ARCHAEOLOGICAL MITIGATION AT 41 BX300, SALADO CREEK WATERSHED, SOUTH-CENTRAL TEXAS

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With Contributions By
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Center for Archaeological Research
The University of Texas at San Antonio
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Prepared under the supervision of
Thomas R. Hester, Principal Investigator

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FOREWORD

The archaeological investigations reported in this volume represent the culmination of a series of cultural resource studies conducted in the area of site 41 BX 300 in south-central Texas. Plans by the Soil Conservation Service, United States Department of Agriculture, to construct a floodwater retarding structure on Elm Waterhole Creek, a tributary of Salado Creek, led to an initial survey at this locality by The University of Texas at Austin in the early 1970s. As plans for the construction moved forward, the Center for Archaeological Research at The University of Texas at San Antonio contracted with the Soil Conservation Service to carry out more intensive surveys and site evaluations. We began to learn more about site 41 BX 300, as well as other sites within the proposed construction area. For example, contact was made with an artifact collector who made available his materials from the site surface, and these were published by a graduate student associated with the Center. Finally, in 1978, as the construction got underway, a full-scale excavation, aimed at mitigating the inevitable loss of the site, was conducted by the Center under the aegis of the National Park Service.

These excavations, directed by Paul Katz, provided an opportunity to examine certain facets of Middle Archaic, Late Archaic, and Late Prehistoric occupations recognized at the site. A variety of excavation and analytical techniques was implemented that had not previously been applied at other south-central Texas sites. The well organized and executed excavations, followed by an equally comprehensive laboratory phase, has provided a wealth of new data and interpretations. Some of the special studies attempted during this project proved to be of limited success or still remain preliminary. Even these, however, can serve as guides in terms of planning similar kinds of research in the future.

In summary, this project combined the requirements of systematic cultural resource studies with a distinctive research orientation. As a result, we not only have a body of "salvaged" data that would have otherwise been lost, but also a body of information and interpretation that can be utilized in continuing archaeological research in the south-central Texas region.

Thomas R. Hester
January 1987

ABSTRACT

Site 41 BX 300, a multicomponent limited activity occupation site situated in the upper Salado Creek watershed of northern Bexar County, Texas, was first recorded in 1971 and initially tested in 1975 and 1976. This report concerns three months of mitigation work conducted in 1978 by the Center for Archaeological Research, The University of Texas at San Antonio.

Geomorphological investigation has determined that the site locality only became stable enough to make habitation suitable in the middle of the post-Pleistocene period. At that time its peripheral resources included a permanent water source in the Elm Waterhole Creek, immediately adjacent to the site, and two nearby chipped stone resource areas.

Investigation by means of controlled surface collection in 10-m blocks, hand excavation of 121 one-meter squares, and 18 backhoe-cut trenches removed 335 m^3 of soil, recovered over 110,000 specimens and samples, recorded 10 cultural features, and identified four periods of occupation.

Artifacts diagnostic of the Early Archaic period were recovered in random locations and redeposited situations, not associated with any features. No occupation of the site at this time is identifiable, supporting the geomorphological evidence of instability. The first well-represented occupation occurred early in the Middle Archaic period, ca. 2600-500 B.C. Three burned rock hearths and diagnostic artifacts, such as **Bulverde, Nolan,** and **Travis** projectile points, and associated tools indicate a faunal procurement and processing suite of activities.

Stratigraphically higher and later in time an occupation late in the Middle Archaic period (ca. 500-250 B.C.) was discerned, characterized by one burned rock midden and an adjacent burned rock scatter which may be an incipient midden. There was no evidence of primary activity associated with it, and the interpretation is that of a "community dump." The presence of **Pedernales** projectile points assist with the chronological placement within the Round Rock phase. Higher in the topsoil are two burned rock hearths and an associated living floor assigned to the Late Archaic period (ca. 250 B.C.-A.D. 750) on the basis of diagnostic projectile point types such as **Castroville, Ensor, Frio,** and **Marcos**. While there is some artifactual evidence for vegetal processing, most of the artifacts indicate faunal procurement and processing activities.

The fourth and final occupation at the site occurred during the Late Prehistoric period (ca. A.D. 750-1800). Diagnostic artifacts of both the Austin and Toyah phases are present in a very restricted and intensively utilized 12-m^2 area close to ground surface. Faunal procurement and processing and chipped stone tool manufacture and maintenance, are the primary activity clusters represented. The Historic period is represented by a few scattered artifacts, hardly indicative of intentional occupation.

Site 41 BX 300 functioned as a hunting camp for over four millenia, from early in the Middle Archaic through the Late Prehistoric cultural periods. The attraction of this site over other potential hunting loci was most likely the combination of a constant water source in the Elm Waterhole and abundant lithic raw materials. Use of space at the site and in particular the treatment of burned rock features varies with each cultural period, providing comparative behavioral data for future investigation of south-central Texas prehistory.

KEYWORDS: prehistoric archaeology, south-central Texas, Archaic, Late Prehistoric, burned rock, midden, hearth, waterhole, hunter-gatherer.

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Providing the critical bridge between field and laboratory was Elizabeth Frkuska, the project's laboratory supervisor and data analyst. She supervised all the steps from data capture in the field, through initial material processing and cataloging, to the production of computerized inventories and analyses. Assisting her in the laboratory procedures were Augustine Frkuska, Rebekah Halpern, Roberta McGregor, and Lang Scruggs. Again there were volunteers, primarily from The University of Texas at San Antonio; Virginia Nones and Harold Prestridge deserve special mention. Deepest gratitude goes to Karin Check, for literally months of volunteered time measuring and classifying artifacts to produce Appendix I.

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INTRODUCTION

The following report of investigations details the intensive testing, subsequent analysis, and resultant interpretations of site 41 BX 300, a multicomponent, limited activity occupation area in northern Bexar County, south-central Texas.

Site 41 BX 300, and two adjacent lithic resource areas designated 41 BX 299 and 41 BX 301, were recorded in 1975 by a survey team from the Center for Archaeological Research (CAR), The University of Texas at San Antonio (UTSA), under a contract with the Soil Conservation Service. This represents Phase I of the total project. The locality in question was to be impacted by Floodwater Retarding Structure (FRS) 13A, one of a series of such facilities being constructed in the upper Salado Creek drainage basin of northern Bexar County (see Fig. 1).

Based on the results of the initial 1975 reconnaissance, a CAR-UTSA crew conducted limited testing of 41 BX 300 during the winter of 1976. Also funded by the Soil Conservation Service, this activity is designated as Phase II of the 41 BX 300 project. The multicomponent nature of the site, suspected during reconnaissance by a range of chronologically diagnostic projectile points, was documented by the identification of a Late Archaic occupation area horizontally distinct from a Middle Archaic burned rock midden. The site was at this time nominated to the National Register of Historic Places. The result of both actions was the preservation of about three acres of the most intensive occupational remains, around which deep pit borrowing was carried out as part of the construction of FRS 13A.

Subsequent monitoring of the site by CAR-UTSA staff members ascertained several facts. The resultant pedestal of preserved site area provided a unique opportunity to observe its subsurface aspects, and vertical stratigraphic components were added to the horizontal stratigraphy identified by initial testing. Multiple burned rock features and chipped stone artifacts were observed in the profiles provided on the site's vertical periphery.

Unfortunately, natural erosion, exacerbated by cattle grazing, was having an adverse impact on the preserved portion of the site, accelerating the eventual loss of this high data potential locality. Apprised of the situation, and after several visits to the site, the Denver office of the National Park Service Interagency Archeological Services decided to fund a final mitigation program at 41 BX 300. The CAR-UTSA received the contract, and intensive testing of the site took place in the spring of 1978. This was the third, and final, phase of investigations.

In its response to the Scope of Work, the CAR-UTSA identified the following major problems facing south-central Texas archaeology. It was intended that investigations at 41 BX 300 would shed some light on all of them, and indeed the research was designed to accomplish just this.

