Additional Radiocarbon Dates from the Twilla Bison Kill Site, Hall County, Texas

Christopher Lintz, John D. Speth, David T. Hughes, and Jeffery A. Huebner

ABSTRACT

Three radiocarbon dates from the Twilla Site (41HL1) in Hall County, Texas are reported and compared to previous dates from Twilla and three other bison kill sites in the upper Red River-Pease River drainage of the Texas Panhandle. Some inconsistencies suggest that these new dates must be used with caution. Nonetheless, the dates now available from the Red and Pease River drainage bison kill sites suggest that dart points were used for bison kills during the Late Archaic and early centuries of the Woodland/Neoindian (Late Prehistoric) periods in the lower Texas Panhandle.

INTRODUCTION: PREVIOUS INVESTIGATIONS

Since 1977 a single radiocarbon date has been available from each of the Twilla, Collier, Bell and Strong bison kill sites in the Texas Panhandle (Hughes 1977). This report announces three more radiocarbon dates from the Twilla site. The Twilla site (41HL1 in the Texas Archeological Research Laboratory site files; A-73 in the Panhandle-Plains Historical Museum site files) is almost 5 km (3 miles) east of Turkey, Texas, and about 1.5 km (1 mile) above the mouth of a dry arroyo that drains into Mockingbird Draw and Cottonwood Creek, a tributary of the North Pease River (Figure 1). The bone bed was reported by I. R. Twilla to Curtis Tunnell who visited the site several times during 1953. Two Lange points were collected from the surface of this site (Tunnell and Hughes 1955), and on March 29, Curtis Tunnell and Jack T. Hughes recovered two retouched flakes and two "percussion flaked fragments" from the surface near the 6-meter-long (20 foot) exposure of the bone bed. From a single test pit, one large unifacial retouched flake of Ogallala chert was recovered directly associated with the bones. Additional points were collected from the surface on unknown dates before 1968 (Collins 1968). Samples of bone from the 30-cm-(1 foot)-thick bone bed were collected but were not submitted for radiocarbon dating immediately.

Test excavations were conducted at the Twilla site between August 10 and September 5, 1968, under the supervision of Billy R. Harrison. The testing of Twilla and several other bison sites in the rolling red-bed plains of the lower Panhandle was supported by funds provided by the Office of the State Archeologist, which was then part of the Texas Building Commission, to West Texas State University. At Twilla, a grid of eight 5x5 ft. squares was laid over the western two-thirds of the site. The

