The Clovis Paleoindian Occupation of Texas: Results of the Texas Clovis Fluted Point Survey

David J. Meltzer

ABSTRACT

A survey of private and public archeological collections in Texas produced data on 205 Clovis points. Areas with high densities of Clovis points are the High Plains, or Llano Estacado, the Balcones fault zone, and the eastern and coastal region of the state. Areas low in Clovis points are the lower Plains and the Trans-Pecos region. These patterns result from differences in site exposure and from the differences in the amount of careful archeological work in the areas, but may also reveal differential land use by Clovis groups. Analysis of functional and technological attributes in this sample of points convirms that Clovis adaptive strategies varied across the state and indicates the strong possibility that Texas Clovis points had multiple uses: many functioned as knives, and some may not have been projectiles at all.

INTRODUCTION

One of the most striking facets of the North American Clovis Paleoindian archeological record is that it comprises largely isolated fluted points not in site contexts. What is true of North America is true of Texas as well; here the Clovis archeological record is dominated by scattered, isolated surface finds (Hester 1977; Mallouf 1981). In general, Clovis Paleoindian sites are uncommon, though admittedly less so on the western Plains than in the forests of eastern North America (Meltzer 1984).

This pattern may be the result of 10,000 years of erosion and other natural and cultural destructive processes that have irretrievably drowned, buried, dispersed, or destroyed the visibility, integrity, or cohesion of later Pleistocene Clovis sites. Certainly one cannot account for the Clovis archeological record without recognition of these processes.

Yet there is a second, more intriguing possibility to consider: it is conceivable that the archeological record of isolated fluted points accurately reflects the structure of Clovis subsistence and settlement strategies. Clovis groups may have participated only rarely in the highly structured spatial behavior that produces sites. This possibility raises some significant questions: what kinds of adaptive strategies produce an archeological record that comprises primarily largely scattered isolated points?, why no other tools?, and what implications does this have for Clovis subsistence strategies? are just a few.

Clovis studies have not yet reached the point where answers to these questions are at hand, but although as yet unanswered, they guide researchers to potentially valuable lines of inquiry. For one thing, they highlight the importance of careful study and analysis of all the Clovis fluted points that litter the landscape. This consideration prompted the Texas Clovis Fluted Point Survey.

Studies of fluted points are not uncommon, particularly in the eastern United States (for the most recent ones see Brennan 1982; Seeman and Prufer 1982). However, with the notable exception of an unpublished paper prepared some 20 years ago (Hester 1967) and a survey of the published record for Clovis points (Prewitt 1985), recent systematic studies do not exist for Texas or, for that matter, for any area west of the Mississippi. Indeed, as Dee Ann Story has noted (1981:142), our views of the Clovis occupation of Texas are based more on speculation than on substantive information; there has not been in the last two decades a systematic study or even inventory of Texas Clovis materials. So the first aim of this study was to compile information on the *amount* and *distribution* of Clovis remains from Texas, beginning with Clovis points, their most readily identified element.

Just as there is no current inventory of Texas Clovis points, so too there is no study of their *typology*. It has long been known that Clovis points show marked morphological variability across the continent and even in single sites (e.g. Haury 1953, Haury et al. 1959). But what causes the variability, whether in use or in style, is unclear and probably will not become clear until, as Alex Krieger noted (1954), the problem is addressed on a large scale through statewide and state-by-state detailed typological studies of Clovis points. So the second aim of this study is to document the morphological diversity in Texas Clovis points. In order to insure that this effort was not constrained by the writer's or others' biases as to what constitues a Clovis fluted point, the analysis included all *non-Folsom* fluted points. Basally thinned Plainview points were not included in the study.

Such a study has implications that go beyond simply detailing point diversity. Take, for example, the matter of Clovis subsistence strategies. Although Clovis groups probably scavenged or occasionally killed mammoths, there is no evidence that Clovis groups were solely specialized big game hunters. But this is not surprising. As a host of authors have argued (Bryant and Shafer 1977; Collins 1976; Johnson 1977; Johnson and Holliday 1984; Meltzer 1984; Meltzer and Smith 1986; Shafer 1977; Story 1981), there are good theoretical reasons to hypothesize that Clovis groups probably practiced a mixed foraging or generalized hunting and gathering, adaptation rather than a specialized big-game-hunting adaptation.

This suggestion, in turn, has significant archeological implications. It has been assumed that the Clovis archeological record of scattered, isolated surface finds represents the remains of highly mobile hunters. Yet the points themselves are rarely found in unequivocal association with faunal remains (Hester 1977:173). More important, the points may not be hunting implements. So the third aim of this study was to detect whether these points were used as anything but projectiles and whether their distribution, when combined with paleoenvironmental data, would provide a glimpse into the foraging and gathering strategies in which they once functioned.

It was for these reasons that the Texas Clovis Fluted Point Survey was undertaken.

THE TEXAS CLOVIS FLUTED POINT SURVEY: METHODS AND BIASES

Any research project that aims to gather data on the abundance, distribution, and diversity of Texas Clovis fluted points faces certain obstacles. The distribution of Clovis points in public and private collections is similar to their distribution in archeological settings, and the points often occur in isolation without meaningful contexts, so few archeologists are able to see many of them. For these reasons collection of data for this study moved along two fronts.

All available published information on Texas Clovis points was recorded, and as many points in private and public collections as was feasible were examined. These collections include the Haynes Collection at the Institute for the Study of the Earth and Man at Southern Methodist University in Dallas, the collections at the Texas Archeological Research Laboratory at The University of Texas at Austin, the Bissell Collection at the Museum of the Southwest in Midland, and the collections at the Plains/Panhandle Historical Society Museum in Canyon. These collections included Clovis points from several sites, though it should be noted that many of the Clovis points found in archeological sites in Texas are intrusive. See, for example, the Clovis points at the Crockett Gardens (Hays 1982), Doering (Wheat 1953), 41SP69 (Chandler 1982), Fred Yarbrough (Johnson 1961), La Perdida (Weir 1956), Meier (Meier and Hester 1972, 1976), and Obshner sites (Crook and Harris 1955), to name just a few that have been published.

In addition, in order to obtain information from unpublished collections throughout the state a questionnaire was sent to the membership of the Texas Archeological Society in the April and July 1985 (Vol. 29, Nos. 2 and 3) issues of the Society's newsletter *Texas Archeology.* This source provided the bulk of the data used here.

Any conclusions drawn in this kind of analysis are constrained by the degree to which the sample is reliable and representative. It is therefore important to identify and assess potential biases in the data that might skew interpretations.

Use of published data on Clovis points is complicated by two potential biases. First, because not all researchers are aware of what kind of information is useful, data needed for my purposes were not always available. This bias should not unduly influence the analysis, since most published reports provide data on point location, size, and shape, as well as a photograph or drawing.

Second, the published record of Clovis material tends to emphasize areas where more extensive archeological survey and fieldwark have been conducted. Indeed, a map of Clovis finds based *solely* on the published record is likely to conform closely to the distribution of major reservoir and highway projects undertaken in the last few decades. This bias is largely offset by the inclusion of unpublished data from private collections.

Data gathered by questionnaire through the TAS Newsletter comes from an extensive network linking avocational and professional archeologists throughout the state, but it has its own biases. There are the usual problems that plague any effort to gather data by questionnaire. Will everyone with Clovis points respond to the survey? Will they fill out the forms correctly? Collecting data by questionnaire limits the quantity of information received for each artifact.

There are also limits on the *kind* of data available. It would be wholly unreasonable to burden survey participants with an extensive list of functional, morphological, and technological attributes to identify, measure, and calculate and to demand precise drawings and technical quality photographs. The information requested in the questionnaire was therefore kept to a minimum, focusing largely on the measurement and description of attributes that carry important functional, technological, and stylistic information (Meltzer 1984). A copy of the survey form is included here as Appendix A, and the data compiled in this study are available from the author. (Any readers who have data on so-far-unreported Texas Clovis points are urged to fill out this form or a facsimile and send it to me.)

There are additional more subtle biases that attend the use of this data set. For one, the questionnaire directly reached only TAS members. Yet, as Elton Prewitt has observed (1985), nonmembers—casual collectors and "hard-core" pothunters—probably control the bulk of the private archeological collections in Texas. Although many TAS members worked to record Clovis points in undocumented collections of nonmembers, most of that material remains unrecorded. (Let me urge again the continued effort to document the collections that exist in the archeological twilight zone.)

Collections of TAS members also may not comprise a representative sample of the Clovis archeological resources of Texas. Visibility of archeological remains varies by region, according to several factors, including vegetation, degree and kind of cultivation, the age of the surface, rate of erosion, and so on. Similarly, the intensity of collecting and survey also varies by region. Because of these biases, blank spots on an archeological distribution map may not reflect the absence of Clovis occupation, but rather the absence of archeological collections or fieldwork. Similarly, areas of high density may well reflect particularly vigorous collectors rather than abundant archeological resources. Interpreting the distribution of Clovis material is complicated by the fact that not all parts of the state have been under the same degree of archeological scrutiny.

Although one can never wholly correct for these biases, they are offset to a certain extent here; part of the bias is eliminated by the splendid and enthusiastic participation of TAS members in completing the survey forms. Equally important, certain biases will fade out as "background noise," owing to the spatial unit (the county) used in the analysis of the distribution of Clovis points. Using the county of discovery as the basic unit for spatial patterning compensates for often incomplete data on the precise location of many Clovis points, insuring that uneven data do not unduly influence the analysis.

More specific matters of bias are addressed in the discussion of spatial patterning below.

THE TEXAS CLOVIS FLUTED POINT SURVEY: RESULTS

The Texas Clovis Fluted Point Survey produced data on 205 points, distributed rather evenly among 95 (37 percent) of the 254 counties in Texas (Table 1, Figures 1, 2). This number is probably on the low side, but what

Table 1. Texas Clovis Fluted Points by County

County	(Site)	Number of Clovis Fluted Points	Reference
Andrews		2	TCFPS
Angelina		1	TCFPS
Armstrong		1	TCFPS
Atascosa		1	Hester 1974 (Fig.1:j)
Bailey		1	TCFPS
Bandera		1	TCFPS
Bee		1	Sellards 1940
Bell		1	TCFPS
Bexar	(41BX 52)	2	TCFPS
Blanco		1	TCFPS, Orchard & Campbell 1954
Borden		1	TCFPS
Bosque		1	TCFPS
Brazos		1	TCFPS
Brewster		2	Enlow and Campbell 1955; Hester 1967
Brown		4	TCFPS
Calhoun		2	Suhm and Jelks 1962
Callahan		1	TCFPS
Cameron		1	Hester 1967
Camp		1	TCFPS
Cherokee		1	Hester 1967, TCFPS
Coke		2	TCFPS
Comanche		2	TCFPS
Concho		1	Stacey Reservoir Report, THC
Cooke		1	Jensen 1968
Crosby	(41CB 64)	12	TCFPS
Dallam		3	TCFPS
Dallas	(Obshner)	3	TCFPS; Crook and Harris 1955 Suhm and Jelks 1962

County	(Site)	Number of Clovis Fluted Points	Reference
Deaf Smith		1	Suhm and Jelks 1962
Denton	(Lewisville)	1	Crook and Harris 1957
De Witt		1	Prewitt, unpublished
Dimmit		6	Hester 1967, 1974 (Fig.1:a,c,f,g)
Duval		1	Hester 1967, 1974 (Fig.1:b)
Ellis		2	TCFPS
Erath		3	TCFPS
Fayette	(Little Pin Oak)	3	Wilson
	(Meier)		Meier and Hester 1972, 1976
Floyd	(41FL6)	1	TCFPS
Foard		1	Etchieson et al. 1979
Gaines		16	TCFPS
Garza		1	TCFPS
Gonzales		1	Hester 1967
Gray		2	TCFPS
Grayson		1	TCFPS
Hamilton		1	TCFPS
Harris	(Galena)	2	Hester 1967; Suhm and Jelks 1962
	(Doering)		Wheat 1953
Harrison		5	Hayner 1955, Hester 1967
Hays	(Spring Lake)	4	TCFPS, Hester 1967
Henderson		1	TCFPS
Hill		2	TCFPS
Hockley		1	Parker, n.d.
Hood		1	Skinner and Rash 1969
Howard		3	TCFPS
Jasper		2	TCFPS
Jefferson	(McFaddin)	10	TCFPS; Long 1977
Johnson		2	TCFPS
Jones		1	TCFPS
Kendall		1	Chandler 1983
Kerr		1	TCFPS
Lamar		2	TCFPS
Lubbock	(Lubbock Lake)	1	Johnson 1983
McLennan		3	TCFPS
McMullen		2	Cooper 1974; Kelly 1983
Marion		4	Hayner 1955; TCFPS
Martin		2	TCFPS
Medina		1	TCFPS
Midland	(Scharbauer)	5	TCFPS
Montague		1	TCFPS
Moore		6	TCFPS

County	(Site)	Number of Clovis Fluted Points	Reference
Navarro		1	TCFPS
Nolan		2	TCFPS
Oldham		2	TCFPS
Panola	(41PN6)	1	Surlock and Davis 1962
Parker		1	TCFPS
Pecos		1	Hester 1967
Roberts	(Miami)	3	Sellards 1952
Robertson		1	TCFPS
Runnels		2	Hester 1967, TCFPS
San Augustine		1	TCFPS
San Patricio	(41SP69)	2	Chandler 1982, Hester 1980
Schackleford		1	TCFPS
Schleicher		2	TCFPS
Starr	(La Perdida)	1	Weir 1956
Swisher		1	TCFPS
Taylor	(McLean)	5	Ray 1930; Sellards 1952; TCFPS
Titus		1	TCFPS
Travis	(Levi; 41TV139)	4	Alexander 1963; Hester 1967
Tyler		1	Suhm and Jelks 1962
Uvalde	(41UV20)	1	Hester 1967
Val Verde		1	Greer 1968
Van Zandt	(Fred Yarbrough)	2	Johnson 1961
Victoria		1	Hester 1974 (Fig.1:i)
Ward		3	TCFPS
Williamson	(Crockett Gar.) Wilson Leonard)	2	Hays 1982 TCFPS
Winkler		2	TCFPS
Yoakum		1	TCFPS
Zavala		2	Hester 1974 (Fig.1:d,e)
Unknown		1	
	TOTAL	205	

NOTES: TCFPS indicates that the source of the data was the Texas Clovis Fluted Point Survey.
The listing of a site on this table does not indicate that all points in the county came from that site.