1. The two previous phases of investigation, and subsequent site monitoring, identified both horizontal and vertical cultural stratigraphy. By means of an excavation plan in which different areas of the site were investigated in depth, a chronological framework for the site's occupation

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would be constructed. Integrating the site sequence into an extant regional chronology would provide data to expand interpretations about, and assist in the refinement of, the latter.

2. The steep-sided nature of the extant site, resulting from pedestaling the preserved portion, would provide the basis for a thorough study of the locality's geomorphology. A series of special samples, recovered from all portions and depths of the site, would form the basis for interpretations of both paleoclimatic episodes and seasonality of occupation phases. These samples would include soil for standard mechanical and organic content analyses, additional soil for micro-specimen recovery of artifacts and ecofacts, soil for phytolithic analysis, burned rock samples for thermoluminescence dating, wood charcoal for species identification, and samples for radiocarbon dating.

3. By employing the method of block excavation in at least one portion of the site, a functionally oriented analysis of the cultural remains would be greatly facilitated. The identification of contemporaneous features and their associated tool kits would provide significant data on site utilization, both from the point of view of specific activities and to observe overall site patterning. Comparison and contrast of stratigraphically distinct patterns would provide data on variations in site utilization and idiosyncratic behavior through time.

4. Patterns identified by the stratigraphic block excavation technique can be related to settlement and demographic interpretations as well as to subsistence activities. The size and number of features, inter-feature spatial considerations, total site area utilization, resource proximity, and artifact density all provide useful data for hypothesizing population density and distribution.

5. Artifactual and ecofactual type and density provide data for interpretations of subsistence activities, and their distribution across the site provides for studies of organization, scheduling, seasonality, and subsistence behavior. Consideration of the nature and usage of nearby sites would help to build a picture of resource exploitation and seasonal rounds for each phase documented in the occupational sequence of the site.

6. Full investigation of the features at the site would provide data on site function at each occupational phase associated with the features. In particular, the burned rock midden, while a common feature in central Texas Archaic prehistory, was accompanied by a variety of functional and architectural interpretations. Careful excavation of the mound at 41 BX 300 would add valuable data to the current state of this feature's interpretations.

The report of investigations is organized into nine sections. The first two provide background about the site locality, from both environmental and cultural perspectives. These are followed by the research design for the mitigation project. Excavation methods and techniques, followed by a summary of the site's natural stratigraphy, precede three descriptive sections. These latter discuss the ecofacts and special samples, artifacts, and features recorded or recovered during the mitigation activities. The final section includes a summary of the project, providing conclusions drawn from the field work and analyses. Occupational chronology and site function throughout time are discussed in detail; and the research design is evaluated at the conclusion of this section.

ENVIRONMENTAL CHARACTERISTICS

PHYSICAL SETTING (Paul D. Lukowski)

Bexar County is situated in south-central Texas and has within its boundaries portions of three physiographic divisions: the West Gulf Coastal Plain, the Balcones Fault Zone, and the Edwards Plateau (Taylor, Hailey, and Richmond 1962).

The almost level to gently undulating plains of the Balcones Fault Zone and West Gulf Coastal Plain occupy the southern two-thirds of Bexar County. Elevations in this portion of the county range from about 500 to 1000 feet. The Edwards Plateau, characterized by a more rugged topography and dissected by southeasterly trending streams, takes up the remaining northern area of the county, with elevations there ranging from about 1000 to 1900 feet (Taylor, Hailey, and Richmond 1962).

Site 41 BX 300 lies within the Balcones Fault Zone in the northeastern part of Bexar County, approximately 4.5 miles due east of the intersection of US Highway 281 and FM 1604 (Fig. 1).

GEOLOGY

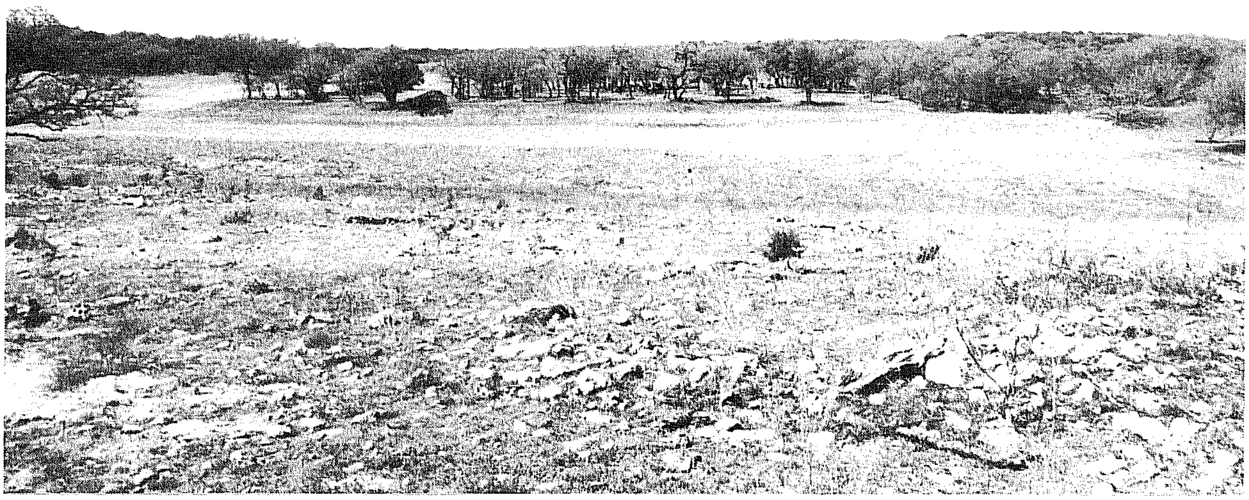
Geological activity some 12 million years ago lifted lower Cretaceous deposits in the area relative to the coastal plain, creating the present-day drainage and topographic patterns characteristic of the southern edge of the Edwards Plateau (Gerstle, Kelly, and Assad 1978:25-26). While most of the drainage systems within the Balcones Fault Zone lose much of their water to the underground Edwards Aquifer, springs of various sizes may be formed along these faults. The large pond adjacent to 41 BX 300 may be one of these springs (Fig. 2,a).

Site 41 BX 300, situated on the southern edge of an exposure of the Edwards limestone formation, is near a series of fault lines (Barnes 1974). The Edwards limestone formation, a chert-bearing source (Gerstle, Kelly, and Assad 1978:25-26), is a lower Cretaceous formation contained within the Balcones Fault Zone, generally between the upper Cretaceous deposits of the Edwards Plateau and the Eocene deposits characteristic of the West Gulf Coastal Plain. A detailed geological summary is presented by Evans in the next section of this report.

SOILS

Soils, for a large area around 41 BX 300 (and including sites 41 BX 301, 41 BX 484, and 41 BX 485), are of the Crawford-Bexar association. A different soil association, the Tarrent, begins just on the east side of the

a



b

Figure 2. **Views of 41 BX 300.** a, Elm Waterhole, looking north; b, general view of 41 BX 300 during Phase III mitigation activities, looking south.

creek across from 41 BX 300 and characterizes sites 41 BX 299 and 41 BX 286. The Tarrent soils differ from the Crawford-Bexar soils mainly in that the former are much shallower.

Crawford and Bexar Stoney soils have low slopes (0-5% slopes) and can be characterized as occupying large, broad areas supporting post oak and black-jack oak savannas (Taylor, Hailey, and Richmond 1962). Depth to bedrock ranges from 17 to 35 inches, and these profiles can contain 10-40% chert and limestone pieces ranging in size from 1/4-inch to 24 inches. Reaction may be from slightly acid to mildly alkaline. When dry, the clay is very hard and develops many cracks (Taylor, Hailey, and Richmond 1962).

The upper layer of Crawford and Bexar Stoney soils is very dark grayish brown to reddish brown clay, six to 10 inches thick. The layer has a structure described as fine, subangular blocky, and granular (Taylor, Hailey, and Richmond 1962). The subsurface layer, about 26 inches thick, is a dense, angular blocky clay and is browner or more reddish than the surface layer. This zone either overlies a thin layer of yellowish red to pale brown clay; or, if the thin soil zone is missing, it rests directly on fractured limestone that may be many feet thick (Taylor, Hailey, and Richmond 1962).

