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American Antiquity, Vol. 51, No. 2. (Apr., 1986), pp. 332-338.

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RE-EVALUATION OF THE FIRST RADIOCARBON AGE FOR THE FOLSOM CULTURE

Vance T. Holliday and Eileen Johnson

*Charred remains of *Bison antiquus* recovered in 1950 from lacustrine sediments at the Lubbock Lake archaeological site (Southern High Plains of Texas) yielded a radiocarbon age of $9,883 \pm 350$ years B.P. (C-558). The bone was believed to be from the Folsom occupation of the site and the date was considered to be the first for the Folsom culture in North America. Although the feature that contained the bone was correlated with bone beds that contained Folsom points found elsewhere at the site, the dated feature did not contain diagnostic artifacts and direct correlations with the Folsom features were not possible.*

Excavations at the site since 1973 provide data that demonstrate that the feature that produced the historic date is stratigraphically above the Folsom horizon. Sediment samples taken from the feature have yielded radiocarbon ages of $8,585 \pm 145$ years B.P. (SI-5499) and $8,130 \pm 80$ years B.P. (SMU-1089). These ages further demonstrate that the feature is from a post-Folsom occupation, and probably represents the Firstview occupation of the site. The Lindenmeier site, Colorado, probably produced the first radiocarbon age for the Folsom culture.

In 1950 charred bone of *Bison antiquus* found at the Lubbock Lake site on the Southern High Plains of Texas (Figure 1) yielded a radiocarbon age of $9,883 \pm 350$ years B.P. (C-558; Libby 1952; Sellards 1952). The bone was believed to be from a Folsom occupation feature and the radiocarbon age was considered to be the first such determination for the Folsom culture and one of the first half-dozen or so applications of the radiocarbon method to the study of Paleoindians in North America (C. Johnson 1974:71; Roberts 1951; Sellards 1952:52-54; Taylor 1985:316; Wendorf

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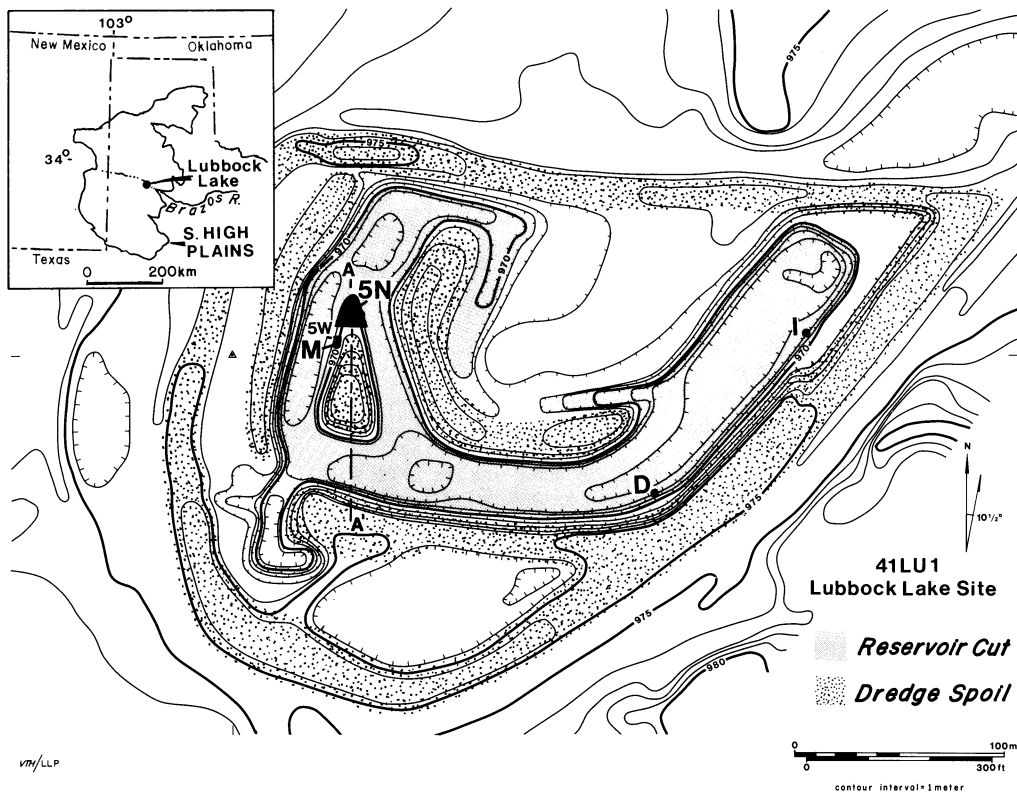


