Mississippian sites. Ron Spores turned Kevin over to John (as well as Carl Kuttruff and John Dowd) who agreed to serve as a reader on Kevin's dissertation (Smith 1992). While possibly a senior moment on John's part, his assistance and guidance to other students in the two decades to follow clearly proved that beneath the gruff exterior of John Broster lay an individual constantly seeking opportunities to improve Tennessee's archaeological record.

The Tennessee Council for Professional Archaeology (TCPA) presented John with the 2013 Career Achievement Award for Professional Archaeology to celebrate his many successes and triumphs (Figure 13). TCPA President Kevin Smith bestowed the award with these opening remarks:

> *It is…my pleasure to present a Career Achievement Award for Professional Archaeology in Tennessee to someone who has earned our respect through nearly five decades of service to our profession. We will find few publications on Paleoindians in Tennessee that do not cite the work of this individual. Indeed, we will find few major publications on Paleoindians in general that do not acknowledge his contributions of the past several decades…Over the past 25 years or so, I learned a great deal from John about field archaeology, what a Clovis point looked like, and I may have picked up a few choice words from him as well.*

Figure 13. TCPA President Kevin Smith presents John with the 2013 TCPA Career Achievement Award.

The authors would be remiss to not mention a passion of John's that, for a moment anyway, was tangentially related to archaeology. The National Hockey League (NHL) Nashville Predators began as an expansion franchise in 1997, and the mascot name and logo derive from the 1971 discovery of a saber-tooth tiger in downtown Nashville (Dowd 2010). This discovery was investigated by Vanderbilt University and the SIAS. To make a long story short, the Division of Archaeology staff participated in a 1997 trailer to promote the sale of season tickets for the new team. In this trailer, an area near the Coats-Hines Mastodon site was the scene of an archaeological investigation that ultimately discovers a pair of ice skates and a puck with the Predators logo. A professional actor was the primary focus of the trailer, with the rest of us filling out the background. John did have a brief speaking part, but was partially overdubbed on the final product. Over the next few years, John served as an off-ice official for the NHL coordinating media commercials with time outs at Predator games. The senior author recalls one game where John was holding a towel to the back of his head. Turns out he had slipped on the ice and opened up a nice gash. But, the team doctor sewed him up and he returned to his job duties--just another day in the life of John Broster.

Closing Statements

The authors have admittedly had a little fun at John's expense during this work. And he certainly deserved some payback for the roles he played in our own lives. But, this amusement has in no way diminished our collective respect for John's many accomplishments over an archaeological career spanning nearly 50 years. For the record, however, we feel his most important accomplishment was actually living long enough to enjoy retirement (Figure 14).

To close, we offer the elegant words of Ron Spores written for John's retirement from the Division of Archaeology:

Many fond memories of John and his wonderful parents…little may be known of his notable achievements during our surveys and excavations in the Nochixtlan Valley of Oaxaca, Mexico in the mid-1960s—perhaps John is trying to forget. Not only did he contribute significantly to a totally new understanding of 2500 years of Mixtec cultural development, but set new standards for consumption of soft drinks in one day. His mysterious trips… to Oaxaca on the weekends were a major component of our project in Yucuita and Yanhuitlan, and to this day remain unexplained. We were saddened to lose him in Oaxaca, but our loss certainly was to the advantage of paleoindian and archaic prehistory in Tennessee and North America. John taught us a lot, especially during those late night conferences liberally lubricated with medium-grade mescal…All praise unto the name and achievements of John B. Broster.

FIGURE 14. A smiling John Broster knows his retirement is just a few months away.

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THE PALEOINDIAN AND EARLY ARCHAIC RECORD IN TENNESSEE: A REVIEW OF THE TENNESSEE FLUTED POINT SURVEY

Jesse W. Tune

Tennessee possesses some of the densest concentrations of Paleoindian and Early Archaic artifacts in North America. As a result, it is an ideal location for research related to the early human colonization of the continent. Under John Broster's guidance, as of 2013, there are nearly 5,500 points documented in the Tennessee Fluted Point Survey. Early Paleoindian points are the most prevalent point type recorded in Tennessee. Clovis/Gainey and Cumberland/Barnes make up over 40 percent of all Paleoindian and Early Archaic points documented in the state. The highest density of Paleoindian and Early Archaic points is recorded from the Highland Rim, and accounts for approximately two-thirds of all points in the state.

Archaeologists working in Tennessee have long known that the state holds a particularly important place in Paleoindian and Early Archaic research (e.g., Lewis and Kneberg 1958; Morse et al. 1964). However, nearly three decades ago John Broster lamented that, "The lack of 'in situ' sites has done much to discourage Paleoindian studies in Tennessee. The professional community has not shown much interest in this important period" (Broster 1989:30). Unlike many western states, there is still a severe lack of intact and datable early sites in Tennessee. While there are exceptional numbers of Paleoindian and Early Archaic artifacts recorded across the state, nearly all have been recovered from disturbed or surface contexts. As a result, archaeologists outside of the state have largely overlooked the research potential here.

Due to Broster's dedication to Tennessee archaeology, and research into the Paleoindian and Early Archaic record, Tennessee is now becoming widely recognized as a key area for research related to the early colonization of North America. Furthermore, under Broster's guidance, the success of the Tennessee Fluted Point Survey (TFPS) stands as an example of the importance of collaboration between professional archaeologists and the avocational community. This paper reviews of the current status of the TFPS, and provides a summary of statewide distributions of Paleoindian and Early Archaic points.

Background

Paleoindian and Early Archaic research has a long history in Tennessee. In 1945, Thomas M. N. Lewis investigated fluted points in Tennessee that he thought to be Folsom-like. Working together with Madeline Kneberg, they continued to do Paleoindian research for several decades. In an attempt to locate intact fluted point deposits, Lewis and Kneberg (1958) investigated the Nuckolls site, along the Lower Tennessee River, and documented an extensive surface collection of Paleoindian and Early Archaic materials. In 1964 Morse and colleagues published the first map of the statewide fluted point distribution in Tennessee, which included 278 points. By 1983, Guthe reported that 389 fluted points had been recovered in Tennessee. Like Morse and colleagues, Guthe also made the prediction that this number represented only a small portion of the fluted points that would eventually be documented from Tennessee.

In 1988 John Broster, with the

Tennessee Division of Archaeology (TDOA), began intensively expanding the TFPS, with the goal of documenting Paleoindian and Early Archaic sites and collections throughout the state (Broster 1989). In turn, Broster used the data compiled in the survey to help construct regional settlement models to further assess mobility and land use strategies during the late Pleistocene (Broster and Norton 1996). The first report of the TFPS, a year into its existence, included 105 locations where fluted points had been recovered (Broster 1989). This included 58 sites where multiple Paleoindian artifacts were recovered, and 47 locations of isolated Paleoindian artifacts.

Under Broster's guidance, the TFPS has become one of the most comprehensive statewide surveys in the country. Thanks to his dedication and perseverance, the TFPS has been greatly expanded and now includes nearly 5,500 Paleoindian and Early Archaic points. This survey is exceptional because, not only does it differentiate between Paleoindian point types, but it also includes Early Archaic point forms. Adding to the significance of the TFPS is the fact that is has been made accessible for research through the Paleoindian Database of the Americas (PIDBA).

Fluted Point Survey Data

Stratified, radiocarbon-datable Paleoindian and Early Archaic sites are notoriously rare in Tennessee and the greater southeastern United States (Anderson 2005; Anderson et al. 2015; Dunnell 1990; Goodyear 1999; Miller and Gingerich 2013). As such, absolute chronologies are not addressed here. Rather, the relative typological sequence used here follows the widely accepted technological and morphological-based chronologies (Anderson and Sassaman 1996; Anderson et al. 2010, 2015; Bradley et al. 2008; Ellis and Deller 1997; Goodyear 1999; Meltzer 2009; Tankersley 1990, 1996; Tune 2016; see Gramly 2013 for alternative).

Extensive fluted point survey data have been collected by statewide surveys and compiled in PIDBA (Anderson 2004; Anderson et al. 2010; Goodyear 1999; Miller and Gingerich 2013). Potential biases and limitations are well known for PIDBA datasets such as incomplete data, sample inconsistency, site formation processes, and ground cover (Anderson et al. 2010; Ballenger et al. 2011; Prasciunas 2011). However, such data are commonly accepted for modeling certain human behaviors (Anderson and Gillam 2000; Anderson et al. 2011; Lanata et al. 2008; Meeks and Anderson 2012; Miller 2011; Shott 2013; Smallwood 2012; Smallwood et al. 2015; Tune 2016).

Methods

The distribution of Paleoindian and Early Archaic points presented here is based on the 2013 TFPS update. Spatial comparisons were made based on county-level provenience and assessed by frequencies and densities. Physiographic comparisons were made by grouping counties into eight major physiographic regions: Alluvial Plain, Coastal Plain, Highland Rim, Central Basin, Cumberland Plateau, Cumberland Mountains, Ridge and Valley, and Blue Ridge Mountains (Figure 1; Fenneman 1917). As county boundaries do not always align with physiographic boundaries, some counties fall within multiple physiographic regions. To address this situation, the area (km^2) of each county was calculated for each

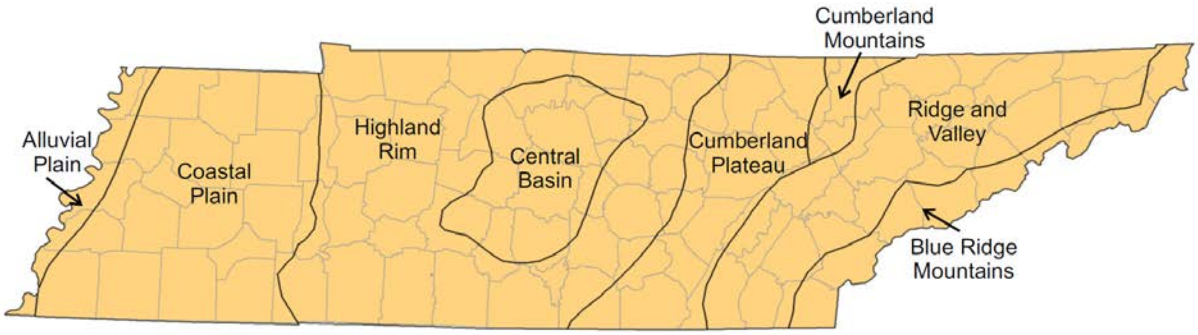

FIGURE 1. Map of the state of Tennessee showing the counties and physiographic regions referenced in this paper.

physiographic region using ArcGIS 10.2. In turn, the percentage of each county was used to estimate the number of points within each physiographic region. The overall densities for each point type are recorded by physiographic region. To account for the differing sizes of each physiographic region, point densities were scaled to 1,000 km^2. Scaling the densities provides a more accurate reflection of statewide point distributions, and enables comparisons between physiographic regions.

To address the statewide distributions of Paleoindian and Early Archaic points, artifacts are grouped into eight previously defined types. Paleoindian types consist of Clovis/Gainey, Cumberland/Barnes, Redstone, Quad, Beaver Lake, and Dalton, while Early Archaic types include Harpeth River and Greenbrier (Broster et al. 2013; Cambron 1970; Justice 1987). It should be noted that some debate exists as to the interpretation of Dalton. As this type has been previously dated to span the Pleistocene/Holocene boundary, it has been referred to as Transitional Paleoindian by some researchers (Clayton 1965; DeJarnette et al 1962; Driskell et al. 2012; Goodyear 1982; Sherwood et al. 2004).

All typological identifications of points included here were originally documented by John Broster and Mark Norton. Due to typological uncertainty that currently surrounds the distinction between Clovis and Gainey (e.g., Eren et al. 2011; Morrow and Morrow 2002), and Cumberland and Barnes (e.g., Bradley et al. 2010; Justice 1987; White 2006), the typology used here groups these forms into two types. Clovis and Gainey points are combined into a single type, as are Cumberland and Barnes points.

Paleoindian and Early Archaic Point Distributions

As of 2013, a total of 5,497 Paleoindian and Early Archaic points are recorded in the TFPS, including unspecified fragments and preforms. Of that total number, only points clearly identified to a single type with county-level provenience are used in this study, which leaves 2,712 points in the revised dataset. This includes 687 Clovis/Gainey, 451 Cumberland/Barnes, 77 Redstone, 289 Quad, 340 Beaver Lake, 316 Dalton, 103 Harpeth River, and 449 Greenbrier (Table 1).

Plotting the distribution of points by county reveals clear patterns in statewide densities. While Paleoindian point types are generally found throughout the entire state, Early Archaic points appear more restricted in distribution. The Cumberland Mountain region is the only region where Paleoindian and Early Archaic points are not currently documented. As such, this region is omitted from further analyses.

Two counties have markedly denser concentrations than the rest of the state, and warrant further discussion. Benton and Humphreys counties border the confluence of the Lower Tennessee and Duck Rivers. This portion of the Tennessee River Valley has been significantly impacted by the impoundment of the Kentucky Lake. As a result, the majority of points recovered from this area are from highly deflated shorelines (Broster et al. 1991, 1994; Lewis and Kneberg 1958). Furthermore, the TDOA, under the direction of Broster, has conducted extensive research in these two counties. Most notably, their work at Carson-Conn-Short has led to roughly 700 Paleoindian bifaces being documented, including points and preforms (Broster and Norton 1993, 1996; Broster et al. 1994, 1996, 2013).

The exceptionally high point densities also warrant consideration of potential sampling biases (see Anderson et al. 2010; Lepper 1983, 1985; Prasciunas 2011; Seeman and Prufer 1982; Shott 2002). However, Miller (2011) has demonstrated that selective recovery biases may not be a significant factor in county-level data in the region. Rather, higher concentrations of points are frequently documented at the intersections of rivers, ecotones, and lithic sources, and may reflect land-use strategies (Miller 2011). As such, the Lower Tennessee River may have simply been an ideal place to live during the Pleistocene-to-Holocene transition.

The inclusion of data from Benton and Humphreys Counties in this study would disproportionally privilege the Coastal Plain and Highland Rim regions. Table 1 presents the statewide point frequencies with and without data from Benton and Humphreys Counties. Because of the disproportional numbers of points from these two counties (approximately 47% of the entire TFPS), they are excluded from further analyses here. The exclusion of these counties further reduces the dataset analyzed here to 1,796 points, and enables a more accurate assessment of the statewide distribution of points.

Alluvial Plain

The Alluvial Plain consists of at least part of six counties, totaling 2,787 km^2. Paleoindian and Early Archaic points are relatively rare in the Alluvial Plain. Only six points are documented from this region, accounting for 0.3 percent (%) of all Paleoindian and Early Archaic points in the state. There is one Clovis/Gainey, one Beaver Lake, two Daltons, and two Greenbriers recorded (Table 2).

Table 1. Frequency of Point Types by Physiographic Region.

	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River	Greenbrier	Total
Alluvial Plain	1	0	0	0	1	2	0	2	6
Coastal Plain	160	60	20	60	36	41	16	34	427
Highland Rim	400	278	38	182	249	247	77	400	1872
Central Basin	74	79	4	26	41	18	9	10	261
Cumberland Plateau	12	12	3	8	6	3	0	1	45
Cumberland Mountain	0	0	0	0	0	0	0	0	0
Ridge and Valley	34	20	11	11	7	5	0	1	90
Blue Ridge Mountains	6	2	1	1	0	1	0	0	11
Total	687	451	77	289	340	316	103	449	2712

Table 2. Distribution of Points in the Alluvial Plain.

County	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River	Greenbrier	Total
Dyer	0	0	0	0	0	0	0	0	0
Lake	0	0	0	0	0	0	0	0	0
Lauderdale	0	0	0	0	1	1	0	2	4
Obion	0	0	0	0	0	0	0	0	0
Shelby	1	0	0	0	0	1	0	0	2
Tipton	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	1	2	0	2	6
Percent of state total	0.2	0.0	0.0	0.0	0.4	0.5	0.0	0.4	1.5

Table 3. Distribution of Points in the Coastal Plain.

County	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River	Greenbrier	Total
Benton	71	34	5	37	25	19	14	14	219
Carroll	16	1	2	2	1	6	0	1	29
Chester	4	1	0	0	0	0	0	3	8
Crockett	2	0	1	0	1	0	0	0	4
Decatur	1	2	2	1	1	0	0	3	10
Dyer	1	0	0	0	0	0	0	0	1
Fayette	0	0	0	0	0	0	0	0	0
Gibson	16	4	1	7	2	2	0	5	37
Hardeman	0	0	0	0	0	0	0	0	0
Hardin	2	2	0	0	0	0	0	1	6
Haywood	2	1	0	0	0	1	0	0	4
Henderson	1	1	1	0	0	0	0	0	3
Henry	26	3	3	11	2	7	1	6	58
Lauderdale	0	0	0	0	1	1	0	1	3
Madison	0	0	0	1	0	0	0	0	1
McNairy	7	9	5	2	2	1	1	0	27
Obion	1	0	0	0	0	1	0	0	2
Shelby	2	0	0	0	1	2	0	0	4
Tipton	1	0	0	0	0	0	0	0	1
Weakley	8	2	0	0	0	1	0	0	11
Total	160	60	20	60	36	41	16	34	427
Percent of state total	5.9	2.2	0.7	2.2	1.3	1.5	0.6	1.3	15.7

Coastal Plain

The Coastal Plain consists of at least part of 19 counties (excluding Benton County), totaling 23,102 km^2. This region has one of the highest frequencies of Paleoindian and Early Archaic points in the state. There are 249 Paleoindian and Early Archaic points currently documented in the Coastal Plain, which accounts for 13.9% of all points documented (Table 3).

Clovis/Gainey points are particularly prevalent in this region with 99 points currently documented. This represents 18.2% of all Clovis/Gainey points known throughout the state. The majority of Clovis/Gainey points from the Coastal Plain come from Henry County, followed by Carroll and Gibson Counties. The remainder are documented from Weakley, McNairy, Chester, Crockett, Hardin, Haywood, Shelby, Decatur, Dyer, Henderson, Obion, and Tipton Counties.

Cumberland/Barnes points are also frequently identified in the Coastal Plain. There are 35 points documented, representing 8.6% of all Cumberland/Barnes in the state. Cumberland/Barnes points are documented in McNairy, Gibson, Henry, Decatur, Hardin, Weakley, Carroll, Chester, Haywood, and Henderson Counties.

Eighteen Redstone points are documented in the Coastal Plain. This represents 29.5% of all Redstones currently known from Tennessee. They are documented from Carroll, Crockett, Decatur, Gibson, Hardin, Henderson, Henry, and McNairy Counties.

Twenty-six Quad points are known from the Coastal Plain, representing 14.1% of the total number recorded throughout the state. Quads are

Table 4. Distribution of Points in the Highland Rim.

County	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River	Greenbrier	Total
Bedford	1	2	0	1	2	0	0	0	5
Benton	72	34	5	37	26	19	15	14	222
Cannon	1	0	0	0	0	0	0	0	1
Cheatham	12	11	0	5	6	4	4	1	43
Clay	2	0	0	0	0	0	0	0	2
Coffee	2	4	0	1	3	3	0	0	13
Davidson	10	5	0	2	5	3	5	3	33
Decatur	1	3	2	1	2	1	0	5	15
DeKalb	5	3	0	0	2	4	0	0	14
Dickson	14	11	0	6	8	6	11	1	57
Franklin	1	1	1	0	0	0	0	1	3
Giles	3	1	1	0	0	0	0	0	5
Grundy	0	0	0	0	0	0	0	0	0
Hardin	7	6	1	1	0	2	0	2	18
Henry	1	0	0	0	0	0	0	0	2
Hickman	3	3	0	1	0	0	0	1	8
Houston	9	9	1	4	9	10	2	72	116
Humphreys	114	72	18	72	120	155	26	272	849
Jackson	2	2	0	5	14	1	1	2	28
Lawrence	15	27	3	8	2	1	0	0	56
Lewis	0	1	1	0	1	0	0	0	3
Lincoln	2	3	0	0	0	0	2	1	8
Macon	0	0	0	0	0	0	0	0	0
Marshall	1	1	0	1	0	1	0	1	5
Maury	2	3	0	1	1	2	0	1	8
Montgomery	14	14	1	6	9	6	2	2	54
Moore	0	1	0	0	0	0	0	0	1
Overton	1	2	1	1	1	1	0	0	5
Perry	1	2	0	2	1	1	0	1	8
Pickett	0	0	0	0	0	0	0	0	0
Putnam	0	1	0	1	0	0	0	0	2
Robertson	32	18	0	13	13	10	9	13	108
Sequatchie	0	0	0	0	0	0	0	0	0
Smith	2	3	0	0	0	0	0	0	6
Stewart	37	10	1	3	6	16	1	5	79
Sumner	12	14	1	4	3	1	0	1	35
Trousdale	0	0	0	0	0	0	0	0	0
Van Buren	1	1	0	1	1	0	0	0	4
Warren	10	2	1	0	9	0	0	1	23
Wayne	5	4	0	3	2	0	0	0	14
White	2	2	0	2	3	0	0	0	8
Williamson	4	2	1	1	1	2	0	2	11
Total	400	278	38	182	249	247	77	400	1872
Percent of state total	14.7	10.3	1.4	6.7	9.2	9.1	2.8	14.8	69.0

documented in Carroll, Decatur, Gibson, Hardin, Henry, Madison, and McNairy Counties.

Fourteen Beaver Lake points are documented in the Coastal Plain. This represents 6.5% of all Beaver Lakes in the state. Beaver Lakes are known from Carroll, Crockett, Decatur, Gibson, Henry, Lauderdale, McNairy, and Shelby Counties.

Twenty-six Dalton points are documented from the Coastal Plain, which represents 17.1% of all Daltons from Tennessee. They are documented in Carroll, Decatur, Gibson, Hardin, Haywood, Henry, Lauderdale, McNairy, Obion, Shelby, Tipton, and Weakley Counties.

Only two Harpeth River points are known from the Coastal Plain, which represents 3.4% of all Harpeth Rivers from the state. Harpeth River points have a very constricted distribution, occurring only in Henry and McNairy Counties.

Twenty-nine Greenbrier points come from the Coastal Plain, representing 16.2% of all Greenbriers in Tennessee. The majority comes from Carroll County, followed by Chester, Decatur, Gibson, Hardin, Henry, and Lauderdale Counties.

Highland Rim

The Highland Rim is the largest physiographic region in the state, and consists of at least part of 40 counties (excluding Benton and Humphreys Counties), totaling 33,040 km^2. More Paleoindian and Early Archaic points are documented in the Highland Rim than all other regions in Tennessee combined. There are currently 1,134 points documented from this region, accounting for 63.1% of all points in the state (Table 4).

Clovis/Gainey is the most common point type from the Highland Rim (*n*=317). This represents 58.4% of all Clovis/Gainey points currently documented in Tennessee. Clovis/Gainey points are recorded for all counties in the Highland Rim except for Grundy, Lewis, Macon, Pickett, Putnam, and Sequatchie.

A total of 258 Cumberland/Barnes points are documented from the Highland Rim. This represents 63.5% of all Cumberland/Barnes currently known from the state. The majority of Cumberland/Barnes points in the Highland Rim are from Smith, Sumner, and Lawrence Counties. The only counties in the region where Cumberland/Barnes are not documented are Cannon, Clay, Grundy, Macon, Pickett, and Sequatchie.

Twenty-four Redstones are documented from the Highland Rim, making up 39.2% of all Redstones from the state. These points have been documented from Decatur, Henry, Giles, Franklin, Hardin, Smith, Sumner, Houston, Lawrence, Lewis, Montgomery, Overton, Stewart, Warren, and Williamson Counties.

A total of 111 Quad points are known from the Highland Rim, accounting for 60.3% of all Quads in the state. These points have been documented from Robertson, Henry, Lawrence, Bedford, Davidson, Sumner, Dickson, Jackson, Montgomery, Smith, Cheatham, Houston, Stewart, Wayne, White, Decatur, Marshall, Perry, Van Buren, Williamson, Coffee, Hardin, Hickman, Maury, Overton, and Pickett.

There are 145 Beaver Lake points documented from the Highland Rim, accounting for 67.8% of all Beaver Lakes in the state. They are documented in all counties in the region except for Smith, Marshall, Henry, Trousdale, Cannon, Clay, Franklin, Giles, Grundy, Hardin, Hickman, Lincoln, Macon, Moore, Pickett, Putnam, and Sequatchie.

A total of 97 Dalton points are known from the Highland Rim, which makes up 63.8% of all Daltons in Tennessee. They are documented from Stewart, Robertson, Houston, Davidson, Henry, Dickson, Montgomery, DeKalb, Cheatham, Smith, Coffee, Maury, Williamson, Hardin, Marshall, Decatur, Jackson, Lawrence, Overton, Perry, Sumner, and Van Buren Counties.

There are 47 Harpeth River points from the Highland Rim, representing 81.0% of the total number known throughout the state. The majority are from Davidson, and Dickson Counties. The remainder is documented from Robertson, Cheatham, Houston, Lincoln, Montgomery, Henry, Jackson, and Stewart Counties.

The vast majority (75.4%) of Greenbrier points in Tennessee are from the Highland Rim (*n*=135). They are documented from Houston, Benton, Robertson, Davidson, Decatur, Henry, Stewart, Hardin, Jackson, Williamson, Montgomery, Cheatham, Dickson, Franklin, Hickman, Lincoln, Maury, Perry, Sumner, Trousdale, and Warren Counties.

Central Basin

The Central Basin consists of at least part of 18 counties, totaling 9,740 km^2. This region has the second highest concentration of points in the state. There are 261 Paleoindian and Early Archaic points documented from this region, accounting for 14.5% of the state total (Table 5).

Table 5. Distribution of Points in the Central Basin.

County	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River	Greenbrier	Total
Bedford	4	9	0	6	9	0	0	0	29
Cannon	1	0	0	0	0	0	0	0	1
Coffee	0	1	0	0	1	0	0	0	2
Davidson	20	9	0	5	9	6	9	5	63
DeKalb	1	1	0	0	0	1	0	0	3
Jackson	1	1	0	1	3	0	0	1	6
Macon	0	0	0	0	0	0	0	0	0
Marshall	1	2	0	1	1	1	0	1	7
Maury	2	2	0	0	1	1	0	0	8
Putnam	0	0	0	0	0	0	0	0	0
Robertson	0	0	0	0	0	0	0	0	0
Rutherford	4	2	1	2	4	2	0	0	15
Smith	19	29	2	6	6	4	0	0	65
Sumner	12	14	1	3	3	0	0	0	34
Trousdale	5	3	0	0	1	0	0	1	10
Williamson	3	2	0	1	1	1	0	1	11
Wilson	0	4	0	0	2	0	0	0	6
Total	74	79	4	26	41	18	9	10	261
Percent of state total	2.7	2.9	0.2	0.9	1.5	0.7	0.3	0.4	9.6

The Central Basin is the only physiographic region in Tennessee where Clovis/Gainey are not the dominant point type. There are 74 Clovis/Gainey points, which account for 13.6% of the state total. These are primarily documented in Davidson and Smith Counties, followed by Sumner, Trousdale, Bedford, Rutherford, Williamson, Maury, Cannon, DeKalb, Jackson, and Marshall.

Cumberland/Barnes points are the most frequent type documented from the Central Basin. There are 79 Cumberland/Barnes points, representing 19.5% of the total sample. These are most frequently document in Smith and Sumner Counties, followed by Bedford, Davidson, Wilson, Trousdale, Marshall, Maury, Rutherford, Williamson, Coffee, DeKalb, and Jackson.

Redstone points are the least common type found in the Central Basin. There are only four Redstones from this region, which accounts for 6.6% of the state total. They are documented from Smith, Rutherford, and Sumner Counties.

There are 26 Quad points documented from the Central Basin, accounting for 14.1% of the total sample. They occur in relatively low frequencies in Bedford, Smith, Davidson, Sumner, Rutherford, Jackson, Marshall, and Williamson Counties.

Beaver Lake points are relatively common in the Central Basin. There are 41 points, accounting for 19.2% of all Beaver Lakes documented throughout the state. They occur most frequently in Bedford and Davidson Counties, while the remainder are documented from Smith, Rutherford, Jackson, Sumner, Wilson, Coffee, Marshall, Maury, Trousdale, and Williamson Counties.

There are 18 Dalton points documented from the Central Basin. This represents 11.8% of all Daltons documented in Tennessee. They are most frequently found in Davidson County, followed by Smith, Rutherford, DeKalb, Marshall, Maury, and Williamson. Nine Harpeth River points are documented in the Central Basin and all come from Davidson County. This accounts for 15.5% of all Harpeth Rivers documented in Tennessee. Ten Greenbrier points are documented from the Central Basin, which represents 6.0% of all Greenbriers from Tennessee. They are found in Davidson, Jackson, Marshall, Trousdale, and Williamson Counties.

Table 6. Distribution of Points in the Cumberland Plateau.

County	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River	Greenbrier	Total
Bledsoe	2	0	0	0	0	0	0	0	2
Cumberland	0	1	0	0	0	0	0	0	1
Fentress	1	0	0	1	0	0	0	0	2
Franklin	1	0	0	0	0	0	0	0	2
Grundy	0	0	0	0	0	0	0	0	0
Hamilton	4	4	1	4	2	2	0	1	18
Marion	0	0	0	0	0	0	0	0	0
Morgan	1	0	0	0	0	0	0	0	1
Overton	1	1	0	0	0	0	0	0	4
Pickett	0	0	0	0	0	0	0	0	0
Putnam	0	1	0	0	0	0	0	0	1
Rhea	0	0	1	0	0	0	0	0	1
Roane	0	0	0	0	0	0	0	0	0
Scott	0	0	0	0	0	0	0	0	0
Sequatchie	0	0	0	0	0	0	0	0	0
Van Buren	1	3	0	1	2	1	0	0	8
Warren	0	0	0	0	0	0	0	0	0
White	1	1	0	1	1	0	0	0	5
Total	12	12	3	8	6	3	0	1	45
Percent of state total	0.4	0.4	0.1	0.3	0.2	0.1	0	0	1.5

Cumberland Plateau

The Cumberland Plateau consists of at least part of 18 counties, totaling 12,120 km^2. There are 45 Paleoindian and Early Archaic points documented in this region, which represents 2.5% of the state total (Table 6).

Clovis/Gainey and Cumberland/ Barnes points are documented in equal frequencies from the Cumberland Plateau, although their distributions are slightly different. There are 12 Clovis/Gainey points, which accounts for 2.2% of the state total. Hamilton County has the highest frequency of Clovis/Gainey, followed by Bledsoe, Fentress, Franklin, Morgan, Overton, Van Buren, and White. The 12 Cumberland/ Barnes points from the Cumberland Plateau represent 3.0% of all Cumberland/Barnes from Tennessee. The majority of Cumberland/Barnes come from Hamilton County, followed by Van Buren, Cumberland, Overton, Putnam, and White.

Only three Redstone points are currently documented from the Cumberland Plateau, accounting for 4.9% of all Redstones from Tennessee. They are documented from Hamilton, Rhea, and Overton Counties. Eight Quad points are known from the Cumberland Plateau, representing 4.3% of all Quads from the state. The majority of Quads are documented from Hamilton County, followed by Fentress, Van Buren, and White. Six Beaver Lakes (2.8%) are documented from the Cumberland Plateau. They were recovered from Hamilton, Van Buren, White, and Overton Counties. There are only three Daltons known from the Cumberland Plateau, which accounts for 2.0% of all Daltons in Tennessee. They are documented from Hamilton and Van Buren Counties. A single Greenbrier is documented from Hamilton County, and represents 0.5% of all Greenbriers in the state. There are no Harpeth Rivers currently known from this region.

Ridge and Valley

The Ridge and Valley region consists of at least part of 29 counties, totaling 20,066 km^2. There are 90 Paleoindian and Early Archaic points from this region, which accounts for 5.0% of the state total (Table 7).

Table 7. Distribution of Points in the Ridge and Valley.

County	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River	Greenbrier	Total
Anderson	0	0	0	0	0	0	0	0	0
Blount	0	0	0	0	0	0	0	0	1
Bradley	0	0	0	0	0	0	0	0	0
Campbell	0	0	0	0	0	0	0	0	0
Carter	1	0	0	0	0	0	0	0	1
Claiborne	0	0	0	0	0	0	0	0	0
Cocke	0	0	0	0	0	0	0	0	0
Cumberland	0	0	0	0	0	0	0	0	0
Grainger	0	0	0	0	1	0	0	0	1
Greene	2	0	0	0	1	1	0	0	4
Hamblen	3	1	0	0	0	0	0	0	4
Hamilton	9	11	4	11	4	4	0	1	44
Hancock	0	0	0	0	0	0	0	0	0
Hawkins	1	0	1	0	0	0	0	0	2
Jefferson	1	0	0	0	0	0	0	0	1
Johnson	0	0	0	0	0	0	0	0	0
Knox	4	2	3	0	0	0	0	0	9
Loudon	1	0	0	0	0	0	0	0	1
McMinn	2	2	1	0	1	0	0	0	6
Meigs	2	2	0	0	0	0	0	0	4
Monroe	0	0	0	0	0	0	0	0	0
Polk	1	0	0	0	0	0	0	0	1
Rhea	1	1	2	0	0	0	0	0	4
Roane	1	1	0	0	0	0	0	0	2
Sevier	0	0	0	0	0	0	0	0	1
Sullivan	2	0	0	0	0	0	0	0	2
Unicoi	0	0	0	0	0	0	0	0	0
Union	0	0	0	0	0	0	0	0	0
Washington	3	0	0	0	0	0	0	0	3
Total	34	20	11	11	7	5	0	1	90
Percent of state total	1.2	0.7	0.4	0.4	0.3	0.2	0.0	0.1	3.3

Clovis/Gainey are the dominant point type in the Ridge and Valley region. There are 34 Clovis/Gainey points, accounting for 6.2% of the state total. Hamilton County has the highest frequency, followed by Knox, Washington, Greene, McMinn, Meigs, Sullivan, Carter, Hawkins, Jefferson, Loudon, Polk, Rhea, and Roane.

Cumberland/Barnes is the second most abundant point type in the Ridge and Valley region with 20 points, which account for 4.9% of the state total. The majority is documented from Hamilton County, followed by Knox, McMinn, Meigs, Hamblen, Rhea, and Roane.