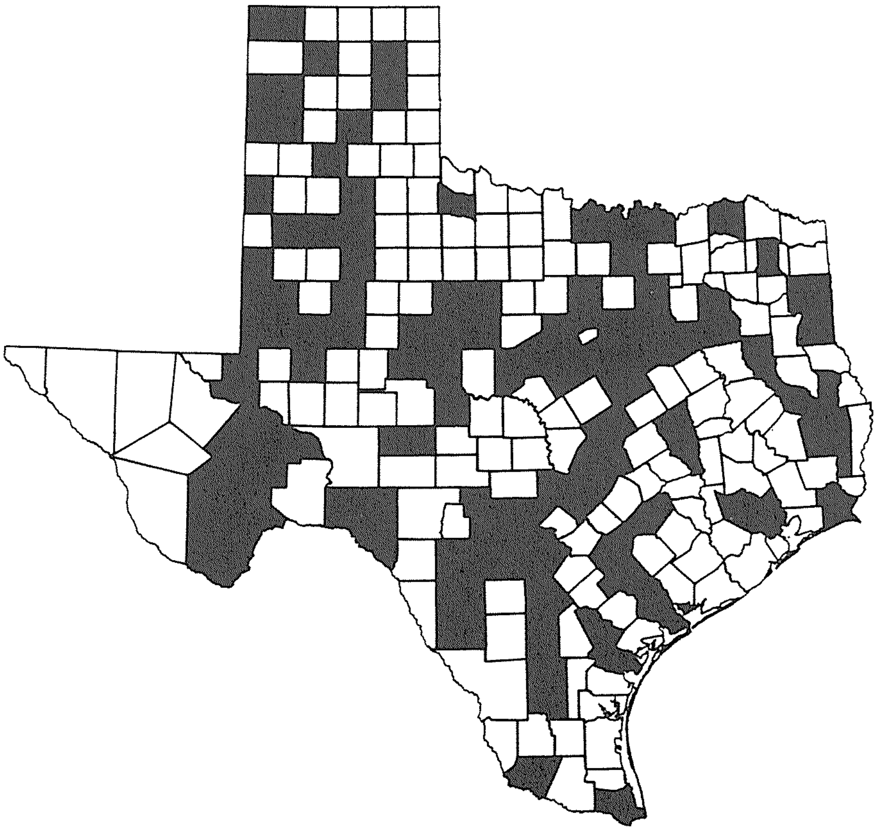

Figure 1. Map of Texas showing the occurrences of Texas Clovis fluted points by county. Data from the Texas Clovis Fluted Point survey.

proportion of Texas Clovis materials it represents cannot be determined in any statistical sense since so little is known of the relevant population parameters.

However, although 205 points may be only a fraction of the points recovered or recoverable in Texas, it nonetheless becomes a substantial sample when compared with tallies from two other surveys of Texas Clovis fluted points. Systematic examination by Prewitt (1985) of 428 published and unpublished site, survey, and salvage reports for the state of Texas resulted in a list of 14 sites and 16 Clovis points. Thomas R. Hester has made a distributional study of Paleoindian points in Texas (Hester 1967), based on an inventory of the published record and public and private collections. He recorded 50 Clovis fluted points scattered among 31 counties in Texas. Although the Texas Clovis Fluted Point Survey may not have produced data on all Texas Clovis points, the sample is at least a fourfold increase over previous tallies.

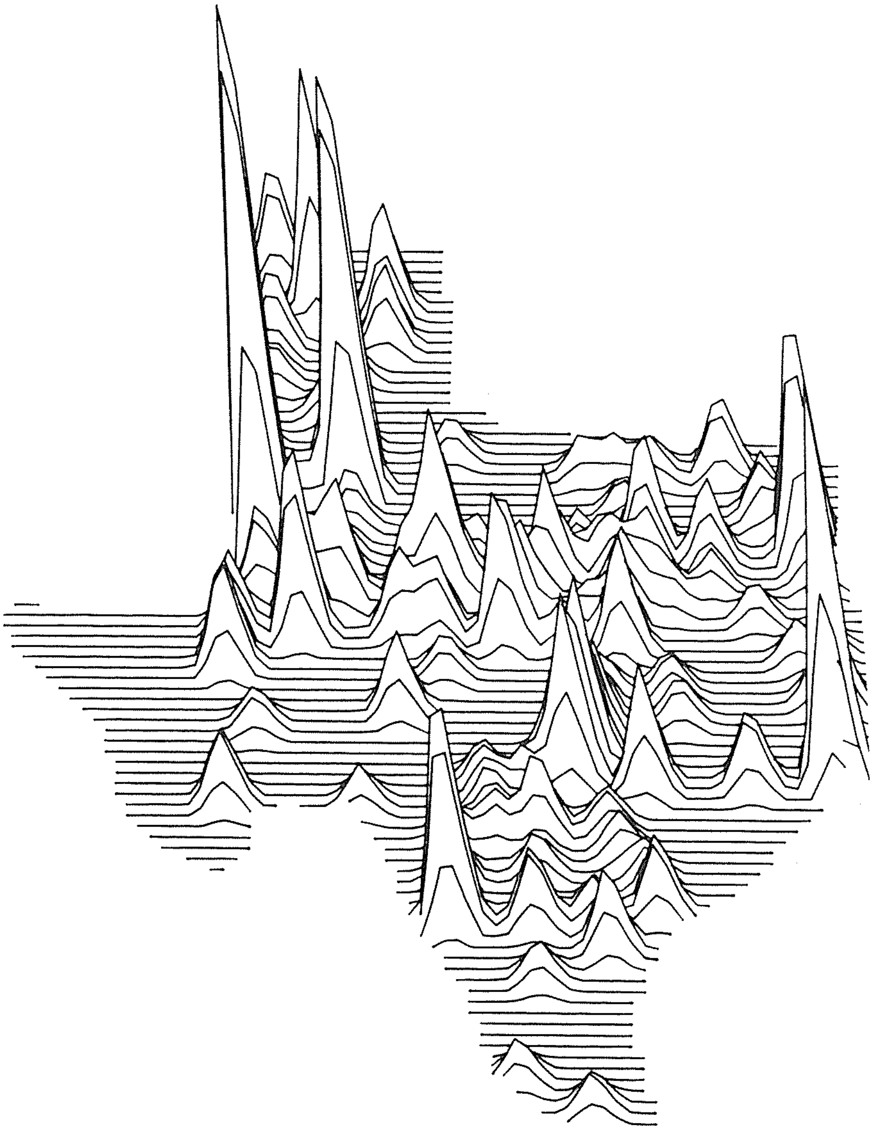

Figure 2. Computer-generated map of Texas showing frequency of Texas Clovis fluted points by County. The highest of the spikes, in Gaines County, represents 16 clovis fluted point occurrences. Data from the Texas Clovis Fluted Point Survey.

The Spatial Distribution of Texas Clovis Points

Of the 95 Texas counties with Clovis points, only three have produced more than six points: two of these, Gaines and Crosby, are High Plains counties, and the third, Jefferson, is a coastal county. In Crosby and Jefferson counties the points come from relatively small sites, 41CB64 and McFaddin Beach respectively. In Gaines County the points were not in site contexts but were dispersed throughout the county. The large number of points from Gaines county is apparently due to the fact that this county has been under more intense scrutiny than have other areas of comparable size.

The three counties just mentioned notwithstanding, Clovis points are fairly evenly distributed. Indeed, the average comes to roughly two points per county, though the statistical mean in this case is somewhat misleading, inflated as it is by the high numbers of points in the three counties mentioned. The modal tendency in this case is more informative (Table 2); 51 of the 95 counties (54 percent) have only one Clovis point, and 87 percent (82/95) of all counties with points have three or less.

Table 2. Modal Distribution of Clovis Fluted Points by County

Number of Clovis Points	1	2	3	4	5	6	<10
Number of Counties	51	23	8	4	3	2	3

Oddly enough, not only do isolated Clovis points fail to cluster significantly in any one county, they do not even appear to reflect the distribution of Paleoindian sites—sites dated between 12,000 and 7000 B.P. (Biessart et al. 1985:40) across the state. A comparison of the distribution by county of isolated Clovis points with the distribution of Paleoindian sites (data from Biessart et al. 1985:107-200, 203-214) reveals that there is no concordance or correlation between the two (Kendall's W=.0001 [n=95]; Kendall's W was used in this instance because of the large number of tied observations). For comparative purposes, there was nearly complete agreement in the frequency distribution by county of Paleoindian sites and the total number of sites of any age (Kendall's W=.957 [n=95]). The distributions of isolated Clovis points and Paleoindian sites by county across the state are unrelated.

One must exercise caution in drawing any conclusions of great moment from this result, given the nature of the data being analyzed and possible distributional biases in the record of Paleoindian sites. But it is worth speculating that this analysis lends credence to the suggestion raised earlier that there might be something distinctive about the distribution of isolated Clovis points in comparison with the distribution of later Paleoindian material. Perhaps this in turn indicates differences in settlement systems through the Paleoindian period. Obviously this possibility warrants further inquiry, though such inquiry is beyond the scope of this paper.

The number of points by county is also unrelated to collector activity, as seen in a comparison of the distribution of Clovis points and collector activity (where TAS members reside is used as a proxy measure of where collecting activity takes place, on the assumption that collecting tends to be done near where one lives). If the distribution of points were a function of the intensity of collector efforts (Hester 1977:173; Lepper 1983), then a map of the distribution of Clovis points by county (Figures 1, 2) would correspond to a map of TAS nember residence by county (Figures 3, 4, Table 3). Comparison of Figures

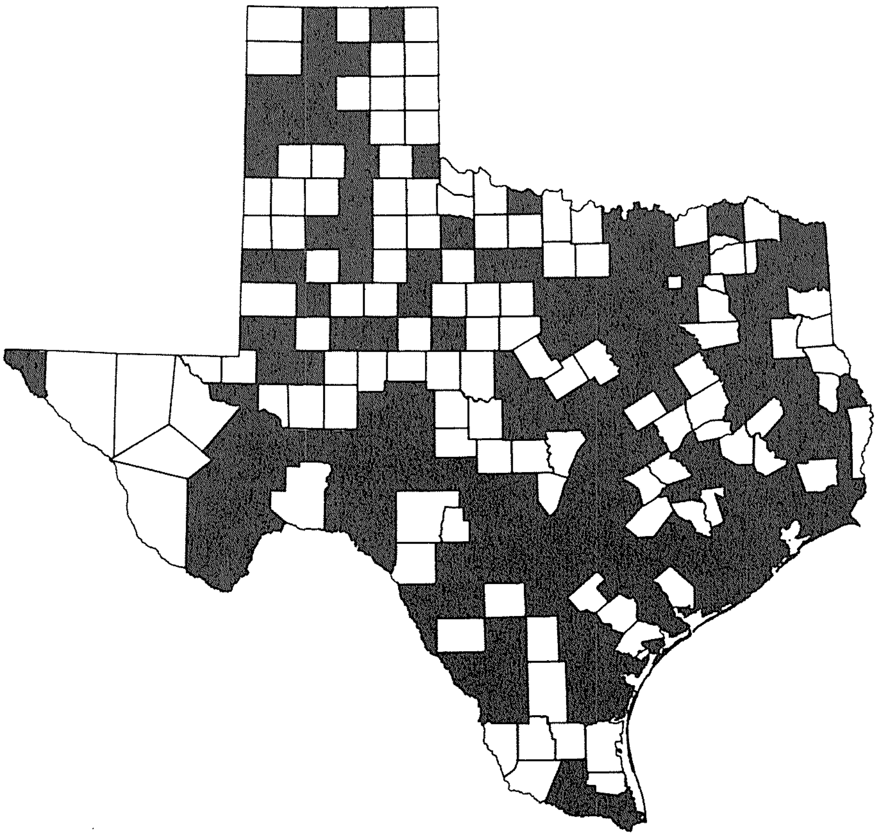

Figure 3. Map of Texas showing the occurrence of TAS members by county. Membership data from TAS membership list, December 22, 1984.