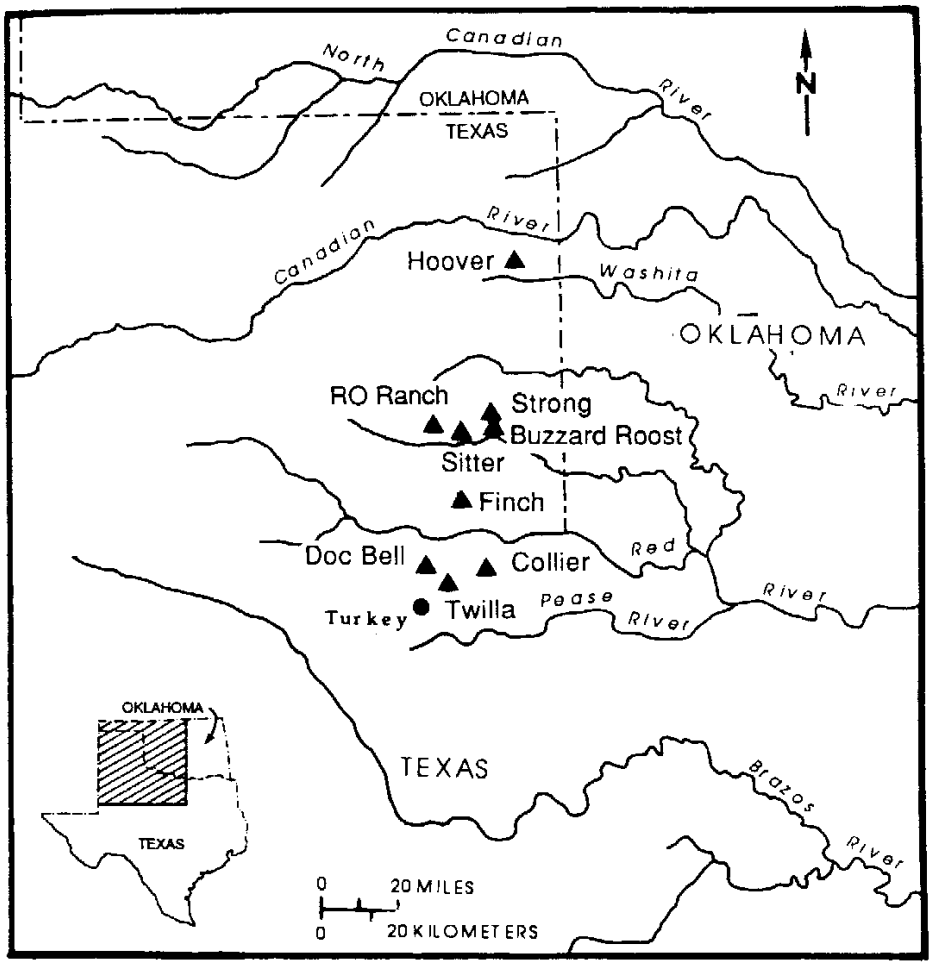

Figure 1. Map of part of the Texas Panhandle and western Oklahoma showing sites for which there are radiocarbon dates.

overburden was removed to within one foot of the bones as an undifferentiated unit; small hand tools were used to expose elements, and measured drawings were maintained for all exposed bones (Hughes 1977:4). Field records indicate the possible presence of two bone beds separated by a thin horizon of sterile silt (Hughes 1989:187).

David and Jack Hughes revisited in the site in 1977 to record the site location accurately for the Panhandle-Plains site files, to obtain soil samples, and to examine the geologic setting of the site in preparation for analysis and drafting of a report. Detailed analyses of excavated remains from the Twilla (41HL1), Doc Bell (41HL65), Strong (41CG31) and Collier (41HL64) sites together with surface materials from Hoover (41HH12), Sitter (41DY18), Finch (41DY19), R. O. Ranch (41DY20), and Buzzard's Roost (41CG30) sites were the basis of an M.A. thesis on bison kills in the lower Texas Panhandle (Hughes 1977). Except for the maintenance

of separate field maps, the bison elements and cultural materials from the possible two layers at Twilla were not segregated by layer during the 1968 excavation or during subsequent storage, processing, analysis, or reporting.

The excavations at Twilla yielded 1,647 partially articulated and disarticulated identifiable bison elements. Left mandible counts indicate that these remains represent at least 23 individuals; dentition wear indicated that the bison herd was composed of animals ranging between 1 and 12 years of age. Postcranial elements suggested that at least three immature/juveniles, 19 early mature and mature cows, and one bull were represented (Hughes 1977:49). Reanalysis of the Twilla site mandibles by Fawcett (1987:402, 417, Appendix D and F) resulted in evidence of at least 50 individuals and, on the basis of tooth eruption and wear data, placed the time of death in the fall of the year.

Cultural materials recovered from the excavations were 15 complete and fragmentary projectile points, one unifacially retouched flake, six unmodified "chips/spalls/flakes," and two "chunks"; surface materials were three cobble fragments, one flaked cobble, two bifacially retouched cobbles, two possible flake cores, one naturally backed tool, one utilized flake, three unifacially retouched flakes, one bifacially retouched flake, 13 unmodified "chips/spalls/flakes," and three "chunks" (Hughes 1977:Table 1; 1989:Table 1).