Redstone and Quad points are documented in equal numbers from this region with 11 points of each type. This accounts for 18.0% of all Redstones documented in Tennessee. Redstone points are known from Hamilton, Knox, Rhea, Hawkins, and McMinn Counties. Six percent of all Quads in Tennessee are documented from this region and all are from Hamilton County.

There are seven Beaver Lake points from the Ridge and Valley region, which represents 3.2% of the state total. They are documented from Hamilton, Grainger, Greene, and McMinn Counties. There are five Dalton points from this region, accounting for 3.3% of all Daltons in Tennessee. They are documented from Hamilton and Greene Counties. Only a single Greenbrier has been documented for this region and comes from Hamilton County. This represents 0.5% of all Greenbriers in the state. There are no Harpeth River points currently documented from the Ridge and Valley region.

Blue Ridge Mountains

The Blue Ridge Mountains consists of at least part of 13 counties, totaling 6,372 km^2. Paleoindian and Early Archaic points

Table 8. Distribution of Points in the Blue Ridge Mountains.

County	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River	Greenbrier	Total
Blount	0	1	1	1	0	0	0	0	2
Carter	0	0	0	0	0	0	0	0	0
Cocke	0	0	0	0	0	0	0	0	0
Greene	1	0	0	0	0	0	0	0	1
Jefferson	0	0	0	0	0	0	0	0	0
Johnson	1	0	0	0	0	0	0	0	1
McMinn	0	0	0	0	0	0	0	0	0
Monroe	0	0	0	0	0	1	0	0	1
Polk	2	1	0	0	0	0	0	0	3
Sevier	1	1	0	1	0	0	0	0	2
Sullivan	0	0	0	0	0	0	0	0	0
Unicoi	1	0	0	0	0	0	0	0	1
Washington	0	0	0	0	0	0	0	0	0
Total	6	2	1	1	0	1	0	0	11
Percent of state total	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3

occur in low frequencies in the Blue Ridge Mountain region of eastern Tennessee. There are 11 points accounting for only 0.6% of the state total (Table 8). There are six Clovis/Gainey points (1.1%) from Polk, Greene, Johnson, and Sevier Counties. Two Cumberland/Barnes points (0.5%) are documented from Polk and Sevier Counties. There is a single Redstone (1.6%) from Blount County, one Quad (0.5%) from Sevier, and one Dalton (0.7%) from Monroe County. There are no Beaver Lake, Harpeth River, or Greenbrier points documented from this region.

Point Frequency by Physiographic Region

The overall frequencies of points by physiographic region further illustrate patterns in statewide distributions. The vast majority of all points occurs in the Highland Rim (63.1%). The Central Basin (14.5%) and Coastal Plain (13.9%) have roughly equal frequencies of points. Points from these three regions make up over 90% of all Paleoindian and Early Archaic points documented in the state. The Ridge and Valley, Cumberland Plateau, Blue Ridge Mountains, and Alluvial Plain have much smaller frequencies, cumulatively totaling 8.4% of all points.

Assessing the frequencies and percentages of individual point types by physiographic region provides additional explanation (Table 9). The frequencies of points differ significantly by physiographic region (X^2=135.727, *df*=42, *p*=<0.001). In the Alluvial Plain all point types occur very near expected frequencies. A similar pattern is evident in the Blue Ridge Mountains where Clovis/Gainey occur slightly more frequently than expected, but all other point types occur very near the expected frequencies.

Clovis/Gainey occurs more frequently than expected in the Coastal Plain, Ridge and Valley, and the Blue Ridge Mountains, and less frequently than expected in the Highland Rim. Clovis/Gainey occur near expected frequencies in the Central Basin and Cumberland Plateau. Cumberland/Barnes occur more frequently than expected only in the Central Basin, and less frequently than expected in the Coastal Plain. They are documented at nearly expected frequencies in all other regions. Redstones occur more frequently than expected in the Coastal Plain and Ridge and Valley, and less frequently than expected in the Highland Rim and Central

Table 9. Frequency of Points by Physiographic Region.

		Alluvial Plain	Coastal Plain	Highland Rim	Central Basin	Cumberland Plateau	Ridge and Valley	Blue Ridge Mountains	Total
Clovis/Gainey									
	Count	1	160	400	74	12	34	6	687
	Expected	1.5	108.1	474.1	66.1	11.4	22.9	2.8	687
	% of point typ	0.2	23.3	58.2	10.7	1.8	4.9	0.9	100
Cumberland/Barnes									
	Count	0	60	278	79	12	20	2	451
	Expected	1.0	71.0	311.2	43.4	7.5	15.0	1.8	451
	% of point typ	0.0	13.2	61.7	17.5	2.6	4.5	0.5	100
Redstone									
	Count	0	20	38	4	3	11	1	77
	Expected	0.2	12.1	53.1	7.4	1.3	2.6	0.3	77
	% of point typ	0.0	25.6	49.4	5.6	4.1	14.5	0.7	100
Quad									
	Count	0	60	182	26	8	11	1	289
	Expected	0.6	45.5	199.4	27.8	4.8	9.6	1.2	289
	% of point typ	0.0	20.9	63.0	8.8	2.9	4.0	0.4	100
Beaver Lake									
	Count	1	36	249	41	6	7	0	340
	Expected	0.7	53.5	234.6	32.7	5.6	11.3	1.4	340
	% of point typ	0.4	10.6	73.3	11.9	1.7	2.1	0.1	100
Dalton									
	Count	2	41	247	18	3	5	1	316
	Expected	0.7	49.7	218.1	30.4	5.2	10.5	1.3	316
	% of point typ	0.5	12.9	78.0	5.6	0.9	1.7	0.2	100
Harpeth River									
	Count	0	16	77	9	0	0	0	103
	Expected	0.2	16.2	71.1	9.9	1.7	3.4	0.4	103
	% of point typ	0.0	15.9	74.9	9.2	0.0	0.0	0.0	100
Greenbrier									
	Count	2	34	400	10	1	1	0	449
	Expected	1.0	70.7	309.9	43.2	7.4	15.0	1.8	449
	% of point typ	0.4	7.6	89.2	2.3	0.2	0.3	0	100
Total									
	Count	6	427	1871	261	45	89	11	2712
	Expected	5.9	426.8	1871.5	260.9	44.9	90.3	11.0	2712
	% of points	0.2	15.7	69.0	9.6	1.7	3.3	0.4	100

Basin. They occur near the expected frequency in the Cumberland Plateau. Quads occur slightly more frequently than expected in the Cumberland Plateau, and slightly less frequently than expected in the Highland Rim. They are near expected frequencies in the Coastal Plain, Central Basin, and Ridge and Valley. Beaver Lakes occur more frequently than expected in the Highland Rim and Central Basin, and less frequently than expected in the Coastal Plain and Ridge and Valley. They are very near the expected frequency in the Cumberland Plateau. Daltons occur slightly more frequently than expected in the Coastal Plain, and slightly less frequently than expected in the Central Basin and Ridge and Valley. They occur at nearly expected frequencies in the Highland Rim and Cumberland Plateau. Harpeth Rivers only occur more frequently than expected in the Highland Rim, and only less frequently than expected in the Coastal Plain. They occur very near the expected frequencies in all other regions. Greenbriers occur at higher than expect frequencies in the Highland Rim and Coastal Plain, and lower than expected in all other regions.

Point Densities by Physiographic Region

To further interpret the distribution of Paleoindian and Early Archaic points, the densities of points were scaled to account for differing sizes of physiographic regions (Table 10). The cumulative density of all

Table 10. Density of Points (per 1,000 km^2) by Physiographic Region.

	Area (km^2)	Clovis/Gainey	Cumberland/ Barnes	Redstone	Quad	Beaver Lake	Dalton	Harpeth River
Alluvial Plain	2,787	0.48	0.00	0.00	0.00	0.47	0.60	0.00
Coastal Plain	23,102	4.29	1.52	0.78	1.13	0.61	1.13	0.09
Highland Rim	33,040	9.59	7.81	0.73	3.36	4.39	2.94	1.42
Central Basin	9,740	7.57	8.12	0.44	2.62	4.17	1.82	0.97
Cumberland Plateau	12,120	1.00	0.97	0.26	0.70	0.47	0.23	0.00
Ridge and Valley	20,066	1.68	1.01	0.55	0.57	0.35	0.27	0.00
Blue Ridge Mountains	6,372	0.97	0.32	0.09	0.19	0.04	0.12	0.00
Total	109,147	25.58	19.74	2.86	8.57	10.49	7.12	2.48

Paleoindian and Early Archaic points throughout the state is 84.00 points per 1,000 km^2. The overall pattern corresponds well to the statewide county densities. The highest density of each point type occurs in the Highland Rim. The density of Clovis/Gainey points in the Highland Rim is 9.59 points per 1,000 km^2, followed by the Central Basin (7.57 per 1,000 km^2), Coastal Plain (4.29 per 1,000 km^2), and Ridge and Valley (1.68 per 1,000 km^2). The same pattern is evident in Cumberland/Barnes, which occur in nearly equal densities in the Central Basin (8.12 per 1,000 km^2) and Highland Rim (7.81 per 1,000 km^2), followed by the Coastal Plain (1.52 per 1,000 km^2) and Ridge and Valley (1.01 per 1,000 km^2).

Redstone points occur in densities of less than one point per 1,000 km^2 in all regions. Quad points occur in the highest density in the Highland Rim at 3.36 per 1,000 km^2, followed by the Central Basin (2.62 per 1,000 km^2) and Coastal Plain (1.13 per 1,000 km^2). All other regions Quad occurs less than one point per 1,000 km^2. Beaver Lake points occur in nearly equal densities in the Highland Rim (4.39 per 1,000 km^2) and Central Basin (4.17 per 1,000 km^2). They occur below one point per 1,000 km^2 in all other regions. The highest density of Dalton points occurs in the Highland Rim (2.94 per 1,000 km^2), followed by the Central Basin (1.82 per 1,000 km^2) and Coastal Plain (1.13 per 1,000 km^2) at nearly equal densities.

Harpeth River points occur at approximately one point per 1,000 km^2 in the Highland Rim (1.42 per 1,000 km^2) and Central Basin (0.97 per 1,000 km^2). Greenbrier has the highest density in the Highland Rim (4.09 per 1,000 km^2) followed by the Coastal Plain (1.26 per 1,000 km^2) and Central Basin (1.08 per 1,000 km^2).

Conclusion

Thanks to a career of hard work and guidance by John Broster, an extensive dataset now exists that can be used to address broad archaeological questions related to the initial human colonization of North America. The TFPS is one of the most comprehensive statewide surveys in North America. Not only does this survey differentiate between Paleoindian point types, but it also includes Early Archaic types. While this dataset may focus on the archaeological record of Tennessee, it is relevant to research throughout North America.

Significant differences exist in the frequencies and regional densities, as well as distributions of Paleoindian and Early Archaic points throughout Tennessee. There appears to be a general reduction in the overall frequencies of points over time in Tennessee from the Paleoindian through the Early Archaic. However, Redstone, assumed to be a Middle Paleoindian type, is the least common Paleoindian and Early Archaic point type in Tennessee.

Paleoindian and Early Archaic points are concentrated toward the center of the state, with an overwhelming majority of all points documented from the Highland Rim, Coastal Plain, and Central Basin. Over 50% of every Paleoindian and Early Archaic point type documented in Tennessee, except Redstone, comes from the Highland Rim. While this is the largest physiographic region in Tennessee, scaling point densities to account for differing region sizes further supports the significance of this region.

Determining if the apparent patterns observed in the Paleoindian and Early Archaic record of Tennessee reflect actual trends in prehistoric adaptations is complicated by the lack of buried and radiocarbon-datable sites. Until assumed typological chronologies are supported by archaeological evidence, questions will remain as to the relationships between individual point types.

The hard work of John Broster has resulted in the documentation of a substantial Paleoindian and Early Archaic record in Tennessee. The success in compiling such a comprehensive statewide survey stands as an example of the importance in working closely with avocational groups. It is now up to others to continue this work and build upon its legacy.

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QUANTIFYING REGIONAL VARIATION IN TERMINAL PLEISTOCENE ASSEMBLAGES FROM THE LOWER TENNESSEE RIVER VALLEY USING CHERT SOURCING

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The study examines the distribution of Terminal Pleistocene/Early Holocene groups in the Lower Tennessee River Valley by chert resource selection. The source data obtained via provenance analysis of 349 Middle/Late Paleoindian and Early Archaic bifaces potentially provides a method to differentiate hunter-gatherer groups through resource selection decisions. Periodic aggregation of Late Paleoindian groups is tentatively offered as an explanation for 'exotic' chert resources found within eight site assemblages. Analysis of the undocumented Late Paleoindian component of the Jim Parris collection compliments John Broster's legacy of collaboration. John's pioneering work with avocationalists in recording the spatial distribution of Paleoindian sites inspires a new generation of researchers.

The archaeological record rarely permits the analysis of individual social units segregated both spatially and temporally due to mixing of multiple cultural components, taphonomic conditions, limitations of radiometric dating techniques, and a slew of other natural and anthropogenic variables. One method in which archaeologists attempt to delineate cultural units in the prehistoric material record is through the categorization of chronologically diagnostic stone tools. These stone tool 'forms' are thought to have been influenced by environmental, technological, and social variables. The knowledge of how to manufacture stone tools was certainly not biological, rather lithic technology was a learned skill and therefore inherently embodies cultural traditions. The current study seeks to identify distinct Terminal Pleistocene/Early Holocene (TPEH) culture groups within the Lower Tennessee River Valley by utilizing standard biface typologies and chert sourcing. The objective is to present a model by which researchers can define unique hunter-gatherer groups by form and their lithic resource selection decisions.

The transition from the late Pleistocene to early Holocene environments and the possible cultural response to this climatic shift in the Southeastern United States has left researchers with a unique challenge in interpreting the archaeological record of the region. The Western Valley or the Lower Tennessee River Valley (LTRV) is a unique setting to study cultural adaptation to climatic stabilization of the early Holocene as the region lies along a convergence zone between the Coastal Plain and Highland Rim biomes. However, the LTRV in Hardin County, Tennessee has received relatively little attention among professional archaeologists even though it is known by the avocational community to contain extensive cultural deposits.

Prior to the documentation of the Jim Parris collection there existed a gap in the known archaeological record of the Paleoindian to Early Archaic periods in the LTRV within Hardin and the surrounding counties. The middle section of the Tennessee River and Pickwick Reservoir immediately to the south in northern Alabama has undergone extensive archaeological testing and contains significant Paleoindian and Early Archaic documented deposits (Cambron 1956, 1958; Cambron and Hulse 1960; DeJarnette et al. 1962; Driskell 1996; Futato 1996; Hubbert 1989; Hulse and Wright 1989; Meyer 1995; Sherwood et al. 2004; Soday 1954). Similarly, the section of the valley near the Tennessee and Kentucky border to its confluence with the Ohio River has enjoyed extensive surveys (Broster and Norton 1996; Freeman et al. 1996; Rolingson 1964; Rolingson and Schwartz 1966). The Parris collection of artifacts, particularly the Paleoindian and Early Archaic assemblage, is an invaluable asset for the archaeological community and fills a large gap in our knowledge of prehistoric occupation in the LTRV.

A significant portion of the data pertaining to Paleoindian research in the Southeast has stemmed from surface collected lithic artifacts and deflated multicomponent sites many of which reside in private collections. Furthermore, since the region is lacking in stratified Paleoindian age deposits, with some noted exceptions, a majority of the areas chronology stems from typologies established by researchers working in far flung regions.

For over twenty years the Parris family surface collected artifacts from various locales in Hardin County and maintained detailed maps and notes of their finds. The Parris collection is primarily comprised of lithic materials encompassing nearly every cultural and temporal period from Paleoindian to Mississippian. The Parris' collecting activities were mainly focused along the floodplains and drainages of the Tennessee River within Hardin County. Hardin is unique because it is the only county in the state that is dissected and not bordered by the Tennessee River.

Terminal Pleistocene Hunter-Gatherers of the Southeast

We admittedly know little about Paleoindian lifeways in the Southeast. Much of what we do know comes from a few well-documented sites such as Dust Cave, Carson-Conn-Short, Topper, and Hardaway. Models for Paleoindian behavior were once reliant upon those derived from adjacent regions west of the Mississippi River and the Northeast. The comparative datasets from these regions were referenced to describe Paleoindian groups of the Southeast as highly mobile hunter-gatherers either tethered to high quality lithic sources or practicing embedded procurement strategies (Daniel 2001; Gardner 1983, 1989; Goodyear 1979; Goodyear et al. 1989). The visual assignment of chert artifacts to material type localities was used as a proxy to hypothesize large territory ranges often extending over hundreds of kilometers, a view greatly influenced by those constructed in adjacent regions. Recently this view has been refined (Anderson 1996; Anderson et al. 2015) to include a regional scale 'place-oriented' model of exploitation of resource rich river valleys.

The river valleys are currently thought to have been 'staging areas' during earlier phases of colonization in the region (Anderson 1990; Smallwood 2012). Later Paleoindian hunter-gatherer groups are viewed as utilizing smaller territory ranges centered on river valleys and adjacent uplands. This model has been constructed in part from the distribution of diagnostic artifacts and chert type identifications. Dense concentrations of diagnostic Paleoindian artifacts along both the Cumberland and Middle Tennessee

River Valleys may demonstrate that these areas were preferentially exploited during the terminal Pleistocene. Environmental reconstructions show that riverine environments in the Southeast would have provided favorable conditions for human occupation possibly earlier than adjacent areas (Delcourt and Delcourt 1985; Hollenbach 2009). A paucity of Paleoindian sites along the LTRV, where the river turns northward from the Pickwick Reservoir, previously gave researchers an inaccurate view of Paleoindian settlement. The gap in site distribution may once have been interpreted as demarcating a northern macro-band centered on the Cumberland River and a second macro-band along the Middle Tennessee River of Northern Alabama. However, the Paleoindian portion of the Parris collection fills this data gap and represents a significant contribution to our understanding of human settlement/subsistence during the TPEH.

Environmental Setting

The lower section of the Tennessee River diverts northward from its easterly route in Lauderdale and Colbert counties, Alabama. Here the river crosses the Fall line dropping in elevation at Muscle Shoals prior to the Mississippi, Alabama and Tennessee border. Flowing northward beyond the Pickwick Reservoir, the Tennessee River flanks the western edge of the Highland Rim physiographic province prior to empting into the Ohio River near Paducah, Kentucky. The LTRV flows between the Coastal Plain physiographic province of Western Tennessee and the Highland Rim of Middle Tennessee draining portions of over 12 counties. A mixed deciduous hardwood forest consisting of hickory, oak and beech trees flourish in the well-drained saprolitic soils and cherty coarse gravels.

Cryptocrystalline stone sources utilized prehistorically are found in abundance within the Highland Rim. Major chert bearing formations include the Devonian aged Camden formation, Silurian aged Brassfield formation, the Mississippian aged Fort Payne, Warsaw, St Louis, and Ste. Genevieve limestone formations. Additional sources of tool stone materials include chert gravel and cobble deposits within the Cretaceous aged Tuscaloosa and Upland Complex (formally Lafayette) gravel formations. A wide variation of color, texture, and size exists in these gravels including honey colored Fort Payne and white Camden chert. Tertiary deposits of Fort Payne (Horse Creek/Pickwick) also may take on crimson red, yellow, and black to grey staining within the iron oxide laden Cretaceous sands.

Methodology

Archaeological Sampling

A total of 519 Paleoindian and early Holocene diagnostic projectile point/ knives from 35 sites was analyzed. Only those sites (*n*=8) containing eight or more diagnostic bifaces are included in the current study so that potential patterning in chert source might be discerned within an adequate site sample. Heavily reworked samples from these eight sites numbering 101 were not included in the analysis and await additional quantitative type identification methods. Therefore, data from 349 near complete diagnostic bifaces collected from sites 40HR370, 40HR15, 40HR381, 40HR456, 40HR458, 40HR383, 40HR395, and 40PY308 are presented in Table 1.

Table 1. Bifaces Analyzed in the Study Presented by Site and by Typological Classification.

Site	Type	n	Chert type	Source region a	n	Source region b	n	Source region c	n
40Hr370									
D-8	Clovis	1	Fort Payne	W. Highland Rim, TN	1	-	-	-	-
	Cumberland	1	Fort Payne	W. Highland Rim, TN	1	-	-	-	-
	Beaver Lake	17	Fort Payne	W. Highland Rim, TN	12	N. Alabama	5	-	-
	Quad	18	Fort Payne	W. Highland Rim, TN	17	N. Alabama	1	-	-
	Greenbrier	88	Fort Payne	W. Highland Rim, TN	46	N. Alabama	21	S. Illinois	21
	Dalton	22	Fort Payne	W. Highland Rim, TN	13	N. Alabama	4	S. Illinois	5
	Stilwell	6	Fort Payne	W. Highland Rim, TN	3	-	-	S. Illinois	3
Site total		153			93		31		29
40Hr15									
H-69	Clovis	1	Fort Payne	W. Highland Rim, TN	1	-	-	-	-
	Beaver Lake	4	Fort Payne	W. Highland Rim, TN	3	-	-	S. Illinois	1
	Greenbrier	42	Fort Payne	W. Highland Rim, TN	26	N. Alabama	8	S. Illinois	8
	Dalton	7	Fort Payne	W. Highland Rim, TN	4	N. Alabama	3	-	-
	Stilwell	2	Fort Payne	W. Highland Rim, TN	1	-	-	S. Illinois	1
	Pine Tree	6	Fort Payne (1 Ste. Gen.)	W. Highland Rim, TN	4	-	-	S. Illinois	1
Site total		62			39		11		11
40Hr381									
H-16s	Beaver Lake	4	Fort Payne	-	-	-	-	S. Illinois	4
	Quad	1	Fort Payne	-	-	-	-	S. Illinois	1
	Greenbrier	34	Fort Payne	W. Highland Rim, TN	2	-	-	S. Illinois	32
	Dalton	10	Fort Payne	-	-	-	-	S. Illinois	10
	LeCroy	1	Fort Payne	-	-	-	-	S. Illinois	1
Site total		50			2		0		48
40Hr456									
H-100	Beaver Lake	2	Fort Payne	W. Highland Rim, TN	2	-	-	-	-
	Quad	1	Fort Payne	-	-	-	-	S. Illinois	1
	Greenbrier	16	Fort Payne	W. Highland Rim, TN	8	N. Alabama	2	S. Illinois	6
	Dalton	7	Fort Payne	W. Highland Rim, TN	1	N. Alabama	3	S. Illinois	3
	Stilwell	3	Fort Payne	W. Highland Rim, TN	2	-	-	S. Illinois	1
Site total		29			13		5		11
40Hr458									
H-101	Beaver Lake	1	Fort Payne	W. Highland Rim, TN	1	-	-	-	-
	Greenbrier	15	Fort Payne	W. Highland Rim, TN	12	N. Alabama	2	S. Illinois	1
	Dalton	12	Fort Payne	W. Highland Rim, TN	9	N. Alabama	2	S. Illinois	1
	Pine Tree	2	Fort Payne	W. Highland Rim, TN	1	N. Alabama	1	-	-
Site total		30			23		5		2
40Hr383									
H-69	Quad	1	Fort Payne	-	-	-	-	S. Illinois	1
	Pine Tree	6	Fort Payne	W. Highland Rim, TN	2	N. Alabama	2	S. Illinois	2
Site total		7			2		2		3
40Hr395									
H-28	Clovis	2	Fort Payne	W. Highland Rim, TN	1	N. Alabama	1	-	-
	Greenbrier	5	Fort Payne	W. Highland Rim, TN	4	N. Alabama	1	-	-
	Pine Tree	3	Fort Payne	W. Highland Rim, TN	1	-	-	S. Illinois	2
Site total		10			6		2		2
40Py308									
P-2	Greenbrier	7	Fort Payne	W. Highland Rim, TN	1	N. Alabama	1	S. Illinois	5
	Dalton	1	Fort Payne	-	-	-	-	S. Illinois	1
Site total		8			1		1		6
Total		**349**			**179**		**57**		**112**

The original numbering system used by Jim Parris is retained and listed respectively as D-8, H-69, H-16s, H-100, H-101, H-69, H-28, and P-2 for future researchers working with the collection. These site assemblages are multi-component localities; however, the Paleoindian component is a significant portion at each. Late Paleoindian projectile points were analyzed including Quad, Beaver Lake, Greenbrier and Dalton variants. Also analyzed were a small sample of Middle Paleoindian and Early Archaic types.

Chert Sampling

Geologic chert samples consist of 30 specimens from each of 76 deposits/outcrops for a total of 2,280 samples. Major material types/variants represented in the chert sample database include Ste. Genevieve/Monteagle (Wyandotte), Upper St. Louis (Cobden, Kentucky Blue), Lower St. Louis (Dover), Fort Payne (Buffalo River [Black/Tan], Bullseye), Tuscaloosa gravel (Horse Creek/Pickwick), Bangor, and Burlington. These major chert types were collected from Missouri, Illinois, Kentucky, Tennessee, Mississippi, Alabama and Georgia. Material types not currently included in the study that may potentially affect source results are Upland Complex gravels, Camden and Brassfield chert.

Recorded prehistoric quarry sites were targeted for sampling first followed by primary procurement sites, both ancient and modern in situ outcrops and alluvial deposits. Samples were obtained across both the vertical and horizontal extent of the deposit utilizing a judgmental random selection method. Geologic formation provenience was recorded by referencing USGS geologic quadrangle maps for in situ outcrops, residual and alluvial deposits. The majority of chert samples consist of materials coming from Mississippian aged carbonate formations outcropping along the Highland Rim physiographic province as well as the Interior Low Plateau and Valley and Ridge (Figure 1).

Projectile Point Typology

Projectile points included in the study displayed light to moderate reworking and indicated distinct macroscopically identifiable diagnostic attributes. Typological assignments were based primarily on Justice (1987) and Cambron and Hulse (1975) point type classifications. Heavily reworked points diagnostic of the Late Paleoindian/Early Archaic transition were not included as specific typologies could not be confidently assigned.

Chert Sourcing (VNIR and FTIR reflectance spectroscopy)

Reflectance spectroscopy techniques non-destructively record the interactions of matter and electromagnetic radiation at both the atomic and molecular scales. Reflectance spectroscopy is not a quantitative geochemical technique where macro, trace, and rare earth elements are identified and counted. The data produced is in the form of reflectance intensity data. Peaks or spectral features are indicative of sample specific atomic and molecular configuration that absorbs a portion of the incident electromagnetic radiation at a unique wavelength. Each absorption peak is indicative of atomic and molecular composition. In chert the absorption peaks relate to micro-mineral groups or impurities within the quartz matrix. However, the dominant spectral features in chert are related to the silica (SiO_2)

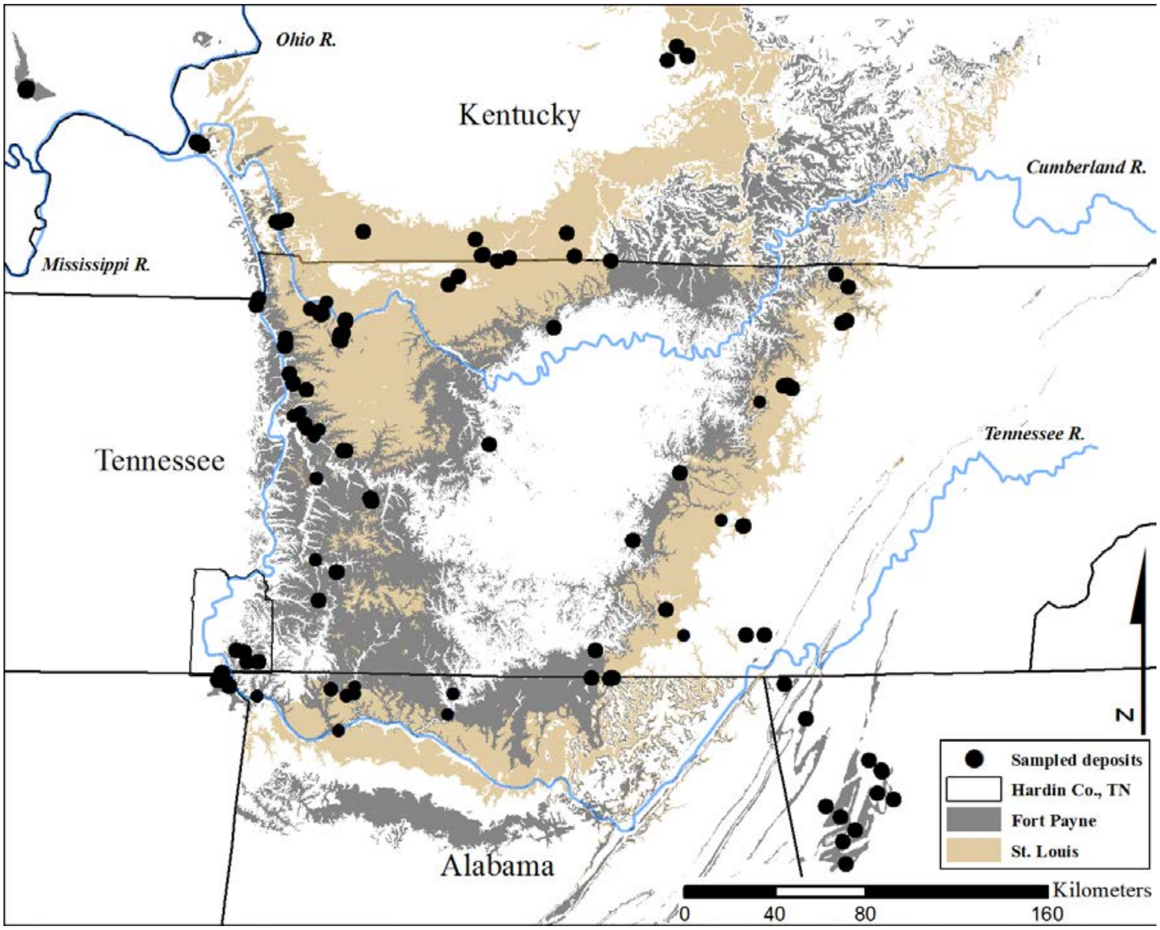

FIGURE 1. Locations of analyzed chert deposits.

molecule. Small impurities alter the shape of the silica features producing potentially diagnostic features related to the diagenetic processes affecting a particular deposit within a particular region.

Two complimentary reflectance spectroscopy techniques are utilized in the study. The first, Visible Near-infrared (VNIR) reflectance spectroscopy, records the interaction of matter with the visible and near-infrared portions of the electromagnetic spectrum. Absorption features are primarily related to atomic configuration, specifically outer valence electron fields. Fourier Transform Infrared (FTIR) reflectance spectroscopy records the interaction of matter with the middle infrared portion of the electromagnetic spectrum. Dipole bonded molecules such as SiO2 are visible as vibrational features. Both the VNIR and FTIR datasets can be mended together creating a composite spectrum of a chert sample consisting of 4,018 reflectance values each potentially diagnostic of parent formation and deposit. The chert samples comprising the database are grouped by type (i.e. geologic formation) and by deposit.

Spectral data was collected from an interior surface of each of the chert geologic samples and processed in order to highlight spectral slope changes and eliminate noise. The resulting spectra were compiled into a chert spectral database or spectral library of samples with known geologic provenience. Two accuracy tests were conducted within the chert database to investigate the ability of the spectral data to characterize the chert samples by parent formation and by deposit. The accuracy tests randomly selected a 10% sample and treated these as having unknown provenience. Discriminant function analysis was selected as the multi-variant statistical method utilized to assign unknown samples to known deposits. The accuracy of the combined reflectance spectroscopy techniques was assessed by the ability to correctly assign the 10% 'unknown' samples back to their known formations and deposits. The internal accuracy tests consistently returned results of 99% correct assignment for both parent formation and deposit provenience.

Spectra were collected from the 519 bifaces non-destructively. The results of 349 of these are reported below representing diagnostic types from eight sites. A series of three measurements were taken per artifact and later averaged in order to provide a comprehensive spectral characterization of each specimen. Where recent damage was present exposing the interior surface, a spectral reading was taken for comparison with the surficial measurement. Artifact spectra were processed in the same manner as the geologic samples again in order to standardize measurements, eliminate noise and highlight spectral features.

Results

Paleoindian Projectile Point Types

All sites exhibit a range of Paleoindian point types spanning the TPEH (Table 1). Diagnostic types analyzed include Clovis, Cumberland, Beaver Lake, Quad, Dalton and Greenbrier. Dalton variants (Dalton/ Greenbrier, Dalton/Colbert, Dalton/ Nuchols) were identified but are collectively reported together. Early Archaic types analyzed include Stilwell, Pine Tree, and LeCroy. The majority of types analyzed were those diagnostic of the Late Paleoindian with Greenbriers comprising the largest component (Table 1). The small number of Middle Paleoindian (Clovis and Cumberland) and Early Archaic types preclude definitive diachronic chert source analysis but the results are reported here to encourage future research.

Chert provenance

The results of the chert provenance data are organized into two analytical groups. The initial analysis sourced the projectile points by chert type or in other words to a geologic formation. This inter-formational provenance data describes the range of chert material types within the eight site assemblages. At both sites a reliance on Fort Payne chert dominates all other material types (Figure 2a, 2b; Table 1). A biface not identified as Fort Payne include a Pine Tree which is characterized as Ste. Genevieve. Other than this single point, a strong preference for Fort Payne resources at all eight sites is apparent. The large geologic occurrence and availability of Fort Payne chert spanning six states and 600 linear kilometers makes finer spatial source determinations necessary.