1 and 2 with Figures 3 and 4 shows little overlap between Clovis finds and membership. The two distributions are statistically unrelated(Kendall's W=.221 for counties with both points and TAS members [n=61]; Kendall's W=.179 for all counties with either TAS members or points [n=171]); one would expect the reverse if the number of Clovis points were a function of the amount of

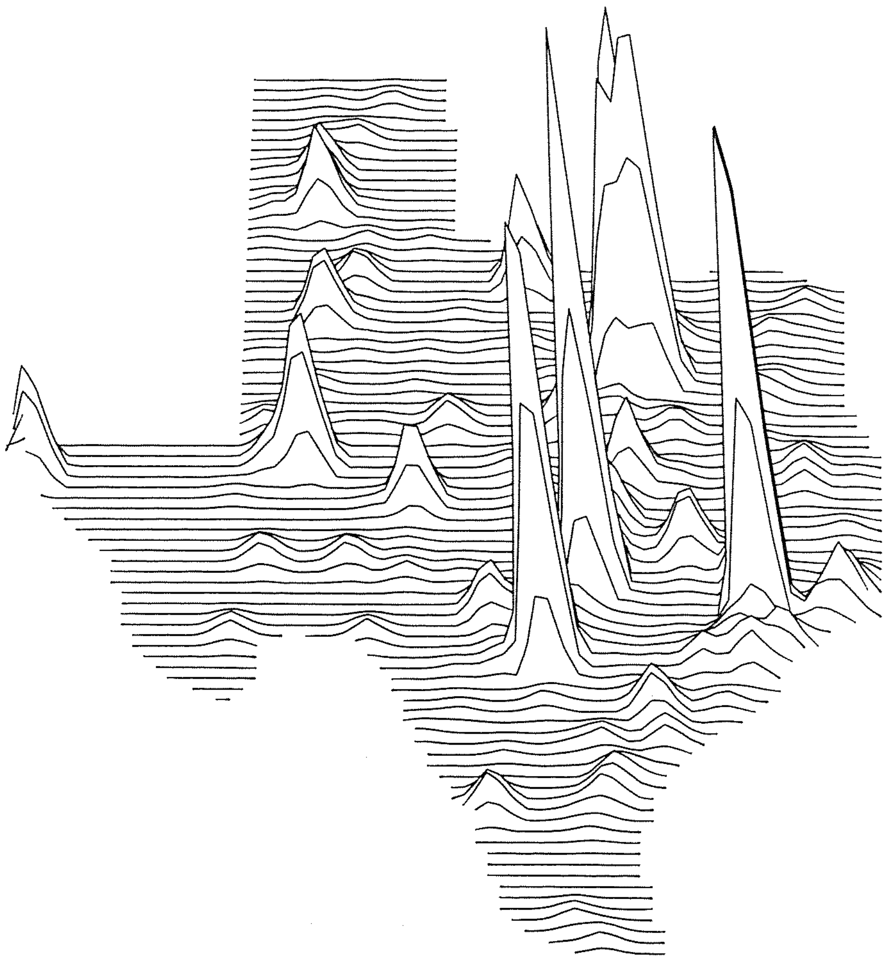

Figure 4. Computer-generated map of Texas showing frequency of TAS members by county. The highest of the spikes, in Harris County, represents 105 TAS members. Membership data from TAS membership list, December 22, 1984.

collecting activity. There may be a relationship between the distribution of archeological finds and collector activity, but the relationship is not evident in this analysis. Low numbers of fluted points in counties of high membership density (e.g. Bexar, Dallas, Denton, Harris, and Travis) are probably not a result of recovery bias. But although the presence or abundance of Clovis points per county is not a direct function of the presence or abundance of TAS members per county, there still remains the possibility that the absence of TAS members in a given county may account for an absence of Clovis points in that county.

Table 3. Frequency of TAS Membership and Texas Clovis Fluted Points by County.

County	TAS Members	Clovis Points	County	TAS Members	Clovis Points
Anderson	1	0	De Witt	1	1
Andrews	3	2	Dimmit	0	6
Angelina	3	1	Duval	0	1
Aransas	1	0	Ector	6	0
Armstrong	1	1	Ellis	1	2
Atascosa	2	1	El Paso	20	0
Bailey	0	1	Erath	7	3
Bandera	2	1	Fayette	0	3
Bastrop	1	0	Fisher	1	0
Bee	3	1	Floyd	6	1
Bell	12	1	Foard	0	1
Bexar	85	2	Fort Bend	6	0
Blanco	0	1	Gaines	0	16
Borden	0	1	Galveston	8	0
Bosque	0	1	Garza	1	1
Bowie	3	0	Gillespie	1	0
Brazoria	8	0	Gonzales	1	1
Brazos	12	1	Gray	0	2
Brewster	3	2	Grayson	1	1
Briscoe	2	0	Gregg	2	0
Brown	2	4	Grimes	1	0
Caldwell	1	0	Guadalupe	2	0
Calhoun	4	2	Hamilton	0	1
Callahan	0	1	Harris	105	2
Cameron	2	1	Harrison	0	5
Camp	1	1	Hays	7	4
Cass	1	0	Henderson	0	1
Chambers	5	0	Hidalgo	2	0
Cherokee	2	1	Hill	1	2
Childress	1	0	Hockley	0	1
Coke	0	2	Hood	2	1
Collin	7	0	Houston	2	0
Colorado	1	0	Howard	1	3
Comal	4	0	Hunt	1	0
Comanche	0	2	Hutchinson	3	0
Concho	0	1	Irion	1	0
Cooke	3	1	Jasper	2	2
Coryell	2	0	Jefferson	11	10
Crockett	4	0	Jim Wells	1	0
Crosby	1	12	Johnson	4	2
Dallam	0	3	Jones	0	1
Dallas	65	3	Kaufman	1	0
Dawson	2	0	Kendall	5	1
Deaf Smith	2	1	Kerr	9	
Denton	67	1	Kimble	1	0

County	TAS Members	Clovis Points	County	TAS Members	Clovis Points
Kleberg	1	0	Robertson	0	1
Knox	1	0	Runnels	0	2
Lamar	1	2	Sabine	1	0
Lampasas	1	0	San Augustine	0	1
La Salle	1	0	San Ptricio	4	2
Lavaca	1	0	San Saba	1	0
Liberty	1	0	Schackleford	0	1
Limestone	2	0	Schleicher	1	2
Live Oak	1	0	Sherman	1	0
Lubbock	14	1	Smith	4	0
McLennan	15	3	Somervell	1	0
McMullen	0	2	Starr	0	1
Marion	1	4	Stonewall	1	0
Martin	0	2	Sutton	2	0
Matagorda	2	0	Swisher	0	1
Maverick	1	0	Tarrant	49	0
Medina	3	1	Taylor	5	5
Midland	29	5	Terry	1	0
Milam	1	0	Throckmorton	1	0
Mills	2	0	Titus	2	1
Mitchell	1	0	Tom Green	15	0
Montague	0	1	Travis	98	4
Montgomery	15	0	Tyler	1	1
Moore	2	6	Upshur	1	0
Morris	1	0	Uvalde	1	1
Nacagdoches	4	0	Val Verde	3	1
Navarro	4	1	Van Zandt	0	2
Nolan	0	2	Victoria	8	1
Nueces	4	0	Ward	1	3
Ochiltree	2	0	Washington	1	0
Oldham	1	2	Webb	7	0
Orange	3	0	Wharton	5	0
Palo Pinto	2	0	Wichita	19	0
Panola	0	1	Williamson	10	2
Parker	2	1	Wilson	1	0
Parmer	1	0	Winkler	0	2
Pecos	4	1	Wood	1	0
Polk	1	0	Yoakum	1	1
Potter	9	0	Young	2	0
Randall	16	0	Zavala	1	2
Roberts	0	3	Unkown	0	1

NOTE: Membership data from TAS Membership List, December 22, 1984.
Number of Texas counties = 254

a. Texas counties with TAS members and 0 Clovis points = 76
b. Texas counties with TAS members and Clovis points = 61
c. Texas counties with Clovis points and 0 TAS members = 34
d. Texas counties with 0 Clovis points and 0 TAS members = 83

In a plot of Clovis points by county certain broad patterns emerge. Points are found from southernmost Cameron County to far northwestern Dallam County , so in a general sense they cover the entire state of Texas. But they do not cover the state evenly; there are clusters of contiguous counties with and without Clovis points. Briefly, the patterns are summarized below (see Figures 1 and 2). Regional designations (Figure 5) follow the geographic and cultural boundaries in *The Handbook of Texas Archeology* (Suhm, Krieger, and Jelks 1954).

1) There is an apparent concentration of Clovis points in the Plains/Panhandle region, specifically in the Llano Estacado or High Plains of West Texas (Brown et al. 1982).

2) There is a scarcity of Clovis points on the lower Plains (Brown et al. 1982); Clovis points are uncommon in a north-south swath 100-km (60-mile) wide and more than 600 km (400 miles) long just to the east of and below the Llano Estacado.

3) The Trans-Pecos region is lowest in the state in both abundance and density of Clovis points.

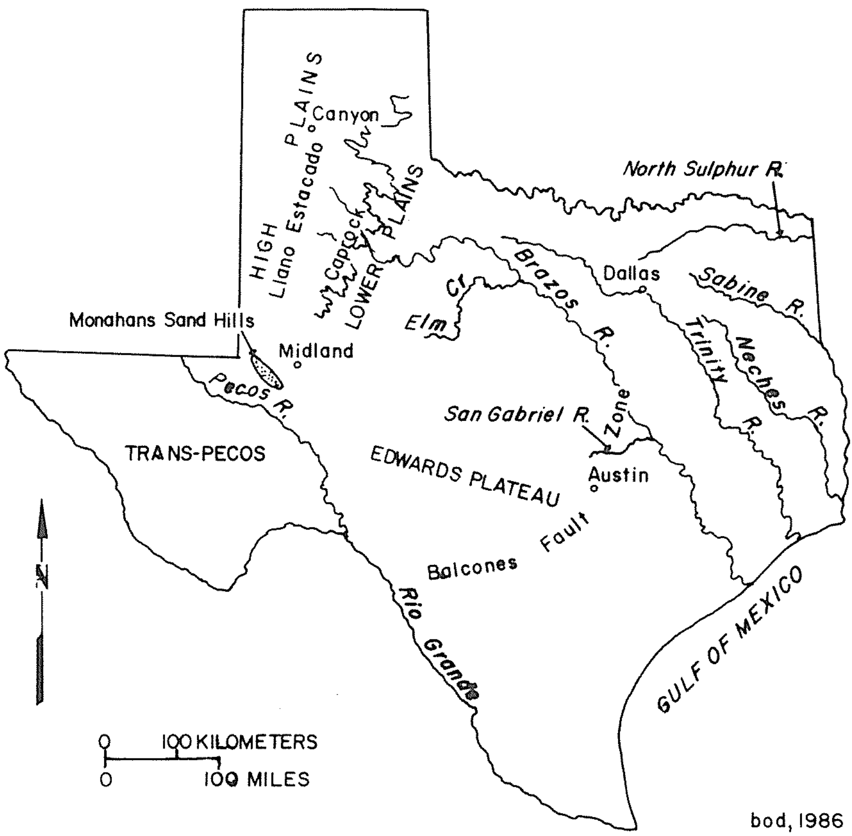

Figure 5. Map of Texas showing the geographical features mentioned in this report. From Erwin Raisz, *Landforms of the United States,* 1939, Revised 1941.

4) Clovis points occur frequently and are rather evenly distributed in a slightly elliptical pattern of contiguous counties extending through Central Texas, from Uvalde County in the southwest to Bell County in Central Texas.

5) Clovis points appear at first glance to be relatively scarce in the coastal region, but some concentrations are found there together with some areas of apparent high versus low densities of point materials.

6) An apparent abundance of Clovis points has been recorded from East Texas.