There is some variability among the projectile points, but they are dominated by large, thin, weakly barbed, corner-notched dart points with relatively short, straight-to-slightly-expanding stems, pointed-to-rounded barbs, and straight-to-markedly-convex bases. Hughes (1977, 1989) recognizes three dominant varieties of projectile points (Figures 2, 3). Variety I is a large, broad point with a sharp tip, convex blade edges, prominent-to-weakly-barbed shoulders, broad but shallow corner notches that leave short, straight-to-slightly-expanding stems, prominent basal tangs, and straight-to-slightly-concave bases. Hughes (1989:188) sees a similarity between Variety I points and the Marcos or Ellis types. Variety II points are shorter than either Variety I or III forms, but they are nevertheless dart forms with broad blades. The tips are usually rounded, blade edges are convex, with prominent-to-weakly barbed shoulders that are not as pronounced as the Variety I points, corner-to-side notches are broad but shallow, stems are slightly-to-moderately expanding, tangs are rounded, and bases are straight-to-recurve/concave. Hughes (1989:189) suggests that these specimens resemble Palmillas or Williams types. Variety III points are large, broad blade points with relatively straight blade edges, prominent-to-weakly-barbed shoulders, broad but shallow corner notches, rounded tangs, and convex bases. No comparisons to known types are suggested. Elsewhere, although Hughes (1977) is wary of classifying these points, he does acknowledge some similarities with the Marcos, Williams, Ellis, Ensor, Trinity, and Palmillas types, which traditionally date between 1000 B.C. and A.D. 1000.

Locally available gravels dominate the lithic materials: Potter chert (n=36; 66 percent), Tecovas jasper (n=4; 7 percent), petrified wood (n=2; 4 percent), chalcedony (n=1; 2 percent), quartzite (n=4; 7 percent) and unidentified cherty materials (n=2; 4 percent). The presence of Alibates (n=3; 6 percent) and Kay County or