A second statistical analysis was conducted upon all projectile points typed as Fort Payne to determine the source region(s) and identify any patterns. The intra-formation analysis is designed to source the projectile points to specific areas within the formation. The 40 sampled Fort Payne deposits located from the southern tip of Illinois to the northwestern corner of Georgia including deposits in central Kentucky, central

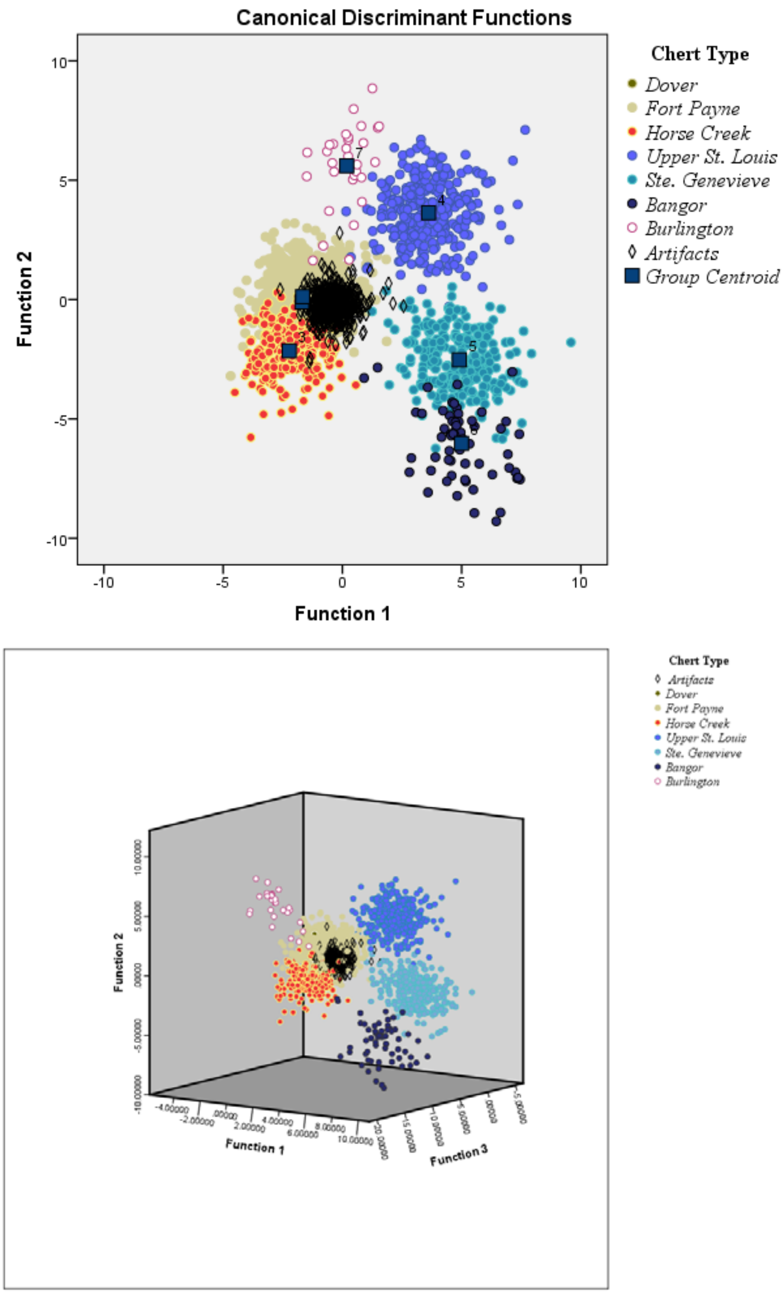

FIGURE 2. a (upper): Discriminant Function scatter plot showing the characterization of diagnostic bifaces to Fort Payne chert samples; b (lower): Three dimensional Discriminant Function scatter plot showing the characterization of diagnostic bifaces to Fort Payne chert samples. Dover group is located behind the Fort Payne.

Tennessee, the northeastern corner of Mississippi and northern Alabama were used to refine the spatial resolution of the provenance data for only those bifaces typed as Fort Payne chert.

The discriminant function analysis was rerun only including each of the 40 sampled Fort Payne Deposits as potential source deposits. Three Fort Payne source regions were exclusively identified from this intra-formation provenance assay. The Fort Payne source regions include the Western Highland Rim of Tennessee, Northern Alabama, and Southern Illinois (Table 1). The majority of all bifaces (51%, *n*=179) were manufactured from Fort Payne deposits found along the Western Highland Rim of Tennessee, specifically those deposits located in Houston, Humphreys, Hickman, and minor amounts from Henry and Wayne counties. Fort Payne deposits from northern Alabama accounted for a total of 16% (*n*=57). The third source region is located at a greater distance from the study area from deposits located at the southern tip of Illinois contributing approximately 32% (*n*=112) of all Fort Payne represented in the diagnostic biface assemblages (Table 1).

The results of the spatially refined provenance analysis broadly demonstrate a reliance upon 'local' deposits of Fort Payne chert located in close proximity to the sites. The use of local material by Middle Paleoindian inhabitants is potentially demonstrated by the source data upon Clovis and Cumberland bifaces (Table 1). The occurrence of 'non-local' Fort Payne materials from Southern Illinois do not appear in the bifaces until those diagnostic of terminal Late Paleoindian/Early Archaic times. The exception to this trend is at site 40HR381 where Fort Payne material from Southern Illinois comprises the majority of stone tool material.

Discussion

The provenance results presented here need to be contextualized from a methodological, technological, theoretical and cultural perspective. The continuing application of reflectance spectroscopy instrumentation to chert provenance research studies demonstrates the rich cultural data it provides. The benefits of reflectance spectroscopy include its relatively low cost, speed, accuracy and non-destructive potential. However, any chert sourcing technique is arguably only as good as the comparison database within which unknown artifacts are being characterized. The chert type database used in the current study consists of 2,280 samples obtained from 76 chert deposits and collectively represents seven material types. Additional sampling of local chert types including Brassfield, Camden and Upland Complex gravel sources may influence future results.

Viewing the results from a technological perspective includes recognition of the potential perils of outer 'patina' surface analysis on archaeological materials. Geochemical studies demonstrate that chemical alterations are present upon the patina surface of some chert types (Gauthier et al. 2012). Preliminary experimentation by the lead author shows that patina may in part be due to the increased angular micro-surface topography occurring on chert that has undergone mechanical and chemical weathering of mineral grains (Parish 2013). The elimination of noise-dominated regions in the visible portion of the electromagnetic spectrum appears to alleviate patina variations in the spectral data. Dual measurements obtained upon the outer and inner surfaces of artifacts exhibiting modern edge damage illustrate the minor differences that patina formation has on spectral measurements (Figure 3). However, additional studies are being conducted to explore these effects. Continuing research and development of outer surface patina effects is crucial if reflectance spectroscopy is to be used as

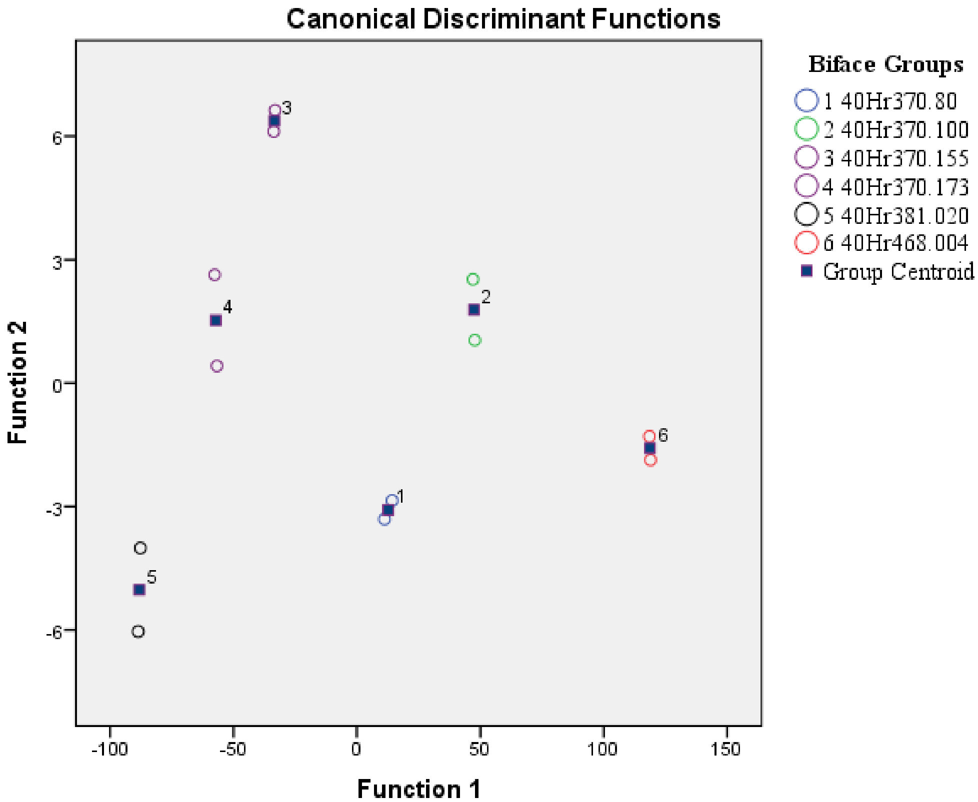

FIGURE 3. Discriminant function analysis depicting the spectral variance of interior (unweathered) vs. exterior (patina) surface measurements taken upon diagnostic bifaces with patina and modern damage exposing inner surfaces.

a non-destructive chert provenance technique.

The provenance data should be grounded in theory if human behavioral data is to be gleaned from the study. It is hypothesized that TPEH groups in the Tennessee and Cumberland River Valleys were settling into resource rich pockets, exploiting local resources, and decreasing range mobility. The large 40HR370 site, possibly located on a terrace of the Tennessee River, could represent a seasonal or periodically occupied residential base camp from which logistical forays into the Coastal Plain and Highland Rim could have been organized (Binford 1980). However, Gardner's (1983, 1989) tethered to high quality tool stone model does not seem to explain the relatively large quantities of Paleoindian diagnostic bifaces found at sites from this section of the LTRV. Currently, no known sources of high quality lithic material exist in the immediate (50 km radius) area though continued evaluation of alluvial sources may change this observation. The Yellow Creek drainage basin south of the region in Mississippi may be an exception (Johnson 1981).

A greater knowledge of the chert gravel deposits within the LTRV will almost certainly clarify our understanding of locally available tool stone resources. As noted by other researchers (Anderson et al. 2010), groups during the TPEH appear to rely more upon local chert deposits. If local exploitation of Tuscaloosa/Fort Payne gravels did occur in the region than analysis of the debitage and discarded bifaces would give us clues regarding initial reduction of river cobbles. Jim Parris on multiple times denied the appearance of large amounts of primary reduction material at these sites. A cursory examination of his collection including the unprovenienced portion reveals the paucity of early stage bifaces and cores, whether this is a function of collector bias is currently unclear. If in fact Gardner's "place-oriented" model is an adequate explanation of site location, as adopted by other researchers in the Southeast (Anderson 1996; Daniel 2001), then TPEH inhabitants may have been there for resources other than chert acquisition.

Traditionally, two main models are proposed to explain the presence of exotic chert materials in archaeological assemblages, direct and indirect acquisition. Highly (residential) mobile foragers is the commonly accepted view of both early and middle Paleoindian groups in adjacent regions. As mentioned previously, this view is challenged in the Southeast due to the spatial distribution of diagnostic bifaces and the prevalence of ubiquitous high quality chert resources. Movements of Late Paleoindian (Greenbrier and Dalton) groups and/or macro-bands are one possible explanation for the presence of Fort Payne chert from Northern Alabama and Southern Illinois. A seasonal or periodic territory range encompassing over 30,000 square kilometers narrowly defined from the confluence of the Ohio and Mississippi Rivers to the Middle Tennessee River Valley in Northern Alabama, pushes the boundaries for historically documented hunter gatherer societies (Binford 1983; Kelly 2007; Steward 1938). Even with the use of watercraft, the question remains what would draw LPEH groups northward, certainly not the relatively small deposits of Fort Payne (Elco) chert.

Indirect acquisition via down the line exchange, maintaining social networks, gifting, etc. are another explanation for the presence of exotic Fort Payne at the TPEH sites along the LTRV. Indirect acquisition is difficult to visualize and often requires additional datasets such as in depth lithic analysis of site assemblages (Meltzer 1989). However, the inhabitants of the LTRV had access to high quality deposits of chert along the Highland Rim of both Tennessee and Alabama albeit possibly not in the immediate vicinity. Indirect acquisition may not adequately explain the chert provenance patterning revealed as relatively large amounts of Fort Payne from Illinois are identified at each site. In fact at 40HR381, Southern Illinois Fort Payne comprises nearly all of the diagnostic biface assemblage. If indirect acquisition was the mechanism for the Illinois Fort Payne than one might expect smaller numbers of these exotics.

Direct acquisition during periodic subsistence rounds and indirect acquisition may not account for the data revealed in this study but the congregation of distant groups in order to exchange information is worth consideration. The series of TPEH sites along this portion of the LTRV may represent occasional congregation areas for three macro-bands centered locally along the Western Highland Rim, Northern Alabama and the confluence of the Ohio and Mississippi Rivers (Figure 4). Periodic aggregations of distant hunter gatherer groups, termed fandangos by Steward through his observations of Reese River Valley Shoshone, would have been important to peoples adjusting to shifting resources. Exchange of information, mates, and materials is documented ethnographically though in differing environmental settings (Binford

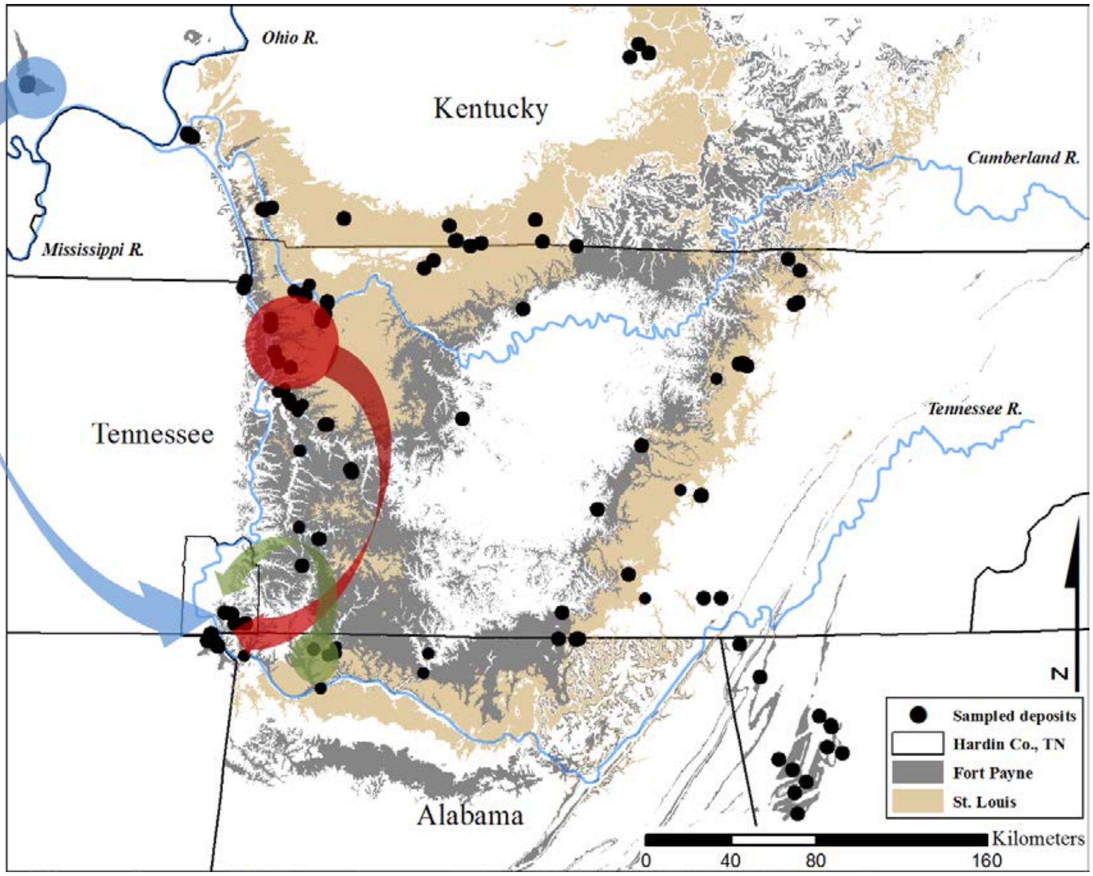

FIGURE 4. Three main Fort Payne source regions identified in the study possibly signifying periodic aggregations of three Late Paleoindian/Early Archaic macro-bands.

1983; Steward 1938; Thomas 1973). Though a tenuous explanation, periodic aggregation between macro-bands along this section of the LTRV may also account for the overabundance of Southern Illinois Fort Payne chert at sites 40HR381 and 40PY308. These sites being repeated primary camp locations for those northern bands. Only continued analysis from methodological, technological, theoretical and cultural perspectives can clarify the results presented here.

In order to test the preliminary results generated in the current study, TPEH assemblages further to the north require chert provenance analysis. Subsequent results may substantiate the use of "Elco" Fort Payne chert by TPEH groups though visual identifications upon diagnostic bifaces by other researchers suggest otherwise (Koldehoff 2013; Koldehoff and Loebel 2009; Lopinot and Butler 1981). Additionally, a complete collection and analysis of any primary reduction debitage from these sites may give clues to acquisition mechanisms. Finally, the vertical integrity of the sites needs to be assessed and the potential of intact deposits needs to be evaluated. Through future research, a greater understanding of the complex and variable record of TPEH peoples may be realized.

Conclusions

The provenance results of 349 Terminal Pleistocene/Early Holocene diagnostic bifaces from eight sites along the Lower Tennessee River Valley illustrate the almost exclusive use of Fort Payne chert resources. Deposits located along the Western Highland Rim collectively represent the majority of material as one would expect for Late Paleoindian regional foragers but a significant portion of the diagnostic bifaces are sourced to deposits in Northern Alabama and Southern Illinois. Explanations for this include methodological/technological issues related to sampling and/or analysis upon outer artifact patina surfaces, direct procurement along large territorial ranges, indirect acquisition and periodic aggregations. Currently given the large chert type database and preliminary studies regarding the effects of outer artifact surface analysis, methodological and technological concerns may be deferred. Both the size of the proposed band-group territory range and number of exotic Fort Payne materials encountered per site is taken as evidence discounting direct procurement by a single group and indirect acquisition. Therefore, it is proposed that evidence for periodic aggregation events along the LTRV during the TPEH period exists.

Apart from the interpretations regarding site function and distributions of chert materials, it is apparent that this relatively small portion of the well provenienced Jim Parris collection significantly impacts our understanding of prehistoric life along the southern reaches of the Lower Tennessee River Valley. Subsequent studies that incorporate data from the Parris collection will greatly clarify our understanding of lifeways extending back from European contact to the earliest inhabitants of Tennessee. The current study hopefully exemplifies John Broster's legacy of working with avocational archaeologists and collectors in piecing together an understanding of life at the Holocene boundary.

Acknowledgements. The authors wish to acknowledge the late Jim Parris and his family for their gracious hospitality on many occasions, enthusiasm, and love for archaeology and life. Also, we acknowledge the legacy of John Broster which continues to inspire a new generation of archaeologists. All errors, oversights, and overreaching hypotheses found within are the authors' sole responsibility. An earlier version of this was presented at the 2013 SEAC meeting in Tampa, Florida November 7-9, 2013.

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A PRELIMINARY REPORT ON THE LATE PLEISTOCENE AND EARLY HOLOCENE ARCHAEOLOGY OF ROCK CREEK MORTAR SHELTER, UPPER CUMBERLAND PLATEAU, TENNESSEE

Jay Franklin, Maureen Hays, Frédéric Surmely, Ilaria Patania, Lucinda Langston, and Travis Bow

Rock Creek Mortar Shelter (40PT209), in Pickett State Forest on the Upper Cumberland Plateau of Tennessee, possesses an intermittent 11,500 year occupation history. This history may be consistent with previous ideas of first colonization of upland rock shelter zones at the end of the Younger Dryas with significant climatic amelioration. However, culturally sterile deposits have yet to be encountered and the site may be older still. This work focuses on the late Pleistocene and early Holocene components, paying particular attention to unifacial, blade, and blade-like tool production and technology, use-wear analysis, and depositional history. Variability in blade production during the late Pleistocene deposits suggests residentially mobile family groups, and could also represent the colonizers' struggles with adapting a blade tool technology to the locally abundant small, rounded Monteagle chert cobbles.

Three field seasons have been completed at Rock Creek Mortar Shelter (40PT209) in Pickett State Forest on the Upper Cumberland Plateau (UCP). The archaeological deposits are comparatively deep and may extend back into the Paleoindian period. Radiocarbon dates suggest this to have occurred perhaps as early as 12,500 years ago but certainly by 11,500 years ago. The shelter lies at what Lane and Anderson (2001) refer to as a migration terminus - the end of early migration routes. The early occupational history of the shelter is thus far consistent with Walthall's (1998) ideas of first colonization of upland rock shelter zones at the end of the Younger Dryas with significant climatic amelioration. The site was intermittently occupied over the course of the next 11,500 years until about AD 1000.

The Upper Cumberland Plateau was likely a very different environment 12,500 years ago at the end of the Pleistocene during the Younger Dryas. Still, some early pioneers ventured their way up on the plateau, perhaps up the Wolf and/or Big South Fork river valleys that represent the ends of early migration routes as noted by Lane and Anderson (2001). As the climate ameliorated beginning about 11,600 years ago, hardwood forest communities migrated to higher elevations. People began to exploit nut mast resources and associated game animals. A seasonal round, or way of doing, was established. This way of doing things in the uplands set the tone for the next several millennia.

Site 40PT209 is important because it represents the first recorded in 20 years of work on the UCP with late Pleistocene and early Holocene deposits that appear intact and in relative stratigraphic position. The previous work includes intensive surveys of the East Fork Obey gorge (Franklin 2002, 2006), Pogue Creek Canyon State Natural Area (Langston 2013; Langston and Franklin 2011), and significant portions of Pickett State Forest (Langston et al. 2012). Culturally sterile layers have not been encountered at Rock Creek Mortar Shelter, thus it is possible that more ancient archaeological

FIGURE 1. Rock Creek Mortar Shelter looking north.

levels could be present. The shelter represents a great opportunity to examine cultural and technological change through time as Early Archaic through Late Archaic and Woodland components are present. This provides not only an extremely rare opportunity to examine colonizing exploitation in an upland region, but also allows an opportunity to examine an 11,000-year prehistoric cultural sequence at one place.

Rock Creek Mortar Shelter faces west and lies at the northern extremity of a long upland bluff line (Figure 1). The shelter is situated within the Rockcastle Conglomerate at an elevation of 464m amsl (about 1520 feet). The Rockcastle is a conglomeratic sandstone (consisting of densely packed quartz pebbles) and sandstone (with a few scattered rounded quartz pebbles), gray to brown in color, and fine to coarse-grained (Phillips et al. 2010:189). This formation ranges in thickness from about 46 to 67 meters (about 150 – 220 feet) and is typically the highest elevation formation in this area of the UCP. This high elevation rock shelter is one of tens of thousands in an upland region dominated by rugged terrain, precipitous stream gorges, and hundreds of kilometers of sandstone bluff lines. The shelter does not occur along a major river as the closest stream is Rock Creek approximately 400 meters due north. However, there is a 70-meter high bluff line that separates the rolling uplands where the shelter sits and Rock Creek (Figure 2).

Rock Creek Mortar Shelter has not been disturbed by vandals or artifact hunters, a rarity in a region with a 150-year history and tradition of artifact

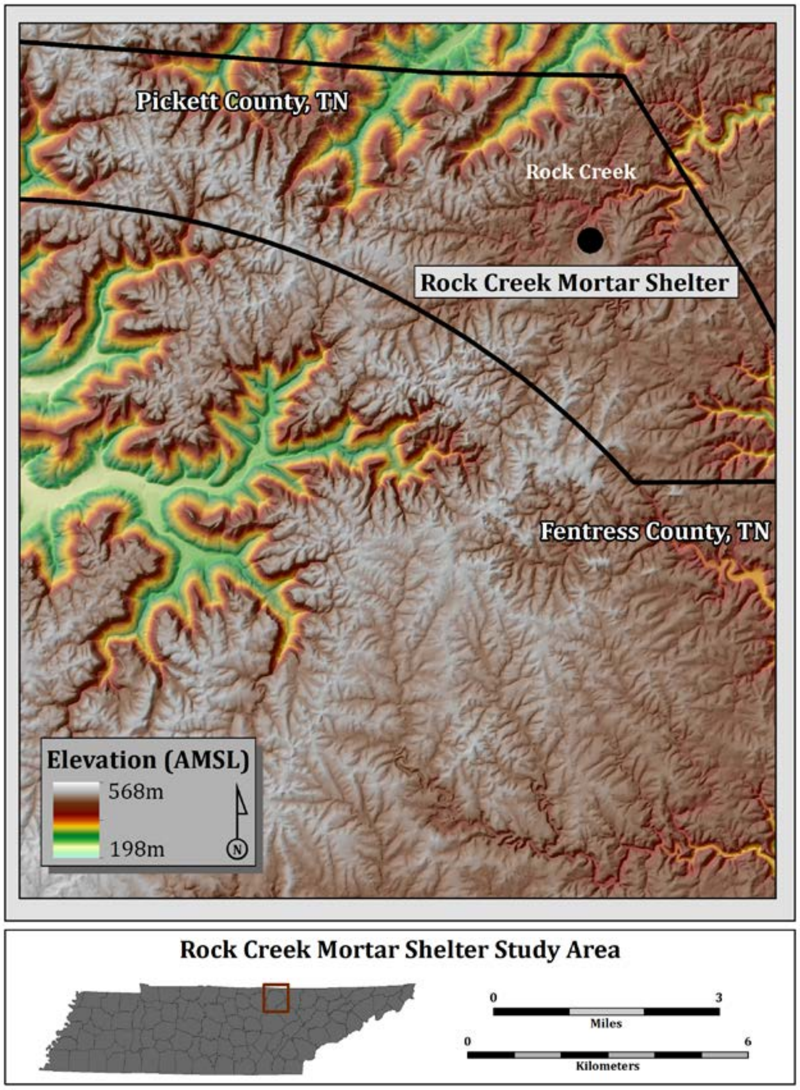

FIGURE 2. Rock Creek Mortar Shelter study area.

hunting and looting (Des Jean and Benthall 1994:139; Franklin 2002:5-6). The site is located near a primary road and Pickett State Park, and its integrity is very much in danger from illegal digging. Park personnel monitor the shelter, but it is unlikely the site can be protected indefinitely. A long term excavation program is planned in conjunction with the 2016 opening of the Pickett State Park Archaeology Museum and ETSU Archaeological Research Station. The site will be an integral part of public outreach at the park.

Rock Creek Mortar Shelter is apparently not the only early site in the Rock Creek drainage of the Little South Fork Cumberland River. Prismatic blades were recovered during survey of sites 40PT216 (open air ridge top) and 40PT241 (Hot Bluff Shelter) in 2012. Research has also recorded several additional pristine rock shelter sites, suggesting the drainage is a high value area to continue archaeological survey and seek out potential Paleoindian and Early Archaic sites.

One issue we propose to address is Lane and Anderson's (2001:92) proposition that the Upper Cumberland Plateau lies at the physiographic end of an early migration route. "There have been no research projects directed to exploring Paleoindian occupations in the area, and large-scale professional excavation of known sites is non-existent" (Lane and Anderson 2001:94). Therefore, what little we do know may actually reflect investigation bias rather than settlement preference on the part of Paleoindian populations. This notion is not surprising as "there is an understandable research bias against examining steeply sloping terrain and this. . . might reduce the likelihood of discovering Paleoindian sites" (Lane and Anderson 2001:90). However, steeply sloping terrain often includes rock shelters, and there are thousands that remain to be investigated

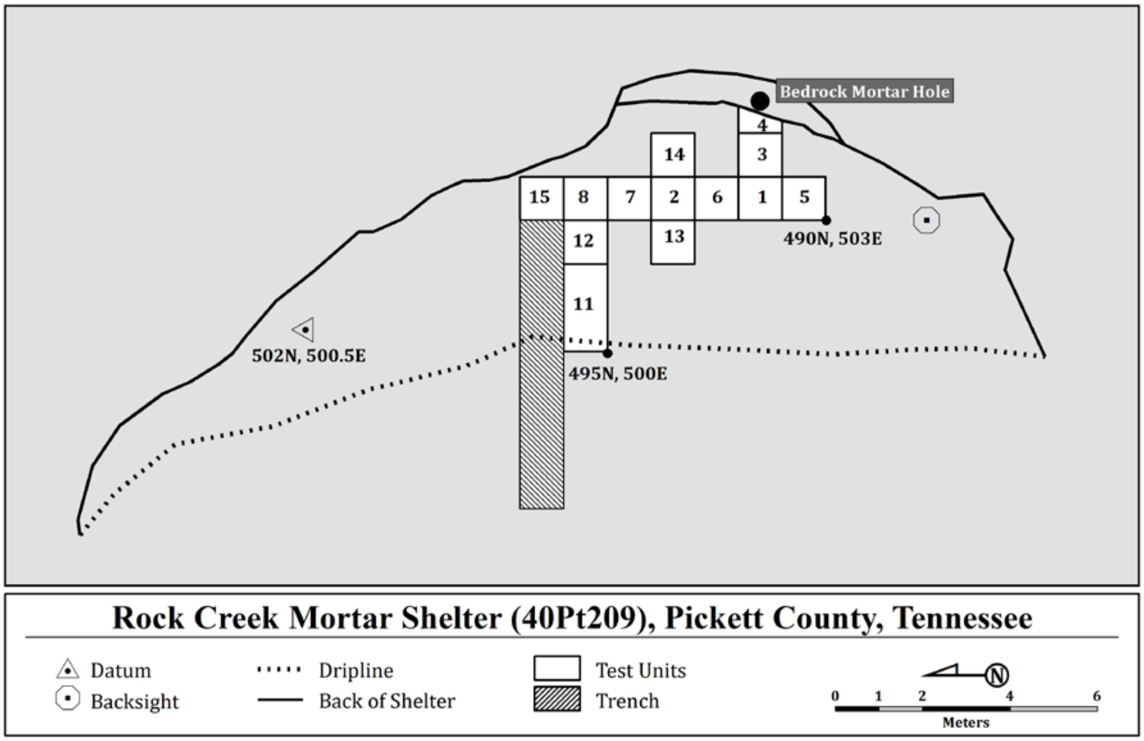

FIGURE 3. Rock Creek Mortar Shelter plan view, January 2014.

on the Upper Cumberland Plateau. The work at Rock Creek will anchor our research program aimed at the late Pleistocene and Early Holocene archaeology of the UCP.

History of Work at Rock Creek Mortar Shelter

Tennessee State Parks ranger Travis Bow discovered Rock Creek Mortar Shelter in early 2012. Two things drew his attention: (1) the presence of a large bedrock mortar hole in a back ledge, and (2) the site was pristine – something previously noted as an uncommon occurrence on the UCP. Jay Franklin visited the site with Bow in March 2012, and returned in January 2013 as part of East Tennessee State University's (ETSU) inaugural winter session field school. The focus of the field school was largely survey for new sites in Pickett State Forest, but the last few days were dedicated to test excavations at the shelter. Woodland and Late Archaic period artifacts were recovered within two test units (Units 1 and 2; Figure 3) in good stratigraphic position.

ETSU returned to the site in March 2013 for further testing. In addition to continuing with the two open test units, a 3 x 1 meter test trench was established perpendicular to the shelter's dripline axis. In this trench, at about 85 cm below surface, we encountered Early Archaic artifacts. This discovery was the first time Early Archaic materials had been discovered by ETSU in stratified contexts on the UCP. Two specimens recovered at 125 cm below surface (a double side scraper made on a blade, and a large biface with possible overshot flaking) favorably compared to Paleoindian artifacts, possibly Clovis (John Broster, personal communication, 2013).

A second winter season of archaeo-logical testing was conducted in

December 2013. The trench was extended another three meters to beyond the drip line. Also, four additional test units were opened along the same east-west line as the two previously mentioned units, in effect creating a trench running parallel to the shelter's axis (Figure 3). Numerous blades and blade fragments were recovered along with a few diagnostic bifaces. Five AMS radiocarbon assays date the late Pleistocene/early Holocene deposits at Rock Creek Mortar Shelter.

A third field season was completed in winter 2014/2015. Several more units were opened, and the trench was extended further beyond the shelter drip line. Additional blades and blade-like flakes were recovered, and the earliest diagnostic bifaces originate from the Early Archaic period. Eight additional AMS dates were obtained during Field Season 3, and all but one AMS date associate these artifacts with the Early Archaic period.

Stratigraphy

Test Units

Stratigraphy in the (eventual) 7 x 1 meter perpendicular trench appears distinct from the test units (farther back in the shelter) that run parallel with the long axis of the shelter. In the test units (Figure 4), Stratum 1 is a recent humus layer that varies between 5-10 cm thick. Stratum 2 is pale yellow to white sand about 20 cm thick in the south part of the shelter that pinches out moving northward, and appears to be the result of weathering of a sandstone ledge 2.5 meters above the surface. Stratum 2 has a horizontal extent of about two meters that is consistent with the ledge. Woodland period artifacts were recovered from the mid to lower levels of this layer.