Table 4. Frequency and Density of Clovis Fluted Points by Region

Region[a]	No. of Points	Area (m^2)	Clovis Points (10,000 m^2)
Plains/Panhandle	73	65,388	11.2
High Plains[b]	66	41,965	15.7
Lower Plains	7	23,423	3.0
Central	59	67,235	8.8
East	22	26,765	8.2
Coast	19	21,527	8.8
Southwest	13	21,683	6.0
North Central	12	24,719	4.9
Trans-Pecos	4	34,797	1.1
Unknown	1	0	0

NOTE: Data on area compiled from Arbingast et al. 1976:78, 79

a All regional divisions except High Plains and lower Plains from Suhm et al. 1954

b High Plains and lower Plains divisions by Brown et al. 1982

The density of Clovis material (Table 4) in the Plains/Panhandle area of West Texas is the highest, by an order of magnitude, in the state. Archeological visibility in the area is high, owing to low vegetation cover and extensive tracts of wheat, grain sorghum, and cotton (Arbingast et al. 1976). Surveys and collecting for Paleoindian remains in the area have also been more common here than in other parts of the state. It was on the Llano Estacado that the Clovis occupation was first discovered and systematically described (e.g. Howard 1935, Sellards 1952). Since that time the area has been scrutinized by archeologists on almost an annual basis.

As a result, there is an extensive record of Clovis material from the High Plains, indeed over one-third (73/205) of all Clovis points in Texas come from this region. In late Pleistocene times the area was undergoing substantial vegetational change. As parklands gave way to extensive grasslands (Bryant and Holloway 1985), a wide variety of Plains floral and faunal resources would have been available, particularly in well-watered settings. Based on both site data and admittedly sketchy information from this survey, Clovis points in this area are found near fossil lakes and marshes and, of course, in association with the draws that today are dry but in the Pleistocene carried substantial amounts of water, perhaps in the form of beaded lakes, across the Plains.

Lithic resources on the Llano Estacado, an area blanketed by extensive Quaternary deposits, are limited to highly localized outcrops or exposures of the Caprock along its west, north, and east margins (Collins 1971:92; Hester 1975:254; Johnson and Holliday 1984:67; Holliday and Welty 1981:202). Clovis projectile points from the Llano Estacado recorded by the Texas Clovis Fluted Point Survey were made from a variety of rocks including Alibates agatized dolomite, Tecovas (or Quitaque) jasper, Edwards chert, and, in the northern counties, Dakota quartzite (see also Hester 1975:254, 255). Unidentified cherts cover a veritable rainbow of colors and a wide range of quality, but no points made from obsidian were recorded (see also Holliday and Welty 1981).

But more important than the diversity of the raw material is the condition of the Clovis points. Johnson and Holliday (1984:67) have suggested that the limited availability of lithic resources on the Llano Estacado led Paleoindian groups to conserve their raw materials through reworking and reuse of artifacts. The data gathered here support this suggestion.

The relative scarcity (Table 4) of Clovis points in a broad, north-south swath on the lower Plains (east of and below the Caprock of the Llano Estacado is intriguing, but the lack of Clovis debris may be more apparent than real. Examination of the data (Table 4, Figures 3, 4) reveals that there are few TAS members living in this 100-to-660-km (60-to-400- mile) corridor, which stretches from Hall and Childress counties in the north to Sterling and Coke counties in the south. The rolling plains and mesquite savanna here probably have not been as intensely surveyed as have other parts of the state.

Perhaps equally important is the fact that even Archaic sites in this corridor are covered by thick overburden. The most striking example of this is a series of hearths associated with chipping debris buried some 8 to 9 meters (24 to 27 ft.) below the surface in the Elm Creek Drainage (see Ray 1930:50, 51; Ray 1940; Figure 6). If this extraordinary report is correct, it demonstrates the potential depth of deposits in the alluvial valleys of the region. In these areas of deeply buried Pleistocene deposits Clovis materials will be less visible than in other parts of the state. Obviously, further work is needed on the surface age and amount of deposition in this corridor.

Fewer Clovis points have been found in the Trans-Pecos region than in any other part of Texas and, given its size, these few points translate into an extremely low Clovis point density (Table 4). The significance of the low frequency and density figures is unclear. It is conceivable that Clovis materials are there in abundance but simply have not yet been found, since surface visibility is low from the Trans-Pecos eastward onto the Edwards Plateau, a region where livestock ranches occupy large tracts of desert scrub and (further east) juniper-oak-mesquite savanna. In addition, many large tracts in this area simply have not been surveyed for archeological remains (Hedrick 1985) and research in the area has been concentrated on sites of later periods (Hester 1967). So the blank spot on the map may result from incomplete sampling.

Nonetheless, it is possible that Clovis groups did not occupy the area in great numbers. Clovis Paleoindian remains are scarce even in the more intensely surveyed parts of the Trans-Pecos (Collins 1976; Mallouf 1981, 1985), suggesting that further survey work may not produce a substantial addition to the Clovis record. Perhaps this should be expected, for, owing to severe environmental constraints on human adaptation, later Paleoindian and prehistoric occupations are only "scattered thinly" throughout the region (Mallouf 1985:100). During the terminal Pleistocene the Trans-Pecos had more water and was more habitable than it is today (Mallouf 1985:16), but the process of postglacial warming and drying was already underway, and by latest Pleistocene times the area probably could support only the kinds of dispersed and fairly mobile populations that occupied the Trans-Pecos in later periods (Mallouf 1981:134).

The distribution of Clovis points through Central Texas forms an ellipse along the east edge of the Edwards Plateau, the Balcones Fault zone. During the glacial period the area supported a mosaic of deciduous and boreal plant and animal taxa, but toward the end of the Pleistocene there was steady warming with a corresponding reduction in forest cover and expansion of grasslands (Bryant and Shafer 1977:14). The Texas Clovis Fluted Point Survey produced little data on the precise settings of Clovis point finds, but the evidence suggests that most were found along streams or on terraces. Prewitt (1984:8) found a similar pattern in the San Gabriel drainage where most sites were on terraces near springs.

In fact, Shiner (1983) has observed that many Clovis and later Paleoindian sites and high concentrations of Paleoindian lithic materials occur along the Balcones Fault zone, particularly at spring heads that emerge at intervals where aquifers breach the fault. He infers that the high density of archeological material at these sites is the result of continuous occupation by Clovis groups who exploited the water, plant, and animal resources that were available yearround at the springs (Shiner 1983:5, 6). Shiner's suggestion is a provocative departure from the common belief that Clovis groups were highly mobile, and appears to rest on sound theoretical principles: sedentary occupations, although uncommon among hunting and gathering groups, are possible when resources in a small area are abundant, reliable, and readily available.

However, an additional, equally important resource occurs along the Balcones Fault zone that influences the character of the archeological record, raising a question as to the validity of the evidence for a sedentary occupation. The same geological process that created the springs also exposed extensive deposits of chert-bearing Cretaceous limestone of the Fredericksburg Group, producing an abundance of high-quality chert in the area. Data collected by the Texas Clovis Fluted Point Survey on rock types used in point manufacture in this area confirm the dominance of the local Edwards cherts. It would be unreasonable to suggest that Clovis settlement patterns were determined by the presence of chert deposits, but certainly the chert deposits would have been a focal point in the settlement system and, more important, would have survived as a highly visible, spatially concentrated component of the archeological record.

When stone is abundant, a substantial archeological record can be produced by a series of brief periods of occupation. Repeated visits to quarry or spring sites will produce interleaved components that, in terms of the sheer amount of archeological debris, mimic a single more sedentary, longterm occupation. Confirmation of the provocative suggestion that Clovis and later Paleoindian groups were almost sedentary (Shiner 1983:6) can be achieved only by an empirical demonstration that goes beyond the observation that lithic materials are there in abundance. Johnson and Holliday (1984:67) reach a similar conclusion.

The figures (Table 4) for the abundance and density of Clovis materials on the Coastal Plain are relatively high. Roughly half of the points came from McFaddin Beach in Jefferson County, an extensively collected locality that has yielded a startling diversity of projectile points and a late Pleistocene fauna (Long 1977). Although it is now on the shoreline, it was far inland during Clovis times, on a vast plain crossed by the Sabine-Neches, Trinity, and smaller rivers (Long 1977:6). Artifacts are not in situ, but are found on the modern beach, where they have been deposited after being eroded out offshore and carried in by currents.

Like the McFaddin Beach material, most of the Clovis points recorded from the coastal region were found in counties bordering the Gulf (Calhoun, Cameron, Jefferson, San Patricio), often just inland, on the beaches, or by drainages that run into the Gulf (e.g. Chandler 1982). The modern Gulf beaches are a Holocene phenomenon, representing the high water mark of postglacial sea levels; the Pleistocene coastline is under water. So any association between Clovis points and modern beaches is significant only for what that association reveals about Clovis materials now lying beneath coastal waters on drowned river terraces and other landforms. Unfortunately, the paleoenvironmental habitat of the Coastal Plain during the Pleistocene is virtually unknown (Bryant and Holloway 1985).

So the relatively high density of Clovis remains in the coastal region (Table 4) is both an underestimate and an overestimate: an underestimate insofar as there is probably a substantial coastal Clovis record under the Gulf waters; an overestimate insofar as the count from McFaddin Beach significantly inflates the density figure for Clovis remains from the inland counties (Bee, Harris, Victoria) of the present-day coastal region, which, in Pleistocene times, were even farther inland. For if the density of Clovis remains is calculated for only the inland counties, the figure—3.9 points in 2,600,0000 hectares (10,000 square miles)—is less than half the figure for the entire coastal region.

It is relevant to add here that although the bulk of the Clovis points from the coastal region are made of Edwards chert from Central Texas (Long 1977), Clovis groups may not have traveled to the Central Texas outcrops for their stone supplies. Several rivers that empty into the Gulf traverse the Edwards Plateau and the Balcones Escarpment, transporting cobbles and gravels of Edwards chert downriver. Although these gravels rarely reach the Gulf Coast (Story 1986), Edwards chert used on the coast may have been transported substantial distances from the outcrops by nonhuman means. It would be valuable to determine whether Clovis lithic debris in Coastal Plain sites shows evidence of rounded, water-smoothed, or pebblelike cortical flakes (Meltzer 1985).

A Clovis point made of Alibates "flint" that has been reported from McFaddin Beach (Long 1977:7) shows little of the wear and attrition that is routinely seen on points that are far from their sources, so it seems oddly out of place on the Gulf Coast of Texas.

The pine and oak forests of East Texas, particularly those in Marion, Harrison, and Panola counties along the Louisiana border, have yielded a number of Clovis points. But 64 percent (14) of the 22 Clovis points from the area recorded in this survey have only minimal documentation, and eight of those have no documentation at all (Hayner 1955). In 1955, using Suhm, Krieger, and Jelks's just-published *Introductory Handbook of Texas Archeology* (1954), Hayner (1955) identified eight Clovis points from Marion and Harrison counties, together with 23 Meserve points that he thought, based on the presence of flutes (Hayner 1955:241), were reworked from original Clovis forms. Unfortunately, none of the purported Clovis points are illustrated. There is no reason for immediate rejection of Hayner's point identifications, but there is room for question. The three Marion County points were purchased from farm hands and could not be documented. Moreover, since the frequency of points for these two counties is rather high (Table 1), a substantial number of Clovis points should have turned up in the 30 years between his report (Hayner 1955) and this survey. Recent work in this area has yielded but one Clovis point, certainly not what is expected from Hayner's report, so these data should be used with caution.

At the time of the Clovis occupation the paleoenvironmental setting of East Texas was probably a complex woodland with a wide variety of deciduous trees and perhaps an occasional boreal species such as spruce. In all likelihood this forest did not support large herds of megafauna (Shafer 1977), save on the north and east edges, where the forest gave way to prairie (Story 1981). Clovis points, together with later Paleoindian material, have been reported from along the North Sulphur River in Lamar County, in an area that has yielded and continues to yield fossils of late Pleistocene megafauna, including mammoth, mastodon, horse, and bison, but there are no associations of Clovis points with the megafauna. If we accept Shafer's (1977) argument (independently developed in Meltzer and Smith 1986), it is likely that any such associations will be rare in this area. Clovis groups in complex forests were probably generalized foragers.

Function, Technology, and Style in Texas Clovis Points

The patterning evident in the distribution of Texas Clovis points raises an interesting question. Are there corresponding differences in point style, function, or technology? Based solely on paleoenvironmental data, one would anticipate significant differences between the Clovis occupations of, for instance, the Llano Estacado and those of the forested east (Bryant and Shafer 1977). Those differences could be manifested in any of a number of ways, including point function or use, technology, and style.

Function

Ideally, a study of the function of Texas Clovis fluted points would include analysis of macro- and microwear patterning. Unfortunately, such analysis was impossible, since most of the data were compiled from questionnaires. This constraint does not preclude the possibility of making statements about tool use, but instead forces the consideration of alternative, less direct clues for information on wear, such as grinding, breakage, and reworking patterns.