Figure 1. The floor of Yellowhouse Draw at the Lubbock Lake site showing the reservoir excavated in 1936, the island in the southwest corner of the reservoir, TMM Stations D, I, and M, LLP Areas 5 North (5N) and 5 West (5W; immediately adjacent to Station M), and the line-of-section (A-A') for Figure 2.

1975a:11; Wormington 1957:40). This radiocarbon age has been cited in many publications dealing with the age of the Folsom culture (e.g., Campbell 1959; Dibble 1968; Green 1962; Griffin 1952; Haynes 1967, 1968, 1971; Haynes and Agogino 1960; Kelley 1974; McDonald 1981; Miller 1982; Roberts 1951; Sellards 1952; Sellards and Evans 1960; Stephenson 1965; Wendorf 1961, 1970; Wendorf et al. 1955). However, several investigators have questioned the reliability of the assay, suggesting that it is rather young considering other radiocarbon ages for Folsom occupations (Irwin 1971:52; C. Johnson 1974:91; Wendorf 1975b:273).

Since the publication of C-558, a considerable amount of additional archaeological investigation has been carried out at Lubbock Lake, through the Lubbock Lake Project. Data from this research shed new light on the cultural association of the bone bed that produced C-558 and on the validity of the radiocarbon age itself. Because C-558 is often cited in scientific literature and because of its significance to the history of North American archaeology a discussion of the new data pertaining to C-558 is presented.

SITE SETTING AND HISTORY OF C-558

The Lubbock Lake site, on the northern outskirts of the city of Lubbock, Lubbock County, Texas, is located in an entrenched meander of Yellowhouse Draw, a tributary of the Brazos River (Figure 1). The site contains well-stratified deposits, 3 to 5 m thick, with a cultural, geological, and biological record that spans past 11,500 years (Holliday et al. 1983, 1985). The site was discovered in 1936, following excavations for a U-shaped reservoir along the inside of the meander. The dredging for the reservoir completely cut through the late Quaternary fill and associated archaeology in the valley.