CLIMATE

Bexar County has a modified subtropical climate with mild winters and hot summers. Average daily temperatures (as recorded during the years 1931-1960) range from 53.7°F for the months of December, January, and February, and 83.2°F during June, July, and August. Yearly average rainfall for the previously mentioned years was 27.89 inches, with the largest amounts of precipitation occurring in the form of short thundershowers between April and September and the lowest monthly averages occurring generally as light rain or drizzle during November through March.

FLORA

Although 41 BX 300 is located within the southern boundary of the Texan Biotic Province, its proximity to two other biotic provinces (the Balconian and the Tamaulipan) places it in an ecotonal setting. The Balconian Biotic Province generally occupies the Edwards Plateau area and can be characterized as an oak-juniper vegetational region (Gould 1969). The Tamaulipan Biotic Province generally begins west of the San Antonio River and south of the Edwards Plateau. Vegetation in the region is characterized by species of the South Texas brushlands such as mesquite, acacia, mimosa, and whitebrush (Blair 1950).

Species from the Balconian and Tamaulipan Biotic Provinces recorded at 41 BX 300 include such invaders as prickly pear, yucca, whitebrush, condalia, agarita, juniper, Texas persimmon, and stunted live oak (Cook and Laquey, Appendix II). Cedar elm, Texas persimmon, and mesquite are the dominant woody species at the site, and, together with the brush species (mainly agarita and whitebrush), comprise the most common vegetation at the site. Because of the disturbed nature of the site, no climax grasses are evident.

Overall, 57% of the cover at the site is woody vegetation; the remaining 43% is comprised of grasses, forbs, and bare ground (Cook and Laquey, Appendix II).

It can be inferred from the literature that relatively recent vegetational changes, mainly in the form of increased brush cover, have occurred since the 18th century (Inglis 1964:94-101). One of the first recorded visits to Bexar County was an expedition led by Teran de los Rios in 1691. Manzanet, a diarist on the journey, noted that on a day's travel, estimated to have begun near the present-day San Antonio International Airport and having proceeded in an east-northeasterly direction (placing the end of the day's journey in the general vicinity, but slightly south, of 41 BX 300), they traveled,

> . . . over lands without woods. To the north are some low ranges, but with little timber. A still higher hill could be seen in the distance. This had tall timber on it. As we progressed on our journey it was left to north. Near this hill there is a heavy mesquite woods which rapidly descend to a dry arroyo [Elm Creek?]. There are very large mulberry trees, pecans, vines, oaks, and hackberries (Inglis 1964:21).

Later, travelers Ferdinand Roemer and W. A. McClintock, crossing the same general area in northern Bexar County in the middle 19th century, noted open prairies of gently rolling hills and groves of timber with numerous deer between the Cibolo and Salado Creeks (Inglis 1964).

FAUNA

Blair (1950) notes 49 species of mammals, 39 species of snakes, 15 species of lizards, and other species of reptiles and birds within the Texan Biotic Province. It can be expected that some species from the Balconian and Tamaulipan Biotic Provinces also occur in the area. The more common species within Bexar County are white-tailed deer, opossum, squirrels, cottontail rabbit, jackrabbit, quail, armadillo, and various species of reptiles. A more complete listing of fauna is presented by Gerstle, Kelly, and Assad (1978:29).

Species once present in the area, but now very rare or missing are bison, antelope, bear, turkey, and prairie dog (Inglis 1964; Campbell 1975). Wild turkeys, however, were observed on several occasions during the archaeological investigations at 41 BX 300.

PALEOCLIMATE

In a recent discussion of the Archaic cultures of the West Gulf Coastal Plain, Story (1980:5-9) summarizes information currently available on the environment of the Holocene. Although the paleoenvironment is poorly known and sometimes conflicting, Story has organized the data into a tentative model containing three provisional periods (Table 1).

TABLE 1. SUMMARY OF SELECTED ENVIRONMENTAL, CHRONOLOGICAL, AND CULTURAL DATA FOR SOUTH AND CENTRAL TEXAS

DATES	PALEOENVIRONMENTAL DATA: PHYTOLITHS (Robinson 1979)	PALEOENVIRONMENTAL DATA: POLLEN (Bryant and Shafer 1977)	WEST GULF COASTAL PLAIN CLIMATIC INTERVALS (Story 1980)	WEST GULF COASTAL PLAIN PREHISTORIC SEQUENCE (Story 1980)	SOUTH-CENTRAL TEXAS PREHISTORIC SEQUENCE (Hester 1980)	CENTRAL TEXAS PREHISTORIC SEQUENCE (Weir 1976)	CENTRAL TEXAS PREHISTORIC SEQUENCE (Prewitt 1981, 1983)	SALADO CREEK WATERSHED LOCAL PERIODS (Black and McGraw 1985)	DIAGNOSTIC ARTIFACTS (cf. Weir 76; Hester 80; Prewitt 81, 83)
1500				LATE PREHISTORIC PERIOD	LATE PREHISTORIC PERIOD	TOYAH	TOYAH	11	*Cliffton, Perdiz* points; *Leon Plain* pottery
1000				TERMINAL ARCHAIC VARIES THROUGH TIME and SPACE		AUSTIN	AUSTIN DRIFTWOOD	10	*Edwards, Granbury, Scallorn* points; bow and arrow
500		Establishment of modern vegetation communities	Modern regional patterns of biota; climatic oscillations continue; humid east more stable than semiarid west		LATE ARCHAIC	TWIN SISTERS	TWIN SISTERS UVALDE	9	*Darl, Ensor* points
A.D./B.C. 0									*Frio, Marcos* points
500	...?... Tall grasses; dense riverine forests			LATE ARCHAIC		SAN MARCOS	SAN MARCOS	8	*Castroville, Marshall, Montell* points
1000	...?...								*Lange, Williams* points
1500	short grasses; reduction in riverine forests		---------?---------		MIDDLE ARCHAIC	ROUND ROCK	ROUND ROCK MARSHALL FORD	7	*Bulverde, Pedernales* points
2000			Amelioration of dry conditions	MIDDLE ARCHAIC					*Bulverde* points
2500	...?...	Gradual loss of arboreal elements (except oak); increase in grasses and herbs	---------?---------			CLEAR FORK	CLEAR FORK	6	*Nolan, Tortugas, Travis* points; *Clear Fork* tools
3000	Tall grasses; dense riverine forests		More frequent and more extensive droughts		EARLY ARCHAIC				
3500				---------?---------			OAKALLA JARRELL	5	
4000	?			EARLY ARCHAIC		SAN GERONIMO			*Bell, Gower, Hoxie, Martindale, Uvalde, Wells* points; *Clear Fork* tools; *Guadalupe* tools
4500							SAN GERONIMO	4	
5000					PRE-ARCHAIC				
5500			Generally cooler and/or more humid				CIRCLEVILLE	3	
6000						PALEO-INDIAN PERIOD			
6500				PALEO-INDIAN PERIOD	PALEO-INDIAN PERIOD			2	*Angostura, Golondrina, Meserve, Scottsbluff* points
7000							PALEO-INDIAN		
								1	

A moister, cooler, and seasonally less differentiated climate characterizes the earliest period (ca. 7000-5000 B.C.) of the Holocene in this model. In the second period, sometime between 5000-2500 B.C., dryer conditions were more prevalent and droughts become more frequent, probably allowing for the expansion of xerophytic species in the region. The basic biotic patterns of the present were then established around 3000-2500 B.C., although there are indications of short-term climatic variations subsequent to 1500 B.C. (Story 1980:8).

OBSERVATIONS ON THE GEOLOGY AND GEOMORPHOLOGY OF SITE 41 BX 300

(Glen L. Evans)

My investigations of this site and its environs were largely restricted to such geologic and geomorphic features and resources as seemed likely to have influenced, in one way or another, the human prehistory of the area. I hoped to determine the origin of the alluvial land feature on which the site was located, and to form some useful estimate of when it became suitable for sustained human occupation. Another focus of study was, of course, the spring fed pool known as Elm Waterhole, for it may have been the single most important resource influencing the selection of the adjacent occupation site. It seemed desirable to learn, if possible, how and when it formed--could it have served as an inducement for Paleo-Indian campers. My objectives were by no means fully realized, but possibly useful opinions were formed.