In keeping with patterns in other regions—grinding is present on virtually all Clovis points, east and west (Meltzer 1984)—basal and lateral grinding was reported on 96 percent (147/153) of the points recorded for the survey. Grinding is an important element of point function, for it prolongs the life of hafts by preventing the edges of hafted tools from cutting the bindings that attach the tools to the shafts. Judge (1973:263, 264) has suggested that the purpose of grinding—especially lateral grinding—is to allow the final fitting of the point to the haft, and in their studies of the manufacturing process of Folsom points, Tunnell (1977) and others (e.g. Frison and Bradley 1980) support this suggestion, showing that grinding is one of the last stages in point production.

It has also been argued (Frison 1978; Goodyear 1974) that heavy basal and especially *lateral* grinding is necessary where a biface is used for cutting. When a hafted tool is used as a knife, the haft area is under extreme lateral stress while the blade is being worked back and forth in the process of cutting, so butchering tools require strong hafts with heavy binding (Frison 1978:336).

By contrast, a projectile does not make the same demands on the haft, for the projectile haft has only a split second of critical use-life. The stress in a projectile is directed predominantly against its base, making basal—but not lateral—grinding a critical need for effective use.

Heavy lateral and basal grinding on Texas Clovis points suggests their use as knives as well as projectiles. This is not to suggest that all laterally ground points are knives. The fact that heavy lateral grinding *would* enhance the value of these points as knives does not mean that it *did* serve that purpose. Rather, instances of heavy lateral grinding on projectiles are important because they indicate that the points may have been used as knives as well as, or instead of, projectiles. But it should be noted here that the sharp-bladed points from the Casper site, a Hell Gap bison kill in Wyoming, although heavily ground along their lateral edges, were used as projectiles and have impact fractures, and they have no wear patterns indicating their use as knives (Frison 1974:71, 82).

Analysis of the breakage patterns in Texas Clovis fluted points revealed that only 37 percent (66/180) were complete; the remaining 63 percent (114/180) were broken (Table 5). This frequency of breakage is comparable to fluted point samples from other areas (Meltzer n.d.). If anything, the Texas Clovis Fluted Point Survey recorded fewer broken points than would be expected in a sample of this size, but it is not suprising when the difficulty of identifying Clovis fragments is considered.

Although 10 breakage categories used here are largely morphological (a limitation imposed by the available data), they do have implications for technology and use. Broken tips, bases, and corners, for example, result from actions that occur when points are unprotected by hafts, during both manufacture and use; tips and corners are structurally the weakest parts of a point. In contrast, lateral snaps, reworking, and impact fractures most often occur when the points are buried in the hafts and commonly result from actions that occur while the points are in use. The pattern of use-related breaks supports the suggestion that these points may also have been knives, and reveals variation across Texas in point use.

Table 5. Breakage Patterns of 25 Texas Clovis Fluted Points

Type of Break	Frequency
1. No break (point complete)	66
2. Base only (lateral snap)	34
3. Reworked (distal end)	23
4. Distal tip broken	20
5. Base only (lateral snap) with broken corners	7
6. Broken corners	9
7. Distal tip broken with broken corners	8
8. Broken base	4
9. Distal tip broken with broken base	4
10. Reworked (distal end) and impact fracture	4
11. Edge damage	1
Total	180

Lateral snaps (Figure 6) were the most common breaks recorded in this sample (Table 5) and also in a larger sample of points from the eastern United States (Meltzer n.d.). A lateral snap commonly results when an artifact is bowed beyond the limits of its tensile strength (Frison and Bradley 1980:43), which can happen during either manufacture or use (Bradley 1974:197). In the Texas Clovis Fluted Point Survey sample nearly all of the snaps occur at the furthest extent of fluting

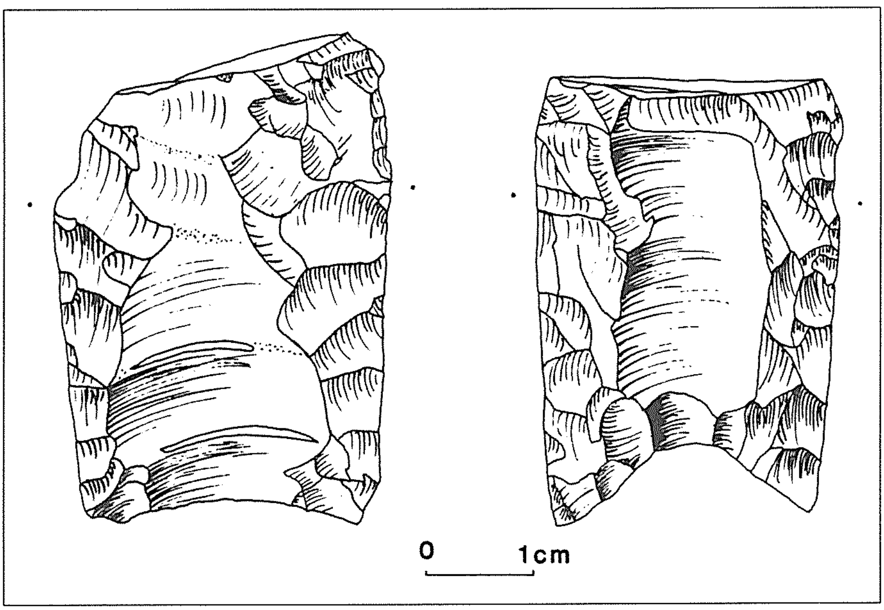

Figure 6. Drawings of Clovis fluted points with lateral snaps: left, from Borden County; right, from Brazos County. Drawn by David Meltzer and Suzanne Siegel.

and lateral grinding, indicating that the breaks occurred during use, while the basal parts of the points were anchored in hafts.

Determining the kind of use that caused these breaks is not a simple task, since lateral snaps can result from use of hafted points as either projectiles or knives (Frison 1974:90, 91; Frison and Stanford 1982:105-107; Purdy 1975:134, 135). However, breakage patterns in Hell Gap projectile points from the Casper site (Frison 1974:72-80) shed some light on this matter. Frison (1974:90, 91) convincingly argues, based on independent evidence including site context and impact fractures, that the Hell Gap points are projectiles that snapped as a result of impact and shock. Examination of the Hell Gap points revealed that less than 15 percent broke at the widest part of the blade, which would coincide with the furthest extent of the haft; most snapped across the lower part of the tang, which would have been buried deep inside the haft; and a smaller percentage snapped above the haft (Frison 1974:90).

Without claiming that this pattern is universal, for much more data and, perhaps, experimentation are needed for such a claim, it is reasonable to assume that all lateral snaps caused by impact and end shock do not occur at the same place on the point, and only rarely do they occur at the distal end of the haft. Based on that assumption, breakage patterns in the Texas Clovis points take on some significance, since in that sample lateral snaps *almost uniformly* occur at or just beyond the distal end of the haft. In other words, although impact-caused snaps occur at virtually any place along the point—but most often within the haft—Texas Clovis points routinely broke at or just beyond the edges of the hafts. This is the break pattern that would be expected in points that were levered in hafts. If the levering that produced these breaks occurred when the hafted points were used as knives, it can be inferred from their breakage patterns that the Texas Clovis points were multifunctional.

Judge (1974:126) has suggested that resharpening and reworking is indicative of multifunctional points. These attributes also occur in areas where stone supplies are scarce. Several reworked points were recorded in the Texas Clovis Fluted Point Survey (Figure 7), but 12.8 percent (23/180) is probably low, since in many cases it was dificult to determine from the sketches and photographs whether a point had been reworked or resharpened. The obvious clues: abrupt changes in thickness, interruptions in the flaking patterns, distal ends that taper asymmetrically in outline and cross section, and remnants of breaks (Bradley 1982:196), were not always evident. When there was any doubt, points were not included in the reworked category.

Reworking generally took place while the points were still set in the hafts. Statistical analysis, using the T test, indicates that width and basal width are identical in points with and without reworking (Table 6, a, b), but that points with and without reworking differ significantly in their overall length (Table 6, c), clearly demonstrating that reworking affects the point length. The constancy in width of points with and without reworking is explained by the fact that reworking took place while the points were still socketed in the hafts, so the sides were protected.

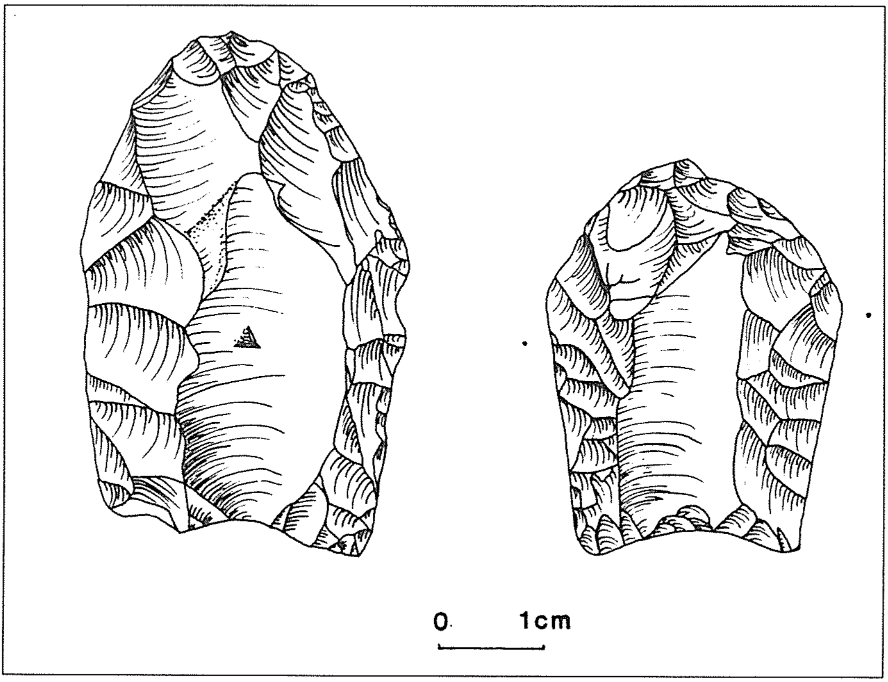

Figure 7. Drawings of reworked Clovis fluted points: left, from Hays County; right, from Monahans Sand Hills. Drawn by David Meltzer and Suzanne Siegel.

This finding is corroborated by Bradley (1982:196, 197), who states that the width:length ratios might be useful for distinguishing points with reworking from those without. Statistical analyses of Texas Clovis data indicate a significant difference in the width:length and base-width:length ratios of points with and without reworking (Table 6, d, e). Overall, width:length ratios are higher in points that have been reworked (Figure 8). These data indicate that it may be possible to use measures of point width:length ratios to determine reworking when direct examination of the points is not possible.

Impact fractures, "small to medium-sized flakes originating at the tip of the point and extending along the face of the blade toward the base" (Wheat 1979:90; Bradley 1974:194), are rare in the Texas Clovis point survey (seen on only two percent of the points). Impact fractures (Figure 9) result from the kind of compressive stress that would be applied to the distal end of a point that made forceful impact with a highly dense material such as bone. Frison (1978:153, 173) indicates that such fractures can result from the use of both hand-thrust spears and thrown spears, suggesting that the angle of attack and impact is as important as the degree of force in producing this breakage pattern. However, experimental work by Dennis Stanford (1985) indicates that hand-thrust spears may not produce sufficient force to cause impact fractures, so more work is needed on this problem.

Table 6. Comparison of Metric Dimensions in Points With and Without Reworking

	Number	Mean cm	Standard Deviation cm
a) Width (T=0.36, df =767, p=0.717)			
Reworking absent	54	2.718	.465
Reworking present	25	2.672	.593
b) Base width (T=0.21, df=76, p=0.833)			
Reworking absent	53	2.289	.437
Reworking present	25	2.264	.565
c) Length (T=5.19, df=77, p <0.001)			
Reworking absent	54	7.463	2.129
Reworking present	25	4.963	1.654
d) Width:length ratio (T=-8.15, df=77, p <0.001)			
Reworking absent	54	.381	.081
Reworking present	25	.564	.113
e) Base width:length ratio (T=-6.93, df=76, p <0.001)			
Reworking absent	53	.327	.005
Reworking present	25	.478	.102

NOTE: T - T value
df - Degrees of freedom
p - Probability

Impact fractures are common in Plains Paleoindian and Archaic bison-kill sites (e.g. Bradley 1982:197; Frison 1974:83; Frison 1978:125, 153, 167, 173, 200; Frison et al. 1976:44-46; Stanford 1978:92; Wheat 1979:90), even in those that predate the earliest record—ca. 9000 B.P. (Wheat 1979:135, 136)—for use of the atlatl. Yet impact fractures are rare, often absent, in most of the classic Clovis mammoth-kill sites, including Blackwater Draw locality No. 1 (Hester 1972:97-99), Dent (Wormington 1957:45), Domebo (Leonhardy 1966:21), Lehner (Haury et al. 1959:16, 17, but see specimen A-12684), McLean (Sellards 1952:39), Miami (Sellards 1952:25, 26), and Naco (Haury 1953:8, 9).