Stratum 3 is a strong brown loamy sand layer that yielded Woodland period artifacts from the top level, and Terminal Archaic artifacts below that. Stratum 3 also yielded evidence of thin, poorly

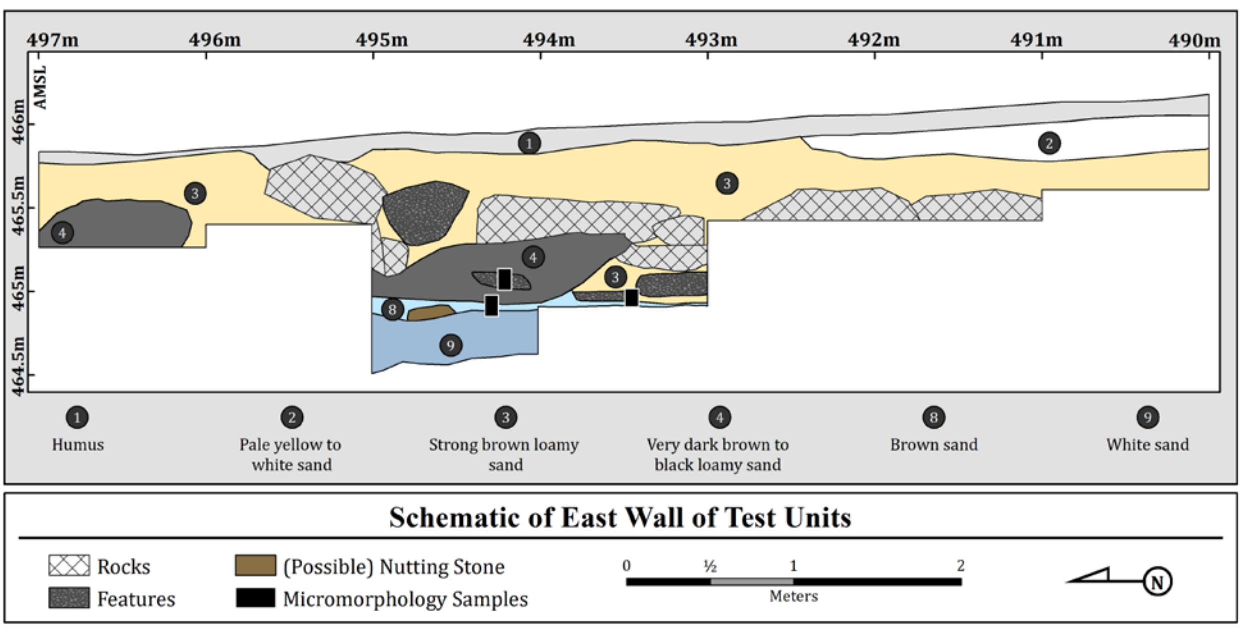

FIGURE 4. East wall profile of test units, January 2014.

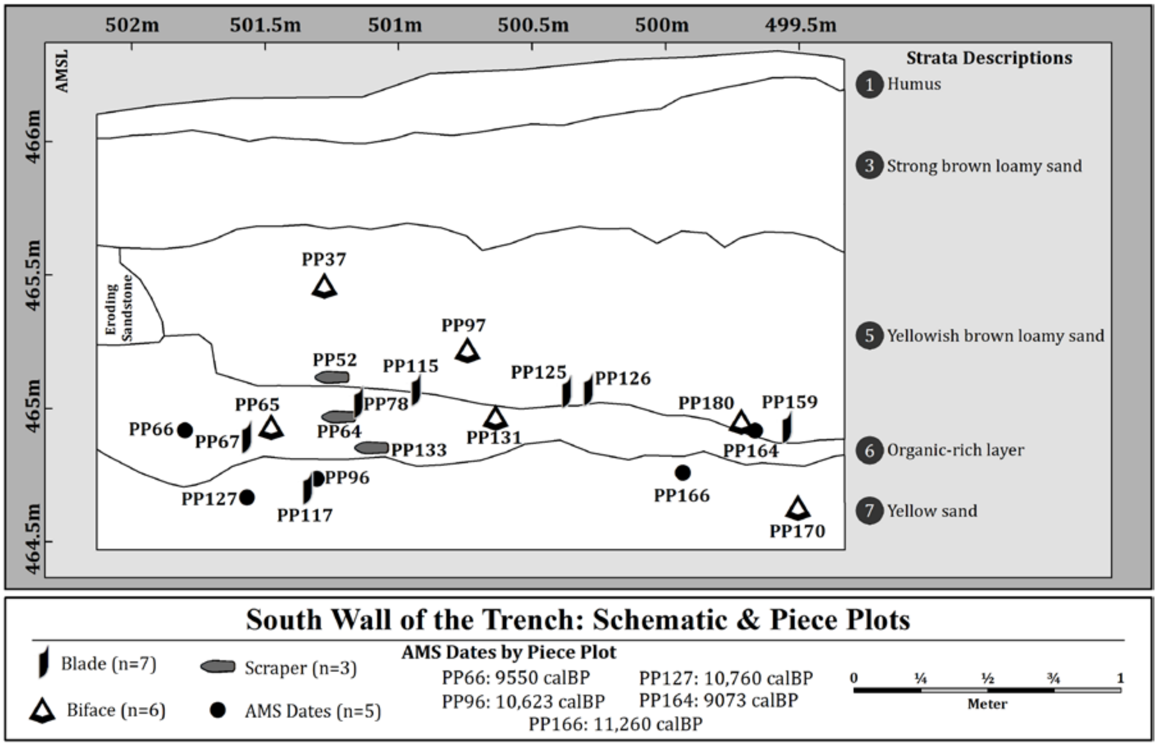

FIGURE 5. South wall profile of trench, January 2014.

preserved, prepared baked clay surfaces.

Stratum 4 comprises a rich organic, very dark brown to black loamy sand that corresponds to the Late and Terminal Archaic periods. This layer varies in thickness and extent and may be better interpreted as a midden rather than a lithostratigraphic unit. It could also be due in part to differential accumulation of organics due to significant rock fall in the shelter. Baked clay surfaces were also encountered in Stratum 4, with some (like Feature 5) better preserved than those encountered in Stratum 3. The presence of baked clay surfaces is consistent with the recovery of nutting stones in Stratum 4. Elsewhere, these surfaces have been described as having been used to parch nuts (Homsey-Messer 2015).

Below Stratum 4 is a brown sand layer defined as Stratum 8 (possibly the result of organics leaching from Stratum 4) containing Middle and Early Archaic period artifacts. Stratum 9 is composed of white sand that may correspond with Stratum 7 in the trench. A few non-diagnostic artifacts were recovered from this essentially sterile layer.

Trench

The trench stratigraphy is different than described for the test units (Figure 5). The humus layer (Stratum 1) is visible, but the yellowish white to white sand Stratum 2 is not present (the trench is removed from the weathering ledge here). Below the humus is a 20-30 cm thick, strong brown to orange brown loamy sand layer similar to Stratum 3. A large steatite bowl fragment in Stratum 3 probably dates to the Terminal Archaic period.

Below Stratum 3 is a 20-40 cm thick layer of yellowish brown loamy sand defined as Stratum 5. Early Archaic artifacts were encountered toward the bottom of this layer. Below Stratum 5 is an organic-rich layer that does not correspond to the previously noted Stratum 4 midden observed in the test units. This layer (Stratum 6) appears to result from organic materials being trapped under a massive slab of sandstone breakdown as it trails off toward the drip line and away from the slab. Early Archaic artifacts were recovered in this layer.

Below the organic-rich layer is approximately 25 cm of yellow sand (Stratum 7) that may correspond with the white sand layer (Stratum 9) in the excavation units farther back under the shelter. Stratum 7 yielded materials interpreted as transitional Paleoindian/ Early Archaic. Excavations in the trench were discontinued at 1.75 to 2.0 meters below surface. A bucket auger revealed another 62 cm of sediment below this level with more organic content and more clay in the sand. However, bedrock has yet to be reached.

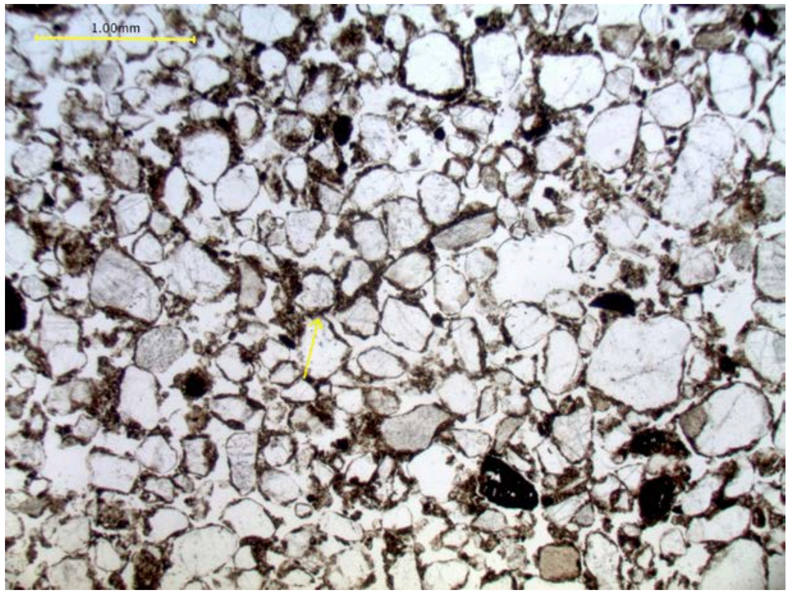

FIGURE 6. Layer 6 composed of well sorted quartz sand and disorthic Mn nodules coated in dusty clay, deposited by alluvial processes.

Micromorphology

Micromorphological analyses are ongoing, with some preliminary results from Strata 6 and 7 presented in this work {samples numbers RCMS 15-5 (Stratum 7), 15-6 (Stratum 6/7 contact), and 15-7 (Stratum 6)}. Sample 15-7 (Stratum 6) is composed of sorted quartz sand with dusty clay coatings and rounded disorthic manganese nodules (Figure 6). There is currently no stream nearby the shelter, but the sediments in Stratum 6 have the appearance of being deposited by alluvial processes from a nearby stream or other body of water. There is no evidence in the sample of a living surface. Although charcoal fragments are observed, no ash or burned bone is visible ruling out the presence of an anthropogenic fire. Stratum 6 will need to be sampled in greater detail to clarify questions of provenience and anthropogenic input.

The composition and arrangement of Stratum 7 (RCMS 15-5) suggests the sediments are the result of in-place dissolution of eboulis and roof fall. Post-depositional processes in this layer are minimal. Manganese crusts and staining confirm water saturation for short periods of time, though there is no evidence of the sediment being waterlogged. Bioturbation in the form of plants and insects is not visible, but more analyses are needed to assess the overall impact of bioturbation on this layer.

Preliminary micromorphological analysis suggests that Stratum 7 is not a cultural layer, as the artifacts and charcoal present may be translocated from the layer above. Formation of Stratum 6 is more complex as it resulted from the combination of geogenic and anthropogenic inputs. However, no living surface or intact fire signatures were observed, suggesting Stratum 6 represents ephemeral and intermittent visits to the site by the shelter's early inhabitants. Cultural and technological associations may also be tenuous.

Chronology

Diagnostic artifacts recovered from Rock Creek Mortar Shelter indicate a long temporal span from the Early Archaic through Woodland periods. In addition there are 20 AMS radiocarbon dates from the site (calibrated using CALIB 7.0), and also two OSL (optically stimulated luminescence) dates from a Woodland ceramic sherd and a baked clay surface (Table 1).

Early Holocene/Late Pleistocene

Eight AMS determinations from wood charcoal date to the early Holocene and one other dates to the late Pleistocene. Six derive from the trench excavation, and two derive from Features 4 and 6 in Stratum 8 (Test Unit 2). Two assays from the trench inside the drip line are 9073 and 9550 cal BP, (piece plots 164 and 66, respectively). Spatially associated artifacts are Kirk Corner Notched and Lost Lake bifaces. Piece plots 193 (9594 cal BP) and 198 (9598 cal BP) are from Features 6 and 4, respectively. Spatially associated artifacts are a Hardaway Side-Notched biface and a prismatic blade core fragment from Stratum 8. A calibrated median date of 9269 cal BP was obtained from Level 4 (piece plot 273) in the trench extension beyond the drip line (Stratum 7). Other recovered Early Archaic bifaces from the site include several bifurcated specimens (Figure 7). Two dates precede 10,000 years ago at 10,623 and 10,760 cal BP (piece plots 96 and 127). One assay from the trench (piece plot 166) straddles the Pleistocene/Holocene boundary at 11,260 cal BP. The previous three dates were obtained from charcoal found in spatial association with 18 prismatic and triangular blades and blade fragments. Three bladelets were also recovered. Associated bifaces include a heavily reworked Greenbrier Dalton (see Figure 7). Finally, an assay of 12,554 cal BP was obtained from Level 5 (piece plot 282) of the trench extension beyond the drip line. Spatially associated artifacts include a blade core fragment and several blade-like flakes.

FIGURE 7. Early Archaic bifaces, Rock Creek Mortar Shelter.

Radiometric dates from Rock Creek Mortar Shelter suggest occupation from the late Pleistocene (Younger Dryas) through the late Holocene. However, Stratum 7 does not appear to be a cultural layer, and Stratum 6 located directly above is problematic with sediments that may be partially cultural but also alluvial.

Table 1. Radiometric Dates from Rock Creek Mortar Shelter (40PT209).

Lab No.	Piece Plot No. (PP)	Provenience	Material	Method	Measure	1σ range(s)	2σ range(s)
Beta-350456	42	TU2, L10, Stratum 4	charred acorn	AMS	2750 ± 30 BP	cal BP 2792 - 2865	cal BP 2772 – 2893; 2902 - 2924
Beta-347963	66	Trench, L4, Stratum 6	wood charcoal	AMS	8640 ± 40 BP	cal BP 9541 - 9622	cal BP 9535 - 9682
Beta-370146	127	Trench, L7, Stratum 7	wood charcoal	AMS	9530 ± 50 BP	cal BP 10717 – 10807; 10847 – 10865; 10954 - 11069	cal BP 10683 - 11091
Beta-370147	166	Trench, Unit 10, L6, Stratum 7	wood charcoal	AMS	9890 ± 50 BP	cal BP 11231 - 11331	cal BP 11202 – 11407; 11451 – 11471; 11558 - 11596
Beta-373685	96	Trench, L6, Stratum 7	wood charcoal	AMS	9390 ± 40 BP	cal BP 10573 - 10673	cal BP 10514 - 10712
Beta-373686	164	Trench, Unit 10, L5, Stratum 5	wood charcoal	AMS	8150 ± 40 BP	cal BP 9022 - 9123	cal BP 9007 – 9145; 9167 - 9251
D-AMS 005776	162	TU8, L10, Stratum 3	wood charcoal	AMS	3405 ± 28 BP	cal BP 3614 – 3650; 3658 - 3691	cal BP 3577 - 3715
D-AMS 005777	168	TU7, L15, Stratum 4	wood charcoal	AMS	4093 ± 25 BP	cal BP 4528 – 4589; 4592 – 4614; 4766 - 4784	cal BP 4453 – 4461; 4521 – 4648; 4672 – 4698; 4760 - 4806
D-AMS 005774	122	TU7, L6, Feature 2, Stratum 4	wood charcoal	AMS	2581 ± 27 BP	cal BP 2726 - 2749	cal BP 2544 – 2556; 2619 – 2629; 2704 - 2760
D-AMS 005775	153	TU4, Feature 3, Stratum 3	wood charcoal	AMS	2444 ± 28 BP	cal BP 2379 – 2395; 2400 – 2415; 2420 – 2496; 2597 – 2611; 2638 - 2684	cal BP 2359 – 2541; 2562 – 2577; 2583 – 2618; 2631 - 2701
D-AMS 005772	110	TU5, L5, Feature 1, Stratum 2	wood charcoal	AMS	1598 ± 23 BP	cal AD 415- 433; 457- 468; 488- 533	cal AD 407- 536
D-AMS 005773	118	TU5, L5, Feature 1 base, Stratum 2	wood charcoal	AMS	1548 ± 24 BP	cal AD 431- 491; 531- 550	cal AD 427- 565
D-AMS 010541	193	Stratum 8, Feature 6	wood charcoal	AMS	8654 ± 31 BP	cal BP 9546 - 9622	cal BP 9542 - 9677
D-AMS 010542	198	Stratum 8, Feature 4	wood charcoal	AMS	8659 ± 31 BP	cal BP 9548 - 9626	cal BP 9544 - 9679
D-AMS 010543	273	Trench, Stratum 7, Level 4	wood charcoal	AMS	8270 ± 31 BP	cal BP 9142 – 9174; 9208 – 9218; 9240 – 9310; 9361 - 9396	cal BP 9132 – 9328; 9343 - 9402
D-AMS 010544	282	Trench, Stratum 7, Level 5	wood charcoal	AMS	10,566 ± 33 BP	cal BP 12437 – 12463; 12527 - 12605	cal BP 12424 – 12498; 12517 - 12651
D-AMS 011162	233	TU5, Stratum 3, Feature 7, Zone A	wood charcoal	AMS	3406 ± 35 BP	cal BP 3610 - 3694	cal BP 3568 – 3724; 3754 – 3757; 3795 - 3819
D-AMS 011163	234	TU13, Stratum 3, Feature 9	wood charcoal	AMS	2183 ± 24 BP	cal BP 2147 – 2162; 2168 – 2178; 2243 - 2302	cal BP 2124 – 2209; 2224 - 2307
D-AMS 011164	236	TU5, Stratum 3, Feature 7, Zone B	wood charcoal	AMS	3272 ± 30 BP	cal BP 3457 – 3509; 3531 - 3556	cal BP 3411 – 3422; 3445 - 3572
D-AMS 011165	258	TU13, Stratum 3, Feature 10	wood charcoal	AMS	3036 ± 30 BP	cal BP 3181 – 3199; 3206 – 3253; 3294 - 3326	cal BP 3160 - 3345
LB1183	3	TU2, L5, Stratum 3	pot sherd	OSL	AD 952 ± 78	na	na
LB1303		TU2, Stratum 4/8 contact, Feature 5	baked clay	OSL	BC 4001 ± 276	na	na

Caution must be exercised when considering the association of these charcoal samples with the archaeological materials. The earliest diagnostic artifacts recovered to date are Early Archaic (early Holocene).

The Technology of Production in the Paleoindian-Early Archaic Transition

Rock Creek Mortar Shelter is the first shelter on the UCP where we have encountered buried Early Archaic deposits in good stratigraphic position. Early Archaic artifacts are very common in the region, but stratified sites are not. The Early Archaic sequence extends from just after the Younger Dryas (Greenbrier Dalton, Lost Lake and Kirk Corner Notched bifaces) through the end of the Early Archaic (bifurcate points such as St. Albans and LeCroy). All but one of our early dates are associated with the Early Archaic period, with both prismatic and triangular blades spatially associated with these dates.

Most of the intentionally-produced blades (*n*=18, and a few bladelets) were made/prepared from unipolar cores. There was a mix of hard hammer and soft hammer percussion used in the blade production, with variable skill level and execution (Table 2; Figure 8). Site 40PT209 has also yielded numerous core edge flakes and crested blade fragments, and far more unifacial tools than any other site on the UCP. Some evidence for overshot flaking is represented by two biface failures (one is an initial large biface recovered in March 2013 that, due to a number of step fractures, was reworked into an end scraper and used for scraping hide).

In short, there is blade technology at the site along with bifacial reduction and thinning. Numerous biface thinning flakes have been recovered, and the vast majority (about 80%) of the flaking debris and tools are made from locally available Monteagle chert. Other identified raw material types include varieties of Ft. Payne chert, St. Louis chert, and locally

FIGURE 8. Blade fragments recovered from Rock Creek Mortar Shelter.

Table 2. Attributes for Selected Early Holocene Artifacts (40PT209).

Piece Plot No. (PP)	Provenience	Elevation	Description	Percussor	Raw Material	Comments
115	Trench, Unit 9, L2	465.071	proximal failed blade fragment; scratched poorly prepared platform	soft hammer (SH)	Monteagle Chert	good conception, poor execution
139	Trench, Unit 9, L5	464.842	simple core edge removal	hard hammer (HH)	Monteagle Chert	
156	Trench, Unit 10, L4	464.950	blade-like flake; lipped platform w/2-3 facets	SH	Monteagle Chert	3+ dorsal scars
117	Trench, west side	464.701	blade w/linear, flat platform w/pecking & polishing; much retouch on bottom of platform	HH	Monteagle Chert	Similar to Epi-Paleolithic & Mesolithic blades from Les Barraquettes, France; 3+ dorsal scars
126	Trench, Unit 8, L3	465.071	proximal blade fragment; flat platform w/retouch along dorsal edge; pronounced bulb	HH	Ft. Payne Chert	abrading to remove overhang (platform)
103	Trench, Unit 9	found in screen	core edge removal w/cortex	HH	Monteagle Chert	
50	Trench, west side, L1	465.165	biface (drill?) fragment; point nor broken cleanly	SH	Ft. Payne Chert	retouched after break
64	Trench, L4	464.968	side scraper on blade	HH	Monteagle Chert	graver spurs on larger end
78	Trench, SW corner	465.024	prismatic blade; cortex on distal end; linear platform; splintered bulb	SH ?	Monteagle Chert	struck with a strong blow; retouch along lateral edges
120	Trench, Unit 9, L3	464.990	preparation (crested blade) removal for blade production; pecked platform	?	Monteagle Chert	unipolar débitage (production mode)
107	Trench, Unit 9, L2	found in screen	blade w/lipped, abraded platform (4 facets)	SH	Monteagle Chert	unipolar débitage (production mode)
52	Trench, west side, L2	465.117	blade/flake fragment retouched along lateral edges	?	Monteagle Chert (maybe St. Louis Chert)	laminar flake or short blade; very similar to artifacts in Carson-Conn-Short Clivs assemblage (John Borster, personal communication, 2013)
159	Trench, Unit 10, L4	464.930	medial blade fragment (triangular cross-section)		St. Louis Chert	retouched both sides
113	Trench, Unit 9, L2	465.075	large, laminar flake w/battered but unfaceted platform; pronounced blub	HH	Monteagle Chert	retouched along one edge
104	Trench, Unit 9	found in screen	proximal prismatic blade fragment; big, flat, lipped platform	SH	Monteagle Chert	well prepared, well abraded platform; very straight blade edges; unipolar débitage (production mode); maybe HH (Surmely)
136	Trench, Unit 9, L4	464.945	distal blade fragment; triangular cross-section)		Monteagle Chert	unipolar débitage (production mode)
133	Trench, west side	464.852	end scraper on probable blade (or possibly a big flake)	?	Monteagle Chert	
102	Trench, Unit 9	found in screen	core fragment/dechet?	?	Monteagle Chert	possible graver spurs
108	Trench, Unit 9	found in screen	broken flake w/ flat platform; big bulb; pronounced ripple marks on ventral surface	HH	Monteagle Chert (maybe St. Louis Chert)	originally thought to be a blade-like flake
105	Trench, Unit 9	found in screen	proximal prismatic blade fragment; well-abraded, faceted platform	SH	Monteagle Chert	failed attempt at a blade (hinge termination); novice or made on a very short core
125	Trench, Unit 9, L3	465.063	proximal blade fragment; triangular cross-section; linear, flat platform w/retouch preparation under platform; good technology	SH	Monteagle Chert	antler percussion; strongly struck (splintered bulb); very similar to Magdalenian and Epi-Paleolithic blades
106	Trench, Unit 9	found in screen	distal flake fragment	?	Monteagle Chert	blade-like flake?
177	Trench, north wall cleaning	464.986	core edge removal	?	Monteagle Chert	
67	Trench, L4	464.893	damaged medial blade fragment	?	Monteagle Chert (heavily patinated)	
134	Back ledge, surface	na	Core edge flake prepared as a blade; lipped platform	SH	Monteagle Chert	2 facets on platform; flake is fire-damaged
na	Trench, Unit 9, L1	~465.146	medial blade fragment; triangular cross-section	?	chalcedony	very regular blade lateral margins

available chalcedony. The entire range of lithic reduction is present in the early levels. Only one prismatic blade core fragment (Figure 9) has been recovered from what appears to be an Early Archaic level (in Stratum 8). The authors hypothesize that the function of some, if not most, blade cores may have shifted to bifacial reduction at a certain point in the chaîne opératoire. These early artifacts and blades have come from a very restricted area, about nine square meters, and likely represent just a small sample of materials in the shelter.

While questions remain about stratigraphic associations, a shift in technology can be hypothesized. Prismatic blade tool production (e.g., Paleolithic and Paleoindian) was a very specific type of production involving very

FIGURE 9. Blade core fragment recovered from Rock Creek Mortar Shelter.

FIGURE 10. Long, flat blade-like flakes recovered from Rock Creek Mortar Shelter.

precise core preparation and the production of long, straight blades with regular lateral edges. Such production is apparent at the site, but at a certain point a production shift occurred. Long flakes were still selected, but the manufacturing process changed as cores were no longer intricately prepared. The resulting flakes were long and flat (bladelike) without the regular lateral margins (Figure 10). While prismatic blades tend to be curved in profile, these blade-like flakes are flat. The authors suggest this shift was intentional. Widely available raw materials may have allowed early inhabitants of the plateau the luxury of spending much less time preparing cores for stone tool manufacture in favor of more expedient methods for essentially the same end products.

Use-Wear Analysis of Selected Late Pleistocene/Early Archaic Materials

A functional use-wear study was undertaken as part of the multi-disciplinary investigation at 40PT209 that addresses the question of why people were using this shelter during the late Pleistocene. Traditional methods developed and refined in the 1980s by Keeley (1980) and Odell (1977) were employed to investigate the wear patterns. For this study, a Nikon Eclipse L150 metallurgical microscope was used to assess the damage and a Canon EOS Rebel T3i 18 mp dslr camera was used to document the findings. Each artifact was photographed on both surfaces so that the location of wear traces could be recorded directly on the image during analysis (Figure 11). The stone artifacts were lightly washed, with rubbing alcohol occasionally used to remove finger grease. Interpretations were made with reference to an experimental collection (Hays 1998, Hays and Lucas 2001) that has continued to develop over the last 20+ years with a wide variety of raw materials. The experimental collection represents a wide range of prehistoric activities, including projectile damage, butchering or meat processing, hide processing, bone and antler working, and wood working.

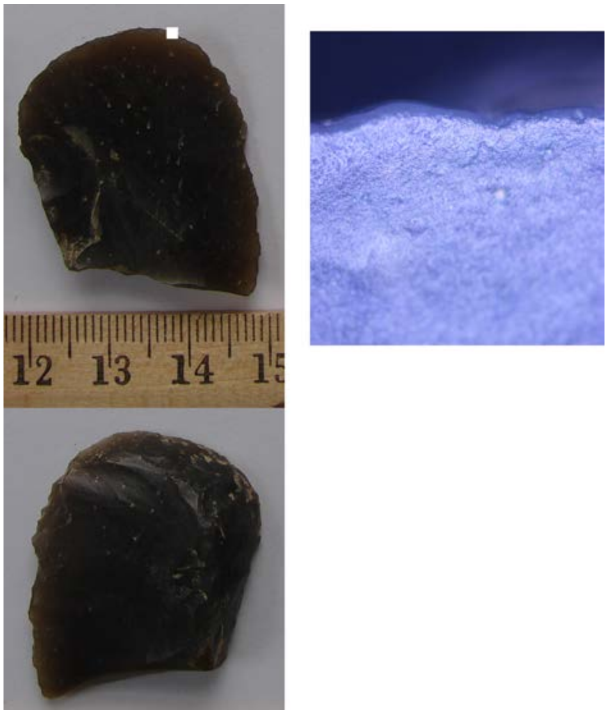

FIGURE 11. Example of recorded wear - PP133, BCL14-011 - End Scraper on Blade Use: Hide Scraping.

Table 3. Microwear Summary for Rock Creek Mortar Shelter Late Pleistocene/Early Holocene Artifacts.

Total (*n*=109)	Unused (*n*= 89)	40Pt209 General Catagories	Used (*n*= 20)	Motion	Material
37	32	Blade/bladelike flake	5	cut/scrape	hide/meat
9	4	End Scraper	1	scrape	bone
			4	scrape	hide
24	20	Flake	1	cut/scrape	hide/meat
			3	cut	hide/meat
16	14	Biface	1	cut/scrape	hide
			1	scrape	wood
2	0	Graver Spur on Blade	1	scrape	hide

The sediments in Rock Creek Mortar shelter are very dry, lending to good faunal and botanical preservation. However, there was microscopic evidence of post- depositional alteration to the surface of some stone tools that presented as an overall sheen. This sheen was probably caused by movement in these sandy deposits that so nicely preserved bone. Every effort was taken to distinguish between polish resulting from use and the naturally occurring sheen. With this phenomenon in mind, the interpretations in this study lean toward the conservative side.

To date, 109 pieces have been analyzed microscopically, with 18% (*n*=20) interpreted as used (Table 3). Represented activities included scraping wood (18%), processing hide, and cutting/scraping meat and hide (80%), and scraping bone (5%) which may be associated with meat processing. Three tools were used to scrape wood (a biface, a blade fragment with graver spurs and a Hardaway Side-Notched point), 16 were used to cut and scrape meat/hide in the early stages of processing, and a single scraper was used on bone. The represented activities are similar to those from the Nuckolls site (40HS60) on the lower Tennessee River (Ellerbusch 2004). Given the distance to the raw material sources (20 to 30 km), it might be expected that a larger number of retouched tools would be used. Also, in consideration of the range of activities identified at Rock Creek Mortar Shelter, the authors believe the lower use rate is a reflection of post-depositional alterations along with the decision for conservative analysis interpretations.

Discussion

When considering the early Holocene assemblage at site 40PT209, a major problem is that we do not yet know how to characterize late Pleistocene/early Holocene assemblages on the UCP, as just a very small portion of Rock Creek Mortar Shelter has been tested. The mix of prismatic blade production with a more expedient blade-like flake production is puzzling. Further, select artifacts appear Paleoindian in character but were recovered from an Early Archaic context. One such artifact, a double side scraper made on a blade or flake fragment (Figure 12, top row, right), would “fit” in the Clovis

FIGURE 12. Unifacial artifacts recovered from Rock Creek Mortar Shelter.

assemblage at the Carson-Conn-Short (40BN190) site (John B. Broster, personal communication, 2013). Clearly the site does not have a Clovis component defined at this time, but the lithic assemblage is nonetheless interesting because of such artifacts as gravers, gravers on end scrapers, and side scrapers on blades that are more typically associated with Paleoindian lithic assemblages in the Midsouth (Broster et al. 2006).

In a recent synthesis, Anderson and Sassaman (2012) place Early Archaic cultural sequences in the Southeast between 11,500 and 8,900 years ago. This seems to be at odds with some regional chronologies that have middle and late Paleoindian sequences overlapping, e.g., the loose chronology proposed by Maggard and Stackelback (2008) in their thorough survey of the Paleoindian period in Kentucky. In any case, regional comparisons are going to be difficult without comparable chronologies, and comparable chronologies may be tenuous without like assemblages.

Stanfield Worley Bluff Shelter is a massive sandstone rock shelter with some 800m2 of potential living space located a little more than 10 km from the central Tennessee River Valley (Walthall 1998:230). DeJarnette and colleagues (1962) recorded a significant Dalton component in Zone D of the shelter deposits that they dated to between 10,000 and 9,000 years ago. More recently, Hollenbach (2009:101) obtained a calibrated AMS radiocarbon determination from Zone D that straddles the Pleistocene/Holocene boundary like Piece Plot 166 from Rock Creek Mortar Shelter. Preservation at Stanfield Worley was excellent with numerous bone tools and fauna recovered. Similar to Rock Creek Mortar Shelter, side scrapers on blades, unifacial scrapers, and gravers were present (Figure 12). There were also myriad Dalton bifaces recovered (Walthall 1998:230-231). However, thus far the Rock Creek biface assemblage is comparatively sparse.

We seem to have an Early Archaic assemblage at Rock Creek associated with blade (and biface) technology. The timing, if not the technology, is consistent with Walthall's (1998) contention that Dalton peoples were the first to systematically use upland rock shelters. This also seems consistent with Lane and Anderson's (2001) idea that the interior highlands (e. g., the Cumberland Plateau) lie at the end of early migration routes. In any case, there are numerous recovered artifacts that are Paleoindian in character if not in age. Bradbury and Carr (2012) suggest that blade technology was not necessarily part and parcel of the Paleoindian toolkit, though they do point out that blade manufacture appears more common in Southeastern Paleoindian assemblages. Bradbury and Carr (2012) further suggest that intentional (prismatic) blade manufacture was not part of the Early Archaic tool kit at all. While Early Archaic peoples made some blades and blade-like flakes, true blade (or prismatic blade) technology should date earlier. And yet, at Rock Creek Mortar Shelter, there are blades in an early Holocene chronological context, so perhaps Bradbury and Carr's contention should not be considered hard and fast.

Rock Creek Mortar Shelter is not the only late Pleistocene/early Holocene site we have recorded on the UCP. The Early Times Rock Shelter yielded a late Paleoindian Quad biface with a heavily ground base along with several wedge pieces (pièces esquillées) and an Early Archaic MacCorkle Stemmed biface. Interestingly, all of these items were demonstrated to have been used for wood working. The site was pristine, but the deposits were largely surficial and thus not well dated. Further, no obvious blades were recovered. Technological and functional studies at Early Times Rock Shelter indicate small groups of hunter-gatherers used the shelter as a temporary special purpose locale where a limited number of activities took place. Locally procured nodules of Monteagle chert were reduced at the site with tools occasionally produced and resharpened. Also, some wood working took place and hide and meat processing of animals occurred on a small scale (Dye et al. 2010).

Very near to Early Times Rock Shelter is the Job Site Rock House site where a Beaver Lake biface was recovered from a disturbed context. The Early Times and Job Site shelters are located on the East Fork Obey River.

Franklin (2002) recorded early, middle, and late Paleoindian sites (*n*=7) in previous archaeological surveys of the UCP. Two sites may be classified as early Paleoindian through the recovery of Clovis bifaces. No Cumberland bifaces were recorded during the survey. Five sites are late Paleoindian represented primarily by Beaver Lake and Quad bifaces. One site contained a Dalton biface, and a local collector possesses a spectacular, very large Dalton biface from the area. To date, Rock Creek Mortar Shelter is the only site of more than 600 recorded through surveys that possesses intact and stratified deposits.