BEDROCK

The outcropping bedrock in the immediate vicinity of the site includes the Edwards limestone and the overlying Del Rio clay, both formations of early Cretaceous age. The Edwards is composed mainly of hard but often highly porous limestone and some dolomite, which form conspicuous and widespread outcrops in the general area. Some members of the formation contain abundant flint nodules, many of which are of a grade suitable for the manufacture of piercing and cutting implements. Rich sources of such flint in the near vicinity of 41 BX 300 were doubtlessly one of the major attractions for aboriginal occupants of the area. Flint, or chert, deposits were generally omitted from my investigations, as they were an integral part of the archaeological survey crews' investigations.

However, one feature observed at the large surface flint quarry designated as 41 BX 301, southwest of site 41 BX 300 (Fig. 1), deserves special mention because of the significant information it provides bearing on the rate of soil erosion that has taken place in the area during the post-Archaic centuries. The site encompasses several acres on a gentle slope of a flint nodule-bearing member of the Edwards limestone. The upper surface of the limestone bed has been eroded to a considerable extent and is covered in most places by a thin, stony, residual soil. Many of the slopes contain erosion-resistant flint nodules, whose lower parts are still firmly encased in the parent limestone, and which now project well above the soil level, thus giving the slopes the appearance of a strewn boulder field.

Virtually all of the projecting nodules show unmistakable evidence of aboriginal knapping or quarrying activity, and many have flakes struck off down to the level of the present soil surface. This shows convincingly that the cobbles were exposed as fully to the Indians as they are to us, and clearly indicates that there has been little or no net loss of soil by erosion on this segment of the Edwards Plateau since the Archaic period. Doubtlessly there have been some solution effects, and at least minimal sheet wash during torrential rains, but residual soil accumulations appear to have approximately kept pace with such losses to erosion.

The Edwards formation provided aborigines not only with flint for tool making and limestone slabs for hearths, but also met their need in other indirect ways as well. Where suitable recharge conditions exist, certain porous members of the formation serve as aquifers, and discharge as springs wherever the aquifer is intersected down from the recharge area by erosion or open fractures. There are a number of Edwards limestone springs of different types in the faulted and dissected parts of the plateau region. Some of these, like Elm Waterhole at 41 BX 300, are remote from other sources of permanent water, and must have been of major importance to aboriginal hunting and gathering peoples, especially during severe drought intervals.

The Del Rio clay in this vicinity is a yellowish gray, marly clay with some thin limestone members. The formation is easily eroded, and typically forms low-relief, inconspicuous outcrops. It contains a great abundance of the marine pelecepod, **Exogyra artietina**, which is a useful aid in identifying the formation. It also contains appreciable amounts of pyrite, which, where well oxidized, may have served the Indians as a pigment.

FAULTING

The Edwards and Del Rio formations, as well as other Cretaceous strata outcropping in the site vicinity, have been extensively displaced by a cluster of predominantly northeast trending and southeast trending faults, which are in the central part of the broad Balcones Fault system. This fault cluster includes a narrow, down-faulted block, or graben, that lies immediately beneath 41 BX 300. In this structure, the impervious Del Rio clay appears to have been down-faulted against the porous, water-bearing Edwards limestone, thus forming a kind of subsurface dam that blocked the down-dip lateral movement of water in the Edwards aquifer, and set the stage for the development--much later--of the sinkhole spring now known as Elm Waterhole.

DRAINAGE AND STREAM DEPOSITS

The site area is drained by Long Creek,[1] an intermittent, headward branch of the San Antonio River system. Long Creek now flows only when fed by runoff from occasional heavy rains in its watershed, and no indication was seen that it was ever a perennial flowing stream, although it may have formerly carried considerably more water than at present.

Where the creek crosses the outcropping Edwards formation, upstream from the site, the channel is entrenched in limestone, not in floodplain alluvium. The channel appears disproportionately broad and shallow, and its bed is strewn with an undetermined thickness of limestone and flint pebbles and cobbles, and numerous subrounded boulders up to 30 inches or more in diameter. The boulders, especially, must have required the transporting energy of infrequent exceptionally heavy floods. A fairly thick stand of trees, mainly cedar elm and juniper, some of which appear to be 30 or 40 years old, grows on the rock-strewn channel floor. Driftwood caught in the lower branches of the trees reveals a recent flow of water to a depth of three or four feet, but the generally healthy appearance of the trees indicates that the channel has carried no major floods during their lifetime.

The only fine-grained alluvium observed along the stream's course through the Edwards limestone terrain was very minor, thin patches of floodplain alluvial soil on the lower parts of the divide between Long Creek and Elm Waterhole Creek, where the stream crosses the outcrop of the easily eroded Del Rio clay at and near 41 BX 300; however, the greatly broadened valley floor was covered with an extensive alluvial deposit, from two to four meters in thickness. Most of this alluvium, and part of the underlying Del Rio clay, was removed prior to our investigation by large-scale excavations for earthen dam-making material. Even so, the following interpretation of stream activity in the vicinity could be deduced from the distribution of channel, floodplain, and terrace alluvium observed in the excellent backhoe trench exposures at 41 BX 300, and in a few preserved alluvial remnants around the large excavations.

Before Elm Waterhole sink came into existence, Long Creek, at flood stage, flowed through both its own channel and the channel of its minor tributary, the upper part of which is now known as Elm Waterhole Creek. The two channels then flowed on opposite sides of the area where 41 BX 300 is now located, and formed their confluence downstream from the site (Fig. 3). Both channels meandered freely, causing at times of high water severe lateral erosion; and the interchannel divide, including most of 41 BX 300, was subject to periodic flooding. Alluvium, ranging in texture from coarse cobbles and boulders to silty clay, was deposited on the site from at least late Pleistocene times.

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[1]Editor's note: The stream referred to by Evans as "Long Creek" (Fig. 3) is designated as "Elm Waterhole Creek" elsewhere in this report (e.g., Fig. 1). The discrepancy stems from a change in the stream designation on successive editions of USGS topographic maps. The reader should consider Long Creek and Elm Waterhole Creek references to be synonymous except in this section by Evans.

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Formation of the elongated Elm Waterhole sink transected the inter-stream divide just above 41 BX 300 and pirated the tributary by deflecting its flow through the sink to a new confluence with Long Creek. Thereafter Long Creek seems to have shifted its course eastward away from the site and deepened its channel to some extent. The site area was then a flat to gently sloping terrace segment, no longer subject to stream erosion, and much less subject to flooding. It was then--probably for the first time--a desirable occupation site for aboriginal people. There is no means of accurately dating this event, but the position and appearance of the alluvium in the abandoned portion of the tributary channel suggest that the sink and related phenomena may have occurred around the middle of the post-Pleistocene. If so, the site probably would not have been suitable for occupation by Paleo-Indians, perhaps not even for Indians of the Early Archaic period.

ELM WATERHOLE (Fig. 2,a)

Elm Waterhole, a spring-fed pool, is an elongated subsidence feature, or sink, which apparently formed by collapse of overlying, fracture-weakened strata into solution caverns in the Edwards limestone. The collapse may have resulted from post-Pleistocene lowering of the water table, which partially drained previously water-filled caverns, and thus eliminated their aqueous roof support. The subsidence of bedrock could have been progressive rather than a single event. There is evidently still a degree of downward adjustment of sediments that are washed into the hole during occasional local floods; otherwise the sink would have long since been filled and obliterated.

In the alluvium downstream from the spring, no trace was seen of aquatic mollusks, travertine, clean, well-sorted deposits, or other evidence of a former spring-fed flowing stream. It seems likely, therefore, that the spring has never supported even a moderate flow down the Long Creek channel, probably because the hydrostatic head in the feeding aquifer has always been insufficient to raise the water in the sinkhole spring to stream bed level. From this it can be assumed that any downstream campsites, however suitable in other respects, would not have been habitable in drought intervals unless some other water source was available. On the other hand, the spring, from the time of its origin, has probably been a permanent, if localized, source of water. The landowner, Mr. Elgin Steubing, has stated that the spring has never failed during his long tenure in the area, not even in the great drought of the 1950s.