The scarcity of impact fractures among Texas Clovis points again implies that few of these points were in fact used as projectile points. All points with impact fractures have been subsequently reworked and repointed, as is common on bison-kill sites (Frison 1978:200; Wheat 1979:90).

Points from the Llano Estacado have been reworked more often (20 percent) than have points from any other region, and impact fractures on Clovis points occur *only* in those from the Llano Estacado. This hints at possible functional differences in Clovis points from different parts of the state, differences that could be easily explored by analyzing breakage patterns by regions (Table 7),

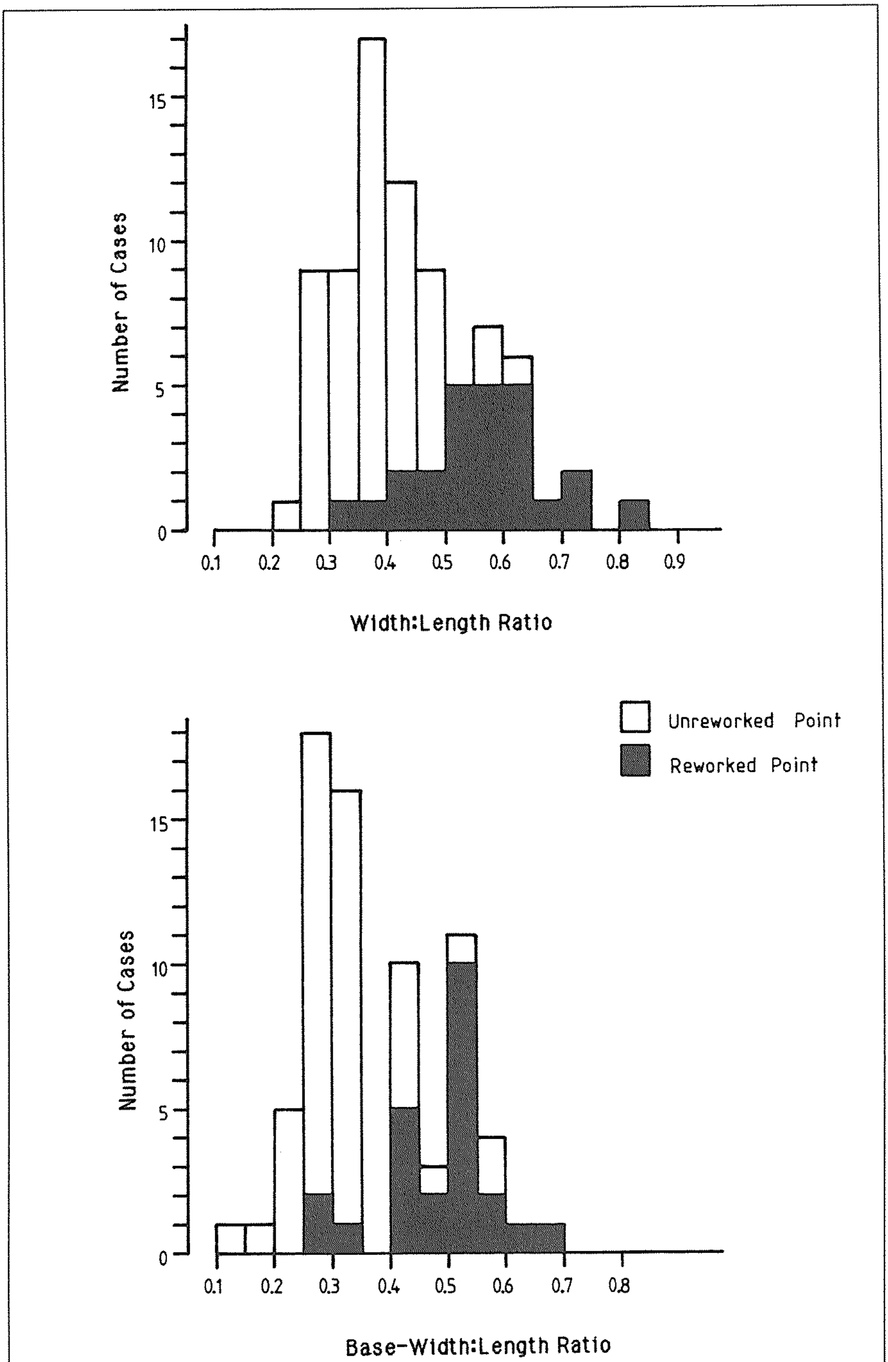

Figure 8. Histograms of values for width: length and base-width:length ratios in Clovis fluted points with and without reworking.

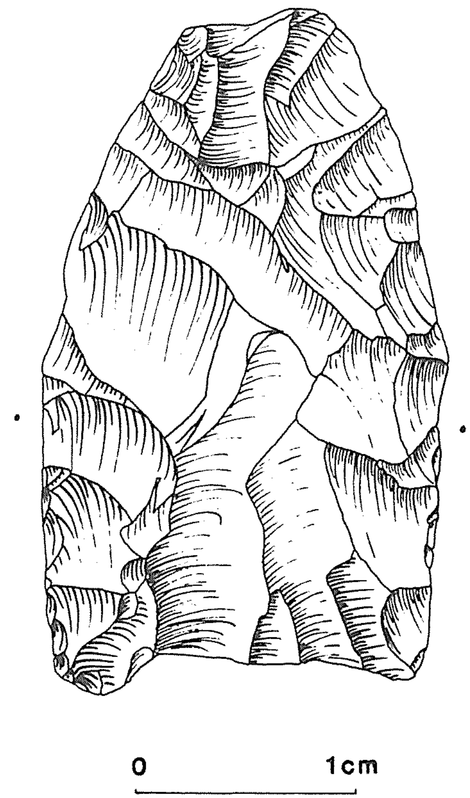

Figure 9. Drawing of reworked Clovis fluted point from Gaines County with impact fracture. Drawn by David Meltzer and Suzanne Siegel.

distinguishing between use and nonuse breaks (see Bradley 1982:197, 198 for a similar discussion).

Chi-square analysis of the data in Table 7 indicates that breakage patterns do not differ significantly by region, but there is some variation in certain regions. Adjusted residual values (Everitt 1977), read as standard normal deviates, reveal that two regions vary significantly from the expected pattern: in the Panhandle-Plains region, use breaks occur more often than would be expected by chance (adjusted residual value=2.12, p=0.0170). By contrast, in the coastal region, whole points and points with nonuse breaks occur more often than would be expected by chance (adjusted residual value=2.73, p=0.0032).

Those data indicate that reworking is relatively high among points from the High Plains and further corroborates the suggestion by Johnson and Holliday (1984) that a shortage of abundant raw material in the region led to use and reuse of the existing supplies. The disproportionately high number of whole points and nonuse breaks from the coastal region may be a function of more abundant raw material, a tendency to collect and record data only on complete or nearly complete points, or different uses for these points.

One feature not identified in Table 5, but worthy of mention, is that none of the points examined had the needle-sharp tips and blade edges characteristic of points in kill sites (Frison 1978:337, 338).

Table 7. Frequency of Whole Points and Nonuse Breaks Versus Use Breaks by Region

Region	Whole Points and Nonuse Breaks[a]	Use Breaks[b]
Plains-Panhandle	38 (-2.08)	34 (2.08)
North-Central	7 (0.11)	4 (-0.11)
East	9 (0.18)	5 (-0.18)
Central	34 (0.38)	19 (-0.38)
Coastal	15 (2.74)	1 (-2.74)
Southwest	7 (0.11)	4 (-0.11)
Trans-Pecos	1 (-0.35)	1 (0.35)

NOTE: Adjusted residual values
Chi-square=9.72, df=6, $0.10 < p < 0.25$
a Comprises categories 1, 4, 6-9, and 11 from Table 5
b Comprises categories 2, 3, 5, and 10 from Table 5

Based on the heavy grinding of the edges and bases of these points, the high frequency of lateral snaps and bend breaks, the scarcity of impact fractures, the incidence of reworking, and the absence of sharp tips or blades, there is a strong possibility that many of the Texas Clovis fluted points had multiple uses as projectiles and as long-handled hafted knives. Following a different line of argument, Judge (1973:128, 1974:126) reaches a similar conclusion, but it is here suggested that at least some of the High Plains Clovis points were used primarily as projectiles, as evidenced by substantial impact fractures. This conclusion must be considered tentative, based as it is on only indirect evidence of tool function. Further intensive work is needed on wear patterns on Texas Clovis points.

Technology

Only half a dozen points recorded in the Texas Clovis Fluted Point Survey were manufacturing rejects, so few direct clues were provided concerning Clovis point technology and manufacturing processes. It is curious that so few unfinished points or preforms were recorded by the survey; the scarcity of unfinished Clovis points from Central Texas is especially puzzling since point production often took place at stone sources, resulting in deposits of manufacturing debris and failed efforts. In areas without abundant stone sources, manufacturing failures probably were carried along and used as other tools in order to stretch the supply of the scarce resource. So it is likely that careful examination of stone source localities will yield evidence of point manufacture as well as a record of used-up points abandoned at the quarry after replenishment of the stone supply (e.g. Gramly 1980).

There are three different techniques for fluting projectile points: (1) Enterline or multiple fluting using guide flakes, (2) straight-based fluting from a beveled edge, and (3) fluting from a prepared nipple or striking platform (see Meltzer 1984:277-282 for a detailed discussion). Multiple fluting of the sort that produces three flute scars—two of which guide the third and main flute—appears to be characteristic of reworking and refluting or perhaps of less proficiency on the part of the knapper. In any case, multiple fluting—three or more flutes—is rare in Texas Clovis points (Table 8).

Table 8. Number of Flute Scars on Texas Clovis Fluted Points

	Number of Flute Scars					Total
	0	1	2	3	4	
Obverse	5	114	29	10	0	158
Reverse	17	91	37	9	3	157

Most Texas Clovis fluted points are singly fluted. Single flutes can be produced from a straight base or from an isolated raised platform. Fluting from a straight base begins with the preparation of a striking platform by beveling one of the faces of the base. On this prepared platform a blow is struck, detaching the flute from the face of the point. This procedure is repeated on the opposite face. In the other process, fluting is accomplished after the careful preparation of a convex or nipple-shaped striking platform on the base. This platform serves as the seat for indirect percussion, which removes the channel flake and creates the flute scar (Roberts 1935; Tunnell 1977).

The primary distinguishing attributes of these techniques are the striking platforms, which are commonly lost in the process of point production. However, the process used for fluting can be recognized from the morphology of the flute scar (Judge 1973:250). In general, short, flakelike—length less than twice the width—flute scars result from striking a straight base; long, bladelike—length twice the width—flute scars result from fluting off a prepared nipple.

Among the points reported in this study, each of these techniques is represented in roughly equal numbers. Of the 205 points, 59 have bladelike flute scars and 57 have flakelike flute scars. In 10/205 cases both blade and flake fluting are present; no data are available for the remaining 79 points in the sample.

Summary statistical data are presented for length, maximum width, maximum width to base, basal width, and thickness (Table 9). Two of these—base and width thickness—clearly are dictated by the technology of hafting and demonstrate that the manufacture of Texas Clovis points was a remarkably precise activity. There were evidently very specific limits within which the finished products could vary.

Table 9. Statistical Data for Selected Variables of Texas Clovis Points

Variable	n	Mean	Minimum	Maximum	Standard Deviation	Kurtosis
Length	153	5.75	1.10	13.04	2.71	-.311
Width	153	2.73	1.71	4.80	.49	1.369
Width to Base	130	2.79	.00	6.50	1.27	.025
Base Width	143	2.34	1.38	4.50	.47	2.343
Thickness	135	.73	.07	2.80	.24	40.014

NOTE: Table includes all points for which measurements are available.
All values except number of observations (n) and kurtosis are in centimeters.
Broken points are included in these calculations. Reanalysis excluding broken points significantly changes the values only forLength, since most breaks affect the length of the point. Mean value of Length in unbroken points is 7.42 cm, standard deviation, 2.13 cm.

This is most readily seen in the positive kurtosis values. Kurtosis measures the relative peakedness or flatness of cases distributed about a mean. Normal distributions have a kurtosis value of zero; in distributions where the curve is flat (cases spread widely about the mean), kurtosis values are negative. In cases where the distribution is more akin to a spike (cases clustered narrowly about the mean), kurtosis values are positive. As is evident in Table 9, kurtosis values for width, base width, and especially, thickness are significantly positive. As mentioned above, because of the reworking of the points, length values vary much more.