Summary

Rock Creek Mortar Shelter is a high elevation rock shelter far removed from major streams and high quality, large package size raw material sources. In fact, the closest possible raw material sources are at least 10 km away (and 200 m below in elevation), and it is not clear these sources were exposed 11,000 years ago. Raw material surveys have not been exhaustive due to the rugged terrain and vegetation cover, but the more likely sources occur some 30 km to the south in the East Fork Obey gorge (Figure 13). This statement runs counter to ideas that prismatic blade production in the Tennessee region was anchored to more localized outcrops of high quality cherts (Broster et al. 2013:304; Ellerbusch 2004:36). Places such as Rock Creek Mortar Shelter may lie at the end of early migration routes, but it is unclear how early peoples accessed the site since it is nearly 30 km from the mouth of Rock Creek at the Big South Fork of the Cumberland River in southeastern

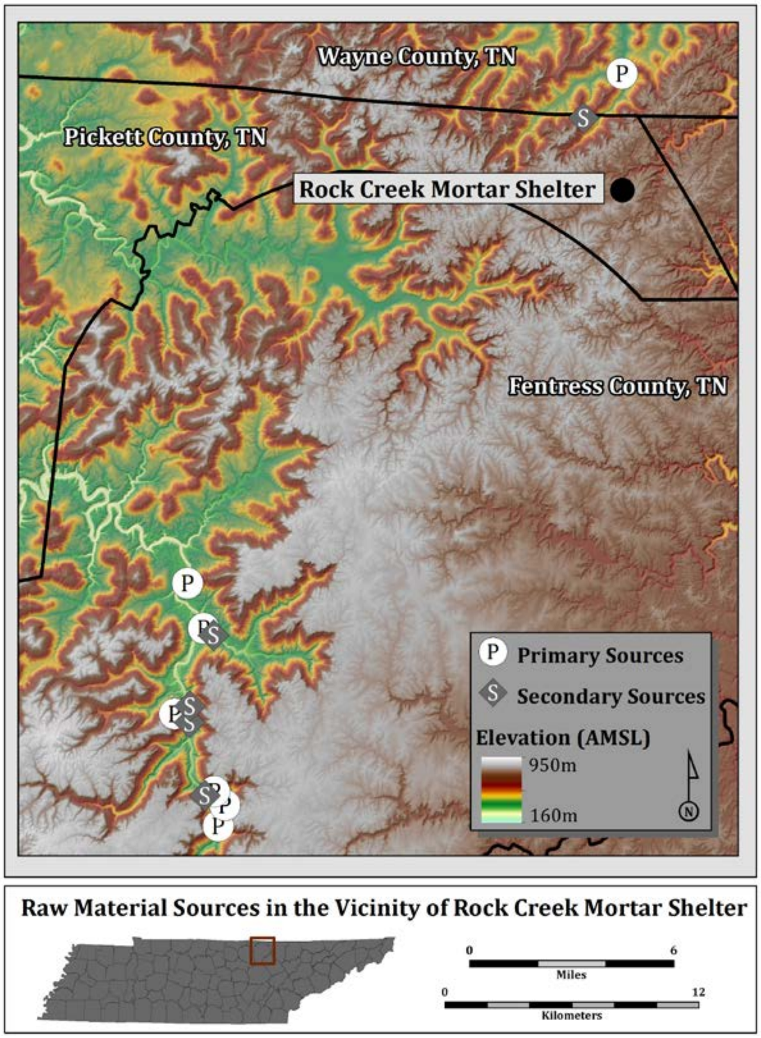

FIGURE 13. Raw material sources in the vicinity of Rock Creek Mortar Shelter.

Kentucky to the shelter near the headwaters of Rock Creek. If the better raw material sources were along the East Fork Obey River (where the Early Times and Job Site rock shelters are also located), then it may be that early pioneering populations were moving up the Obey and across the ridge tops toward Rock Creek. State Route 154, which runs near the site, follows the best passable ridge tops up into Kentucky. Local inhabitants indicate this route was also an old Indian trail: "Another trail left the East and West Trail about three miles East of Jamestown and went northwestwardly to the head of Wolf River [Pogue Creek] along the mountaintop to Kentucky." (Hogue 1933:2).

A generally continuous record of human occupation at Rock Creek Mortar Shelter has been recorded from at least the end of the Pleistocene around 11,500 years ago to about AD 1000. The late Pleistocene and early Holocene deposits located 1.25 – 2 meters below surface have yielded many blades, unifacial side and end scrapers, gravers on scrapers, and a few bifaces from a restricted area under the drip line of the shelter. Broster et al. (2006:120) suggest these types of artifacts from the Widemeier site (40DV9) on the Cumberland River in the Central Basin were probably associated with Clovis and Cumberland components, though their excavation areas were often mixed. Dates and general stratigraphy at Rock Creek Mortar Shelter suggest these artifacts are associated with the Early Archaic period. However, there is one AMS date of 12,554 cal BP in (mixed) deposits that possess blade cores, prismatic blades, and other artifacts sometimes considered to be representative of early (Clovis) Paleoindian period assemblages in Tennessee (Broster et al. 2013:299; Collins and Hemmings 2005).

Clearly there is much work to do to sort out the stratigraphic, chronological, and technological relationships at 40PT209. For now, we might hypothesize a transitional assemblage, or set of assemblages. For example, the gravers

FIGURE 14. Back ledge at Rock Creek Mortar Shelter above buried deposits.

and gravers on end scrapers suggest the manufacture of spearshafts and foreshafts (e. g., Broster et al. 2006:126).

There also seems to be a mix of skill level and execution for blade manufacture. A few of the well-made blades would be at home in European Late and Epi-Paleolithic assemblages, while other blades are poorly made. This may suggest a family group on site where older and more skilled knappers taught younger novices to make blades. Also, the earliest inhabitants of the UCP may have been coping with the constraints of using the small rounded local cobbles of Monteagle chert for blade production (as opposed to large tabular cherts encountered in the lower Tennessee River drainage).

The Rock Creek Mortar Shelter is currently interpreted as a short-term hunting camp occupied by residentially mobile foragers. Given the large size of the shelter, we hypothesize that this is consistent with Walthall's (1998) ideas of Dalton rock shelter use. Site 40PT209 would fall in Walthall's (1998) Group I shelters with an estimated 150m2 of living space. Early Holocene family groups likely used Rock Creek Mortar Shelter as a temporary residence during the fall and perhaps winter months.

This article has briefly introduced the archaeology of Rock Creek Mortar Shelter. The authors are excited about additional work at a site with a continuous cultural sequence spanning more than 11,000 years. Of note is that one of the crew crawled back under the lower back ledge to a distance of about 20 feet (Figure 14). Given the depth of the cultural deposits already evaluated, the shelter likely extends much farther back and deeper during the Late Pleistocene and early Holocene.

Acknowledgements. Discovery, initial testing, and the 2014/2015 winter field season of Rock Creek Mortar Shelter was funded by three Tennessee Historical Commission survey and planning grants. Funding of the 2013/2014 winter field season was funded by National Geographic Society/Waitt Institute Grant No. W302-13. The winter 2013/2014 testing was conducted under Tennessee Division of Archaeology (TDOA) Permit No. 000796. The Tennessee Division of Archaeology also generously funded two AMS radiocarbon dates. The folks at the Division (Mike Moore, Mark Norton, John Broster, Suzanne Hoyal, and Aaron Deter Wolf) have been very supportive of our work at Pickett, and we are thankful for their interest. We are especially grateful to Alan Wasik, Pickett State Park Manager, for his long term support of and commitment to archaeological work at Pickett. Brock Hill, Deputy Commissioner, Tennessee Department of Environment and Conservation has generously supported our work at Pickett and Pogue Creek Canyon State Natural Area, particularly with arrangements for lodging. John Froeschauer, Interpretive Specialist, Tennessee State Parks, has not only been supportive of the work but has also been a great friend and colleague in the field. In general, we greatly appreciate of our relationship with Tennessee State Parks and their commitment to archaeological resource management. The MOUs between Tennessee State Parks and ETSU Archaeology are a perfect example of how mutually beneficial partnerships in resource management can be. Jay Franklin would like to thank David Todd, Assistant State Forester, Tennessee State Forests, for his support of and interest in the project. Jay Franklin also thanks Vice Provost Bill Duncan and the folks at ETSU Research and Sponsored Programs for their support and administration of the grant contracts for this project. Thanks also go to Joe Smith, ETSU University Relations, for his help in publicizing the work. We appreciate the interest and favorable reviews for the project from David Anderson and Kandi Hollenbach. Jacob Wall and Christina Bolte served as crew chiefs for the project. Andrew Hyder served as a graduate assistant. Cayla Cannon conducted the ceramic analysis, and Sierra Bow assisted with the ceramic analysis. Jay Franklin would like to thank the many ETSU students who have worked on the project to this point, and he greatly appreciates the support from ETSU in allowing us to conduct archaeological field schools in the dead of winter. Finally, we would like to acknowledge John Broster, who enthusiastically advised us concerning the character of the early Holocene assemblage from the site.

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COLONIZATION AFTER CLOVIS: USING THE IDEAL FREE DISTRIBUTION TO INTERPRET THE DISTRIBUTION OF LATE PLEISTOCENE AND EARLY HOLOCENE ARCHAEOLOGICAL SITES IN THE DUCK RIVER VALLEY, TENNESSEE

D. Shane Miller and Stephen B. Carmody

While the timing of the initial colonization of North America is still hotly debated, the appearance of the Clovis culture likely represents an early, widespread colonization episode at the end of the Pleistocene. Here, we use the Ideal Free Distribution from Behavioral Ecology to interpret variability in the spatial distribution of previously recorded archaeological sites in the Duck River Valley in Middle Tennessee from the appearance of Clovis sites in the terminal Pleistocene though the Early Holocene (~13,250 – 8,880 cal yr BP). We hypothesized that the distribution of Clovis sites would be skewed towards the confluence of the Duck and Tennessee Rivers, and then subsequent populations would spread to higher elevations over the course of the Younger Dryas and Early Holocene as boreal forests were replaced by mixed hardwood, deciduous forests. After correcting the sample of archaeological sites to account for survey and taphonomic biases, we found that sites dating to the latter part of the Younger Dryas and the Early Holocene become more frequent at higher elevations. However, contrary to the predictions of our model, site frequencies become less frequent during the Early Holocene at the confluence of the Tennessee and Duck Rivers. Our results are consistent with other studies that have proposed that the Cumberland Plateau and the Appalachian Highlands were not intensively occupied until well after the disappearance of the Clovis culture.

In this paper, we examine Late Pleistocene and Early Holocene landscape use in the Duck River drainage using a model from behavioral ecology, the Ideal Free Distribution (Fretwell and Lucas 1970). Understanding how hunter-gatherers utilized the Duck River drainage during the Pleistocene-Holocene transition is particularly important because of its location in the heart of the Midsouth, a region that likely played a vital role in not only the colonization of the Americas, but also the first steps in a trajectory that eventually led to increasing sedentism and resource intensification (Bissett 2014; Brown and Vierra 1983), plant domestication (Chapman and Shea 1981; Crites 1985, 1987, 1993; Smith 1987, 1992, 2001, 2007, 2011), emerging trade networks (Jefferies 1995, 1996, 1997; McNutt 2008), inter-group violence (Milner 1999; Smith 1995, 1996), and other major changes that occurred in eastern North America during the mid-Holocene (Anderson et al. 2007). Additionally, archaeologists have conducted multiple large scale surveys in the Duck River drainage, making it one of the most intensively studied areas of the Mid-South and an ideal location to track variation in landscape use (Miller 2014).

Using a geospatial database of archaeological sites derived from the state site file records at the Tennessee Division of Archaeology and the Tennessee Fluted Point Survey (e.g., Broster et al. 2013; Miller 2014), we found that archaeological sites were initially concentrated in the confluence of the Duck River with the Tennessee River. However, over the course of the Younger Dryas and into the Early Holocene, the distribution of archaeological sites extends to the Eastern Highland Rim and the Cumberland Plateau. We argue that this pattern is consistent with broader trends in landscape use (e.g., Lane and Anderson 2003; Maggard and Stackelbeck 2008; Tankersley 1990), and reflects populations expanding into higher elevations as temperate forests replaced boreal forests as climate became warmer and wetter during the Early Holocene.

Paleoindian and Early Archaic Landscape Use in the Southeastern United States

When people discuss the colonization of the southeastern United States, it is common practice to begin with a discussion of the Clovis culture, and the merits and shortcomings of a handful of pre-Clovis sites like Cactus Hill, Meadowcroft Rockshelter, Page-Ladson, and Topper (Anderson et al. 2015; Goodyear 2005). Aside from these sites, there are only a few sites with buried, terminal Pleistocene archaeological deposits, and an even smaller percentage of these that have produced widely accepted radiocarbon dates. Consequently, archaeologists in the southeastern United States have to rely heavily on well-dated sites from outside the region to construct chronologies, as the climate and geomorphology of the Southeast is not conducive to site burial and organic preservation (Dunnell 1990; Goodyear 1999; Miller and Gingerich 2014).

However, the southeastern United States is unique in that, while there are only a relatively few dated sites, there is an abundance of surface sites and isolated finds (Anderson et al. 2010). Moreover, professional archaeologists in the region benefit from a long history of collectors and avocational archaeologists recording the location and attributes of Paleoindian period projectile points dating back to the mid-1940s with Ben McCary's (1947) "Folsomoid" point survey in Virginia. Mason (1962), Brennan (1982), and later Anderson (1990) compiled this information and used their results to create distribution maps that were the basis for creating models of landscape use and colonization processes. Because of their efforts, we now know that there is a rich Pleistocene and Early Holocene archaeological record in the southeastern United States, and contemporary researchers have at their disposal a dataset that allows them to analyze Paleoindian landscape use at multiple temporal and spatial scales.

The ability to evaluate changes in landscape use is particularly important in Paleoindian archaeology, where major research themes include the timing, rate, and nature of the spread of peoples into North America at the end of the Pleistocene (Meltzer 2009:1-22). In particular, Martin (1973, 2006) and Haynes (1964, 2005) argued that Clovis were the initial colonists that spread rapidly across North America with relatively high reproductive rates while hunting megafauna species to extinction. This model is based primarily on the widespread distribution of Clovis technology across North America and the recovery of multiple kill sites on the Great Plains and in the southwestern United States. Kelly and Todd (1988) updated the "Clovis First/Overkill" model to argue that the first colonists of the Americas were "technology-oriented." In other words, Clovis groups coupled high residential mobility with a toolkit geared towards hunting large animals to overcome any environmental incongruities they encountered.

The archaeological record of eastern North America, and in particular the Mid-South, is often cited in critiques of "Clovis First / Overkill / Technology-Oriented" models for the colonization of the Americas. Critiques generally reference the antiquity of sites in eastern North America that pre-date Clovis (e.g., Goodyear 2005), the limited evidence for predation on megafauna aside from Kimmswick in Missouri (Graham et al. 1981), Coates-Hines in Tennessee (Deter-Wolf et al. 2011), and Big Bone Lick in Kentucky (Tankersley et al. 2009), and the broad diet breadth exhibited in the Late Paleoindian components at Dust Cave in Alabama (Hollenbach 2007, 2009; Walker 1998, 2007). However, the primary appropriation of the eastern Paleoindian record to critique the "Clovis First/Overkill/Technology-Oriented" model is the sheer density and differential distribution of archaeological sites and artifacts. Gardener (1974, 1983) argued that Clovis sites were clustered, or were tethered, to lithic raw material sources in the Shenandoah Valley of Virginia. Meltzer (1988) interpreted the frequent occurrences of isolated artifacts and surface scatters in the southeastern United States as indicative of a *forager* subsistence strategy (e.g., Binford 1980), as opposed to a *collector* strategy displayed by archaeological sites at higher latitudes in eastern North America. Anderson (1990, 1995; Anderson and Gillam 2000) used the distribution of Paleoindian period projectile points as the basis for his "staging area" model for the colonization of North America. He contends that groups settled in resource-rich valleys, and then expanded in a leap-frog fashion into subsequent areas. Anderson's "staging area" model dovetails with a demographic model put forth by Meltzer (2004), who contends that a place-oriented colonization strategy would have the benefit of minimizing resource uncertainty and demographic risk.

The distribution and frequency of Paleoindian projectile points in the southeastern United States have also been used in arguments regarding whether or not the onset of the Younger Dryas stadial had a discernable effect on people. Anderson and Faught (2000) used the distribution of bifaces to argue that, at the onset of the Younger Dryas, the range of projectile point types diminished and regionally specific types appear to take the place of Clovis. They argued that this likely represents a fracturing of information exchange networks that appear to coincide with abrupt and sustained climate change. Similarly, Goodyear (2006) and Daniel and Goodyear (2006) argue that a decline in the frequency and distribution of Redstone bifaces (presumably a post-Clovis projectile point) likely indicates a decline in population at the onset of the Younger Dryas. However, Smallwood (2012) has identified subtle variation in the production of Clovis bifaces in areas that Anderson identified as staging areas, leading her to conclude that emerging divisions in learning networks were well underway prior to the onset of the Younger Dryas. Similarly, Thulman (2009) found that early Paleoindian period bifaces in Florida were remarkably similar, whereas subtle variation in the variability of Late Paleoindian types clustered geographically, which he also argued was indicative of the fracturing of learning networks. Moreover, he also found that the distribution of sites during the Younger Dryas was located near sinkholes, leading him to conclude that access to freshwater may have been an issue during the Younger Dryas. Consequently, the effect of the onset of the Younger Dryas in the southeastern United States is still an open question, but it is clear that the distribution and frequency of archaeological sites and isolated finds has, and will continue, to play a role in resolving this issue.

More specific to the Mid-South, the distribution of Dalton bifaces in Arkansas has been at the center of a debate as to whether Late Paleoindian groups moved within, or between, river drainages (Gillam 1999; Morse 1971, 1973, 1975, 1977; Schiffer 1975a, 1975b). Walthall (1998) argued that by the end of the Pleistocene, Dalton groups' use of rockshelters and the cemetery site at Sloan indicate that groups were clearly "place-oriented" and used the same locations repeatedly. Hollenbach (2007, 2009) used variability between paleobotanical assemblages to argue that terminal Pleistocene and Early Holocene groups in northern Alabama moved around the landscape in a well-developed, and well-planned, seasonal cycle to take advantage of predictable fluctuations in resource availability. Maggard and Stackelbeck (2008) contend that the rarity of early sites on the Cumberland Plateau in Kentucky likely indicates that it was not colonized until latter parts of the Younger Dryas and into the Early Holocene, a pattern that Lane and Anderson (2001) have argued extends for the entirety of the Cumberland Plateau and the Appalachian Highlands.

Other attempts to discern patterns of early hunter-gatherer landscape use in the southeastern United States utilized archaeological data from large federally funded projects. However, most had only small samples of Pleistocene-aged sites or artifacts, and instead focused on Early Archaic assemblages. For example, Kimball (1996) utilized assemblages from deeply stratified sites and isolated finds from the Little Tennessee River Valley in East Tennessee. By using frequencies of different tool types, he argued that Early Archaic mobility consisted of large, residential base camps buried in the alluvial terraces, while smaller logistical camps were situated on the periphery of the drainage. A similar study conducted in the Little Tennessee River Valley by Davis (1990) showed that base camps were more often located along the first terrace of the Little Tennessee River while logistical camps, when identified were found on the back edge of the Little Tennessee River valley or along its tributaries (Davis 1990:210). A shift towards the use of the uplands occurred during the late Early Archaic period, identifies as the Upper Kirk period. The trend quickly reverses by the end of the Early Archaic period where base camp sites are again primarily found along the Little Tennessee River valley (Davis 1990:210). Kerr and Bradbury (1998) argued that in the Lower Tennessee River Valley, Early Paleoindian assemblages were small and dispersed, while Terminal Paleoindian and Early Archaic sites were greater in number and reflected a wider use of the valley. Anderson and Hanson (1988) used raw material variation and the ratio of expedient to curated tools to argue that bands of Early Archaic hunter-gatherers aggregated at the "Fall Line" during the fall and winter and dispersed to Piedmont and Coastal Plain during the spring and summer to take advantage of seasonally abundant resources. Daniel (2001) argued, similar to Gardener's (1974, 1983) model for the Shenandoah Valley, that rather than being oriented along major rivers, Early Archaic settlement in the southeastern United States was tethered to lithic raw material sources.

The heavy reliance on the analysis of site and artifact distributions has been ongoing theme for the study of the Late

Pleistocene and Early Holocene archaeological record in eastern North America. This is likely due to a convergence of factors that include: (1) the influence of processual approaches that emphasize the analysis of the organization of technology across time and space in relation to environmental parameters (Binford 1979, 1980; Nelson 1991); (2) a concerted effort to connect the early record of the southeastern United States to larger questions surrounding the colonization of the Americas (Anderson et al. 2015); (3) an interest in the relationship between climate and culture change, especially in regards to the impact of the Younger Dryas stadial; and (4) an effort to make the most out of a regional record has few buried sites, but lots of surface scatters and isolated finds (Dunnell 1990; Goodyear 1999; Miller and Gingerich 2013). By focusing on the analysis of site and artifact distributions, archaeologists studying the Pleistocene and Early Holocene record in the southeastern United States have historically made the most out of the proverbial cards that they have been dealt.

Using Site Distributions to Reconstruct Demography and Landscape Use

While using the frequency and distribution of sites and artifacts to assess demography and landscape use is common practice in archaeology, there are still several issues that must be overcome with this approach. First, like the frequency of ^{14}C dates, archaeological sites are also subject to a variety of taphonomic biases that make finding and recording older archaeological sites more difficult (e.g., Dunnell 1990; Kelly et al. 2013; Surovell et al. 2009). Moreover, some areas have been subjected to substantially more research than others, which leads to a form of survey and research bias in the samples of Paleoindian and Archaic site distributions (Anderson 1996; Buchanan 2003; Prasciunas 2011; Shott 2002, 2005). Another issue noted by Anderson (1996) is the variation in the size of sites (isolated finds vs. large, dense sites), and that state site files usually only record temporal data by broad time periods. One way to resolve this issue would be to convert a site-based approach into a non-site survey (e.g., Dunnell and Dancey 1983; Thomas 1975). For example, Cabak et al. (1998) analyzed the site records for the Savannah River site to make inferences about shifts in landscape use over the duration of the Holocene. Another potential analytical avenue would be to use Surovell's (2009) proxies for measuring occupation intensity for a sample of assemblages. However, attempting to replicate Cabak et al.'s (1998) and Surovell's (2009) analyses would be difficult because different excavation protocols and curation criteria would severely limit the sample of sites available for analysis in the Duck River Valley.

Finally, attempts to use the distribution and frequency of sites to reconstruct demography suffer from a lack of a developed interpretive framework. For example, Meltzer (1988) interpreted the high frequency of recorded Early Paleoindian sites and their wide distribution across the southeastern United States as evidence that groups were smaller and more residentially mobile when compared to Paleoindian groups at higher latitudes. Anderson (1996) interpreted the increase in the frequency and wider distribution of sites in the Late Archaic across the southeast as evidence for an increase in population compared to earlier time periods. Does the increase in frequency and a wider distribution mean more people, or fewer people moving around more often? Clearly, there is an equifinality issue here. In this article, we argue that a formal model from behavioral ecology, the Ideal Free Distribution (Fretwell and Lucas 1970), can be appropriated as an interpretive framework for analyzing variation in site frequencies and distributions to understand fluctuations in landscape use, and by extension demographic trends. We apply this approach to a database of archaeological sites in the Duck River drainage to trace variation in landscape use over the Late Pleistocene and Early Holocene epochs.

The Ideal Free Distribution

The Ideal Free Distribution (IFD) was first used to model habitat selection by birds (Fretwell and Lucas 1970; Figure 1). Its most basic assumption is that individuals will select habitats to maximize fitness, and that the suitability of the habitat and population density will influence an individual's decision to either stay in a habitat or move to a location with greater net fitness benefits. Consequently, if the IFD holds true, the distribution of individuals should reflect the relative suitability of habitats. The model assumes that the first individuals moving into a new area will occupy the most favorable habitat. As the quality of that habitat or patch declines due to increasing population, resource depletion, and competition, individuals will move to a neighboring habitat that was initially less suitable but is now superior to the original habitat. The IFD model shares certain characteristics with the Marginal Value Theorem (e.g., Charnov 1976; Kelly 1995:90-97): it assumes that individuals

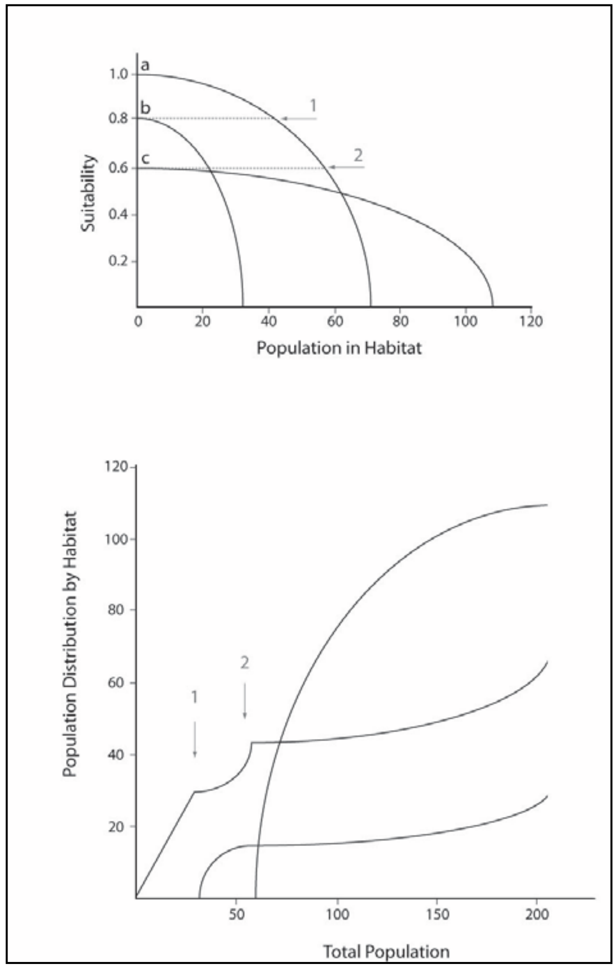

FIGURE 1. The Ideal Free Distribution. The upper panel shows suitability curves on a normalized scale of 0-1 for three habitats (A, B, and C) as a function of population density in the habitat. The habitats are ranked in alphabetical order by the suitability experienced by the initial occupant, and in all cases suitability declines with population growth. The lowest ranked habitat (C) also experiences the lowest rate of declining suitability. The lower panel shows how population growth will be allocated among habitats given these suitabilities (Fretwell and Lucas 1970; Winterhalder et al. 2010:473)

have all of the available information to make a decision on whether to move or stay, and that all individuals are free to leave or enter a new habitat. However, unlike the Marginal Value Theorem, the Ideal Free Distribution incorporates

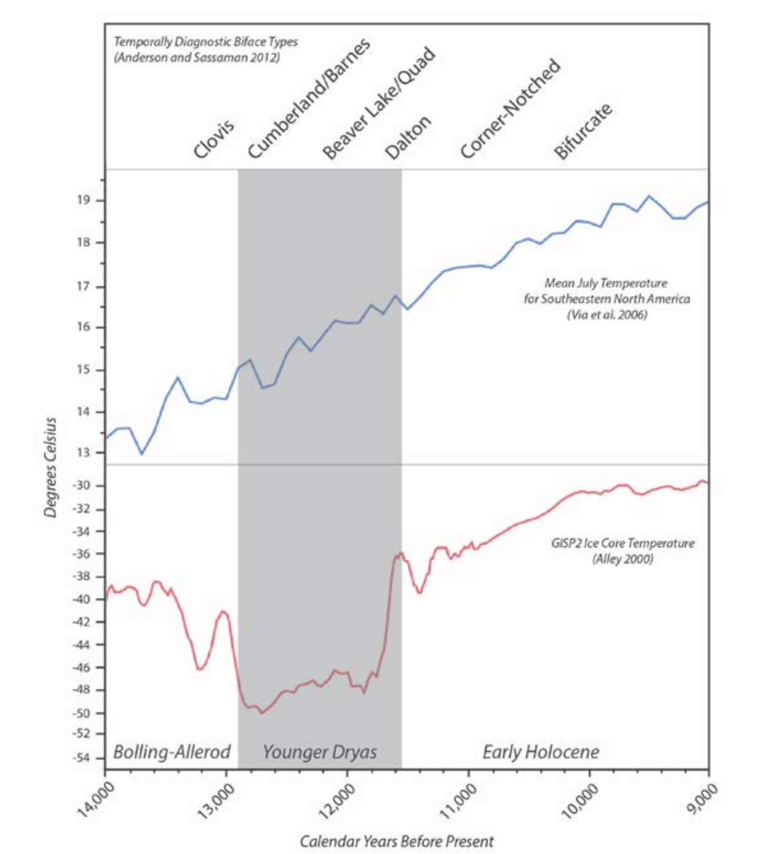

FIGURE 2. Temperature reconstruction based on the Greenland Ice Sheet Project (GISP2) (Alley 2000) and pollen records (Viau et al. 2006) with the sequence of temporally diagnostic projectile points (from Anderson and Sassaman 2012).

expectations relating to population density, or landscape in-filling, which makes it useful as an interpretive framework for assessing demography and landscape use. The applicability of using the IFD in conjunction with archaeological data has been demonstrated with recent studies of the transition to agriculture in Spain (McClure et al. 2006), the spread of agriculture into Europe (Shennan and Edinborough 2007), and the colonization of Oceania (Kennett al. 2006) and the Channel Islands in California (Kennett and Winterhalder 2008; Winterhalder et al. 2010).

A critical component of using the IFD to interpret the distribution of archaeological sites is determining the suitability of each habitat. Complicating matters further, this study uses assemblages that span several millennia where substantial environmental changes occurred in eastern North America (e.g., Delcourt and Delcourt 1981, 1983; Viau et al. 2006; Williams et al. 2004) (Figure 2). Delcourt and Delcourt (1981, 1983) argued that the boreal forests that covered eastern North America during the Last Glacial Maximum (LGM) began moving north and more temperate species expanded to cover large swaths of area by the Mid-Holocene as a response to increasing temperature and moisture. Anderson Pond (Delcourt 1979) in Tennessee and Jackson Pond in Kentucky (Wilkins et al. 1991) are the two primary pollen cores that were used to reconstruct the transition from boreal to deciduous forests in the Mid-South. A subsequent reanalysis of these cores by Liu et al. (2013) placed the transition from boreal-to-deciduous forests at 15,900 cal yr BP at Anderson Pond and 15,400 cal yr BP at Jackson Pond. This transition does not occur at Silver Lake in Ohio and Appleman Lake in Michigan until approximately 2,000 years later (Gill et al. 2009), which Liu et al. (2013) cite as support for a time-transgressive shift from in forest composition at the end of the Pleistocene from south to north.

While a time-transgressive shift from boreal to deciduous forests occurred *northward*, it also likely occurred *upward*. In other words, the trend of shifting forest composition is also reflected in the distribution of species relative to altitude. For example, Mills and Delcourt (1991) observed that several areas of the Blue Ridge Mountains show evidence of alpine tundra being replaced by boreal forests after 12,500 years ago (~14,761 cal BP). Consequently, the replacement of these boreal forests by deciduous forests likely occurred well after disappearance of alpine tundra. Moreover, the reconstructions by Delcourt and Delcourt (1981, 1983) and Williams et al. (2004) show a delay in the northward movement of boreal forests in areas with higher altitude, especially the Appalachian Highlands and the Cumberland Plateau. This pattern likely indicates a “sky island” effect where remnant boreal forests and alpine tundra are present in the uplands well after deciduous forests spread into lower elevations. However, with the dramatic increase in temperature at the end of the Younger Dryas and into the Early Holocene, the size of these boreal sky islands would have diminished as deciduous forests climbed to higher elevations. This pattern is relevant to an analysis of the Duck River Valley because there is considerable variation in elevation from the eastern Gulf Coastal Plain (~115m) to the Cumberland Plateau (~600m) (Figure 3).

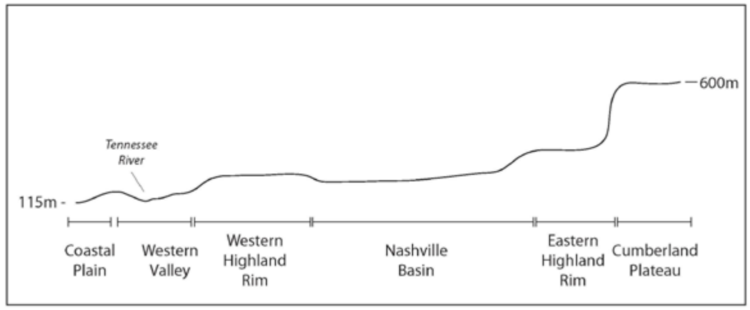

FIGURE 3. Variation in elevation across the Duck River Drainage derived from the National Elevation Dataset (USGS 2014) (vertical exaggeration 10x).

The shift from boreal to temperate forests would have greatly altered the resources available for prehistoric groups. For example, the pollen cores from both Jackson Pond in Kentucky and Anderson Pond in Middle Tennessee show large increases in oak pollen from the Late Pleistocene through Early Holocene (Delcourt 1979; Liu et al. 2013; Wilkins et al. 1991). Furthermore, at Anderson pond the influx of oak pollen not only correlates strongly with hickory pollen, but also positively correlates with 25 other species, which contrasts significantly with the coniferous species that dominated eastern North America during the LGM. The spread of mixed hardwood forests would have had the combined effect of increasing the amount of oak and hickory available for humans, as well as deer populations whose preferred food resource are acorns (Munson 1986; Gardener 1997). Consequently, the expected pattern for settlement in the Duck River drainage would be for groups to colonize the lowest elevations first, followed by an expansion to higher elevations as boreal forests give way to deciduous forests from the Late Pleistocene to Early Holocene.

Study Sample

Works Progress Administration crews first surveyed the areas around the confluence of the Duck and Tennessee Rivers in the 1930s as part of the Kentucky Lake project (Lewis and Kneberg 1959). This area has since been resurveyed by both Cultural Resource Analysts in the early 1990s (Kerr and

Bradbury 1998) and most recently by the University of Tennessee Archaeological Research Lab (Angst 2012). The section of the river in Coffee and Bedford counties in the Eastern Highland Rim was surveyed as part of the Normandy Reservoir project in the early 1970s (Faulkner and McCullough 1973). The area that traverses the Nashville Basin in Maury and Marshall counties was surveyed as part of the Columbia Reservoir project (Evans 1972). Jolley (1980) conducted a survey of sites in Hickman and Humphreys counties to locate sites between the extent of the Kentucky Lake and Columbia Reservoir surveys. In the ensuing years, many additional sites were reported as part of cultural resource management projects, making this one of the more comprehensively surveyed drainages in the Mid-South. The Duck River also crosses multiple physiographic provinces, including the lower Tennessee River Valley, the Western Highland Rim, Nashville Basin, Eastern Highland Rim, and Cumberland Plateau (e.g., Fenneman 1938). Because of the unique geologic setting and variation in elevation in this drainage, we used each physiographic section as a proxy for a "habitat" in an Ideal Free Distribution analysis.