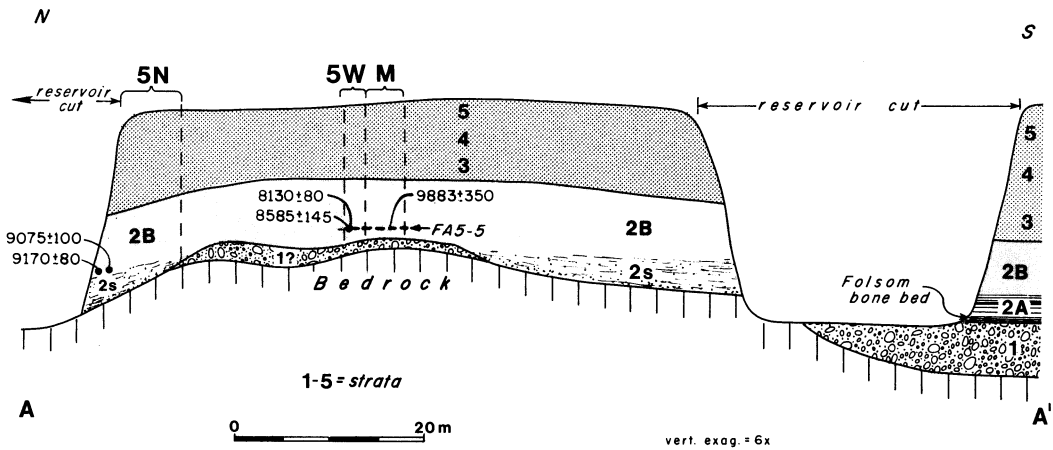


Figure 2. Geologic cross section through the island and the south wall of the reservoir at Lubbock Lake showing the stratigraphic relations of the subunits and facies of Stratum 2, the TMM-LLP bone bed at Station M (FA5-5), the Folsom bone bed exposed along the south wall, and the radiocarbon ages.

Archaeological investigations have been carried out at Lubbock Lake intermittently since 1939 (Black 1974). Of interest to this discussion are the investigations carried out under the auspices of the Texas Memorial Museum (TMM) of the University of Texas in 1948, 1950, and 1951 and through the Lubbock Lake Project from 1973 to 1984. Most of what is known about the history of the TMM excavations at Lubbock Lake is from records on file at the Texas Archaeological Research Laboratory of The University of Texas. This work, directed by E. H. Sellards and supervised by Glen Evans and Grayson Meade, was carried out at a series of stations (lettered A–M on Figure 1) located along the walls of the reservoir.

In 1950 most of the TMM excavations at Lubbock Lake were conducted at Station M, located on the west side of an island of late Quaternary fill left on the southwest side of the reservoir during the dredging in 1936. Charred and uncharred remains of extinct bison (*Bison antiquus*) were found within about 20 to 30 cm of the base of an organic-rich deposit of lacustrine material (Bed 2 of Sellards 1952:54). Diagnostic lithic artifacts were not recovered. However, the previous year Sellards had begun work at Blackwater Draw Locality No. 1 and in deposits very similar to those containing the bone bed at Lubbock Lake (referred to as “diatomaceous earth” at both sites) the TMM party encountered extinct bison remains and associated Folsom points (Hester 1972). This situation at Blackwater Draw Locality No. 1 suggested that the bone bed at Station M at Lubbock Lake was a Folsom feature.

Late in 1950 some of the charred bone from Station M was collected and sent to Willard Libby, at the Laboratory of Nuclear Physics in Chicago, who was conducting pioneer research in dating using ^{14}C . The age of $9,883 \pm 350$ years B.P. was determined within several months.

In 1951 more excavations were conducted at Lubbock Lake concentrating on Station M and along the outer walls on the south and southeast side of the reservoir. Four Folsom points were found among the bone beds of extinct bison near the base of organic-rich and diatomaceous lacustrine deposits on the southeast side of the reservoir: two near Station I and two near Station D. Because of the stratigraphic position of the features with the Folsom points near the base of the lacustrine material and the similar stratigraphic position of the bone bed at Station M, the feature at the latter locale was considered to be a Folsom bison kill and the radiocarbon age was considered to date the Folsom occupation of the site. However, direct stratigraphic correlation could not be made between Station M and the outer wall of the reservoir because the dredging had isolated the late Quaternary fill that comprised the island (Figure 2).

NEW STRATIGRAPHIC AND RADIOCARBON EVIDENCE

Renewed archaeological and geological research at Lubbock Lake, through the Lubbock Lake Project (LLP), under the auspices of the Museum, Texas Tech University, began in 1973 and are continuing. As a result of these endeavors a considerable amount of new information is available concerning the features and stratigraphy encountered by the TMM investigators.