These statistics indicate that substantial precision was required in the manufacture of Clovis points; certain dimensions of the points are remarkably standardized. But why the precision? Judge (1973:264) and others, among them Keeley (1982:800), have argued that more time was required to produce a haft than to make a tool, at least when that tool was flaked rather than ground. The obvious implication of this argument is that points were made for hafts, and not vice versa, and that hafts were maintained and curated through the lifetimes of several points. Making a new tool was more efficient than making a new haft.

The disparity in cost between tool making and haft making would have selected for production of many points to fit a few hafts. The resulting standardization in the manufacturing process is reflected in the high kurtosis values for the hafting dimensions: width, basal width, and thickness.

Style

Analysis of stylistic diversity in Texas Clovis fluted points and of the relationship of Texas Clovis points to fluted points in other regions is incomplete, but some preliminary comments can be made.

The great diversity in the morphology of Texas Clovis fluted points (Figure 10) covers forms that mimic both the classic Clovis style and other fluted points. Some of the Texas forms resemble points from the east and particularly the southeast

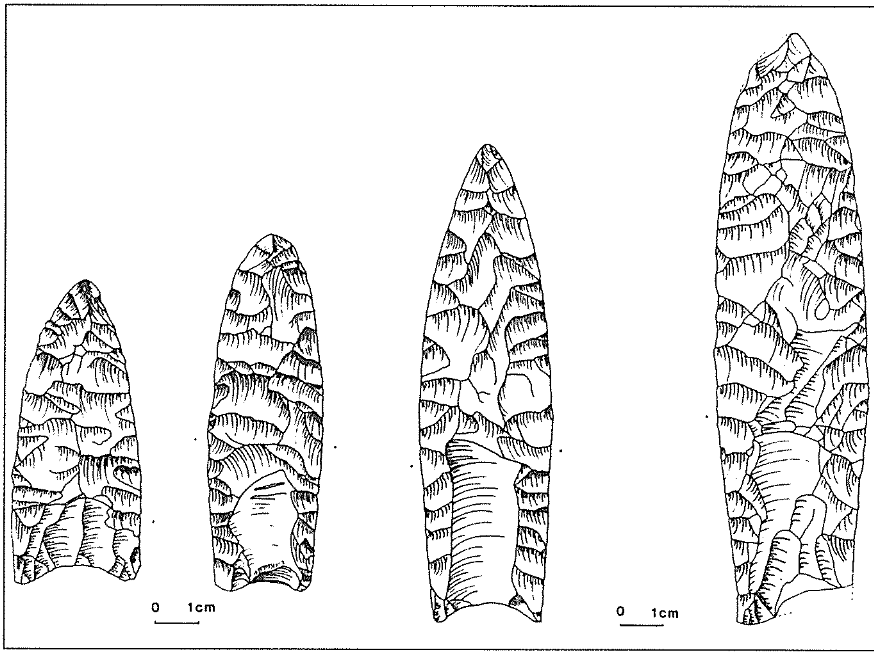

Figure 10. Drawings of Texas Clovis fluted points showing examples of morphological variation. Left to right, from McLennan, McLennan, Winkler, and unknown counties. Drawn by David Meltzer and Suzanne Siegel.

(though there are no Cumberland forms in Texas), but it is noteworthy that the most common point form in the eastern United States—parallel-sided, flake-fluted, elliptical-based points with no "ears"— is not well represented in Texas, comprising less than 5 percent of the points in the Texas Clovis Fluted Point Survey. The Texas sample is dominated by points with tapered sides, and bases that are significantly narrower than the widest parts of the blades.

Presumably this morphological diversity reflects changes in point styles over space and time, but analysis of attributes such as base size and shape failed to produce any significant spatial patterning that might in turn reveal variation in time. The presence or absence of "ears" on the points may have a nonrandom distribution in space. Apparently there are no "ears" on the points from Central Texas, but the significance of this is unclear. Fluting technology is the attribute of fluted points that has the greatest promise for significant variation over space and time. Certainly, fluting from a prepared nipple—producing bladelike flute scars—appears to come late in the Clovis sequence, and by Folsom times it was the dominant fluting technology. However, as noted earlier, fluting from a straight base and from a prepared nipple occur in roughly equal frequency in the sample of Texas Clovis points, and there is no apparent difference in the distribution of blade and flake fluting. Blade and flake fluting appear to be as common on the High Plains as in other parts of the state.

The fact that blade and flake fluting overlap in space does not mean that they necessarily overlap in time. It would be interesting to pursue—through further analysis of the points and through excavation—the hypothesis that flake fluting occurs earlier than blade fluting in Clovis points. If this could be demonstrated, it would provide a valuable indicator of age in the absence of other dating.

It has been suggested that certain exotic fluted point styles, specifically Cumberland points, are found in Texas. In 1935, E. B. Howard (1935: Plates 30(1) and 37(1) illustrated two Clovis points from Texas. One was a classic Cumberland: a large, blade-fluted, fish-tailed point, but no information was given on its provenience, though Howard credited Cyrus Ray and W. E. Baker as having provided him with Texas specimens. Hester (1967:13) later reported that the Galena site in Harris County yielded a point "quite similar to the so-called Cumberland Fluted point" of the eastern United States. There is no way to determine whether the points mentioned by Howard and Hester are one and the same. Whether they are the same or not, this identification poses a problem, for there is no evidence that any other Cumberland forms have been found in Texas. Since Cumberland points are restricted largely to Ohio, Tennessee, and Kentucky, they would be well out of their range in Texas, so in both cases an effort should be made to determine whether the points were actually found in Texas.

SUMMARY AND CONCLUSIONS

Aided by the membership of the Texas Archeological Society and through studies of museum and private collections, the Texas Clovis Fluted Point Survey recorded data on 205 Clovis points from 95 Texas counties. It is not known how representative that sample is of Clovis material recovered in Texas, since an unknown number of points lie out of sight in undocumented collections. And it is not known how representative that sample is of the Clovis archeological record in Texas, since not all parts of the state have been under the same degree of archeological scrutiny, nor do all areas have equivalent exposures of Pleistocene deposits. These limitations notwithstanding, the Texas Clovis Fluted Point Survey data provide a measure of the density and distribution of Clovis points across the state.

Texas Clovis points are distributed evenly by county (mode of one per county). Only a few counties have disproportionately large samples; these are probably counties in which there are particularly active collectors. Texas Clovis points are concentrated generally on the High Plains (Llano Estacado), along the Balcones Fault zone, and in north-central and East Texas. The concentrations in north-central and East Texas may reflect the high intensity of collecting activities there. However, the dense concentration of points on the High Plains and along the Balcones Escarpment probably has archeological significance.

In contrast, Clovis points are relatively scarce off the caprock in the lower Plains (Brown et al. 1982), in the Trans-Pecos region, and perhaps in the coastal area. These patterns may simply reflect sampling patterns or, in the case of the coastal regions, geological processes that have obscured the archeological record.

There is a great deal of morphological diversity in Texas Clovis points, but no clear-cut patterns can be found in the distribution of particular attributes across the state. This does not preclude the possibility that such attributes may ultimately reveal temporal patterning, but the possibility remains that differences such as differences such as those in fluting technology will help sort out some of the temporal variation in the Texas Clovis occupation.

It appears from this study that many or most of the Texas Clovis fluted points were multifunctional, serving as both handled or hafted knives and projectiles. These uses are in keeping with the patterns of breakage, reworking, fracture, and grinding evident in this sample. Obviously, more detailed macro- and microwear studies are needed.

Although the Texas Clovis Fluted Point Survey has uncovered a substantial sample of data on the Texas Clovis occupations, much is still unknown. Attention should be paid to several parts of the archeological and paleoenvironmental record, including documenting the now undocumented collections of Clovis Paleoindian materials, gathering detailed paleoenvironmental data on Texas in the late Pleistocene (Hester 1977), gathering more precise information on locations of Texas Clovis material and relating that information to paleotopography and paleoenvironments, identifying primary and secondary sources of lithic raw material and documenting the use of those sources by Clovis groups, examining macro- and microwear traces on Clovis points in order to understand tool use better, and continuing to explore the spatial and temporal variation of the Texas Clovis Paleoindian occupation through stylistic variations in the points.

The call then is not simply for new data, but also for better refinement of existing data. Obviously many of the most pressing issues regarding the Clovis Paleoindian occupation can be answered only by the discovery and careful excavation of Clovis sites. In the interim, much can be learned from the distribution of Clovis points across Texas.

APPENDIX: TEXAS CLOVIS FLUTED POINT SURVEY FORM

TEXAS CLOVIS FLUTED POINT SURVEY

1. Please trace the outline of the fluted point on the back of this page. Be sure to show the outline of the flute(s). A photocopy of the point would be fine. Please be sure to show both faces.

2. Maximum length ____________ (cm or inches)

3. Maximum width _____________ (cm or inches)

4. Length from base to site of maximum width ______________ (cm or inches) (If widest part of point is at the base, this value is 0).

5. Maximum thickness _____________ (cm or inches)

6. Width of base ______________ (cm or inches)

(On items (2) through (6), above, be sure to circle whether measurements were taken in centimeters [cm] or inches).

7. Is the base of the point ground smooth? Yes No

8. Are the sides of the point ground smooth? Yes No

9. If the answer to (8) is Yes, please show the extent of the grinding on your sketch or photocopy of the point (see figure).

10. How many flute scars are on each face of the point?
 a. Flute scars on obverse: 1 2 3 4 (circle one)
 b. Flute scars on reverse: 1 2 3 4 (circle one)

11. Is the largest flute scar on the obverse face twice as long as it is wide?
 Yes No

12. Is the largest flute scar ont he reverse face twice as long as it is wide?
 Yes No

13. Location where point was discovered: ______________________________

____

____

(Please be as specific as possible: include County name)

14. Associated artifacts or features found with point: ____________________
____
____

15. Describe the color and type of stone material: ____________________
____

Please print your name and address: Please mail the completed form to
David J. Meltzer
Department of Anthropology
Southern Methodist University
Dallas, Texas 75275

ACKNOWLEDGEMENTS

The Texas Clovis Fluted Point Survey could not have been accomplished without the cooperation of scores of individuals who provided information on their Clovis points, reported on points in other collections, allowed me to gain access to Clovis points in their charge, or otherwise insured the success of the survey. The list is long, and it is with gratitude that I acknowledge the help of

Tom E. Adams
Strain Armstrong
Darrell E. Ballew
Eunice Barkes
Milton Bell
James Boone
Chris Callaway
Denny Carley
C. K. Chandler
Darrell Creel
Wilson W. Crook, Jr.
E. Mott and Beth O. Davis
E. David Dorchester
Julian D. Driscoll
Bransford Eubank
R. E. Forrester
Riley and Susan Goates
Kelly Hardin
Billy R. Harrison
Keith L. Harrison
L. Cliff Hazlewood
Jack Hedrick
Jesse J. Howard
Nancy Kenmotsu
Russell J. Long
David Lusk
O. M. McMillan
H. Edward Mattox III
A. D. Maynig
Bo Nelson
Peter W. Nichols
Hoss and LaVerne Newsome
Wayne Parker
Victor Palyak
Donald J. Priour
Albert J. Redder
Richard A. Rose
Joel L. Shiner
Darral M. Shirey
S. Alan Skinner
J. B. Sollberger
Paul Tanner
Richard Walter
David J. Warner
Frank A. Weir
Joseph B. Wilson
James H. Word
Bill Young

I also thank Joe Saunders for assistance in compilation and analysis of data, and Michael B. Collins, Keith C. Glasscock, Thomas R. Hester, Elton R. Prewitt, Dennis J. Stanford, and Dee Ann Story for sharing with me their data and extensive knowledge of the Texas Clovis occupation. Tom Hester, Vance T. Holliday, and Henry T. Wright provided valuable comments on an early draft.

This paper is for my wife Suzanne, who, during her maternity leave, kindly drafted many of the figures, and my daughter Emily Dana, who graciously delayed her arrival until her father had finished the revisions.

REFERENCES CITED

Alexander, H. J.

1963 The Levi site: a paleo-Indian campsite in Central Texas. American Antiquity 28:510-528.

Arbingast, Stanley A.; L. G. Kennamer; R. H. Ryan; J. R. Richardson; W. L. Hezlep; L. T. Ellis; T. G. Jordan; C. T. Cranger, and C. P. Zlatkovich

1976 Atlas of Texas. Bureau of Business Research, The University of Texas At Austin.

Biesaart, L. A., W. R. Roberson, and L.C. Spotts

1985 Prehistoric archeological sites in Texas: a statistical overview. Office of the State Archeologist, Special Report [Number] 28. Texas Historical Commission, Austin.

Bradley, Bruce

1974 Comments on the lithic technology of the Casper site materials. In The Casper Site, edited by G. Frison, pp. 191-197. Academic Press, New York.

1982 Flaked stone technology and typology. In The Agate Basin site, edited by G. C. Frison and D. J. Stanford, pp. 181-208. Academic Press, New York.