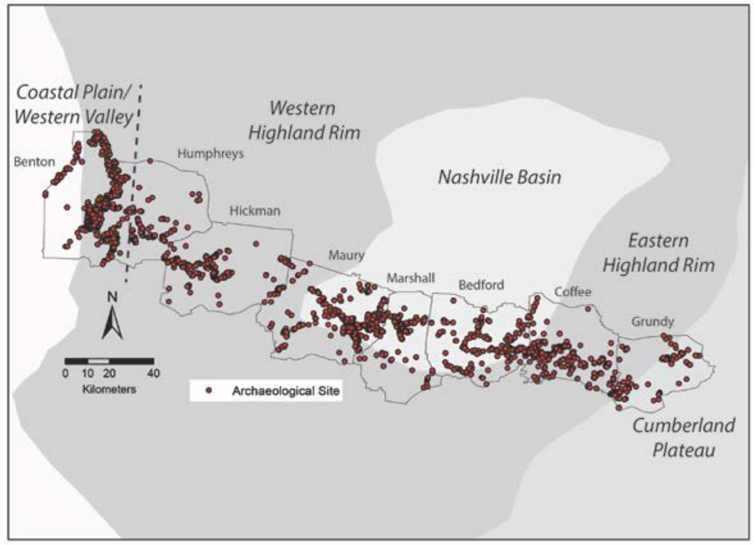

FIGURE 4. The distribution of recorded archaeological sites in the Duck River drainage.

There are two primary sources of data on the distributions of sites and artifacts for the study area. The first is the Tennessee state archaeological site files at the Tennessee Division of Archaeology. This dataset contains information on site location, condition, cultural affiliation, artifacts recovered or observed, and where the collections are curated. In addition to site file information, the state of Tennessee also has one of the most active Paleoindian projectile point surveys in North America (Anderson et al. 2010; Broster and Norton 1996; Broster et al. 2013). This database, obtained in large part from private collections, contains information on the projectile point type, metric attributes, raw material type, and date of recovery. Miller (2014) integrated these sources into a database that contains information for 2,427 recorded sites from the eight counties spanning the extent of the Duck River drainage, of which he was able to acquire specific coordinates for 2,211 of these sites (Table 1; Figure 4). For this study, we use 421 components from 1175 terminal Paleoindian and Archaic period sites based on the reported presence of temporally diagnostic projectile point types.

Methods

Miller (2014) assessed potential sources of sampling bias in the distribution of archaeological sites. These potential effects that were assessed

Table 1. Summary Data for the Site File Record Analysis for the Duck River Drainage.

Temporal Component[1]	Coastal Plain/ Western Valley	Western Highland Rim	Nashville Basin (Maury County)	Nashville Basin (Marshall and Bedford Counties)	Eastern Highland Rim (Coffee County)	Eastern Highland Rim & Cumberland Plateau (Grundy County)	Total
Clovis	43	5	0	1	4	0	53
Cumberland/Barnes	26	2	2	0	5	0	35
Quad/Beaver Lake	31	9	7	1	12	0	60
Dalton/Greenbrier	33	7	1	2	13	2	58
Early Archaic Corner-Notched	26	22	23	29	61	13	174
Bifurcate	4	4	6	3	18	6	41
Total Paleoindian and Archaic	309	233	144	125	289	75	1175
Total Components	1088	802	662	577	864	252	4245
Total Sites	568	411	434	373	316	109	2211

[1] A component is determined by the presence of absence of a temporally diagnostic artifact at a site as defined by the Tennessee Division of Archaeology.

included a taphonomic bias, modern population/collector bias, landcover, geology, and geomorphology. Based on this analysis, a temporal taphonomic bias and an over-representation of sites in areas that were surveyed as part of the Kentucky Lake, Columbia, and Normandy reservoir projects are the two main sources of variation that appear to be biasing the study sample.

Consequently, it is necessary to adjust the study sample in two ways to winnow out the effects of these biases in the reporting of sites containing Paleoindian and Archaic components in the Duck River drainage. As a means of counteracting survey bias, we first divided each cell (i.e. the frequency of components by time period and physiographic section) by the total number of Paleoindian and Archaic components identified in each physiographic section. For example, in the Coastal Plain/Western Valley physiographic section, there are 43 Clovis components out of a total of 309 Paleoindian and Archaic components for the entirety of the Duck River drainage. For that cell, we simply divided the number of Clovis components by the total number of Paleoindian and Archaic components, which provides a relative measure of the distribution of components over time for that physiographic section. This is essentially the same approach Anderson (1996) used in his analysis of the distribution of Archaic sites across the southeastern United States.

Alternatively, we divided each cell by the total number of sites for the same temporal component. Again, using the Clovis sample from the Coastal Plain/Western Valley physiographic section as an example, we divided the total number of Clovis components in the physiographic section (43) by the total number of Clovis components in the entire study sample (53). This provides a relative measure of the distribution of components across space at a particular time. Modifying the sample in this way helps to account for the taphonomic bias that affects the temporal distribution of sites by isolating the study sample at each time slice to analyze how each component varies across space. Finally, we used Pearson's "Goodness of Fit" test (Pearson 1900) with Cramer's (1946) *V* to control for scalar effects to determine if the distributions are statistically significant.

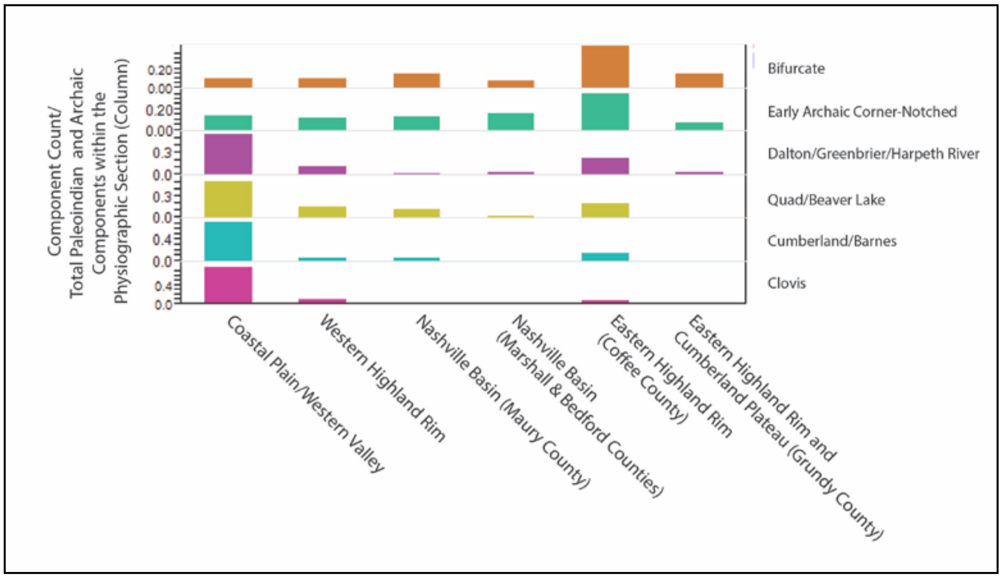

FIGURE 5. Distribution of temporal components divided by the total Paleoindian and Archaic components from within the physiographic section (column).

Results

Two trends are apparent after adjusting the data to account for survey coverage bias (Figure 5). First, the majority of Clovis, Cumberland/Barnes, Quad/Beaver Lake, and Dalton/Harpeth River/Greenbrier components are found in Coastal Plain/Western Valley physiographic section associated with the lower Tennessee River Valley. However, there is a slightly higher representation of the Quad/Beaver Lake and Dalton/ Harpeth River/Greenbrier components across the drainage, and in particular in the Eastern Highland Rim in Coffee County. Then, with the Early Archaic Corner-Notched and Bifurcate components, the trend reverses with the majority of the sites in these time periods located in the Nashville Basin, Eastern Highland Rim, and Cumberland Plateau. The same two trends also appear after adjusting the data to account for temporal taphonomic bias (Figure 6).

We used Pearson's "Goodness of Fit" test with Cramer's *V* as another means to illustrate the degree to which sites are distributed across the drainage. As a null hypothesis, we used an even distribution of sites across the drainage. To derive this, we divided the total number of components for each time slice by the percentage of the total area of the county. In other words, if a physiographic section encompasses 30% of the total area of the drainage, it should also contain 30% of the components for a given a time slice if they were perfectly dispersed across the drainage. To meet the minimum sample size requirements for each cell, we combined the physiographic sections into three categories (Coastal Plain/Western Highland Rim, Nashville Basin, and Eastern Highland Rim/Cumberland Plateau). We also collapsed the Clovis, Cumberland, Quad/Beaver Lake and Dalton/Greenbrier components into a general Paleoindian group, and the Early Archaic Corner-Notched and Bifurcate components into another. This analysis illustrates that the trends described above are statistically significant. The Paleoindian group is over-represented in

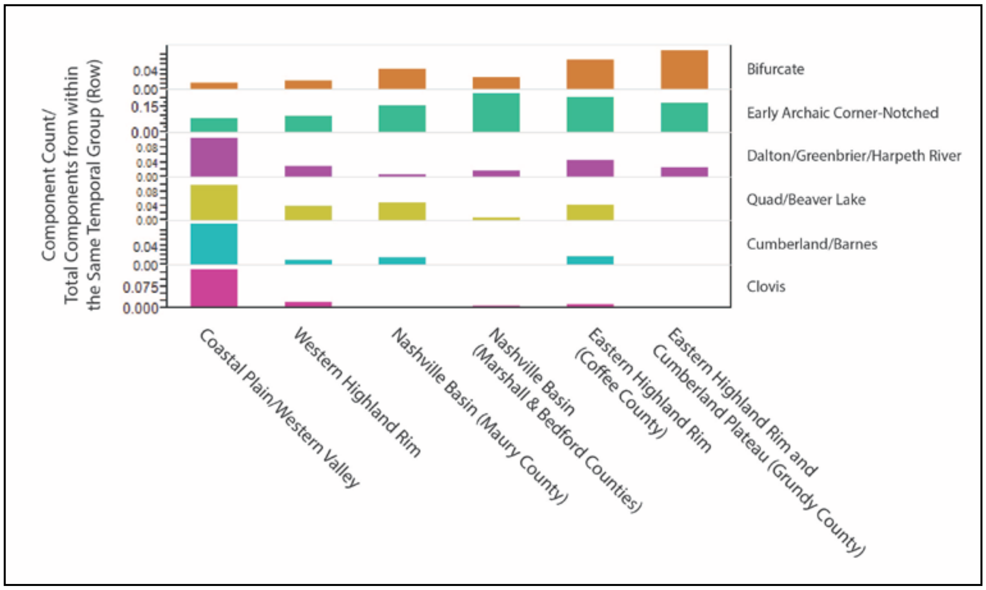

FIGURE 6. Distribution temporal components by county divided by the total components from the same temporal group (row).

the Coastal Plain/Western Highland Rim physiographic section and under-represented in the Eastern Highland Rim/Cumberland Plateau (X^2=42.85; *df*=3; *p*<.001; *V*=.32). The inverse pattern was observed in the Early Archaic group, with the frequency of sites over-represented in the Eastern Highland Rim/Cumberland Plateau and under-represented in the Coastal Plain/Western Highland Rim physiographic section (X^2=85.48; *df*=3; *p*<.001; *V*=.45).

Discussion

After correcting for temporal taphonomic bias and differential survey coverage, the Clovis and Cumberland sites are primarily found at the confluence with the Tennessee River, and then during the Middle and Late Paleoindian they start to appear with greater frequency in the Eastern Highland Rim. By the Early Archaic period, sites are much more prevalent in the Eastern Highland Rim and Cumberland Plateau.

Moreover, this pattern does not appear to be unique to the Duck River Valley. Additional studies by Franklin (2002) in Fentress County and Jolley (1979) in the Calfkiller River Valley along the western edge of the Cumberland Plateau also show substantially more sites with Early Archaic components compared to Paleoindian period components. This pattern also extends into Kentucky, where Early Paleoindian sites are rarely found on the Cumberland Plateau compared to adjacent physiographic sections at lower elevations (Maggard and Stackelbeck 2008). Nor is this pattern restricted to the Cumberland Plateau. Both Bass (1977) and Kimball (1996) reported a large number of Early Archaic sites from the Great Smoky Mountains and Tellico Reservoir in east Tennessee, of which Kimball used 333 different assemblages to model Early Holocene site function and landscape use. Considering that the Tellico Reservoir and Great Smoky Mountains have been extensively surveyed, it is striking that only seven projectile points (a Clovis, a Redstone, two Cumberlands, two Quads, and one Dalton) from Monroe, Blount, and Sevier counties are included in the Tennessee

Fluted Point Survey (Broster et al. 2013). Lane and Anderson (2001) argue that this pattern extends for the entirety of the Appalachian Highlands and the Cumberland Plateau.

Lane and Anderson (2001) and Maggard and Stackelbeck (2008) both argued that due to topography the Cumberland Plateau and Appalachian Highlands were at the periphery, of the initial colonization process for eastern North America. In both of these studies, they argued that areas at higher elevations were perhaps ignored initially because of the energy costs associated with exploring areas at higher elevations. Similarly, we argue that the relative absence of Paleoindian sites and subsequent abundance of Early Archaic sites at higher elevations meets the expectations of the Ideal Free Distribution (e.g., Fretewell and Lucas 1970). This model assumes that the first individuals moving into a new area will occupy the most favorable habitat, and as more people move into this habitat, crowding, resource depletion, and competition will result in people colonizing secondary, unsettled habitats. However, rather than the energetic costs of moving to higher elevations being the primary deterrent, we argue that the composition of forests, which also correlates with elevation, was the likely culprit that prevented early populations from initially establishing a permanent presence in highland areas in the Late Pleistocene. In other words, it was not until regional climate became warmer and wetter during the Early Holocene that mixed hardwood forests moved into higher elevations to displace remnant boreal forests, thereby increasing the abundance and diversity of resources available for hunting and gathering.

More puzzling, however, is the relatively few early Holocene sites at the confluence of the Tennessee and Duck Rivers. While Kirk Point, a substantial Early Archaic site, has been recorded in this area (McNutt et al. 2008), there are fewer reported Early Archaic components in this area when compared to the sites compared to the rest of the Duck River drainage. Furthermore, Miller (2014) created a database of over 5,000 bifaces from Benton and Humphreys counties. He found relatively few Early Archaic Corner-Notched and Bifurcate projectile points compared to the frequency of the preceding Late Paleoindian Dalton types, and the subsequent terminal Early Archaic Kirk Stemmed and Middle Archaic Eva I types. The Ideal Free Distribution would predict that if the suitability of this habitat remained constant relative to other habitats in the drainage, then the relative frequency of sites in this area should also remain constant. However, that is clearly not the case.

There could be several explanations for the decrease in the frequency of Early Archaic sites at the confluence of the Tennessee and Duck Rivers in the Early Holocene. First, there could be geomorphological bias specific to the Tennessee River that caused the erosion of levee deposits utilized by Early Holocene hunter-gatherers. However, for this to be the case, this process would have to have also left the deposits containing Late Pleistocene and Middle Holocene intact. Second, there could also be a chronological issue, where in the Tennessee River Valley Early Archaic projectile point types are not mutually exclusive and overlap considerably in time. Given the vagaries with the Late Pleistocene and Early Holocene radiocarbon record in the southeastern United States, placing accurate and precise time brackets for the appearance and disappearance of temporally diagnostic projectile point types is still difficult (e.g., Anderson et al. 2010; Goodyear 1999; Miller and Gingerich 2013). Finally, the decrease in sites dating to the Early Holocene could be due to variability in local environmental conditions that are not reflected in broader studies (Delcourt and Delcourt 1981, 1983; Liu et al. 2013; Williams et al. 2004) or paleoenvironmental proxies from adjacent physiographic provinces (Brackenridge 1984; Delcourt 1979; Klippel and Parmalee 1982; Wilkins et al. 1991). Despite the extensive surveys and subsequent research conducted on sites from the Lower Tennessee and Duck River Valleys, there is still much to learn regarding Late Pleistocene and Early Holocene chronology, environments, and hunter-gatherer adaptations in this area, and is critical for understanding the origins of the Shell Mound Archaic in the Mid-South (e.g., Bissett 2014).

Conclusion

Analyses of the distribution of archaeological sites have played a prominent role in the study of the Late Pleistocene and the Early Holocene epochs in the southeastern United States. We argue that the reliance on analyzing site distributions stems from the abundant and widespread record of surface sites and isolated finds in the region in contrast to the poor record of sites with buried components with organic material remains. In this paper, we utilized the Ideal Free Distribution from Behavioral Ecology (e.g., Fretwell and Lucas 1970) to analyze variation in landscape use in the Duck River drainage. After adjusting the data to account for variation caused by survey bias and a temporal taphonomic bias, we found that archaeological sites are initially concentrated in the confluence with the Tennessee and Duck Rivers. However, over the course of the Younger Dryas and into the Early Holocene, the distribution of archaeological sites extends to the Eastern Highland Rim and the Cumberland Plateau. We argue that this pattern is consistent with broader trends in landscape use (e.g., Lane and Anderson 2003; Maggard and Stackelbeck 2008; Tankersley 1990), and reflects populations expanding into higher elevations as temperate forests replaced boreal forests as climate became warmer and wetter during the Early Holocene. However, counter to the expectations of the Ideal Free Distribution, we also observed that the relative frequency of Early Holocene sites decrease at the confluence of the Tennessee and Duck River valleys. We argue that this may be the result of Early Holocene erosion of the levees adjacent to the Tennessee River, imprecision in the regional sequence of temporally diagnostic projectile points, or local environmental variability that has gone undetected in regional proxy records.

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THE PALEOINDIAN AND EARLY ARCHAIC HILLTOP OCCUPATIONS AT THE TOPPER SITE

Derek T. Anderson, Ashley M. Smallwood, Albert C. Goodyear, and Sarah E. Walters

Recent AMS dating of charred remains from the Paleoindian occupation of the upper hillside area at the Topper site has provided the first precise radiocarbon date in the Southeast that is directly associated with diagnostic Clovis lithic artifacts. This paper presents the results of dating, geoarchaeological, and lithic analyses in this area of the site, with a focus on the Paleoindian and Early Archaic components.

Topper (38AL23) is well-known as a lithic quarry-related site, with an extensive Clovis component (Goodyear and Charles 1984; Goodyear and Steffy 2003), but little attention has been paid to the post-Clovis utilization of the site (Goodyear 2001; Miller 2010:25-33; Sain 2012:47). Likewise, while the production, use, and discard of stone tools at Topper has been the focus of multiple analyses (Goodyear and Steffy 2003; Goodyear et al. 2009; Miller and Goodyear 2008; Miller and Smallwood 2012; Sain 2012; Smallwood 2010; 2011; Smallwood and Goodyear 2009; Steffy and Goodyear 2006), unmodified debitage has received very little attention.

From 1998 to 2008, annual fieldwork at Topper focused on the terrace and hillside portions of the site (Figure 1). Excavations of large, contiguous blocks as well as scattered 2x2 m units across the site resulted in the recovery of four finished and discarded Clovis point bases (Smallwood 2011:75), numerous early, middle, and late stage Clovis preforms with evidence of end thinning and overshot flaking, and many categories of other formal tools (Smallwood et al. 2013). Early Archaic Taylor points, tools, and debitage overlie the Clovis material in many areas of the site, and these are deposited below Middle and Late Archaic, Woodland, and Mississippian assemblages (Goodyear 2001). In 2009, the first of a series of units were excavated on the upland portion of the site (referred to as the “hilltop”), in order to determine the spatial extent of the Clovis material, and excavations have continued on the hilltop on a limited basis since then. This article describes some of the recent (2009-2014) investigations of the Topper site, with a focus on the Paleoindian and Early Archaic assemblages, and the establishment of a cultural chronology on the hilltop.

Hilltop Excavations

Excavations on the hilltop began as a series of 2x2 m “test units” placed progressively farther from the river and the chert outcrop, and the most productive of these initial units were expanded into three contiguous blocks. Terrestrially-outcropping nodules are available about 100 meters from the excavation block; nodules with “river cortex” or “river staining” can be found in and along the banks of the Savannah River, about 200 meters away. Accumulations of heavily weathered debitage (e.g., Miller 2010:35) lacking diagnostic bifacial tools have been encountered in all units on the hilltop, in some cases at depths greater than one

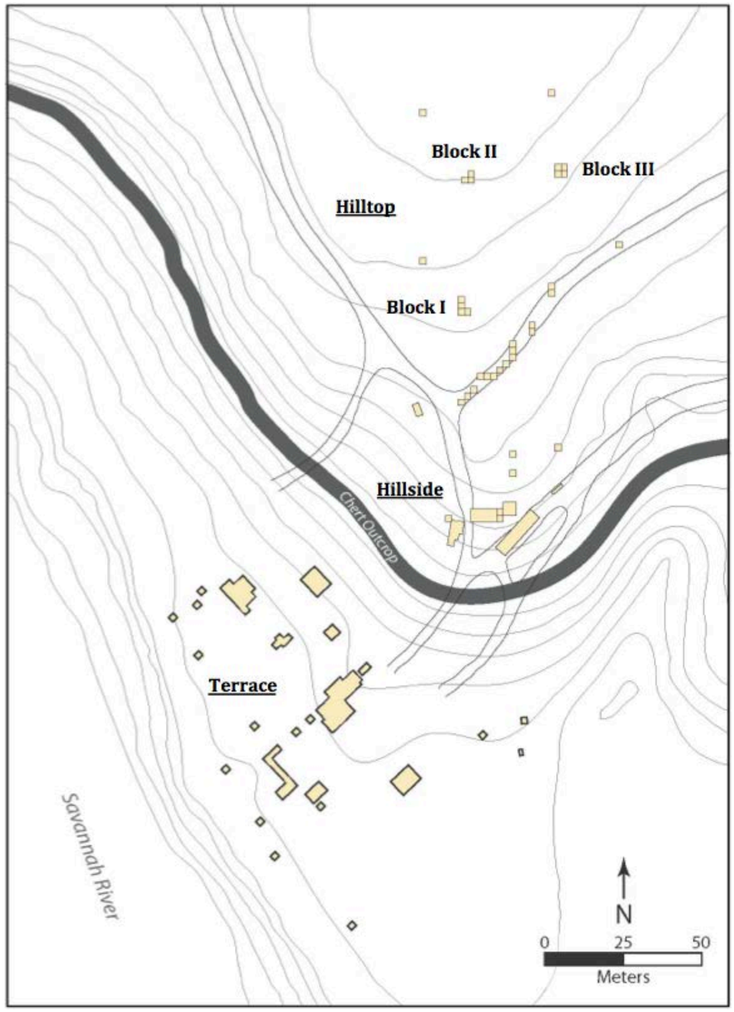

FIGURE 1. Map of excavation units at the Topper site with terrace, hillside, and hilltop areas highlighted. Adapted from Miller (2010).

meter below ground surface. Although excavations on the hilltop began in 2009, demonstrating this was a thoroughly utilized area of the site beginning at least in the Early Archaic period, no diagnostic Clovis artifacts were recovered until the 2011 season. Because multiple components are likely represented in each of the three blocks, each block has been assigned a sequential numeric designation in order to differentiate them from large excavation blocks in other parts of the site.

Block I

The first contiguous block excavated on the hilltop is also closest to the chert outcrop. Three units forming an "L" shape were excavated in 2009, and a fourth unit that extended the block an additional two meters to the north was added in 2012. Two Early Archaic side-notched points (Figure 2) were found associated with an accumulation of debitage at about 80 cm below ground surface; a variety of non-diagnostic bifacial and flake tools including a large macroblade and an end-thinned or fluted preform were found up to 15 cm below the Early Archaic material and likely represent a separate, earlier component. No detailed analysis of this material has occurred at this point, but sediment samples have been collected for flotation and particle size analysis.

FIGURE 2. Early Archaic side-notched points recovered in Block I.

FIGURE 3. Kirk Corner-notched point recovered in Block II.

Block II

In 2010, a 2x2 m unit was opened about 30 meters north of Block I. At approximately 109 cm below ground surface, a Kirk corner-notched point was recovered (Figure 3) associated with a lithic scatter and a faint lens of ash and charred botanical remains that likely represent a hearth or cooking feature. The unit was re-opened in 2011, and excavations continued to a depth of 130 cm below surface. Although a small amount of cultural material was present at this depth, and the unit never fully "bottomed out," excavations were halted for safety reasons and no diagnostic tools were found below the Kirk component. In 2012, two additional 2x2 m units were excavated adjacent to the original unit. The unit to the north contained a large disturbed area and was only partially excavated, but the unit to the west was fully excavated and contained endscrapers, bifacial tools or preforms, and flake tools at the same 5 cm level as the Kirk point and hearth. Scattered debitage and charred botanical material was recovered to a depth of approximately 130 cm below surface in both of these units as well, but no diagnostic tools were recovered below the Kirk component.

Block III

A second 2x2 m unit was initiated in 2010, about 25 meters east of Block II. Excavations were halted at the end of the season before the unit could be completed, due to an extremely dense layer of weathered lithic material consisting of debitage and non-diagnostic tools a meter below ground surface. In 2011, the unit was re-opened, and the discovery of Clovis artifacts including a late stage fluted preform, an overshot flake, and multiple tools (including macroblade fragments) to a depth of 115 cm below ground surface led to the excavation of an adjacent 2x2 m unit to the east. Over 600 artifacts were mapped *in situ* in a 15 cm "lithic floor" in the second unit, so two additional 2x2 m units

Table 1. Counts of Bifaces with Evidence of Thinning Flake Scars from the Paleoindian Levels of Block III.

Stage of Reduction	Overface Scars	Overshot Scars	Endthinning Scars
Early (n = 11)	9	2	6
Middle (n = 6)	5	0	2
Late (n = 8)	6	2	5

FIGURE 4. Bifaces from the Paleoindian component in Block III.

were excavated to the north in 2012, resulting in a 4x4m block.

Hilltop Assemblage

Twenty-seven bifaces and biface fragments were recovered from the buried Paleoindian component (Figure 4). Of these, four fragments mend as refitted bifaces, making three complete bifaces and 22 fragments. Based on morphological characteristics, shape ratios, and the flaking index of reduction (Miller and Smallwood 2012; Smallwood 2010), the hilltop assemblage has 11 early stage bifaces, six middle stage bifaces, and eight late stage bifaces. Hilltop bifaces were crafted from large spalls struck from locally available chert nodules. Spalls were bifacially flaked to remove cortex and irregularities. After initial reduction, bifaces were thinned and shaped. Four bifaces retain overshot flake scars, 20 bifaces have evidence of broad overface removals, and 13 bifaces retain scars from end thinning (Table 1). Preforms generally have squared, beveled bases and excurvate lateral margins. Debitage that can be considered diagnostic of Clovis reduction (Bradley et al. 2010; Smallwood 2012; Waters et al. 2011; also see Eren et al. 2013) was also recovered, including one complete overshot flake, four distal portions of overshot flakes, and two end thinning flakes. A single Dalton (see Goodyear 1974) preform made of local Coastal Plain chert (Figure 5) was recovered in the upper portion of the Paleoindian component as well. Its collateral flaking to

FIGURE 5. Dalton preform recovered from the Paleoindian component in Block III.

the midline, lobed ears, and planview distinguish it from Clovis, and it appeared to have been pushed down into the deposits, as it was resting at a 60 degree slope. This late Paleoindian point is noteworthy as it is only the second post-Clovis, diagnostic Paleoindian artifact found in over 800 square meters of excavations at Topper; the other is an orthoquartzite Redstone point from the hillside (Miller 2010:31).

The hilltop Paleoindian assemblage also includes 21 formal flake and core tools and at least 15 retouched flakes. Of the flake and core tools, there are eight sidescrapers, seven endscrapers, two cobble chopping tools, one denticulate, one adze preform, one planer blank, and one wedge tool (following Andrefky 2005; also see Smallwood et al. 2013 for tool type descriptions for Topper). Based on Kuhn's (1990) calculation of Reduction Index (RI), six of these tools have RIs greater than 0.70, which are values experimentally shown by Kuhn to exhibit retouch resulting from greater than 5 reduction events.

Based on the presence of bifacial reduction debitage and the ratio of bifaces per square meter (1.75), the hilltop served as a biface production locus, like other areas of the Topper site. However, the hilltop is unique in the greater density of other tool types. Based on simple comparisons of density per square meter, the density of flake/core tools and modified flakes in the Paleoindian component is 2.25 tools per square meter for Block III, compared to the 0.68 value calculated for the 128 square meters of the hillside assemblage (Smallwood et al. 2013). Clearly, flake and core tool production and use were important activities taking place in the hilltop portion of the site. While these activities are evident in other areas of Topper,

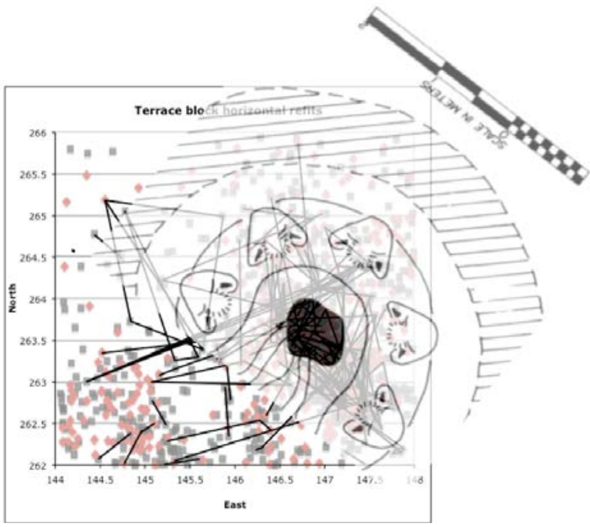

FIGURE 6. Plan view of a hearth-centered activity area in the "terrace block" at Topper. Black lines represent refits; red diamonds are thermally altered artifacts, and black squares are unaltered artifacts. Hearth-centered seating model via Binford 1978.

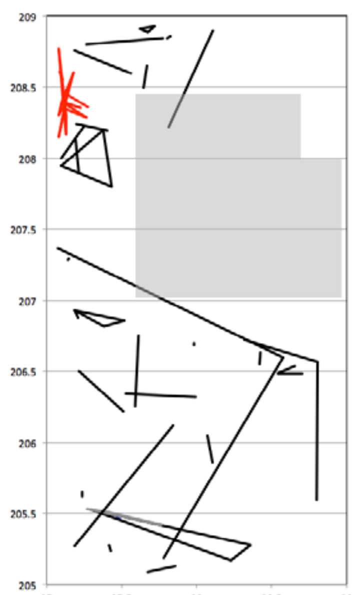

FIGURE 7. Preliminary results of lithic refitting from Block II. Shaded portion represents disturbed area that was not fully excavated.

especially the hillside (Smallwood 2015), the hilltop has produced the densest evidence of flake and core tool production and use thus far.

Lithic Refitting

In 2010, a 4x4m block was excavated on the terrace that contained a mixed Paleoindian and Taylor assemblage. A detailed analysis of debitage from the block ultimately resulted in the refitting of over 25% of the mapped artifacts, providing a means of differentiating between the two components and demonstrating that the deposits at Topper are relatively undisturbed, both horizontally and vertically (Anderson 2011). Although no charcoal, staining, or textural differences were observed during excavations, analysis of individually mapped items shows that thermally altered and burned artifacts are concentrated in two areas within the block. When the refit distributions are overlaid, these two areas are recognizable as activity areas, likely hearths (Figure 6).

Refitting in the hilltop excavation blocks has demonstrated that other portions of the site are equally well-preserved and intact. Preliminary analysis of the lithics from a portion of Block II (Figure 7) indicates that at least one hearth-centered activity area exists in the northern portion of the block, in addition to the hearth that was bisected in the southern wall. Average vertical distance between all refits in Block II is 3.8 cm, and about 7.5% of the mapped assemblage from the two units that have been analyzed so far refits (86 of 1147 artifacts). Refitting of the third 2x2 m unit in this block is planned and should help to increase the overall percentage of refits within the assemblage.

Detailed spatial analysis and refitting of Block III is also in progress and has produced similar results. Concentrations of artifacts that likely represent knapping clusters and hearths are visible in

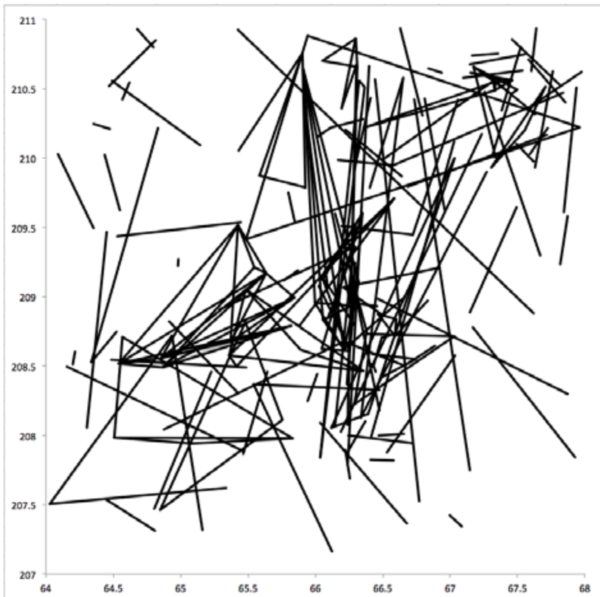

FIGURE 8. Preliminary results of lithic refitting from Block III.

planview (Figure 8), and although more vertical movement of material is present in this part of the site (tree roots or an intrusive pit appear to have moved many artifacts in the northeast corner of the block), many features seem to be largely intact. The success rate for refitting in Block III is currently over 13% of the mapped assemblage (253 of 1,918 artifacts), and the excavation and analysis of additional units in the future should aid in our understanding of late Pleistocene and early Holocene spatial organization among hunter-gatherer groups.

Dating and Chronology at Topper

The acidic soils that are common to many archaeological sites in the southeastern United States are often devoid of recoverable organic remains (Hollenbach 2009:1), and the sandy deposits of the Coastal Plain are no exception. As a result, radiocarbon dates from the Paleoindian and Early Archaic periods are relatively rare in the Southeast, particularly at open-air sites (Hollenbach 2009:98). The Flamingo Bay site (38AK469) has produced a series of dates on Early Archaic material (Moore et al. 2012), but no other published dates exist for the late Pleistocene or early Holocene in South Carolina (Miller and Gingerich 2013a, 2013b), severely limiting discussions of regional chronologies and culture change.