Paleoindian material at Lubbock Lake is found within strata 1 and 2. Of concern here is Stratum 2 (Bed 2 of TMM), which consists primarily of about 0.5 to 1.0 m of interbedded lenses of diatomite and peaty mud (substratum 2A) overlain by 0.5 to 1.0 m of a homogeneous deposit of organic-rich silt and clay (substratum 2B). Deposition of 2A began about 11,000 years B.P. and ended about 10,000 years B.P. with the beginning of 2B sedimentation that, in turn, ended about 8,500 years B.P. (Holliday et al. 1983). A near-shore facies (substratum 2s) of the 2A–2B sequence commonly is observed where Stratum 2 is in contact with the bedrock of the valley walls. Substratum 2s is composed of lenses of sand and gravel reworked from the valley walls and interbedded with organic-rich lacustrine sediments.

Geologic testing has been conducted all along the walls of the reservoir, including the area of Stations D and I. The results of this research indicate that the bone beds with the Folsom artifacts are from near the base of substratum 2A.

One of the areas of concentration on the Paleoindian archaeology at Lubbock Lake is in Stratum 2 on the island (Area 5) near Station M (Figures 1 and 2). Most of the work has been on the north end of the island, about 20 to 30 m north of Station M but some testing was carried out in a block immediately adjacent to Station M (Area 5, West Block, Figures 1 and 2). A feature (FA5-5) uncovered in the West Block and representing a kill/butchering locale with the remains of *Bison antiquus* is considered to be a continuation of the bone bed found by the TMM investigators in Station M. The LLP feature is in the same stratigraphic position as the TMM feature and no other bone beds have been encountered above or below the LLP feature. A few lithic resharpening flakes were recovered but no diagnostic artifacts.

The Stratum 2 record on the island is not the typical 2A–2B sequence. The island is astride a paleotopographic high in the bedrock that represents the inside of the entrenched meander. A remnant of a terrace (Stratum 1) is preserved on the highest portion of the bedrock high (Figure 2). Stratum 2 is above the terrace and fills the draw to the north, west, and south, and also thickens in these directions. On the north end of the island substratum 2s, comprising the lower portion of Stratum 2, thins and disappears to the south as the valley wall rises in this direction. Substratum 2B overlies 2s and is continuous across the west side of the island. In the area of Station M, therefore, substratum 2A was never deposited and the Stratum 2 sequence in that area is composed entirely of substratum 2B, which rests unconformably on gravel of the remnant Stratum 1 or pre-Stratum 1 terrace. This situation indicates that the radiocarbon-dated bone bed (FA5-5) is not related to the Folsom occupation and is less than 10,000 radiocarbon years old.

Two samples of the organic-rich sediment that contains the bone bed yielded radiocarbon ages of $8,585 \pm 145$ years B.P. (SI-5499; NaOH-insoluble fraction) and $8,130 \pm 80$ years B.P. (SMU-1089; NaOH-soluble fraction). These ages are in good agreement with other radiocarbon ages determined on sediments from substratum 2B in other areas of the site (Holliday et al. 1983, 1985). In addition, organic-rich sediment provided radiocarbon ages for the base of 2B in the North Block of Area 5: $9,170 \pm 80$ years B.P. (SMU-829; NaOH-soluble fraction) and $9,075 \pm 100$ years B.P. (SI-4179; NaOH-insoluble fraction). These ages are in good stratigraphic agreement with the new ages from the West Block because the 2s/2B contact in the North Block is stratigraphically below the position of FA5-5.

CONCLUSIONS

New stratigraphic and radiometric evidence demonstrates that the radiocarbon age of $9,883 \pm 350$ years B.P., determined on charred bone found at Station M in 1950, is not associated with the Folsom occupation of Lubbock Lake. The age was tentatively considered to be associated with the

Plainview occupation of the site (Johnson and Holliday 1980; Johnson et al. 1982), which dates to about 10,000 years B.P. The new data indicate that this interpretation was also in error. The new radiocarbon ages and stratigraphic position of the feature suggest that the bone bed is related to the Firstview occupation of the site, the remains of which are found in upper 2B and are around 8,500 years old (Holliday et al. 1983; Johnson and Holliday 1981). The old radiocarbon age therefore is not the first such age for the Folsom culture, but still remains as one of the earliest applications of the radiocarbon method to the study of Paleoindians. Moreover, the age determination on the charred bone is falsely old, probably due either to problems encountered in the dating of bone (Tamers and Pearson 1965; Taylor and Slota 1979) or the use of the solid-carbon method of dating (Ralph 1971).