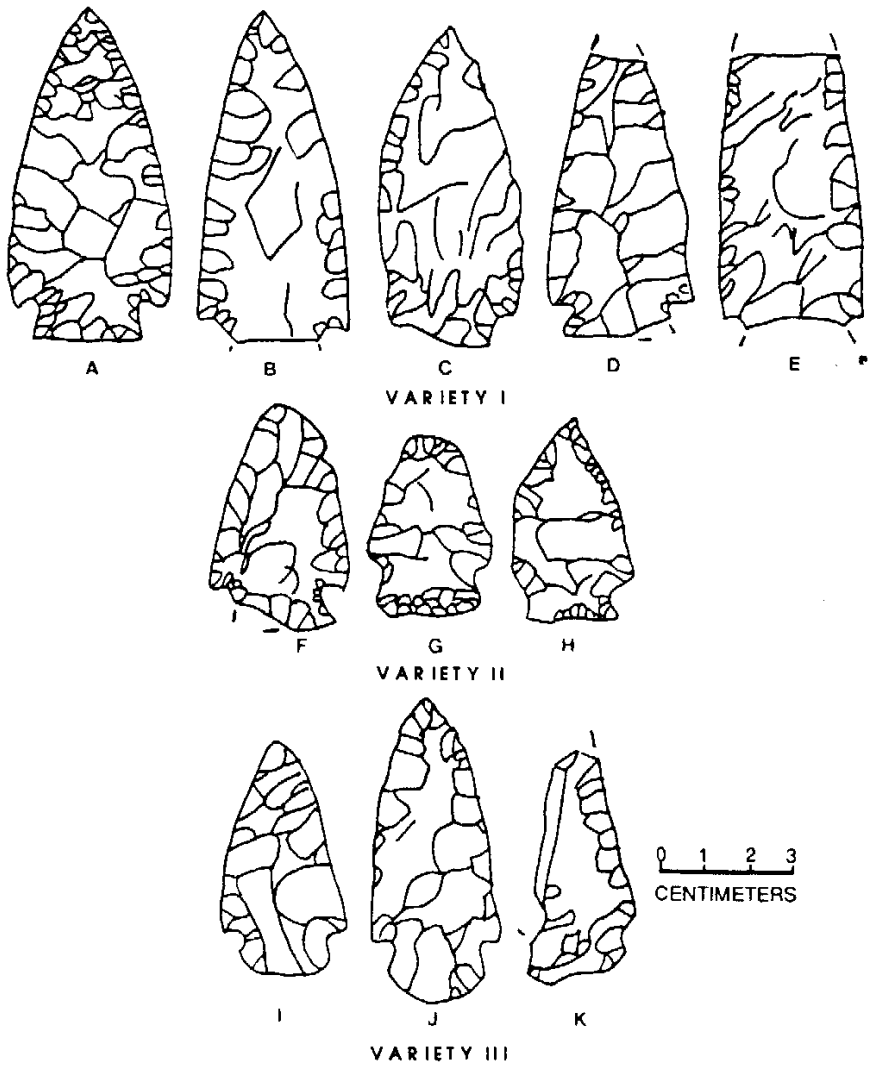

Figure 2. Drawings of Variety I, II, and III projectile points from the Twilla site.

Florence chert (n=1; 2 percent) possibly indicate movement through or interaction with groups in the north and northeast.

In 1977, samples of ribs and vertebrae from Twilla, which had been stored in paper, plastic, and waxed-paper bags for almost a decade, were submitted, together with bone samples from other bison kill sites, to Radiocarbon, Ltd. for dating (Hughes 1977, 1989). The uncorrected results of these four samples ranged between A.D. 20±110 (RL-571) at the Collier site and A.D. 970±100 (RL-572) at the Strong site (Table 1). The uncorrected radiocarbon date from Twilla was A.D. 830 ± 100 (Hughes 1977:131, 1989:201). The radiocarbon dating of large Archaic Period dart

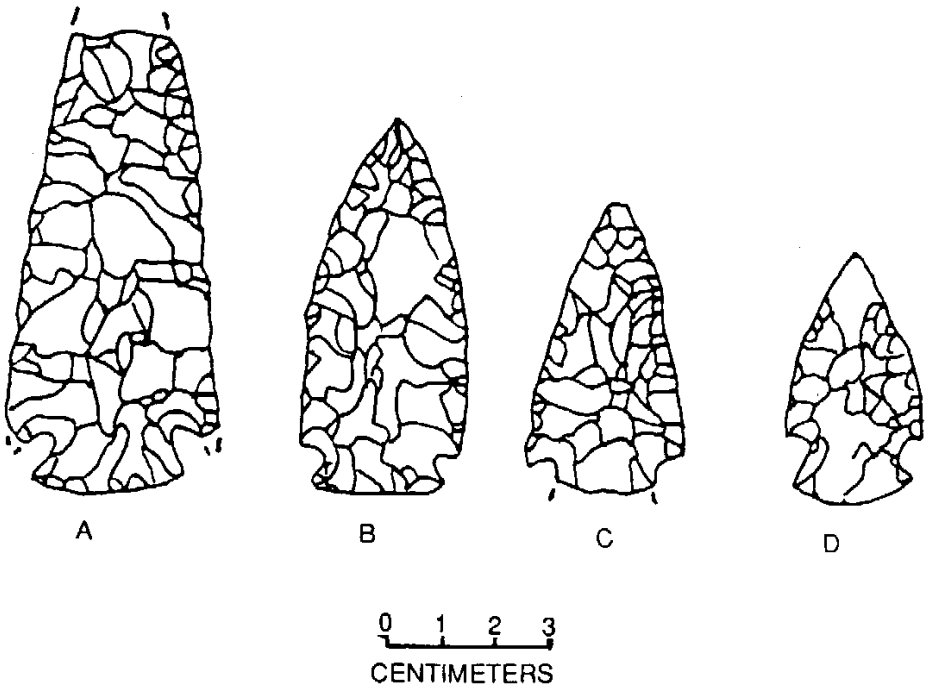

Figure 3. Drawings of projectile points collected earlier by Tunnel and Collins from the Twilla site.

points to times traditionally assigned to the Woodland period suggested to Hughes that the radiocarbon samples might have been contaminated during storage. However, Hughes notes that the occurrence of bone beds at the bottoms of filled gullies suggests that the kills took place at the end of a climatic episode that caused the gully cutting and that the wetter climatic conditions of the first half of the first millennium A.D. could account for the gully filling.