Historically, attempts to date the Clovis occupation at Topper have been relatively unsuccessful. Waters et al. (2009:1305) were only able to collect one radiocarbon sample from the Clovis deposits on the terrace, but it resulted in a date of 2,170 +/- 40 B.P. (CAMS-66110; charcoal) and was clearly introduced from above. Although a series of optically stimulated luminescence dates more accurately dated Clovis at the site, they were also considered unreliable due to bioturbation, and standard deviations of over 1,000 years make them unsuitable for isolating individual cultural components (Waters et al. 2009:1308).

Beginning in 2010, however, excavations on the hilltop have resulted in the recovery of large quantities of small, charred botanical remains both *in situ* and from the 1/8" screens. After recognizing that charred organic remains in Block II were likely associated with an ancient hearth feature, a series of test columns were excavated across the hilltop for flotation analysis. Presence/absence studies and preliminary analysis from one of the columns identified a variety of paleobotanical remains, many of which are likely culturally deposited (Walters 2013; Walters et al. 2013). This suggests that botanical remains are not only present throughout the hilltop portion of the site, but are found in all cultural deposits, from the Paleoindian period to the present. Since 2011, a concerted effort has been made to collect as many

Table 2. Radiocarbon Samples from the Topper Hilltop Units. All Dates are Reported in Uncalibrated Calendar Years.

Excavation Block	Unit	Depth (cmbs)	Context	Material	Lab Number	Radiocarbon Age	delta-13C value
II	HSN205E37-12	105-110	1/8" screen	Hickory nut shell	Beta-296974	8,130 +/- 40	-23.3
II	HSN207E37-12	108.8	In situ	Hardwood (diffuse-porous)	Beta-359836	9,840 +/- 40	-25.3
II	HSN205E37-13	111.7	In situ	Muscadine	AA-100293	8,226 +/- 55	-26.3
II	HSN207E37-14	120.4	In situ	Black gum	AA-100292	3,306 +/- 41	-23.5
III	HSN209E66-10	107-112	1/8" screen	Softwood	Beta-359835	2,070 +/- 30	-24.4
III	HSN207E66-11	107-112	1/8" screen	Softwood (cf. white pine)	Beta-359834	10,030 +/- 50	-25.5
III	HSN206E64	115-120	Flotation	Softwood (spruce/fir/larch)	AA-100294	10,958 +/- 65	-24.2

samples of organic material as possible from the excavation units. Dozens of pieces of charred material have been mapped *in situ*, and hundreds more have been recovered from the screens.

In 2011, a sample of hickory nut shell associated with the Kirk corner-notched point in Block II was dated at 8,130 +/- 40 BP (Beta-296974, delta 13C = -23.3) indicating that old charcoal existed on the hillside and providing another line of evidence that minimal post-depositional movement of cultural material had occurred within the deposits. After successfully dating the Kirk component, three additional samples from the same excavation block were selected and submitted to radiocarbon dating labs in 2012 and 2013. A sample of black gum was clearly displaced from above (3,306 +/- 41 BP, AA-100292, delta 13C = -23.5), but a piece of muscadine at the base of the Kirk occupation corroborates the initial Kirk date, and a diffuse-porous hardwood associated with the basal lithic floor at approximately 130 cm below surface likely dates the Taylor component on the hilltop (Table 2).

Three samples from Block III were also dated in 2013 (Table 2). A cold-adapted softwood (spruce, fir, or larch) from one of Walters' flotation columns provided the first - and thus far, only - radiocarbon date from the Clovis component at the site (Goodyear 2013; Walters et al. 2013) and falls within Waters and Stafford's (2007) redefined range for the Clovis period (11,500 - 10,900 BP; 13,250-12,800 CALYBP). Two additional softwood samples were then selected for dating from material recovered in the 1/8" screens from adjacent units. A roughly 2,100 year-old sample likely represents a relatively recent root burn, but the second falls within the Younger Dryas chronozone (12,850-11,700 cal yr BP, a time span that is under-represented in the Southeast [Miller and Gingerich 2013a]) and could date a late Dalton or early Taylor occupation at the site.

Conclusion

Topper represents a unique and persistent place on the landscape (Schlanger 1992) that was utilized by most, if not all, of the various groups of people living on the Coastal Plain of South Carolina for the past 13,000 years. Like most of the sandy sites in the region, Topper does not have clearly defined stratigraphic breaks that make it possible to pick a spot on the profile wall of a unit and determine its age based on depth alone. However, Topper does have a large number of diagnostic artifacts, surprisingly well-preserved botanical remains, and a steadily-increasing number of dates. Based on the current results, it appears the Kirk component dates from roughly 8000-9000 BP, Taylor from 9000-10,000 BP, and the Dalton through Clovis components from 10,000-11,000 BP, paralleling discoveries elsewhere in the Southeast. Additional radiocarbon and OSL samples are currently being processed, and with the continued recovery of carbonized remains, Topper has the potential to not only securely date Clovis in the Southeast, but to construct a complete cultural chronology for the region as well. Different occupational episodes at the site can also be identified through the use of a variety of analytical techniques. Refitting in all three hilltop blocks, along with minimal nodule analysis (MANA) (e.g., Larson and Kornfeld 1997) and microdebitage analysis continue to help differentiate and define the assemblages left at the site by the prehistoric people who visited Topper.

Further, it is becoming increasingly clear that the Paleoindian occupation at Topper is complex and spatially varied. With the presence of overshot flakes, a debitage type thus far shown to be diagnostic of Clovis, the Dalton point preform, and an Early Archaic radiocarbon date, the expansion of Block III on the hilltop in particular may be key to revealing the nature of a post-Clovis Paleoindian occupation at Topper, which outside of this block thus far appears to be sparse. If further analysis of the hilltop proves that Topper was extensively used by Dalton populations as a workshop and camp, like the Clovis occupation has shown, this would be the first recorded Late Paleoindian-age quarry-related site in the Southeast. Certainly, this would provide a significant opportunity to fully understand post-Clovis production technology and settlement.

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CLOVIS BLADE TECHNOLOGY AND TOOL USE ALONG THE SOUTH ATLANTIC COASTAL PLAIN AND PIEDMONT OF THE LOWER SOUTHEAST

Douglas Sain and Albert C. Goodyear

John Broster has contributed to our knowledge and understanding of Southeastern Archaeology over the course of his career, and in this capacity has been an inspiration to the work of numerous individuals. The discovery of Paleoindian sites across the Southeastern U.S. has revealed a substantial presence of blades, and blade cores. While fluted points have been extensively recorded as part of the Paleoindian Database of the Americas, less research has considered the role of blades in such contexts. This paper presents the formation and development of a Clovis blade database to account for the distribution of these artifacts across the Southeast U.S. A technological and morphological analysis of a sample of blades from this dataset demonstrates patterns of variation when compared with blades from known quarry sites in the Central Savannah River Valley.

The discovery of Paleoindian sites across the Southeast U.S. has revealed a substantial presence of chipped stone tools including fluted points, prismatic blades, and blade cores. Fluted points have been extensively recorded as part of the Paleoindian Database of the Americas, with data available on nearly 30,000 artifacts to date (Anderson et al. 2010). However, less research has considered the distribution and role of Clovis prismatic blades across similar contexts. Blades, as a form of stone tool technology, are increasingly being recognized as an integral element of the Clovis lithic toolkit (Bradley et al. 2010). The comparison of blades from excavated and isolated contexts throughout the Southeast U.S. provides an excellent opportunity to examine the role of blades in the organization of Clovis life-ways.

This paper presents the results of a technological analysis of blade discoveries throughout the Coastal Plain and Piedmont of South Carolina. A sample of 21 blades from isolated contexts were examined and compared to the attributes of blades from the Topper and Big Pine Tree sites, two known quarry related lithic manufacture sites in the Central Savannah River Valley that form a part of what has been referred to as the Allendale Brier Creek Complex (Sain and Goodyear 2012). The morphological and technological attributes of these blades were examined to explore patterns of artifact variation across space. The results of this study demonstrate that modified blades recovered from isolated localities of the Coastal Plain of and Piedmont South Carolina and Georgia are technologically similar to blades recovered from identified quarry sites within the Central Savannah River Valley. However, morphological differences exist which suggest that blades were being treated differently once transported away from these quarries. One byproduct of this study is the development of a regional blade database that can serve as an aid for future documentation, research endeavors and comparative studies. Moreover, a template form for recording specific criteria important for classifying blades is also provided and can increase public awareness of these artifact forms.

Blade Technology

A blade is a specialized, elongated form of flake, detached from a prepared core. Blades are useful blanks for a variety of cutting and scraping activities and are efficient uses of raw material in terms of total length of cutting edge from a given mass of stone (Collins 1999; Whitaker 1994). The presence of blades from Clovis aged deposits has been known since the 1962 description of a cache of 17 blades recovered from the Blackwater Locality No. 1 by F.E. Green (Green 1963). Since this discovery, blades have been recovered from Clovis sites in many regions throughout North America, with the majority reported from Pleistocene kill sites and caches in the U.S. Southwest and Southern Plains (Kilby 2010, 2011, 2013).

Contemporary Clovis blade research has focused on the identification of specific technological blade attributes as a means of distinguishing Clovis-aged blades from those representative of other cultures in the absence of independent dating control (Meltzer and Cooper 2006: 127). In a seminal report on Clovis blade technology, Collins examined blades from the South Central U.S and found that they typically exceed 100mm in length, are curved as opposed to straight in profile, exhibit small striking platforms, and have flat or no bulbs of force (Collins 1999). Consequently, by isolating these specific attributes, blades can be as temporally diagnostic as Clovis points and thus can serve as another index to Clovis settlement behavior; important given that blades are often recovered from surface assemblages and from disturbed contexts.

A majority of the blades examined by Collins were recovered from assemblages located in the Plains and South Central United States. As such, the possibility for variation to exist in blade technologies across and within different geographical regions remained largely unknown based upon the limited number of assemblages that have been examined. Apart from the Southern Plains and Southwest, additional studies have documented the discovery of Clovis blades from other regions of the U.S., most notably the Southeast. In this region, blades have been reported from habitation sites, quarries, surface contexts, and from lithic manufacture sites where such artifacts were produced (Broster and Norton 2009; Ellerbusch 2004; Sain 2010; Steffy and Goodyear 2006). In the Central Savannah River Valley of South Carolina, blades have been recovered alongside fluted projectile points from excavated contexts at the Topper and Big Pine Tree sites (Sain 2010a, 2012; Sain and Goodyear 2012; Smallwood et al. 2013). Figure 1 presents a sample of prismatic blades recovered from stratigraphically intact Paleoindian deposits at these sites. Technological analyses of blades from regional quarry sites resulted in the discovery of cross-regional variation in some attributes of these forms when compared with blades from the Mid-South and Southern Plains (Sain 2010a, 2010b).

There is also increasing evidence for blades found among private collections and from isolated surface localities throughout the lower Southeast. While Clovis and Late Paleoindian points from such contexts have been extensively reported, and distributional studies of these artifacts have been used to test models of prehistoric mobility and settlement subsistence systems (Goodyear 2009; Miller and Smallwood 2009; Smallwood 2010), less research has considered the role that blades might have served across similar landscapes.

FIGURE 1. Prismatic blades from the Big Pine Tree (top row) and Topper (bottom row) Sites (38AL23).

One problem with using blades from isolated contexts to test settlement subsistence models is being able to differentiate the technological attributes of Clovis blades from those that could have been produced during different time periods. Although blades were produced during the Woodland and Mississippian periods (Parry 1994), research has found that a "true blade technology was not used by Early Archaic peoples from the region and that potential blades from this time period typically take the form of blade-like flakes (Carr and Bradbury 2012:90). The documentation of isolated blade discoveries can inform about a number of significant questions concerning the organization of Clovis lithic technology. The goals of this project are: (1) to determine what role, if any raw material accessibility, form, and type have on the distribution blades; (2) to establish the geographical range of isolated blade discoveries relative to the spatial distribution of lithic quarries in the Savannah River Valley; (3) assess whether the geographic distribution of blades coincides with that of fluted Clovis points of the same tool-stone; and (4) determine whether blades from isolated contexts compare technologically and morphologically to those recovered from

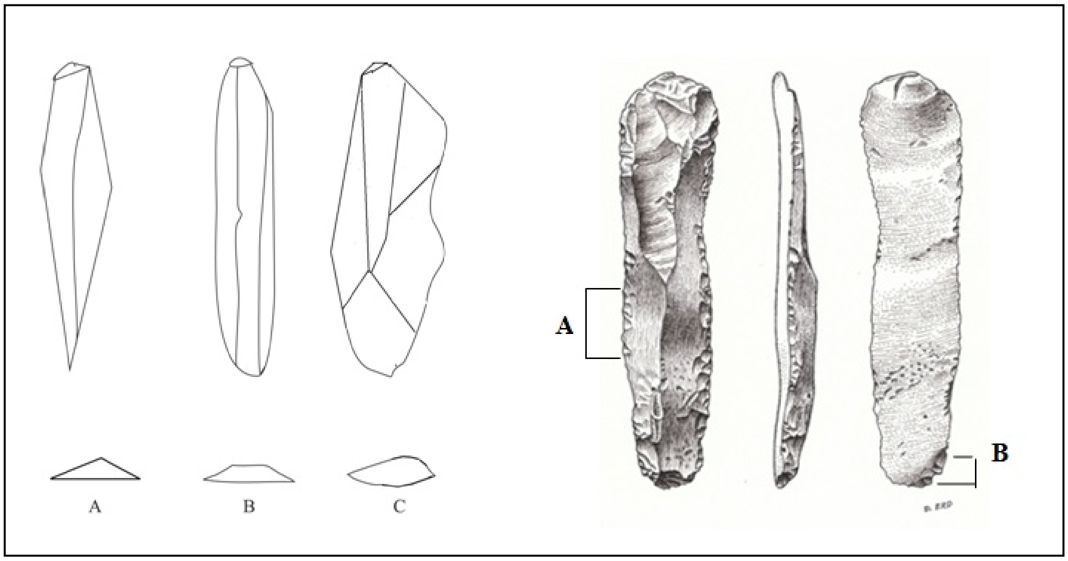


FIGURE 2. Blade scar patterning and cross section classes at left: (A) Triangular, (B) Trapezoidal, (C) Lenticular. At right, types of modification found on blades: (A) lateral margin retouch, (B) distal retouch (*Image by Darby Erd*).

quarry sites, and if not, how they were being used away from such quarries?

Blade Technology and Clovis Settlement Subsistence

Blade manufacture consists of a specific design strategy, the product of which is intended to yield a specialized type of lithic flake resulting from the reduction of a prepared core. Blades typically exhibit a suite of technological and morphological attributes. In general, blades are defined as having two or more parallel removal scars on the exterior surface, and cross sections that are triangular or trapezoidal when viewed in profile. The parallel scar patterns present on blades reflect the systematic, removals of prior detachments, as opposed to opportunistic reduction that may result in multi directional removals (Figure 2).

Morphologically, blades are at least twice as long as they are wide. They may be curved or straight in profile dependent upon raw material form and force application during detachment. Because they are manufactured to have straight parallel margins which are reliable for maximizing the length of cutting surface per working edge, blades and blade tools serve an advantage over other flakes produced from amorphous cores. If they become dull through use, simple modification through chipping or retouch of the blade edge allows additional use life for blade tools.

Blades designed using strategies that allow for modification would have been particularly essential to humans in areas of the landscape where raw material was scarce. In such areas, the presence of blade modification indicates a high utility given for these tool forms and the greater occurrence of multi-purpose blade tools recovered in areas of raw material scarcity implies that a premium was placed on high quality tool-stone. Therefore, the concept of blade modification can be employed to develop test implications regarding prehistoric settlement subsistence systems. If blade modification was conducted in response to raw material scarcity, then it follows that blades should exhibit greater attributes of utility in the form of modification the further one travels from sources of high quality tool-stone (Goodyear 1979). Such attributes would hold great value for a specific type of blade tool that could be maintained in the field and repurposed if necessary for other tool functions.

Methods

In an effort to explore the role of blades in the organization of Clovis lithic technology, we compared the morphological and technological attributes of blades recovered from two known quarry sites in the Savannah River Valley to the attributes identified on a sample of 21 blades recovered from isolated surface contexts throughout the Coastal Plain and Piedmont of South Carolina. This region was chosen, and is particularly well suited for such a study as no primary sources of high quality tool-stone are found outside the Central Savannah River Valley. For this analysis, site assemblage data was taken from a sample of 333 blades from the Topper site and 472 blades from the Big Pine Tree site (Sain and Goodyear 2012). Both sites have previously been identified as prehistoric quarry and habitation sites with stratified Paleoindian deposits (Goodyear 1999; Smallwood 2010; Waters et al. 2009). All blades examined for this analysis were taken from stratigraphically discrete, intact deposits where evidence of Clovis biface technology was also noted.

Morphological Attribute Analysis

All blades were examined, recording specific morphological and technological attributes of the exterior and interior surfaces (Figure 3). All dimensional

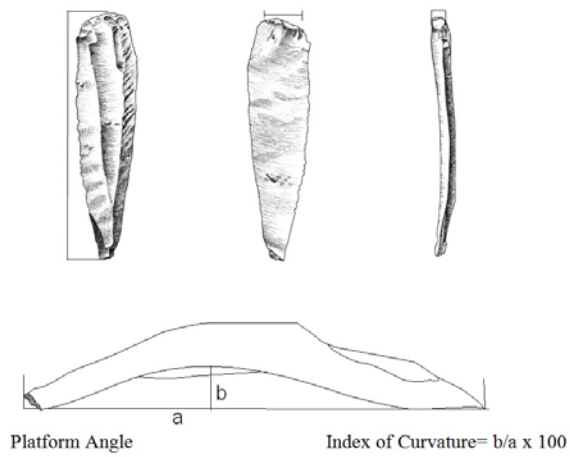


FIGURE 3. Selected morphological measurements of blades. Top, blades size; at bottom, index of curvature.

measurements were recorded with the aid of metric calipers. The morphological attributes considered for this analysis include maximum blade length, maximum width, weight, platform angle, and index of curvature. Index of curvature is a ratio of total blade length divided by the distance at the arc of greatest curvature. Once obtained, this value is in turn multiplied by 100 to producing an “index” of curvature. Blade curvature can enlighten on a number of issues, including reduction stage, manufacture technique, tool function, and raw material morphology.

The platform angle of a blade is the angle between the platform remnant and the longitudinal axis of the blade exterior. An inclinometer was used to obtain the platform angle. Blades detached from conical and wedge shaped cores typically have greater platform angles (but less than 90 degrees) than flakes and blade like flakes struck from bifaces (Collins 1999). This is a direct result of the angle of applied force taken when detaching a blade from a core. In contrast, flakes struck from bifaces typically have acute striking platform angles.

Technological Attribute Analysis

Eight technological attribute conditions were considered for this analysis. Condition categories for each technological attribute are presented in Table 1. Platform condition and type refer to the condition of the blade where force was applied during detachment. Preparation of the striking platform by way of grinding, or through the removal of small flakes allows for added control when detaching a blade from a core. The bulb of force, found on the interior surface of the blade at the proximal end can reflect the technique(s) employed in blade manufacture. Diffuse bulbs of force are flat or expanding, while salient bulbs are prominent (Collins 1999). Likewise, the form by which the distal end of the blade terminates may also indicate the method or amount of applied force, or the presence of impurities within raw material. In most cases, feather terminations are most desired, whereas hinge and step terminations reflect human error, improper applied force, or less homogenous raw material.

The number and direction of exterior surface scars can inform on reduction stage, or the point in the manufacture sequence from which a given blade was detached. Uni-directional or bi-directional removal scars reflect the systematic removal of prior blades from a core. Like directionality, cross section is an attribute that may be used as an indicator of reduction. Later stages of blade production often exhibit cross sections that are trapezoidal in form, whereas triangular cross sections reflect earlier stages in the manufacture process. The form of the blade margin is one indicator of how a blade detached from the core face during force initiation. Parallel margins are thought to be best desired, and enable for maximum length per cutting edge. Irregular blade margins may reflect human error, inexperience, or the use of material of lesser quality. They also are a frequent by-product of initial core reduction episodes, conducted to establish ridges for subsequent blade detachment and to rejuvenate the core platform and face.

In addition to the attribute analysis, each blade was subsequently examined for the presence of modification and technological retouch. This examination was conducted with the aid of a hand held lens. Modification includes utilization or retouch, and applies to any type of trimming (unifacial or bifacial), at any angle, that is restricted to any margin or edge of an artifact (White et al. 1963). Modification categories considered for the

Table 1. Technological attribute conditions for blades.

Platform Type	Cortical	Plain	Faceted	Multi-faceted
Platform Condition	Crushed	Grinding	None	
Bulb of force	Salient	Diffuse		
Termination type	Feather	Step	Hinge	
Scar Directionality	Uni-directional	Bi-directional	Multi-directriona	
Number of scars	0	1	2	3+
Blade margin form	Regular/straight	Irregular/Curve		
Cross Section	Triangular	Trapezoidal	Lenticular	

blade analysis include lateral retouch along one or more margins or distal retouch (Figure 2). Moreover, the presence or absence of specific tool forms on blades such as gravers or burins were also noted. In addition to the retouch categories, all blades were examined for the occurrence of snap fractures, polish, and natural chipping. Finally, properties of raw material type, quality, and condition were recorded for each blade which can inform about the extent of tool utility relative to the distance to raw material source.

Results of Analysis

Figure 4 presents the distribution of fluted projectile points and blades discovered from isolated surface contexts from the study area. Both blades and fluted points fall within the geographic footprint of the Savannah River Valley. A total of 21 of the 25 blades were analyzed. The morphological and technological attributes of a sample of these blades are presented in Tables 2 and 3, and images are illustrated in Figure 5. Technological attributes consistently found on modified blades include multiple parallel uni-directional scars of previous blade detachments on the exterior surface, cross sections that are triangular to trapezoidal in form and platform angles that are typically greater than 60 degrees. All but a single blade was found to have a bulb of force that was diffuse. Likewise, blade margins are predominantly parallel,

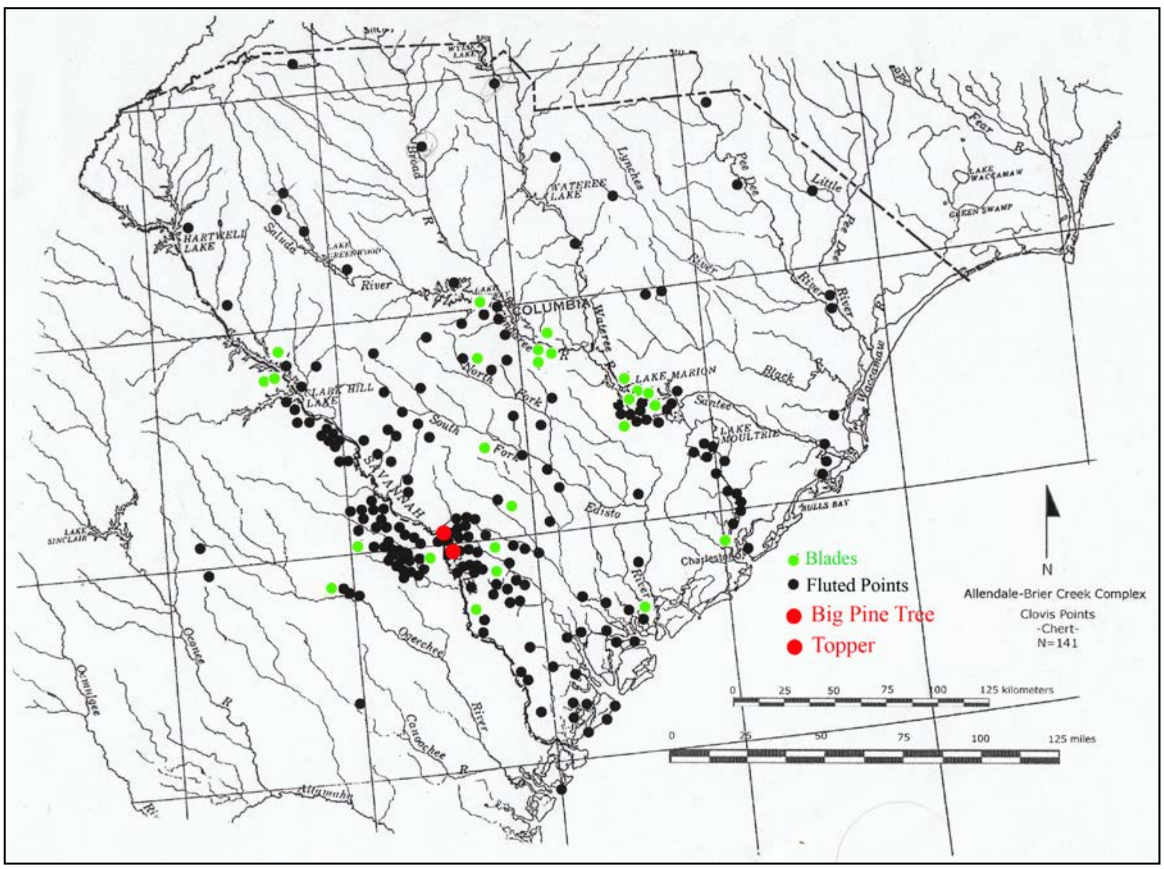


FIGURE 4. Distribution of fluted Clovis points and modified prismatic blades from Allendale Briar Creek complex. Twenty-one blades from this sample were examined for the present study (adapted from Goodyear 2015).

Table 2. Morphological and Retouch Attributes of Blades Recovered from Isolated Surface Contexts from the Coastal Plain and Piedmont of South Carolina and Georgia.

Specimen		*L(mm)*	W(mm)	*Weight (g)*	*Retouch*	*breaks*	*polish*
1	Complete	95.8	19.5	14	x		
2	Complete	117.6	25.4	-	x		
3	Complete	91.9	34.5	-	x		
4	Complete	124.88	47.26	68.3	x	x	
5	Proximal	57.3	36.3	20.2	x		x
6	Proximal	29.22	22.8	5	x		
7	Proximal	50.3	24.5	9	x		
8	Complete	74.32	36.18	16.9	x		
9	Medial	59.6	21.2	8	x		
10	Proximal	48.6	26.9	9	x		x
11	Complete	84	27.8	-	x		
12	Complete	89.8	24	24	x		
13	Proximal	50.04	25.1	-	x		

Table 3. Isolated Blade Discoveries from Private Collections in South Carolina and Georgia.

	Location of Discovery	Site	Portion	Length	Width	I/C*	Modification
1	Jefferson Co., GA.	-	Complete	95.8	19.5	2.68	Unifacial retouch, lateral margins and end
2	Blackville, Barnwell Co., SC	-	Complete	117.6	25.4	-	Unifacial retouch, lateral margin
3	West Branch Cooper River	38BK1766	Complete	91.9	34.5	-	Unifacial retouch, lateral margins and end
4	Allendale Co., SC	38AL163	Complete	124.88	47.26	-	Unifacial retouch, lateral margins and end
5	Island Site, Calhoun Co., SC	-	Proximal	57.3	36.3	-	Unifacial retouch, lateral margins
6	Peachtree Rock, SC	38LX385	Proximal	29.22	22.8	-	Unifacial retouch, lateral margins and end
7	Colleton Co., SC	38CN7833	Complete	-	-	-	-
8	Allendale Co., SC	-	Complete	-	-	-	-
9	Island Site, Calhoun Co., S.C	-		-	-	-	-
10	Lake Marion, SC	-		-	-	-	-
11	Island Site, Calhoun Co., S.C	-	Proximal	-	-	-	-
12	Clarks Hill Reservoir, SC	-	Proximal	50.3	24.5	-	-
13	Allendale Co., SC	-	Complete	74.32	36.18	6.4	Bifacial retouch, lateral margins
14	Burke Co., GA.	-	Medial	59.6	21.2	-	Unifacial retouch, lateral margins and end
15	Flint Island	-	Proximal	48.6	26.9	-	Unifacial retouch, lateral margin
16	Burke Co., GA.	-	Complete	84	27.8	-	Unifacial retouch, lateral margin
17	Allendale Co., SC	-	Complete	-	-	-	-
18	Berkeley Co., SC	-	Complete	-	-	-	Unifacial retouch, distal end
19	Georgia	-	Complete	89.8	24	5.01	Unifacial retouch, lateral margins and end
20	Clarks Hill Reservoir, SC	-	Proximal	50.04	25.1	-	Unifacial retouch, lateral margin
21	Lincoln Co., GA.	-	Complete	-	-	-	Unifacial retouch, lateral margins and end
22	Bamberg Co., SC	-	Complete	-	-	-	Unifacial retouch, lateral margins and end
23	Allendale Co., SC	-	Proximal	-	-	-	Unifacial retouch, lateral margin
24	Bamberg Co., SC	-	Complete	50.57	20.38	-	Unifacial retouch, lateral margins and end

and only one blade was found to have a profile that was excessively curved. Platform remnants, when present, are plain, with a single example showing evidence of having been ground.

Morphological attributes were recorded for 13 of the 21 blades from the study sample. Of these, seven blades are complete. The remaining blades include five proximal fragments and a single medial segment. In terms of morphology, complete blades were found to range in length from a minimum of 74.38 mm to a maximum of 124.88 mm, with a mean length of 96.9 mm. Blade widths ranged from 19.5 mm to 47.26 mm in width, with a mean of 36.66 mm, and blade weights ranged from 14 g to 68.3 g with a mean of 30.8 g. When lateral edge angles on these blades were considered, the results show that they frequently exhibit angles that are acute, and range from 30-45 degrees.

The sample of blades from isolated surface contexts was examined for the presence or absence of modification. The

FIGURE 5. Modified blades recovered from isolated, non-quarry related contexts in South Carolina and Georgia.

results of this analysis identified 16 (76%) blades that exhibit modification. Modification typically consists of unifacial retouch along one or both margins. Four blades exhibit retouch along both margins and an end, while two additional blades have retouch only along the margins. At least one blade has been modified to create a multi-functional tool, including a graver spur at the distal terminus. The presence of blades that may serve as multi-functional tools indicates a high utility given for these tool forms. The higher quantity of multi-purpose blades, recovered in areas of raw material scarcity implies that a premium was likely placed on high quality tool-stone in this region. Moreover, the results demonstrate that lithic tools that exhibit the greatest attributes of utility (modification) are more often recovered at greater distances from sources of high quality tools-tone. In other words, there is a trend in greater tool utilization with distance from raw material source.

Comparative Study

The sample of blades recovered from isolated surface contexts was compared to the attributes of blades recovered from the Topper and Big Pine Tree sites, two known quarry related sites in the Central Savannah River Valley (Figure 6). For this analysis, site assemblage data was taken from a sample of 333 blades from the Topper site, including 114 complete blades, and 472 blades from the Big Pine Tree site of which 314 are complete (Sain 2012; Sain and Goodyear 2012; see Table 4). Both sites have previously been identified as prehistoric quarry/ manufacture and habitation sites in Allendale, County South Carolina. Furthermore, both sites also have stratified Paleoindian deposits.

T-tests were conducted in order to determine if there exists any statistical difference in the morphological attributes of blades from each sample and the results of these tests are presented in Tables 5-7. For this analysis, probability values of less than .05 are considered statistically significant. Attributes examined for the analysis include maximum blade length, maximum blade width, and weight. In addition to the t-tests, artifact plot maps were created that display the distribution of each assemblage by the attributes of length and width (Figures 7-9). This analysis allows for a visual comparison of each blade assemblage with the specific objective to note the presence, absence or degree of morphological attribute variation across space.

The results of the comparative analysis show that the blades recovered from isolated contexts are typically longer, wider, and heavier than blades recovered from either the Topper or Big Pine Tree sites. The results of the t-test confirm this finding for artifact length, and demonstrate that off-site complete blades are statistically longer than complete blades from Big Pine Tree or from Topper. However, when artifact width and weight were considered, the blades from the isolated contexts only exhibit a statistical difference when compared to the blades from Big Pine Tree. Although larger, blades from off-site isolated contexts are not statistically wider or heavier that blades from Topper at the .05 significance level. The same patterns were found when blade weights were examined.

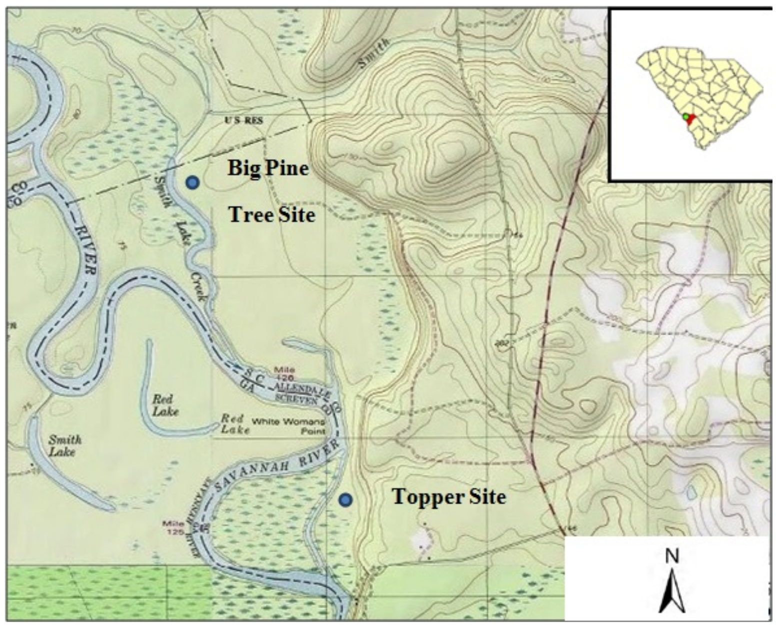


FIGURE 6. Topographic map showing location of the Topper and Big Pine Tree sites (Allendale County, South Carolina).

Table 4. Mean Morphological Attributes of Blades from Isolated Contexts Compared to the Attributes of Blades from Known Quarry Sites in the Savannah River valley.