Brennan, L.

1982 A compilation of fluted points of eastern North America by count and distribution: an AENA project. Archaeology of eastern North America 10:27-46.

Brown, T. K. Killen, H. Simons, and V. Wulfkuhle

1982 Resource protection planning process for Texas. Texas Historical Commission, Austin.

Bryant, V. M., and R. G. Holloway

1985 A Late-Quaternary paleoenvironmental record of Texas: an overview of the pollen evidence. In Pollen Records of Late-Quarternary North American Sediments, edited by V. M. Bryant and R. G. Holloway, pp. 39-70. American Association of Stratigraphic Palynologists, Austin.

Bryant, V. M., and H. J. Shafer

1977 The Late Quaternary paleoenvironment of Texas: a model for the archeologist. Bulletin of the Texas Archeological Society 48:1-25.

Chandler, C. K.

1982 Paleo-Indian projectile points form San Patricio County, Texas. La Tierra 9(3):26-28.

1983 Paleo-Indian projectile points from Kendall County, Texas. La Tierra 10(4):36-37.

Collins, M. B.
1971 A review of Llano Estacado archaeology and ethnohistory. Plains Anthropologist 16:85-104.

1976 Terminal Pleistocene cultural adaptations in southern Texas. In Habitats humains anterieurs a l'Holocene en Amerique, edited by J.B. Griffin, pp. 102-135. UISPP, Nice, France.

Cooper, B.
1974 A fluted point from McMullen County, Texas. La Tierra 1(3):18.

Crook, W. W., and K. Harris
1955 Scottsbluff points in the Obshner site near Dallas, Texas. Bulletin of the Texas Archeological Society 26:75-100.

1957 Hearths and artifacts of early man near Lewisville, Texas and associated fauna. Bulletin of the Texas Archeological Society 28:7-97.

Enlow, D., and T. N. Campbell
1955 Some Paleo-Indian projectile points from the southeastern periphery of the Great Plains. The Panhandle-Plains Historical Review 28:29-38.

Etchieson, G., R. Speer, and J. Hughes
1979 Archaeological investigations in the Crowell Reservoir area, Cottle, Foard, King, and Knox counties, Texas. Report submitted to the U.S. Army Corps of Engineers, by the Archaeological Research Laboratory, Killgore Research Center, West Texas State University, Canyon, Texas.

Everitt, B.S.
1977 The analysis of contingency tables. Chapman and Hall, London.

Frison, G.
1974 Archaeology of the Casper site. In The Casper Site, edited by G. Frison, pp. 1-111. Academic Press, New York.

1978 Prehistoric hunters of the High Plains. Academic Press, New York.

Frison, G. C., and B. Bradley
1980 Folsom tools and technology at the Hanson site, Wyoming. University of New Mexico Press, Albuquerque.

Frison, G. C., and D. J. Stanford
1982 Agate Basin components. In The Agate Basin Site, edited by G.C. Frison and D.J. Stanford, pp. 76-134. Academic Press, New York.

Frison G., M. Wilson, and D. Wilson
1976 Fossil bison and artifacts from an early Altithermal period arroyo trap in Wyoming. American Antiquity 41:28-57.

Goodyear, A. C.
1974 The Brand site: a techno-functional study of a Dalton site in northeast Arkansas. Arkansas Archaeological Survey, Research Series, [Number] 7.

Gramly, R. M.
1980 Raw materials source areas and "curated" tool assemblages. American Antiquity 45:823-833.

Greer, J. W.
1968 Some unusual artifacts from Val Verde county, Texas. Texas Journal of Science 20:183-192.

Haury, E. W.
1953 Artifacts with mammoth remains, Naco, Arizona. 1. Discovery of the Naco mammoth and associated projectile points. American Antiquity 19:1-14.

Haury, E. W., E. B. Sayles, and W. Wasley
1959 The Lehner mammoth site, southeastern Arizona. American Antiquity 25:2-42.

Hayner, E. W.
1955 Research in East Texas projectile points. Bulletin of the Texas Archeological Society 26:235-243.

Hays, T.
1982 Archaeological investigations of the San Gabriel Reservoir Districts, Central Texas. Institute of Applied Sciences, North Texas State University, Volume 1.

Hedrick,J.
1985 Personal communication

Hester, J. J.
1972 Blackwater Locality No. 1. A stratified early man site in eastern New Mexico. Fort Burgwin Research Center, Southern Methodist University, Dallas.

1975 Paleoarchaeology of the Llano Estacado. In Late Pleistocene environments of the southern High Plains, edited by F. Wendorf and J.J. Hester, pp. 247-256. Fort Burgwin Research Center, Southern Methodist University, Dallas.

Hester, T. R.
1967 A distributional study of Paleo-Indian projectile point types in Texas. Unpublished paper, on file with the author.

1974 On fluted points and South Texas archaeology. Texas Archeology, The Newsletter of the Texas Archeological Society, 18(2):11-14.

1977 The current status of Paleoindian studies in southern Texas and northestern Mexico. In Paleoindian Lifeways, edited by E. Johnson, pp. 169-186. Texas Tech University, Lubbock.

1980 A survey of Paleo-Indian archaeological remains along the Texas Coast. In Papers on the Archaeology of the Texas Coast, edited by L. Highly and T. R. Hester, pp.

1-12. Special Report No. 11, Center for Archaeological Research, The University of Texas at San Antonio.

Holliday, V., and C. Welty
1981 Lithic tool resources of the eastern Llano Estacado. Bulletin of the Texas Archeological Society 52:201-214.

Howard, E.B.
1935 Evidence of early man in North America. The Museum Journal 24 (2-3).

Jensen, H.
1968 Report on excavations at the Field Ranch site (X41CO-10) Cooke County, Texas. Bulletin of the Texas Archeological Society 39:133-146.

Johnson, E.
1977 Animal food resources of Paleoindians. In Paleoindian Lifeways, edited by E. Johnson, pp. 65-77. Texas Tech University, Lubbock.

1983 The Lubbock Lake paleoindian record. In Guidebook to the Central Llano Estacado, edited by V.T. Holliday. Lubbock, Center for Arid Land Studies.

Johnson, E., and V. T. Holliday
1984 Comments on "Large Springs and early American indians" by Joel L. Shiner. Plains Anthropologist 29:65-70.

Johnson, L.
1961 The Yarbrough and Miller sites of northeastern Texas, with a preliminary definition of the La Harpe Aspect. Bulletin of the Texas Archeological Society 32:141-284.

Judge, W. J.
1973 Paleoindian occupation of the central Rio Grande Valley in New Mexico. University of New Mexico Press, Albuquerque.

1974 Projectile point form and function in late Paleo-Indian period assemblages. In History and prehistory of the Lubbock Lake site, edited by C. Black, pp. 123-132. Texas Tech University, Lubbock.

Keeley, L. H.
1982 Hafting and retooling: effects on the archaeological record. American Antiquity 47:798-809.

Kelly, T. C.
1983 The Brom Cooper Paleo-Indian collection from McMullen County, Texas. La Tierra 10(3):17-40.

Krieger, A. D.
1954 A comment on "Fluted point relationships," by John Witthoft. American Antiquity 19:273-275.

Leonhardy, F.
1966 Domebo: a Paleo-Indian mammoth kill in the prairie-plains. Contributions of the Museum of the Great Plains, [Number] 1. Lawton, Oklahoma.

Lepper, B. T.
1983 Fluted point distributional patterns in the eastern United States: a contemporary phenomena. Midcontinental Journal of Archaeology 8:269-285.

Long, R. J.
1977 McFaddin Beach. The Patillo Higgins Series of Natural History and Anthropology, [Number] 1, Spindletop Museum, Lamar Unviersity, Beaumont.

Mallouf, R. J.
1981 Observations concerning environmental and cultural interactions during the termi nal Pleistocene and early Holocene in the Big Bend of Texas and adjoining regions. Bulletin of the Texas Archeological Society 52:121-146.

1985 A synthesis of eastern Trans-Pecos prehistory. Unpublished Master's Thesis, Department of Anthropology, The University of Texas, Austin.

Meier, C. J., and T. R. Hester
1972 Notes on the Meier site, Fayette County, Texas. Bulletin of the Lower Plains Archeological Society 3:69-72.

1976 Paleo-Indian artifacts from the Meier site, southeast Texas. La Tierra 3(1):16-19.

Meltzer, D. J.
n.d. Unpublished data

1984 Late Pleistocene human adaptations in eastern North America. Unpublished Ph.D. dissertation, Department of Anthropology, University of Washington, Seattle.

1985 On stone procurement and settlement mobility in eastern fluted point groups. North American Archaeologist 6:1-24.

Meltzer, D. J., and B. D. Smith
1986 Paleo-Indian and early Archaic subsistence strategies in eastern North America. In Foraging, collecting and harvesting: Archaic period subsistence and settlement in the eastern Woodlands, edited by S. Neusius. Center for Archaeological Investi gations, Southern Illinois University, Carbondale.

Orchard, C., and T. Campbell
1954 Evidences of early man from the vicinity of San Antonio, Texas. Texas Journal of Science 4:454-465.

Parker, W.
n.d. Preliminary notes on a Clovis point associated with mammoth tusk fragments in Hockley County, Texas. Unpublished paper on file with the author.

Prewitt, E. R.
1984 Paleo-Indian archaeology: San Gabriel river drainage, Texas. Paper presented at the 1984 meeting of the Texas Academy of Sciences, San Antonio, Texas.

1985 Personal communication

Purdy, B.
1975 Fractures for the archaeologist. In Lithic technology: making and using stone tools, edited by E. Swanson, pp. 133-141. Mouton, The Hague.

Ray, C. N.
1930 Report on some recent archaeological researches in the Abilene section. Bulletin of the Texas Archeological and Paleontological Society 2:59-78.

1940 The deeply buried Gibson site. Bulletin of the Texas Archeological and Paleontological Society 12:223-237.

Roberts, F. H.
1935 A Folsom complex: preliminary report on investigations at the Lindenmeier site in northern Colorado. Smithsonian Miscellaneous Collections 94(4).

Scurlock, J., and W. Davis
1962 Appraisal of the archaeological resources of Toledo Bend Reservoir, Panola, Newton, Sabine, and Shelby Counties, Texas; Sabine and De Soto Parishes, Louisiana. Report submitted to the National Park Service by the Texas Archaeological Salvage Project, The University of Texas, Austin.

Seeman, M., and O. Prufer
1982 An updated distribution of Ohio fluted points. Midcontinental Journal of Archaeology 7:155-169.

Sellards, E. H.
1940 Pleistocene artifacts and associated fossils from Bee County, Texas. Bulletin of the Geological Society of America 51:1627-1658.

1952 Early man in America. University of Texas Press, Austin.

Shafer, H. J.
1977 Early lithic assemblages in eastern Texas. In Paleoindian Lifeways, edited by E. Johnson, pp. 187-197. Texas Tech University, Lubbock.

Shiner, J. L.
1983 Large springs and early American Indians. Plains Anthropologist 28:1-7.

Skinner, S. A., and R. Rash
1969 A Clovis fluted point from Hood County, Texas. Bulletin of the Texas Archeological Society 40:1-2.

Stanford, D.
1978 The Jones-Miller site: an example of Hell Gap bison procurement strategy. In Bison procurement and utilization: a symposium, edited by L. Davis and M. Wilson. Plains Anthropologist, Memoir 14:90-97.

1985 Personal communication

Story, D. A.
1981 An overview of the archaeology of East Texas. Plains Anthropologist 26:139-156.

1986 Personal communication

Suhm, D. A., and E. B. Jelks
1962 Handbook of Texas archeology: type descriptions. Texas Archeological Society, Special Publication 1:1-299.

Suhm, D. A., A. D. Krieger, and E. B. Jelks
1954 An introductory handbook of Texas archaeology. Bulletin of the Texas Archeological Society 25.

Tunnell, C.
1977 Fluted projectile point production as revealed by lithic specimens from the Adair-Steadman site in northwest Texas. In Paleoindian Lifeways, edited by E. Johnson, pp. 140-168. Texas Tech University, Lubbock.

Weir, F.
1956 Surface artifacts from La Perdida, Starr County, Texas. Bulletin of the Texas Archeological Society 27:59-78.

Wheat, J. B.
1953 An archaeological survey of the Addicks Dam basin, southeast Texas. River Basin Surveys Papers 4, Bureau of American Ethnology, Bulletin 154:143-252.

1979 The Jurgens site. Plains Anthropologist, Memoir 15.

Wilson, J.
1979 A preliminary report on the Little Pin Oak Creek site (41FY53): a campsite with Clovis, Plainview, and subsequent artifacts in Fayette County, Texas. Bulletin of the Texas Archeological Society 50:135-140.

Wormington, H. M.
1957 Ancient man in North America. 4th ed. Denver Museum of Natural History, Denver.