In an attempt to resolve the apparent chronological contradiction, and to remove the factor of possible contamination of samples by the storage bags, additional bone samples were collected from the Twilla site on September 15, 1980, by John D. Speth and Billy R. Harrison. During this visit, however, the bison bone bed was found to have been almost totally destroyed by vandals; fresh pick marks and footprints were still visible. Most of the identifiable bone fragments found on a large spoil pile were collected in plastic bags. From these unprovenienced remains, three composite samples consisting of half a dozen articular and shaft fragments, each weighing between 700 and 800 grams, were selected and submitted within three weeks of collection to Beta Analytic, Inc. for dating and $^{13}C/^{12}C$ analysis. Although the results of these analyses have been available for several years, they have been reported only in a doctoral dissertation (Fawcett 1987:370, Appendix B).

THE RADIOCARBON DATES

The three additional radiocarbon dates from Twilla are based on bone collagen and range between 20±85 B.C. and A.D. 660±95 (Table 1). Ratios obtained from $^{13}C/^{12}C$ analyses of the three samples showed no consistency. The values, varying from -0.07 per mil to –8.98 per mil to –16.58 per mil, are difficult to interpret. The variation in stable isotope ratios in bison bone is a product of their diet, which comprises predominately grass species. These plants fix carbon from atmospheric carbon dioxide by one of two photosynthetic pathways, which produce distinctly different stable isotope ratios. When the plants are consumed by herbivores, the carbon is incorporated into their bone collagen, and the amount of each type eaten can be calculated (DeNiro and Epstein 1978). Most grasses (e.g., *Stipa sp.*) use the C_3 Calvin-Benson pathway, which has an average isotopic fraction of –26.5 per mil; C_4 grasses (e.g., *Buchloe dactyloides, Bouteloua sp.*), which use the Hatch-Slack pathway, average –12.5 per mil (Smith and Epstein 1971). When these plants are consumed by animals, they undergo a fractionation of approximately +5 per mil (van der Merwe 1982). This enrichment caused by metabolic processes would give the bones of a pure C_4 plant consumer a stable isotope ratio of –7.5 per mil; a pure C_3 plant diet would produce a ratio of –21.5 per mil. The percentage of C_3 and C_4 species in a herbivore's diet can be figured from a simple linear interpolation (Chisholm, 1989). If a consistent chronometric trend was reflected in the $^{13}C/^{12}C$ ratio values, this might indicate that the dated materials came from separate bison bone beds derived from kills that bridged the postulated climatic change towards more mesic conditions during the early part of the first millennium A.D. (Hall 1982; 1989). Unfortunately, no consistent pattern emerges when the $^{13}C/^{12}C$ values are organized chronometrically; the lowest $^{13}C/^{12}C$ value is from the middle date. The cause of the variability is therefore uncertain.

The Beta Analytic laboratory mentioned that the wide variability of the $^{13}C/^{12}C$ values "would be indicative of possible in situ contamination" (written communication, M. Tamers to J. Speth, December 11, 1980). The source and extent of contamination are unknown, as are the effects of the contamination on the chronometric age (cf. Stafford et al. 1987). For these reasons it is inappropriate to apply the various correction and calibration procedures to these dates.

SUMMARY AND DISCUSSION

The chronologically inconsistent pattern of the $^{13}C/^{12}C$ results from the three new dates from the Twilla bison kill site suggests that there may have been some in situ contamination. Therefore, these dates must be used cautiously.