Site	Sample Size/Complete	Mean Length	Mean Width	Mean Weight	Modified
Big Pine Tree	474/474	34.93	16.43	3.78	72 (15%)
Topper	188/333	61.92	24.53	16.06	16 (3%)
Isolated	7/21	96.9	36.66	30.8	8 (76%)

Table 5. Results of Students T-Test Comparing the Length of Blades from Isolated Contexts to the Length of Blades from Known Clovis Quarry Sites in the Savannah River Valley.

T-Test Blade Length	T-Value	P-Value	Difference at α .05
Isolated/Topper	3.752944	0.000116	Significant
Isolated/Big Pine Tree	10.042747	< 0.00001	Significant
Topper/Big Pine Tree	16.5754	< 0.00001	Significant

Table 6. Results of Students T-Test Comparing the Width of Blades from Isolated Contexts to the Width of Blades from Known Clovis Quarry Sites in the Savannah River Valley.

T-Test Blade Width	T-Value	P-Value	Difference at α .05
Isolated/Topper	1.563826	0.059753	Not Significant
Isolated/Big Pine Tree	4.682345	< 0.00001	Significant
Topper/Big Pine Tree	10.894505	< 0.00001	Significant

Table 7. Results of Students T-Test Comparing the Weight of Blades from Isolated Contexts to the Weight of Blades from Known Clovis Quarry Sites in the Savannah River Valley.

T-Test Blade Weight	T-Value	P-Value	Difference at α .05
Isolated/Topper	1.254112	0.105752	Not Significant
Isolated/Big Pine Tree	8.476276	< 0.00001	Significant
Topper/Big Pine Tree	8.955171	< 0.00001	Significant

FIGURE 7. Comparison of maximum blade length versus width (mm) for Topper Clovis blades (blue) and those recovered from offsite contexts (red). Colored lines represent the mean length for each sample.

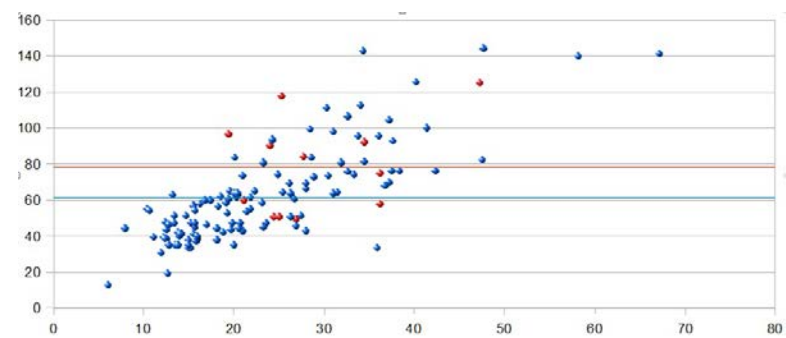
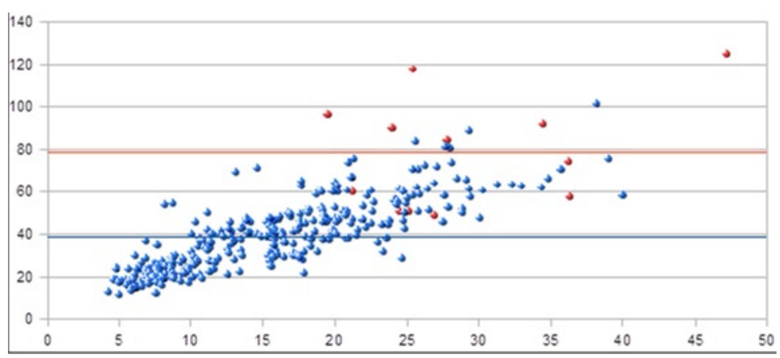


FIGURE 8. Comparison of maximum blade length versus width (mm) for Big Pine Tree Clovis blades (blue) and blades recovered from offsite isolated contexts (red). Colored lines represent the mean length for each sample.



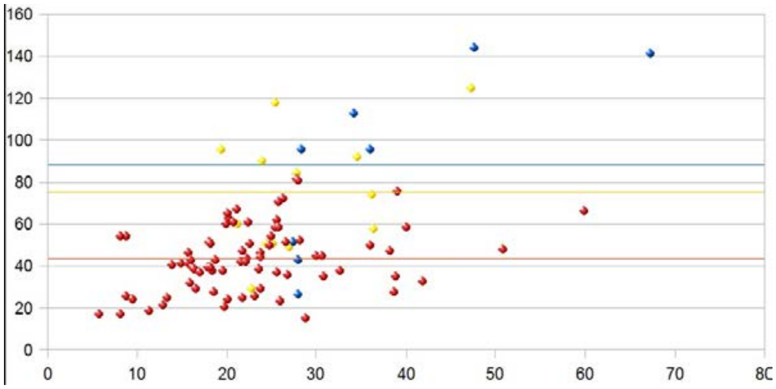


FIGURE 9. Comparison of maximum blade length versus width (mm) for offsite modified blades (yellow), Topper modified blades (blue), and Big Pine Tree Modified blades (red). Colored lines represent the mean lengths for blades from each sample.

FIGURE 10. Modified blades from the Big Pine Tree Site (top) and Topper Site (bottom).

In an effort to assess blade utility, I examined each blade from the off-site isolated sample noting the presence and degree of modification. The results were then compared to the sample of modified blades from the Topper and Big Pine sample (Figure 10). The results of this analysis show that most blades from off-site contexts exhibit modification in some form. Modification frequently consists of retouch along one or more exterior margins of the blade. By contrast, only three percent (3%) of blades from Topper, and fifteen percent (15%) of blades from Big Pine Tree are modified. The high percentage of modified blades found afield is indication that once used and removed from the local quarry, blades were being rejuvenated in regions of limited high quality raw material. Moreover, a number of blades recovered from isolated off-site contexts appear to have been modified into multifunctional tools. Such blades are rare at Topper and Big Pine Tree, where only a single example has been identified to date. Of the off-site sample, the blades that exhibit the greatest extent of modification are typically shorter in maximum length, exhibit higher proportions of tools per working edge, and are also found at greater distances from potential sources of origin than are unmodified blades.

The modified blades from Topper, Big Pine Tree, and isolated surface contexts were examined by morphology. The results of a T-test show no statistically significant difference was in blade length between the off-site isolated sample and the modified blades from Topper (Table 8). It would appear that longer, wider blades produced at quarries were those best suited for use, and were the blades most frequently carried away from for

Table 8. Results of Students T-Test Comparing the Attributes of Modified Blades from Topper to Blades from Off-site Contexts (modified blades are rare at Topper, comprising only 3% of the blade assemblage).

	Topper (n =7)	Off Site Contexts		
	Mean	Mean	T-Statistic	Probability
Length	97.40	96.9	.0302	.9764
Width	38.40	24.53	1.1887	.2576
Curvature	6.21	4.44	.7039	.4976
Platform Width	10.97	9.64	.6051	.5564
Platform Thickness	9.50	3.74	3.9571	.00016

uses afield. Many blades recovered from quarry sites may have been failures or rejects of the manufacture process. Moreover, as quarries are areas for raw material extraction and stone tool production, it would make sense for a wide range of blade forms to have been discarded at or near the quarry. Thus, blades that fit a specific criterion, in this case, those that were long and wide enough to serve a desired function, were the pieces most likely to have been selected for transport and to have been used away from the quarry. If in fact this is the case, then blade utility (extent of modification) should increase with distance from source.

All blades from the study sample were examined by raw material type. Based on the geographical distribution of isolated blade discoveries presented in Figure 5, all but one example is a product of Allendale Coastal Plain Chert. The near exclusive use of Allendale Coastal Plain Chert for the manufacture of blades across the region lends credence to the notion that tool-stone was a significant factor in Paleoindian settlement mobility systems (Goodyear et al. 2009, Goodyear and Steffy 2003). Other lithic raw material sources such as quartz, quartz crystal, and quartzite are locally available in the Piedmont and Coastal Plain and Piedmont of South Carolina and Georgia (Novick 1978). Moreover, various highly fossiliferous cherts such as Black Mingo and Wyboo are present in the Santee River Valley, however blades produced from these materials are not present within the study sample. Apart from Allendale Coastal Plain chert, metavolcanic materials originating from North Carolina are the most widely exploited tool-stones and the regional occurrence of Clovis projectile points produced of these materials lends support to the conclusion that chert was not the sole material exploited by Paleoindian inhabitants of the region (Daniel and Goodyear 2006, 2013; Goodyear 2010;). However, that blades were not produced of lesser quality tool-stone, even when such materials were locally available, is evidence for selection of high quality raw material which allowed maintenance of a highly curated technology. It is also possible that only cryptocrystalline raw materials of high quality and of large package sizes allowed for the production of blades that met specific size thresholds needed to carry out required tasks.

Development of a Regional Blade Database

One byproduct of this study is the development of a regional blade database that can serve as an aid to future artifact documentation, and comparative analyses. A data-entry form for recording specific criteria important for classifying blades has been developed. This form can serve as a data entry sheet that can subsequently be used to increase public awareness about blades and blade tools, especially since they can often be found in private artifact collections. The data entry form is divided into two sections, including: (1) primary background information; and (2) observable artifact attributes. The primary background section is necessary for recording information such as the location and date of discovery, the owner/repository of the artifact, as well as any initial visual artifact observations. Such observations may include raw material type or condition, the presence or absence of exterior surface cortex, or the stage in the reduction process as represented by the number of dorsal scars, and the presence and extent of modification.

Section two of the data entry form provides space to document the morphological and technological conditions of each blade. Space necessary for the documentation of all morphological attributes is allotted on the left column of the data entry form, with an area for the technological attribute conditions provided on the right. If available, a photograph or sketch of the blade may be attached on page two of the recording form.

The blade recording form presents an initial step at formulating a standardized method to identify and document Clovis blades when encountered in the field. The results of this project provide an example of the usefulness of a comparative blade database that can be used to inform about the organization of Clovis lithic technology in the region. Specifically, this can be accomplished through the proper recording of specific technological and morphological attributes found on blades. The most important objective of this project is to provide the resources necessary to develop a regional database which may serve to entice public interest in blades, and ultimately to broaden our knowledge regarding the organization of Clovis lithic technology in the Southeast U.S.

Conclusions

A preliminary analysis of artifact attributes from a small sample of blades from isolated surface contexts recovered from the Coastal Plain and Piedmont of South Carolina and Georgia demonstrate that patterns of variation exist in blade morphology and tool utility at a spatial scale and that raw material accessibility does have some role on the distribution of blades across the study area. Specifically, the results of this study show that although blades from isolated contexts compare technologically with those identified from quarry sites, blade morphology and to an extent tool utility tend to vary in accordance with distance to raw material source locations.

Clovis inhabitants of South Carolina and Georgia were dependent upon high quality tool-stone for the manufacture of blades. The results show that blades produced from Allendale chert are found at distances of up to 70km from the nearest known raw material sources, thus establishing a geographical range for isolated blade discoveries relative to the spatial distribution of known lithic quarries in the Savannah River Valley. Moreover, the geographic distribution of blades coincides with the distribution of fluted Clovis points of the same tool-stone. In areas of limited raw material access, or where high quality sources were scarce, tool-stone was conserved, resulting in longer life-spans for blade tools, as well as increased tool utility. Based on these findings, the known geographical distribution of blades across the lower Southeast suggests that these artifact forms were integral to Clovis adaptation and technological organization.

Given the small number of blades identified from isolated localities to date, one could conclude that blades were not integral to Clovis adaptations in the study area. However, research has shown that continued efforts to systematically assemble and share data on Paleoindian artifacts have generated new insight about patterns of land use, demographic trends and raw material utilization for the Paleoindian period (Anderson et al. 2010). The compilation of locational and attribute information on over 30,000 fluted points over the past two decades is one example of the value of Paleoindian data recording projects, and demonstrates that a substantial amount of data can be acquired within a relatively short amount of time. As such, it is hoped that the development of a regional blade database may generate interest in blades and ultimately lead to the identification of additional blades that may reveal important information about Clovis technological organization in the region.

Although this project presents a number of intriguing findings, it is important to note that the results should be considered as preliminary, as the study sample used for the comparative analysis was relatively small (*n*=21). Additional data are therefore needed to confirm or refute the results of this analysis. Through public outreach and assistance in the documentation and proper recording of blades, it is hoped that this research serves to impart valuable insight and knowledge about the preservation and accurate dissemination of cultural heritage.

Acknowledgements. John Broster has contributed to our knowledge and understanding of Southeastern Archaeology over the course of his career, and in this capacity has been an inspiration to the work of numerous individuals. Research conducted by Broster has led to the identification of new Paleoindian sites across the Southeast, expanded Paleoindian projectile point surveys, provided new insight regarding Clovis blade technology, and has made available to the general public data from these projects, as part of the Paleoindian Database of the Americas (PIDBA). The present study on blade technology in the Southeast U.S. was heavily influenced by prior research efforts such as those conducted by John Broster, and without efforts such as these, the final product of this study would not have been possible.

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MAKING A DIFFERENCE: JOHN B. BROSTER AND PALEOINDIAN ARCHAEOLOGY IN TENNESSEE

David G. Anderson

Every state needs someone like John Broster, who with younger colleagues like Mark Norton, took on the role of finding, compiling, and publishing information on Paleoindian archaeology locally beginning some 30 years ago. Few states have such a person, much less someone who has done so much for so long, making John's approach an example that others should adopt, and whose legacy will hopefully continue in Tennessee now that he is formally retired. Fortunately, John is still very much in the game, as he would say, if moving a little slower at it. The organizers and contributors deserve our thanks for producing this series of essays in honor of John Broster, one of our region's leading Paleoindian researchers and personalities, and much more besides. Indeed, as Shane Miller and Jesse Tune note in their introduction, and as Mike Moore, Kevin Smith, Aaron Deter-Wolf, and David Stuart summarize so capably in their biographical overview, John is not just a Paleoindian archaeologist, but has worked on sites of all periods in Tennessee, particularly on sites of the Mississippian and historic periods with his colleagues at the Division of Archaeology and beyond. But he also conducted fieldwork in the Southwest, on the southern Plains, in the Netherlands, and particularly in Mesoamerica, where his legacy in and out of the field remains the subject of legend.

I first began interacting with John Broster in the late 1980s, when I asked him about prehistoric site distributions in central Tennessee, notably the occurrence of Late Woodland and Mississippian phases, as well as if he knew where Paleoindian sites were to be found in the state. He responded to both questions in great detail, providing a lot of primary data that helped me produce maps for these periods that covered most of eastern North America (Anderson 1990a, 1991; John's contributions are acknowledged in each paper). That marked the beginning of a long friendship and many subsequent exchanges of information, something he has always generously done when I or others have asked, and what makes John Broster such a great colleague. He will give you the shirt off his back, or more accurately, access to the primary data he has collected, if he thinks it will advance archaeology. Not every archaeologist, especially in the Paleoindian research community—sometimes as rowdy and cantankerous a group as there ever has been in American archaeology—is as open with their data and ideas and as collegial in helping their colleagues as John Broster has been down through the years.

It quickly became clear that John Broster was the person most knowledgeable about Paleoindian archaeology in Tennessee, and for that reason I invited both him and Mark Norton to come to a workshop on "Paleoindian and Early Archaic Period Research in the Southeast" that was held in Columbia, South Carolina in September 1991. That workshop became the basis for the book *The Paleoindian and Early Archaic Southeast* (Anderson and Sassaman 1996), which has a chapter that John and

Mark Norton wrote summarizing Tennessee Paleoindian archaeology, documenting the impressive record of sites and artifacts that have been found in the state (Broster and Norton 1992, 1996). John's many papers, in fact, constitute a substantial portion of the published record on modern Paleoindian archaeology in Tennessee. But he didn't do the work by himself, as he has always been quick to state… John has always been generous with sharing authorship and credit, another mark of a true scholar. As an aside, I video-filmed the 1991 conference, and John's talk is crisp and lucid, recounting the numbers of Paleoindian projectile points by type recorded as of that time in the survey started in 1988, as well as information on the Paleoindian sites like Johnson he was working on at the time. Interestingly, in the film John's hair is dark black, and he didn't have quite the pronounced drawl nor the somewhat grayer hair he has today, both of which may be the result of subsequent decades working with Tennessee landowners, collectors, and state agency officials. When I asked John at the 1991 meeting how he pronounced his last name so we could introduce him, he said "Brewster, rhymes with rooster!" This is very appropriate… and not for the reasons some may be thinking, but because like the gamecocks of South Carolina, John has always been a scrapper, scratching and pecking river banks, plowed fields, and private collections in search of early sites and assemblages.

Michael Moore, Kevin Smith, Aaron Deter-Wolf, and David Stuart's paper provides an excellent overview and tribute to John's life and professional career, helping younger readers understand why John is such a presence in both the technical and personal sides of modern Tennessee archaeology. No stunt double was ever necessary… as they document, John has done an impressive amount of field archaeology, where he did all his own stunts and a lot of hard work besides, and he remains a larger than life figure to all familiar with him. The words Moore and his colleagues used to describe John, that are echoed in the other papers herein, are respect, trust, and admiration. Indeed, John's work with the avocational community in Tennessee is a primary reason why we know as much as we do about the Paleoindian archaeological record of the state. His career reminds us through example of the importance of working with avocationals, reaching out to the public, and building relationships with private citizens and professional colleagues alike based on mutual of trust, respect, and generosity.

Fieldwork has also been a major part of John's life, and a lot of our knowledge of the archaeological record in Tennessee, particularly for the early periods, is largely based on his work, and that of his colleagues and collaborators like Mark Norton, Emanuel Breitburg, and many others. He has participated in the discovery and documentation of such remarkable Paleoindian sites as Coats-Hines, Carson-Conn-Short, Johnson, and Widemeier, among others. There is a saying in archaeology that luck is an important part of our research, at least in the discovery phase, but you have to be good at fieldwork and research too. John has been both lucky at finding sites and good at wresting important information from them, making his own luck through hard work throughout his career. Indeed, my respect for John was heightened even more than I thought possible when he came out day after day to the Bells Bend field project Shane Miller, Thad Bissett, Stephen Carmody and I were running

FIGURE 1. Shane Miller and John Broster at the Bells Bend Archaeological Project area near Nashville, August 2012. The Widemeier site is in the background, which probably explains the golden rays of light shining on them.

FIGURE 2. John Broster, Aaron Deter-Wolf, and Shane Miller discussing strategy, with Sarah Walters in the background, during the Bells Bend Archaeological Project near Nashville, August 2012.

along the Cumberland River near Nashville in 2010 and 2012, looking for early sites (Figures 1–3) (Miller et al. 2012). John visited and worked with us in the often 100 plus degree summer heat, providing insight into what we were finding, and showing us locations along and near the river he had visited where further research might be profitable. He also, I might add, through his method of instruction using colorful oral historical accounts, left a lasting impression on the undergraduate and graduate students on the project.

Jesse Tune, whose paper herein provides an update on the Tennessee Fluted Point survey John Broster and Mark Norton started in 1988, was one of many people whose archaeological career was strongly and positively influenced by John Broster. Indeed, one of John's lasting contributions to the field is the influence he has had on young people, turning them from interested students to solid scholars. John does this through example, with his infectious interest and enthusiasm for all things Paleoindian, delivering information with a charm and confident expertise that epitomizes a true southern gentleman, albeit perhaps with a touch of the rascal or gunfighter thrown in. As Tune recounts, nearly 5,500 Paleoindian points have been documented in Tennessee to date by

FIGURE 3. Tom Pertierra, John Broster, Shane Miller, Aaron Deter-Wolf, and Valerie McCormack, at a site in the Bells Bend Archaeological Project area near Nashville, August 2012. John always wore broad brimmed Mexican hats, making him easily recognizable at great distances.

Broster and Norton, the largest number of points with systematically recorded attribute data recorded for any state or province in North America. This information is available online in PIDBA, the Paleoindian Database of the Americas, where John and his colleagues have been contributing their data for decades (Anderson 1990a, 1990b; Anderson et al. 2010:66, 2015:16; Broster 1989; Broster and Norton 1992, 1996; Broster et al. 2013). Importantly, Broster and Norton record all Paleoindian points, including both fluted and unfluted forms. The Tennessee total accounts for over 40% of all the recorded Paleoindian points in PIDBA from the southeastern United States, and by far the largest numbers of recorded Clovis, Cumberland, and Dalton points (Anderson et al. 2015:16). Indeed, in only three states in the region, Tennessee, Mississippi, and Georgia, has attribute data on Dalton points been systematically recorded statewide, although recently recording these points has begun in the Carolinas (Anderson et al. 1990; Ledbetter et al. 2008; McGahey 2004; Smallwood et al. 2015). Given the large numbers of points recorded in Tennessee, mostly from the central and western parts of the state, distributional analyses must take into account the impact individual researchers or teams of researchers can have on sample sizes and locations, in the state and beyond, over the larger region. The fact that Paleoindian points in Tennessee are concentrated in the center of the state may be due to the presence of major drainages there, like the Tennessee and Cumberland Rivers, but it also likely reflects a proximity to John Broster's office at the Tennessee Division of Archaeology in Nashville, where he has worked for decades. What the Tennessee data does show, additionally, is that we need many more people across North America as conscientious as John and Mark in recording data on early sites and artifacts, and as open and helpful in sharing it. The Tennessee fluted point survey, as Tune and others have shown (most notably John Broster and Mark Norton), provides a wealth of data useful to the documentation of morphological variability in Paleoindian bifaces and their occurrence on the landscape.

The paper by Parish and Finn shows what can be learned from the careful documentation of private collections, especially in areas where Paleoindian settlement is suspected, but few sites or assemblages have been documented. Their work along the lower Tennessee River, revealing a previously unsuspected major concentration of fluted point sites, shows that low density areas or voids in our current distribution maps may, unless demonstrated otherwise, reflect gaps in our data and survey coverage rather than where people were or weren't living in the past, as a number of researchers have suggested (e.g., Buchanan 2003; Lane and Anderson 2001; Miller and Carmody, herein; Prasciunas 2011; Shott 2002, 2005). Loebel and colleagues have made similar observations in the upper Midwest based on work with private collections in Wisconsin and Illinois; areas in those states long assumed to have few Paleoindian sites and artifacts, upon extended analysis, have proven to be anything but barren (Koldehoff and Loebel 2009; Loebel 2005). While I don't expect the major concentrations of fluted points across the continent to change markedly in the decades to come, or be overshadowed by new areas, I do believe our maps will become far more detailed, providing more accurate information on point occurrence and density. But to succeed at this, to bring our knowledge of Paleoindian land use into better resolution, we will continue to need to find and recruit new people to document sites and collections, as John himself has done in Tennessee.

Parish and Finn also make an important contribution to recognizing variability in lithic raw materials outcropping within Tennessee as well as on artifacts found on sites in the state. The authors note more problem oriented, fine grained lithic sourcing analyses will be needed if we are to have greater confidence in our interpretations of prehistoric settlement locally, but their results are a good step for determining the scale over which lithic raw materials and perhaps people moved. Whether and where Paleoindian band-macroband settlement systems were located will require analyses like that conducted by Parish and Ryan over vast areas, but their conclusion that Paleoindian sites along the Lower Tennessee River may represent "occasional congregation areas for three macro-bands centered locally along the Western Highland Rim, Northern Alabama and the confluence of the Ohio and Mississippi Rivers" is certainly something that can be evaluated in the years to come. I don't doubt that aggregation areas may be present, but I do question why they need to be between or at the margins of the ranges of groups based elsewhere, as both Daniel (2001) and Parish and Finn suggest. I argue instead, as I have for decades (Anderson 1996a; Anderson and Hanson 1988), that macroband aggregation loci were simply resource rich areas within the ranges of individual bands that were a convenient (and ideally memorable and resource rich areas) place for groups from other areas to visit and be hosted by the home group, with the favor reciprocated at similar locations in other group ranges in subsequent years or decades, depending on the interval between aggregation. Adopting such a perspective implies a different use of the landscape than that inferred in lithic-centric models by Gardner (1983, 1989), Goodyear (1989) and others, that have these early peoples tethered (i.e., living at or near) to specific lithic raw material sources. I instead believe that Paleoindian people in the Southeast lived more widely over the landscape, in areas that had attractions other than or in addition to knappable stone. They probably would have lived around quarry areas only if their band resided in the immediate area, or if located elsewhere, when they needed to go there as part of specialized lithic procurement forays, perhaps as part of periodic aggregations. Given ethnographic evidence that long distance forays for raw materials were not uncommon among some hunter gatherers, we should be evaluating what other parts of the southeastern landscape were attractive to early populations (Speth et al. 2013). Settlement may have occurred anywhere resources sufficient for groups needs were present, and aggregation loci, in this view, could have been wherever large numbers of people could be sustained for a few days or weeks, ideally at dramatic places on the landscape that could be easily remembered and reached (Anderson 1990a, 1995; Miller 2011, 2014).

Jay Franklin and his colleagues work at the Rock Creek Mortar Shelter (40PT209), documenting potential Paleoindian occupations on the Upper Cumberland Plateau, is an important and unexpected contribution to Tennessee archaeology. As the authors note, potential stratified Paleoindian and Early Archaic assemblages or indeed artifacts of any kind are rare in the upland and mountainous areas of the Midsouth, at least until the Dalton period, something long noted but only poorly understood, and attributed to the area being less favorable for settlement than lower lying larger river valleys, and hence among the last areas to be occupied (e.g., Anderson 1990a; Lane and Anderson 2001; Miller 2014; Walthall 1998). As Franklin and his colleagues note, this absence may be more due to the history of archaeological research than where past peoples were actually living, since little intensive systematic subsurface archaeological survey has occurred in the highland areas, and less extensive cultivation exposing surface areas where artifacts might be found. Based on their discovery, Franklin et al. argue that we need to reconsider the traditional assumption that Paleoindian use of this part of the landscape may have been minimal. Miller and Carmody's analysis herein, using a large sample of site file data from the general region, in fact, demonstrates how unusual Rock Creek Mortar Shelter is given our present state of knowledge about site occurrence, highlighting the site's importance, and the need to determine the extent of bias in our survey coverage. The Paleoindian assemblage from Rock Creek Mortar shelter is, in fact, extensive and includes well-made blades, which are characteristic of Clovis assemblages elsewhere in North America (e.g., Collins 1999; Sain 2011; Tankersley 2004). Blade-like flake tools have also been found in Dalton levels at the Dust Cave and Stanfield Worley sites in Alabama, where they were worked into scraping tools (DeJarnette et al. 1962; Hollenbach 2009; Sherwood et al. 2004), which fits with their association with a reworked Greenbrier Dalton at Rock

Creek Mortar Shelter. Until further work has occurred, the possibility also remains that the blades from Rock Creek Mortar Shelter could be from earlier occupations. The evidence from the use-wear analysis and the diversified nature of the early assemblage at Rock Creek Mortar Shelter clearly point to a range of activities occurring, indicating site use, and hence occupation and use of this upland area, was unlikely to have been temporary or limited.

Finally, a comment on chronology is warranted, given Franklin et al.'s observation that tying cultures to specific time periods makes intersite comparisons difficult. I agree, and argue that work directed to producing stratigraphically well controlled and dated assemblages, like he and his colleagues are doing at Rock Creek Mortar Shelter, is absolutely critical if we are to understand what was occurring at specific times over the region. Because archaeological assemblages typically overlap and even within known phases do not occur at the same time everywhere, use of traditional stage formulations based on the occurrence of site or artifact types can be problematic. Sometimes diagnostic artifacts are all we have to work with, but whenever possible we should use chronological or period terminology rather than cultural phases or stages when reporting and comparing assemblages. In a framework for Pleistocene occupations proposed for Eastern North America discussed at some length in a recent synthesis (Anderson et al. 2015:8–9), the Early Paleoindian period corresponds to assemblages >13,250 cal yr BP., the Middle Paleoindian period to sites dating from 13,250 to 12,850 cal yr BP, not uncoincidentally the currently accepted range of the Clovis culture, and the Late Paleoindian period from 12,850 to 11,700 cal yr BP, corresponding to the Younger Dryas chronozone (Anderson 2001:152–156; Anderson and Sassaman 2012:5; see also Waters and Stafford 2013 who argue for a similar arrangement, with their Early Paleoindian Pre Clovis era described as the 'Exploration' period).

Shane Miller and Stephen Carmody's paper, as noted, offers a contrast to the discoveries at Rock Creek Mortar Shelter through a theoretically informed analysis of site file data. In it they argue that the Upper Cumberland Plateau was not settled intensively until the Late Paleoindian period and particularly in Early Archaic times, well after the Middle Paleoindian Clovis period. Their paper summarizes and serves as an excellent example of the increasingly theoretically sophisticated and data rich research that has been occurring in the Southeast in recent years examining culture change over time during and immediately after the Paleoindian era (e.g., Anderson et al. 2015; Gingerich 2013; Miller 2011, 2014; Miller and Gingerich 2013; Morrow 2014, 2015; Smallwood 2012; Smallwood et al. 2015; Thulman 2006, 2009). Miller and Carmody's analysis, like that by Finn and Parish, shows that our assumptions about Paleoindian settlement in the Midsouth are in need of qualification and finer grained study. There appear to be great differences in the occurrence of Paleoindian assemblages in different parts of the region due, in part, to the nature of the settlement systems in use and the expansion of populations into less favorable habitats, facilitated by changes in climate and vegetation.

The major decrease in Early Archaic sites noted by Miller and Carmody at the confluence of the Duck and Tennessee Rivers is puzzling since it runs against theoretical expectations that such a readily accessible, resource-rich area should always be densely settled. As the authors state, “there is still much to learn” about past occupations in the region. It may be that empty areas or buffer zones between groups, or even large areal abandonments were occurring at this early date, possibly the result of migration, warfare, or changes in resource structure. Although these kind of large scale events are thought to have occurred much later in time, there are parallels elsewhere in the east, such as the post Dalton Early Archaic period settlement ‘collapse’ in the central Mississippi Valley (Morse and Morse 1983), or the varied incidence of sites throughout the Archaic period over the region (Anderson 1996b; Sassaman 2010).

The Topper site along the lower Savannah River in South Carolina has produced one of the most extensive Clovis archaeological assemblages in secure stratigraphic context ever found in the Southeast. It is thus fitting that two papers presenting new information about Topper—by Derek Anderson and his colleagues, and Doug Sain and Albert C. Goodyear—are included in a collection of essays dedicated to the work of John Broster, who with his colleagues has found and worked on similarly important stratified Paleoindian sites in Tennessee like Carson-Conn-Short, Coats-Hines, Johnson, and Widemeier, to name just some of the many sites of this period he has helped explore (Broster et al. 1991, 1996, 2006, 2013; Broster and Barker 1992; Broster and Norton 1992, 1993, 1996; Deter-Wolf et al. 2011). Because the Clovis biface and blade assemblages from Carson-Conn-Short and Topper are so extensive and in such good context, collections from them are seeing extensive descriptive and comparative investigation (e.g., Sain 2011; Smallwood 2011, 2012; Stanford et al. 2006). That such work has occurred and will for many years to come reflects the willingness of the principal investigators, John Broster and Mark Norton, and Albert C. Goodyear, to make the data from these sites available to interested researchers. Both recognize that archaeologists work best when they work cooperatively, something essential in fieldwork, analysis, and writing. Such behavior serves as a model of openness and data sharing all archaeologists in the region can admire, and is another reason why John Broster is so well appreciated by his colleagues. Well, that and for the great stories he tells!

Sites like Topper and Carson-Conn-Short will thus occupy the attention of scholars for generations to come, as it is clear there is much more that can be learned from them, both through additional fieldwork and multidisciplinary analyses. Indeed, as recent monographic scale reporting of the Clovis materials from the deeply stratified Gault site in Texas has shown (Waters et al. 2011), it takes the work of a great many scholars to adequately report assemblages from large, complex Paleoindian sites. Derek Anderson has been the field and laboratory director for excavations into the Clovis deposits at Topper in recent years, overseeing with Al Goodyear a lot of the important work that has been ongoing, some of which is summarized herein, just as John Broster has guided and assisted with research on Paleoindian sites and collections in Tennessee. The recent AMS dating of the hillside Clovis occupation to about 13,000 cal yr BP based on samples collected by Sarah Walters, importantly, is the first date to fall within the posited range for this culture obtained from a stratified terrestrial Clovis site in the Lower Southeast (Goodyear 2013; Walters 2013, 2016; Walters et al. 2013; Waters and Stafford 2007). Above and beyond the early date, the recent work at Topper demonstrates the utility of refitting analyses for assessing the integrity of deposits, by showing how much horizontally and vertically originally conjoined artifacts have moved, and for reconstructing activity areas, helping determine what was occurring at the site (Anderson 2011; Miller 2010). Indeed, Derek Anderson has a masterful ability at refitting, permitting determination of where individual knappers were sitting, and the kinds of activities they were conducting, skills perhaps too infrequently employed or appreciated.

Douglas Sain and Albert C. Goodyear's paper calling for the systematic description and reporting of Paleoindian blade data, is the kind of work needed if we are to more completely understand early occupations in the Southeast. Little effort has been directed to the movement of blades on the landscape in Paleoindian times, and Sain and Goodyear's analysis is important in showing that these artifacts moved the same distances points did, suggesting they were used or carried together, and that blade modification apparently increases with distance from source areas. The sharing of primary data is a fundamental premise of science, since the data our analyses are based on must be available for inspection if the results are to be properly replicated and evaluated. Doug Sain has been doing his part in this regard, with images as well as detailed attribute data available for hundreds of blades in his thesis monograph on Topper blades (Sain 2011). Sain most recently completed a dissertation on the Pre-Clovis deposits at Topper that includes almost 2000 pages of appendices of primary data taken from the 30 years of fieldwork at the site (Sain 2015), again highlighting the importance of making primary data readily available.

In closing, I am pleased to have been a part of this session honoring the life and accomplishments, professional and personal, of my friend, colleague, and mentor in Tennessee archaeology, John Broster. His career stands as model of hard work and data sharing and openness for all archaeological researchers in the region. John has also been blessed with a great life partner, Diane, who he has always acknowledged as his greatest discovery and strongest supporter. One feature of this collection of papers that gives me great hope for the future is the fact that almost all the authors are half the age of our honoree and this discussant. There are thus a number of young scholars following in John's footsteps… although perhaps for their sake and longevity, given his eventful life, hopefully not exactly in his footsteps. John, I look forward to sitting on backdirt piles with you in the years to come watching these younger folks at work.

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