The miscorrelation of the bone bed in Station M with the Folsom features found elsewhere at Lubbock Lake is an understandable mistake given the data available to the TMM investigators in 1950. Only with significantly more stratigraphic data and a number of radiocarbon ages (utilizing improved radiocarbon techniques) could the stratigraphy of Station M and the cultural affiliations of the bone bed be ascertained.

The elimination of C-558 from the list of radiocarbon ages for the Folsom culture allows for better control on the age range of this cultural manifestation. At Lubbock Lake the Folsom occupation is dated to between 10,500 and 10,200 years B.P. (Holliday et al. 1983, 1985). Throughout the Great Plains Folsom sites date from the period 11,000 to 10,000 years B.P. (Frison 1978:23; Haynes 1971:10; Wheat 1972:156–157).

The first radiocarbon age for the Folsom culture probably is that of Haynes and Agogino (1960), reported for the Folsom level at the Lindenmeier site, Colorado. Charcoal from Lindenmeier yielded an age of $10,780 \pm 375$ years B.P. (I-141; Haynes and Agogino 1960). Interestingly, Roberts, who conducted most of the work at Lindenmeier (Wilmsen and Roberts 1978), stated in a letter to Griffin (1952:368) his belief that the Folsom level at Lindenmeier was "somewhat older" than the date from Lubbock Lake. The data presented in this report demonstrate that this interpretation is correct.

Acknowledgments. The authors would like to thank Glen Evans (Austin) for his comments on the manuscript and for sharing his knowledge of the TMM work at Lubbock Lake. The Cartography Laboratory of the University of Wisconsin–Madison aided in preparation of the figures. This investigation is part of the continuing research of the Lubbock Lake Project. Funding has been provided by: National Science Foundation (SOC75-14857; BNS7612006; BNS7612006-A101; BNS78-11155), National Geographic Society, Texas Historical Commission, City and County of Lubbock, Center for Field Research (EARTHWATCH), The Museum, Texas Tech University, and the West Texas Museum Association.

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SPURRED END SCRAPERS AS DIAGNOSTIC PALEOINDIAN ARTIFACTS: A DISTRIBUTIONAL ANALYSIS ON STREAM TERRACES

Richard A. Rogers

Analysis of archaeological sites on a stream terrace system in Kansas supports the idea that spurred end scrapers are valid diagnostic Paleoindian artifacts. No sites with spurred end scrapers were discovered on the Holocene terraces, while the Wisconsin terraces did yield such sites. The differential distribution of spurred end scraper sites on terraces appears to be statistically significant. The results are consistent with the hypothesis that spurred end scrapers were not found on the Holocene terraces because they were not being used when the Holocene terraces formed.

Spurred end scrapers have a lateral pointed projection. Two examples recovered during archaeological research on the Arkansas River Drainage in Kansas are illustrated in Figure 1. This type of implement has been considered to be possibly diagnostic of Paleoindian activity (Frison 1978: 78), and the discovery of spurred end scrapers has been used to confirm the Paleoindian affinities of archaeological sites (for example, O'Brien 1984:44). The dating of a terrace system in the Arkansas River Drainage in Kansas permits a geoarchaeological test of the validity of the hypothesis that spurred end scrapers are indeed valid evidence of Paleoindian occupation.

THE STREAM TERRACES

Alluvial terraces are remnants of former floodplains. When a stream downcuts and establishes a new floodplain, it leaves the remains of its previous floodplain as a terrace. If this happens repeatedly, then a series of terraces is established in a stream valley, producing a chronological set of landforms useful for relative dating. The length of time that stream terraces have been available for human occupation varies with terrace position. Terraces higher above stream level may have been occupied

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