The three new Twilla site dates, nevertheless, contribute to the chronology of bison kill sites on the Southern Plains. The seven available uncorrected radiocarbon dates from the bison kills in the Red River drainage span a period from 20±85 B.C. to A.D. 970±100 (Table 1). The one-standard-deviation intervals for three of the dates from the Twilla and Collier sites overlap the period from 90 B.C. to A.D.120; no dates fall between A.D. 120 and 320. Single-standard-deviation intervals span

Table 1. Radiocarbon Dates From Selected Bison Kill Sites in the Texas Panhandle

Lab Number	Material	^{14}C Age B.P. ±1 s. d.	$^{13}C/^{12}C$ Per Mil	Fractionation Corrected ^{14}C Age
Twilla Site (41HL1, A73)				
Beta-1927	Bone	1925±95 B.P	–0.07	2335±100 B.P.
	Collagen	A.D. 25±95		385±100 B.C.
Beta-1928	Bone	1290±95 B.P	–8.98	1550±100 B.P.
	Collagen	A.D. 660±95		A.D. 400±100
Beta-1929	Bone	1970±85 B.P	–16.58	2110±85 B.P.
	Collagen	20±85 B.C		160±85 B.C.
RL-570	Bone	1120±100 B.P.		
	Collagen	A.D. 830±100		
Collier Site (41HL64, A373)				
RL-571	Bone	1930±110 B.P.		
	Collagen	A.D. 20±110		
Strong Site (41CG31, A694)				
RL-572	Bone	980±100 B.P.		
	Collagen	A.D. 970±100		
Bell site (41HL65, A696)				
RL-573	Bone	1520±110 B.P.		
	Collagen	A.D. 430±110		

NOTE: No dendrochronological calibrations have been used in this study.

the period from A.D. 320 to 540 and A.D. 560 to 1070, with slight one-standard-deviation overlaps at A.D. 730 to 760 and A.D. 870 and 930. Although the diagnostic artifact assemblage consists exclusively of large Archaic-style dart points, the radiocarbon dates tenuously suggest a transitional Late Archaic to early Neo-Archaic/Woodland (Late Prehistoric) period affiliation. This pattern has been recognized recently for other sites in western Oklahoma (Thurmond 1989); a radiocarbon sample from a nonkill site, 34RM334, which contained Ensor, Marcos, and Palmillas points, yielded a mass spectrometer radiocarbon date of A.D. 16±81 (NZA712).

Indigenous complexes (e.g., Lake Creek and Palo Duro) in the Texas Panhandle include arrowpoints as early as A.D. 170; however, it seems probable that atlatl technology persisted. The large points probably represent a specialized atlatl/lance weaponry, or hafted knives used for butchering bison, during the first millennium A.D. Although subsequent Plains Village (Late Prehistoric) groups (Antelope Creek, Custer, Washita River, etc.) perfected a bow-and-arrow technology primarily for killing solitary bison, it seems reasonable to believe that the bow would not immediately replace the atlatl. Since considerable body motion is required for

launching projectiles with atlatls, they may have been used for the dispatch of bison in small herds in situations that were topographically favorable for stampedes or drives. In contrast, bows and arrows, which require little body movement, could have been used contemporaneously with atlatls in the stalking of single animals, without alarming entire herds. Similar nonstampeding hunting stratagies were used effectively by Anglo bison hunters in the 1870–1880s, who used powerful rifles to eliminate bison herds on the Southern Plains (Baker and Harrison 1986).

The contemporaneity of atlatl and bow hunting technologies in the Texas Panhandle is not an isolated occurrence. Recent obsidian hydration dates on large dart points found in high altitude sites in the Southwest indicate that they were used by Puebloan hunters into the 1200s, even though the bow-and-arrow technology had appeared in the Southwest nearly a millennium earlier (Bertram et al. 1989). In the Southwest, their size and velocity may have made atlatl darts very effective in the immediate felling of large game such as elk when they were used in meadow margin hunting strategies from concealed forest-edge blinds (tracking of wounded animals through thick forest underbrush increases the risk of failure). There is no inconsistency in the logic of recognizing the retention of atlatl dart hunting strategies as a complement to bow hunting. After all, archers persist in this modern age of ballistical hunters.