As previously stated, Elm Waterhole may have originated around the middle of post-Pleistocene times, perhaps somewhat later. The formation of the sinkhole spring provided a permanent source of water for people and wildlife in an area where none previously existed. It also deflected a stream's course and converted an adjacent land area into a desirable occupation site.

ARCHAEOLOGICAL BACKGROUND

CHRONOLOGY OF SOUTH-CENTRAL TEXAS (Eric C. Gibson and Paul Katz)

The following summary presents current concepts of the succession of cultures in south-central Texas. A more detailed summary of archaeological research in the general area is available in Hester (1980). In this discussion all dates for cultural-historical periods are considered approximate. The term "cultural-historical period" as used in this report indicates a range of behavioral and cultural activities and their observed traits documented within a broad but identifiable geographic and temporal parameter.

The cultural-historical periods related to south-central Texas prehistory are not fully understood, because only in the last 20 years have extensive excavations been conducted and radiocarbon dates obtained (Hester 1980:131). Diagnostic artifacts dated by radiocarbon have generally been reported from outside of Bexar County (e.g., the lower Pecos region to the west and the Edwards Plateau region to the north), and cross dating has usually been necessary. In the absence of published materials some of these data came from the site files of the Texas Archeological Research Laboratory (TARL), The University of Texas at Austin and the Center for Archaeological Research (CAR), The University of Texas at San Antonio.

PALEO-INDIAN PERIOD (9200 to 6500 B.C.)

Most archaeologists use the term Paleo-Indian when referring to the earliest human inhabitants of North America. Other terms such as "Early Man" or "Paleo-American" have an equivalent meaning but are used less frequently (Jennings 1974). Some archaeological data suggest that humans entered North America from eastern Asia as early as 30,000 years ago (Evans 1961; Krieger 1964; Gagliano 1967), although these data still remain controversial. The professional consensus places the entry of **Homo sapiens** into North America during the terminal stages of the Wisconsin glaciation, ca. 13,000 to 11,000 B.C. (Jennings 1974; Adovasio **et al**. 1978, 1980). The range of well-documented dates for Paleo-Indian occupation of North America falls between 9200 B.C. and 6500 B.C. (Hester 1980).

Freisenhahn Cave, located on the border of Comal and Bexar Counties, contained chipped stone objects from buried strata that also yielded the remains of Pleistocene mammals (Evans 1961). These chipped stone objects and some bone fragments are believed by some archaeologists to be artifacts. However, others contend that these specimens were modified by nature and not by humans. Thus, Freisenhahn Cave remains the south-central Texas representative to that group of controversial and problematic pre-Paleo-Indian sites in North America.

In south-central Texas, a major cultural tradition appears to be present in the area at ca. 9200 to 8500 B.C. This tradition is characterized by fluted points and includes all of the known Clovis and Folsom sites in the region (Hester 1976:5). Around 8200 B.C., the Plainview complex is recognized. During this early period, in Texas and on the western plains, megafauna such as giant bison, mammoth, camel, and horse was hunted. The "Big Game Hunters" have received much emphasis among students of North American prehistory; however, many sites (e.g., Lindenmeir, Blackwater Draw, Levi Rockshelter) show evidence that small game and wild plants were also important food resources (Jennings 1974).

Paleo-Indian occupation is indicated at several sites in Bexar County, and many of these sites are located within the Salado Creek watershed (i.e., the Salado Creek and its many tributaries; Fig. 4). The Panther Springs Creek site (41 BX 228) is a stratified site with occupational evidence from Late Paleo-Indian to Late Prehistoric times (Black and McGraw 1985). The stratified St. Mary's Hall site (41 BX 229) on a hillside overlooking the Salado Creek valley also yielded Paleo-Indian projectile points (**Folsom, Plainview, Golondrina**), a Plainview occupational component, as well as Archaic and Late Prehistoric artifacts (Hester 1979).

Most recently, investigations at the Peacock Bluff site (41 BX 52), in alluvial/colluvial deposits adjacent to Leon Creek, yielded lithic assemblages indicating a Folsom occupation and possible early Clovis habitation in excellent archaeological context. This excavation was conducted by archaeologists of the State Department of Highways and Public Transportation (Hester 1980).

Sites in the Amistad Reservoir region, a transitional zone between southern and Trans-Pecos Texas, have produced subsurface evidence of Paleo-Indian occupations. Bone Bed II at Bonfire Shelter contained **Folsom** and **Plainview** points in direct association with extinct bison (Dibble and Lorrain 1968). The lowest level of the Devil's Mouth site contained **Lerma, Angostura, Plainview**, and **Golondrina** projectile points (Johnson 1964). **Golondrina** points dated to 7000 B.C. also occurred in the lowest cultural stratum at Baker Cave (Hester 1979). The Golondrina complex, found across much of south-central and southern Texas, existed within a post-Pleistocene environment.

Additionally many surface Paleo-Indian artifact finds have been reported from south-central Texas (e.g., Orchard and Campbell 1954; Hester 1968; Howard 1971; Fawcett 1972; Howard 1974; Fox 1975; Kelly and Hester 1976; Cox 1977). Taken together, these data suggest that south-central Texas was extensively occupied by Paleo-Indian groups, especially in Late Paleo-Indian times (ca. 8000-6500 B.C.).

ARCHAIC PERIOD (6500 B.C. to A.D. 750)

Early Archaic Period (6500-2600 B.C.)

Sollberger and Hester (1972) first described a Pre-Archaic cultural-historical period. Alternatively, other researchers have objected to the use of the term "Pre-Archaic" and prefer to divide the Archaic into only three subperiods: Early, Middle, and Late (Story 1980:10).

Weir (1976), after a reexamination of the Archaic in central Texas, offered another chronological framework for that region, one based on cultural phases rather than chronological periods or subperiods. Weir's original seven

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phases were later expanded to 11 by Prewitt (1981, 1983), while still maintaining the tripartite subdivision of the Archaic period. Table 1 provides a comparison of these various schemes.

The use of any of the Archaic period chronologies presented here is conditioned by how various archaeologists view the interval that follows the Paleo-Indian period. If it appears to be a transitional period, then a Pre-Archaic is usually recognized. If it appears distinctively Archaic, then the chronology favored by Story is frequently used. If one is working in central Texas, the phase model of Weir and Prewitt is often followed.

Paleoenvironmental data (Table 1) indicate the piñon pine parkland of Texas was gradually replaced by a grassland savanna early in the Early Archaic period (Bryant 1969; Bryant and Shafer 1977). In particular, the time span between ca. 5000 and 3000 B.C. may have been a period of prolonged aridity (Story 1980:12). This increasingly semiarid climate (cf. the "Altithermal" of the western United States) probably diminished the amount of available ground water.

The archaeological record shows that throughout Texas, as Pleistocene megafauna became extinct, more animals, such as bison, deer, rabbit, squirrel, and other small game, were hunted. Due to the aridity of the Early Archaic period, large game may have been scarce in the region (Dillehay 1974). During this interval, techniques and tools for hunting and plant processing gradually became more specialized. This technological specialization continued and became more pronounced in the subsequent Archaic period.

Early Archaic sites are interpreted as small hunting camps, and it is estimated that population densities were probably low throughout Texas (Sollberger and Hester 1972; Weir 1976; Story 1980). The Early Archaic settlement pattern has been summarized as follows (Story 1980:13):

> The sites are characteristically small, widely distributed, and non-specialized. They are often surface or slightly buried scatters of lithic tools and debitage on knolls and fossil floodplains, many times mixed with later materials. Less common are components deeply buried in alluvial terrace deposits. When deeply buried components are found, they usually underlie larger Middle and Late Archaic occupations.