ACKNOWLEDGMENTS

We thank the Office of the State Archeologist for funding excavations at Twilla and other bison kill sites during the summer of 1968. Funding for the initial dates was also provided by the Office of the State Archeologist; the three more recent dates were financed by the Museum of Anthropology of the University of Michigan. We also thank Charles Tucek of Radiocarbon, Ltd. of Lampasas, Texas and Dr. Murry Tamers of Beta Analytic, Inc. of Coral Gables, Florida for processing the radiocarbon dates from these sites.

REFERENCES CITED

Baker, T. L., and B. R. Harrison

1986 Adobe Walls: The History and Archeology of the 1874 Trading Post. Texas A&M University Press, College Station.

Bertram, J. B., J. A. Schutt, Steven Kuhn, A. C. Earls, W. N. Trierweiler, Christopher Lintz, J. C. Acklen, Charles Carrillo and Janette Elyea

1989 Report of surface collection and testing at 18 sites near Abiquiu Reservoir, Northern New Mexico. Report submitted to the U.S. Army Corps of Engineers, Albuquerque District under contract DACW-47-86-D-0002, by Mariah Associates, Inc., Albuquerque.

Chisholm, B.

1989 Variation in Diet Reconstructions Based on Stable Isotopic Evidence. T. D. Price, Editor. In: *The Chemistry of Prehistoric Human Bone,* pp 10–37. School of American Research, Advanced Seminar Series, Cambridge University Press

Collins, M. B.

1968 A Note on Broad Corner-Notched Projectile Points Used in Bison Hunting in Western Texas. *Bull Roarer,* Newsletter of the University of Texas Anthropological Society 3(2):13–14.

DeNiro, M. J., and Samuel Epstein

1978 Influence of Diet on the Distribution of Carbon Isotopes in Animals. *Geochimica et Cosmochimica Acta* 45:341–351.

Fawcett, W. B.

1987 Communal Hunts, Human Aggregations, Social Variation and Climatic Change:Bison Utilization by Prehistoric Inhabitants of the Great Plains. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Massachusetts, Amherst.

Hall, S. A.

1982 Late Holocene Paleoecology of the Southern Plains. *Quaternary Research* 17:391–407.

1989 Environment and Archaeology of the Central Osage Plains. *Plains Anthropologist* 33:203–218.

Hughes, D. T.

1977 Analysis of Certain Prehistoric Bison Kills in the Texas Panhandle and Adjacent Areas. Unpublished M.A. Thesis, Department of Anthropology, University of Arkansas, Fayetteville.

1989 Terminal Archaic Bison Kills in the Texas Panhandle. B. C. Roper, Editor. In: In The Light of Past Experience: Papers in Honor of Jack T. Hughes. *Panhandle Archaeological Society* Publication 5:183–204, Amarillo.

Smith, B. N., and Samuel Epstein

1971 Two Categories of $^{13}C/^{12}C$ Ratios for Higher Plants. *Plant Physiography* 47:380–384.

Stafford, T. W., A. J. Tull, Klaus Brendel, R. C. Duhamel and Douglas Donohue

1987 Study of Bone Radiocarbon Dating Accuracy at the University of Arizona NSF Accelerator Facility for Radiocarbon Analysis. *Radiocarbon* 29:24–44.

Thurmond, Peter

1989 An Archaic Mass Spectrometry Date from a "Late Archaic" Component in Roger Mills County. *Oklahoma Anthropological Society Newsletter* 37(6):3–4.

Tunnell, Curtis, and Jack Hughes

1955 An Archaic Bison Kill in the Panhandle. *Panhandle-Plains Historical Review* 23:63–70.

van der Merwe, N. J.

1982 Carbon Isotopes, Photosynthesis and Archaeology. *American Scientist* 70:596-606.