Typical Early Archaic projectile points are triangular, basally notched, corner-notched, and stemmed varieties (Table 1). Significant Early Archaic sites in central, southern, and western Texas are Landslide (Sorrow, Shafer, and Ross 1967), Jetta Court (Wesolowsky, Hester, and Brown 1976), 41 KE 49 (Kelly and Hester 1976), La Jita (Hester 1971), Baker Cave (Word and Douglas 1970), Devil's Mouth (Johnson 1964), Devil's Rockshelter (Prewitt 1966), and Granberg II (Hester and Kohnitz 1975).

<u>Middle-Late Archaic Periods</u> (2600 B.C. to A.D. 750)

Paleoenvironmental data from south and central Texas indicate that drying conditions that began in the Early Archaic continued into the Middle Archaic period (Table 1). These data show that climatic fluctuation may have been more frequent in some regions and less so in others. Research conducted in central Texas has suggested that the driest interval in that area was from ca. 3000 to 2000 B.C. (Gunn and Weir 1976:32). These climatic fluctuations probably influenced, but did not determine, prehistoric human patterns of adaptation in these regions (Story 1980).

In terms of a general overview, Middle and Late Archaic sites are more numerous and varied than those of the preceding Early Archaic period. This phenomenon may indicate an increase in prehistoric populations (Story 1980). Many archaeologists have viewed this increase in population as a rather sudden occurrence (Sollberger and Hester 1972:338; Gunn and Weir 1976:32; Weir 1976:124). Recent calculations by Prewitt (1983) have demonstrated considerable fluctuations throughout the Archaic period.

Sollberger and Hester (1972) have also suggested that the arid conditions were ameliorated in Texas at this time and, therefore, the habitat became more productive. Additionally, Hester (1981) has proposed that in south Texas, when food resources were (and are) irregularly spaced, short-term climatic fluctuations would have a greater adverse impact on the prehistoric inhabitants. It is suggested here that during times when adverse ecological impacts occurred in south Texas, the Salado Creek drainage system may have been more intensively occupied.

In south-central Texas, Middle and Late Archaic occupation sites vary in size, and it has been suggested that the size of the local groups changed with seasonal and spatial variations in food resources (Story 1980:26). Southern Texas was predominantly characterized by a savanna (or prairie) vegetational pattern later in the Archaic period. But the region may have been as ecologically diverse then as it is now. At present, the most diverse food resources cluster along the major river systems (Rio Grande, Nueces, Frio, and San Antonio) and the coast (Hester 1981).

During the Archaic period, seed-bearing plants, succulents (such as prickly pear), and acorns became increasingly important food resources to the local inhabitants of south Texas. Methods of processing these foods also became more specialized, as is indicated by many grinding function artifacts (e.g., manos, metates). Characteristic of a majority of later Archaic period sites is the burned rock midden feature. As in the Early Archaic period, hunting continued to be focused on deer and smaller game. Evidence also suggests that bison were again present in the region. A study by Dillehay (1974) proposes that bison were present during two different periods, from approximately 10,000-6000/5000 B.C. (the Paleo-Indian period) and from 2500 B.C.-A.D. 500 (the Middle-Late Archaic period). Dillehay further suggests that warmer climatic fluctuations may have caused these herd movements and subsequent regional abandonments.

The Middle-Late Archaic period (Table 1) in south Texas is characterized by such lithic artifacts as percussion-flaked triangular, leaf-shaped, and stemmed projectile points (e.g., **Abasolo, Catan, Desmuke, Tortugas**). In central Texas, **Travis, Nolan, Pedernales, Bulverde**, and **Marshall** are common Middle Archaic dart points; **Marcos, Montell, Castroville, Ensor, Frio, Fairland**, and **Darl** are characteristic of the Late Archaic period. In both central and south Texas, other Archaic period artifacts are manos and metates, other rough stone artifacts, unifacial and bifacial choppers, **Clear Fork** gouges, various kinds of large scrapers, drills, and utilized flakes. "Perishable" artifacts such as baskets, nets, mats, fur, leather, cloth, sandals, cordage, wooden darts, atlatls, and clubs have been reported from Archaic components in southwest Texas rockshelters (Kelley 1959:281).

LATE PREHISTORIC PERIOD (A.D. 750-1800)

The Late Prehistoric lifeway bears many similarities in its settlement and subsistence patterns to the Archaic; and indeed Late Prehistoric components often overlie Archaic campsites. The Late Prehistoric period is distinguished from the preceding Archaic by a set of technological innovations, most notably the introduction of the bow and arrow. Small, very light, and thin pressure-flaked projectile points of various types (**Perdiz, Scallorn, Cliffton, Granbury**) are diagnostic artifacts of the Late Prehistoric period (Table 1). The bow and arrow diffused into some regions of Texas earlier than in others, and thus the beginning of the Late Prehistoric period varies across the state (Table 1). Other indicators of this period are new kinds of lithic tools (blade technology, end scrapers, beveled knives) and the making of bone-tempered (**Leon Plain**) pottery.

HISTORIC PERIOD (A.D. 1800-present)

The account of Cabeza de Vaca's travels through southern and western Texas during the 1520s and 1530s is the first documented contact between Spanish explorers and the aboriginal inhabitants. However, the Europeans had minimal cultural impact on the natives of south-central Texas until the arrival of the Spanish missionaries during the late 1600s (Hester 1980:160).

Southern and south-central Texas, throughout the Historic period, were the domain of numerous small bands of Indians who spoke Coahuilteco ("Coahuiltecan") and other poorly known languages. Hester (1980:40) has summarized the lifeways of these bands as:

> The Coahuilteco and other hunting and gathering Indians in southern Texas lived in small groups, each with a distinctive name and territory utilized for the hunting, plant food gathering and fishing necessary to obtain subsistence. They moved throughout their territories, sometimes overlapping into the territories of other groups, in a seminomadic fashion. More detailed population estimates are difficult, as many groups were often found in widely separated areas during the seventeenth and eighteenth centuries. Villages were established at favored locations near rivers or creeks, occupied for a short time, and then the group would move on.

As the missions were built and more Spaniards settled in south Texas, the cultural impact on the region's aboriginal populations resulted in their being missionized, displaced to remote areas, assimilated into Spanish-Mexican groups, or killed by European-introduced diseases.

REVIEW OF ARCHAEOLOGICAL INVESTIGATIONS IN BEXAR COUNTY (Eric C. Gibson)

In recent years, Bexar County has been the focus of some of the most intensive archaeological research in Texas. A brief review of the county is provided here, and the reader is referred to Hester (1980) for a more detailed summary.

Prior to 1974, few archaeological projects had been conducted in Bexar County. The first documented investigation of Bexar County was in 1935 by S. W. Woolford (1935). Woolford discerned certain archaeological zones with specific kinds of sites. C. D. Orchard (1938) revised Woolford's assessment after his study of Olmos Basin.

A long hiatus in published research followed, and it was not until 1954 that further archaeological work was reported from Bexar County. Orchard and Campbell (1954) published a description of Paleo-Indian materials collected by Orchard from the Olmos Basin in the 1920s during the construction of Olmos Dam. Orchard observed over 100 hearths, and **Plainview** and **Angostura** points were listed among the collection.

The next published investigations from Bexar County appeared in 1960. Schuetz (1960) identified a number of flintworking locations on Pleistocene gravels along the Martinez Creek drainage. In the vicinities of the Olmos Basin and San Pedro Park, Orchard and Campbell (1960) described a series of sites containing such southwestern ceramics as **Reserve Black-on-White, Tularosa Black-on-White**, and **Las Lunas Smudged**. These may be indicators of an extensive exchange network and are dated between A.D. 950-1250.

In 1964, Wise (1964) excavated the Robard site in northeastern Bexar County. This site was interpreted as a flintworking location situated on a hilltop. Several large bifaces were recovered from this site, and it was stylistically dated to the Archaic period.

During 1966, three archaeological investigations were reported from Bexar County. The Rogers site (41 BX 22), located on a tributary of the Salado Creek, contained Archaic and Late Prehistoric components (Fawcett 1970). The Cutaway site (41 BX 37) was a Paleo-Indian site reported by Uecker (1966). A **Plainview** projectile point and other artifacts associated with an ash lense were recovered from this site. The Granberg site was reported in detail by Schuetz (1966), who was associated with the Witte Memorial Museum in San Antonio. The Granberg site was also located in the Salado Creek drainage and was probably a large camp occupied from Early Archaic to Late Prehistoric times (Schuetz 1966:67-68).

An archaeological survey was conducted by Hsu and Ralph in 1968 along the Cibolo Creek drainage in adjacent Wilson County. Late Prehistoric and Archaic sites were recorded along large alluvial terraces (Hsu and Ralph 1968). Also in 1968, Givens (1968) reported on excavations conducted by Trinity University at the Hitzfelder Cave site in 1967. Givens made the controversial interpretation that the human remains recovered from Hitzfelder Cave (41 BX 26) were morphologically distinct from American Indian **Homo sapiens** populations. Givens also suggested the Hitzfelder Cave specimens were biologically a heterogeneous population that exhibited evidence of pre-sapiens ancestry or were pre-sapiens themselves. The implication meant that the site would date from the extreme Lower Paleolithic, or more than 250,000 years ago. Collins (1970) demonstrated that this was unlikely, and that the morphological crania attributes discussed by Givens fell well within the range of Archaic period **Homo sapiens** populations from Texas. Furthermore, Middle and Late Archaic points were found with these skeletal materials (Collins 1970:301).

In 1970, W. B. Fawcett, Jr., became actively involved in the archaeology of Bexar County (e.g., Fawcett 1970; Fawcett and McGuff 1970). This interest culminated in a published overview of the prehistory of Bexar County (Fawcett 1972).

In 1971, C. D. Howard reported on surface finds of Paleo-Indian points in southern Bexar County, south of the Medina River (Howard 1971). Also in 1971, the Texas Archeological Survey conducted the initial reconnaissance of the Salado Creek watershed (Dibble 1979). One of their field recorded sites was subsequently designated 41 BX 300. During 1973, Scurlock and Hudson (1973) published their initial findings from the Walker Ranch, which is also situated in the upper Salado Creek drainage.

In 1974, the Center for Archaeological Research (CAR-UTSA) was created and immediately became actively involved in archaeological investigations in south-central Texas (Hester 1974). Additionally, 1974 was the year that the Southern Texas Archaeological Association (STAA) began publishing its journal, **La Tierra**, which furthered the documentation of archaeological research in Bexar County.

Since their inception in 1974, the CAR and the STAA have been extremely active in Bexar County and elsewhere in south, south-central, and southwestern Texas. By 1986, in Bexar County alone there are close to 600 recorded archaeological sites, where there were fewer than 50 in 1974. This is an average of 45 sites per year, and the CAR and STAA are almost totally responsible for this impressive archaeological achievement. In addition to site recording, both organizations have participated in the assessment, testing, and mitigation of numerous sites, one of which was 41 BX 300.

THE PANTHER SPRINGS CREEK SITE (41 BX 228)

Site 41 BX 228 is located approximately 10 km southwest of 41 BX 300, near the confluence of Panther Springs Creek and the upper Salado Creek (Fig. 4). Survey and testing activities between 1973 and 1978 had determined that the site was multicomponent, multifunctional, and quite rich in artifactual material and cultural features. Ongoing and uncontrolled looting activity was causing partial destruction of the site, and additional impact was anticipated directly from a Soil Conservation Service flood control project and indirectly from surrounding urban development. As a site within the Walker Ranch National Register Historic District, funds were provided in 1978 by the National Park Service, Rocky Mountain Region to conduct archaeological mitigation under the same contract (C3561[78]) as 41 BX 300.

Investigations at the site were conducted during the six months from July-December 1979. A wide range of methods was employed, including shovel tests, test squares, block excavation units, and backhoe trenches. Techniques for data recovery consisted of surface collection, hand and mechanical investigation, screening, extensive profile drawing, and the collection of samples of nonartifactual materials in variety and quantity. Among the most important aspects of the research design were the investigation of multiple burned rock features, the elucidation of the Early Archaic occupation period identified in the backhoe trenches, and the integration of this extensive and complex site into the larger patterns of prehistoric life in the upper Salado Creek watershed.

As a result of the archaeological mitigation of 41 BX 228, it is now well documented that "the Panther Springs Creek site, like many central Texas sites, was intermittently occupied over a relatively long time span (at least 5000 years)" (Black and McGraw 1985:272). From this investigation, a series of components was identified, described, and ordered into a sequence of local periods representing a substantial portion of the prehistory of the upper Salado Creek watershed. The earliest major occupation (Local Period 5), with a radiocarbon date of 3380 B.C., falls within the Early Archaic regional cultural period (Table 1). "The Local Period 5 component, although distinct from succeeding components, begins a long occupational sequence exhibiting considerable cultural continuity through time. Deer hunting and chipped stone tool making remain important activities throughout the succeeding components" (Black and McGraw 1985:275). These occupational components continue throughout the Archaic and Late Prehistoric regional cultural periods, concluding with Local Periods 10/11 radiocarbon dated at A.D. 980 (Table 1).

<u>VICINITY OF 41 BX 300</u> (Paul D. Lukowski)

Archaeological activity in the vicinity of Elm Waterhole has been reported over a period of 40 years (Kelly 1976). Professional archaeological investigations, however, only began a decade ago, in 1971. During August through November 1971, the Texas Archeological Survey Project, The University of Texas at Austin conducted a survey of the upper Salado Creek watershed (Fig. 4) prior to the construction of a series of floodwater retarding structures by the Soil Conservation Service (SCS). Fifteen potential dam sites were investigated, surface collections were made, and limited shovel testing was conducted (Dibble 1979).

At the proposed location of Floodwater Retarding Structure 13-A, six archaeological sites were recorded and numbered 1-6 (Dibble 1979:22). It is these six sites that were later re-recorded in 1975, when the Soil Conservation Service contracted with the CAR-UTSA to inventory the prehistoric resources in the Floodwater Retarding Structure 13-A project area. In 1976, an intensive survey and testing program were conducted by the CAR (Hester, Katz, and Kelly 1977). Monitoring of the sites between 1976 and 1978 led to the final phase of investigations, the activities reported herein.

Figure 1 indicates the relationship of the six prehistoric sites to Floodwater Retarding Structure 13-A. The 1971 arabic designations have been superseded by official trinomial site numbers: 41 BX 299, 41 BX 300, 41 BX 301, 41 BX 484, 41 BX 485, and 41 BX 486.

THE MENGER COLLECTION

The number and variety of prehistoric artifacts collected by various people in the Elm Waterhole vicinity are best documented by an extensive collection from the Menger brothers. A quantity of projectile points (Table 2), bifaces, and gouges, representative of different Archaic periods, were donated to the CAR-UTSA for analysis. These artifacts are reportedly from the Elm Waterhole Creek drainage, near 41 BX 300. The Mengers also carried out small, uncontrolled excavations within the northern portions of the burned rock midden at 41 BX 300 and have reported the location of other burned rock middens along Elm Waterhole Creek and other streams in the area.

PHASE I ACTIVITIES AT 41 BX 300

A surface reconnaissance was conducted by a two-man survey team, directed by Thomas C. Kelly, in the vicinity of 41 BX 300 in October 1975, under contract with the Soil Conservation Service, in order to inventory the prehistoric resources prior to construction of a floodwater retarding structure. This survey was part of a continuing series of surface surveys being conducted at that time by the CAR within the Salado Creek watershed. A total of 294 acres was surveyed in the area to be impacted by Floodwater Retarding Structure 13-A (Kelly 1975). During this time, three sites were recorded (41 BX 299, 41 BX 300, and 41 BX 301). Sites 41 BX 299 and 41 BX 301 were identified as extensive quarry workshops, and 41 BX 300 was described as a large open campsite (Fig. 1). A light lithic scatter, later designated 41 BX 486, was noted at this time, although indications during the Phase I survey were not sufficient to warrant site designation at that time (Kelly 1975). Small, general surface collections were made at 41 BX 300 and 41 BX 301; additionally, several test units and small shovel tests were excavated at 41 BX 300 (Table 3). The subsequent recommendations for sites 41 BX 300 and 41 BX 301 resulted in Phase II activities.

PHASE II ACTIVITIES AT 41 BX 300

As a result of the recommendations presented at the conclusion of Phase I, 41 BX 300 and 41 BX 301 were contracted for additional work during January-March 1976. An intensive survey of 41 BX 301 was conducted by Katz (1978); the work was directed at sampling this extensive quarry workshop and mapping the cultural and material resource areas. Field work at 41 BX 300 involved power augering to help delineate site boundaries and the excavation of additional test pits located in various areas of the site (Fig. 5,a,b; Table 3). Thomas C. Kelly directed the efforts at 41 BX 300 with volunteers from the STAA and The University of Texas at San Antonio anthropology classes (Hester, Katz, and Kelly 1977). The test units and auger holes located a large burned rock midden and at least two occupation areas. The occupation

TABLE 2. FREQUENCY OF PROJECTILE POINT TYPES WITHIN THE MENGER COLLECTION DONATED TO THE UNIVERSITY OF TEXAS AT SAN ANTONIO FOR ARCHAEOLOGICAL RESEARCH

a. FREQUENCY BY QUANTITY

Type Designation	Number of Specimens per Type	Percentage of Total per Type
Pedernales	66	25
Montell	27	10
Marshall	21	8
Frio	18	7
Uvalde	14	5
Martindale	12	5
Ensor, Edgewood, Castroville	11	4
Marcos	9	3
Tortugas, Lange	8	3
Nolan, Marcos-like	7	3
Angostura, Early Barbed, **Travis, Triangular**	5	2
Ensor-Frio, Langtry, Williams	2	<1
Bell, Early Corner Notched, **Fairland, Gower, La Jita**	1	<1
Total	261	

b. FREQUENCY BY CULTURAL PERIOD

Early Archaic		Middle Archaic		Late Archaic	
Type Designation	Number of Specimens %	Type Designation	Number of Specimens %	Type Designation	Number of Specimens %
Uvalde	14	**Pedernales**	66	**Montell**	27
Martindale	12	**Marshall**	21	**Frio**	18
Tortugas	8	**Lange**	8	**Ensor**	11
Angostura	5	**Nolan**	7	**Edgewood**	11
Early Barbed	5	**Travis**	5	**Castroville**	11
Triangular	5	**Langtry**	2	**Marcos**	9
Bell	1	**Williams**	2	**Marcos-**like	7
Early Corner Notched	1	**La Jita**	1	**Ensor-Frio**	2
Gower	1			**Fairland**	1
Total	52 (20%)		112 (43%)		97 (37%)

TABLE 3. 41 BX 300 EXCAVATION STATISTICS: PHASES I AND II

	Phase I (*Reconnaissance*)			Phase II (*Testing*)		
Phase III Site Areas	No. of Units Excavated	Excavated Area (m^2)	Excavated Volume (m^3)	No. of Units Excavated	Excavated Area (m^2)	Excavated Volume (m^3)
Blue						
Green				14	14.00	5.55
Red				7	7.00	4.80
White						
Yellow	2	1.00	0.31	1	1.00	0.68
Site Total	2	1.00	0.31	22	22.00	11.03
Off-Site Total	-0-			8	8.00	2.79
Project Total	2	1.00	0.31	30	30.00	13.82

a

b

Figure 5. **Phase II Testing.** a, cleared survey lane shown; b, screening of excavated matrix, Thomas C. Kelly at left, Shirley Van Der Veer at screen.

areas seemed to indicate the presence of multiple components, both vertically and horizontally distinct.

It was during the Phase II work that the potential for providing valuable scientific data was reinforced at 41 BX 300. Negotiations were carried out by Dr. Thomas R. Hester and the SCS to provide for the protection of 41 BX 300 during construction activities. The result was to pedestal the site, as the surrounding soil was removed for dam fill. Observations of the sides of the site exposed by pedestaling indicated the possibility of further vertical differentiation of cultural groups.

After construction operations were completed, three new sites were identified in the disturbed soil: 41 BX 484, 41 BX 485, and 41 BX 486. Previous to their partial destruction, these sites had been noted as areas with light flake scatters, and they had been subjected to a controlled surface collection (Table 4).

THE SITES

Site 41 BX 484

Site 41 BX 484 is located 180 m north-northeast of the 41 BX 300 central datum (Fig. 1). Most of the site was removed during borrow activities in 1976. However, two test pits (1- x 1-m units) were excavated on what is now believed to be the northern limits of the site. Additional work at the site consisted of a controlled surface collection of 300 m^2, organized by laying out 12 continuous pairs of 5- x 5-m units, and including the two excavated test units. Surface collections produced one **Castroville** projectile point, one **Marshall** projectile point, 11 biface fragments, 22 scrapers, 59 retouched flakes, and 261 unmodified flakes. Surface indications were of a moderately light (under 20 flakes per square meter) lithic scatter, although two adjacent collection units produced 70 and 117 flakes, respectively.

The two excavated units yielded moderately dense subsurface concentrations. One unit produced the following inventory from Level 1 (0-15 cm): a **Castroville** point, a **Marshall** point, the distal end of a biface, three scrapers, a blank, four retouched flakes, 51 primary flakes, 88 secondary flakes, and 595 interior flakes. Level 2 (15-30 cm) produced only unmodified flakes (two primary flakes, 23 secondary flakes, and 108 interior flakes). Only one level (0-15 cm) was excavated in the second unit; this produced one unidentified projectile point, five biface fragments, three cores, 22 scrapers, 15 retouched flakes, 12 primary flakes, 193 secondary flakes, and 519 interior flakes. A general surface collection after construction activities were completed yielded projectile points of the **Bulverde** (one), **Darl** (six), **Montell** (one), and **Pedernales** types. Table 4 provides a summary of the site collection.

Site 41 BX 485

Site 41 BX 485 is 10 x 50 m in size, situated 180 m south-southwest of the 41 BX 300 central datum (Fig. 1). It is identified as a buried burned rock

TABLE 4. SUMMARY OF RECOVERED SPECIMENS AT SITES IN THE VICINITY OF FLOODWATER RETARDING STRUCTURE 13-A, 1975-1976

Specimens	41 BX 484	41 BX 485	41 BX 486	41 BX 299	41 BX 301	41 BX 300 Phase I	41 BX 300 Phase II
CHIPPED STONE MANUFACTURING AND MAINTENANCE							
Cores				28	26		4
Chunks	4	24					1273
Interior flakes	1433	625	+	38	9	847	17,838
Platform cortex flakes							525
Secondary flakes	348	168	+	186	10	216	2406
Primary flakes	78	30	+	728	72	68	639
Blanks	1			+	3	5	16
Tested nodules					44		4
OTHER CHIPPED STONE TOOLS							
Perforators, gravers, and notches							15
Retouched flakes	69	26			3	2	161
Guadalupe tools			2				2
Unifaces and fragments	58	12		+		4	3
Bifaces and fragments	23			+			144
PROJECTILE POINTS							
Unidentifiable dart points	10		+				37
Paleo-Indian dart points					1		
Early Archaic dart points	1						1
Middle Archaic dart points	6				1	4	14
Late Archaic dart points	9			1	1	4	19
Arrow points							4
MINERALS		63					86
ORGANIC MATERIALS							
Other land snails		59					1156
Rabdotus		120					8831
Vegetal material							1
Seeds							8
Bones							76
HISTORIC PERIOD							
Ammunition							1
Metal		13					
Glass							5
Rough stone							2

midden. The midden was located immediately west and upslope from two test pits excavated in 1976. Material recovered in 1976 from Level 1 of a test pit included red ochre, yellow ochre, hematite, 25 primary flakes, 59 secondary flakes, and 354 interior flakes. Level 2 (15-30 cm) contained a distal biface fragment, five scrapers, 13 retouched flakes, five primary flakes, 105 secondary flakes, and 265 interior flakes. Data on material from the other test pit is not available. Table 4 summarizes the site collection.

Site 41 BX 486

Site 41 BX 486 was initially noted as a very light lithic scatter during 41 BX 300 Phase I investigations. The site is located on the east bank of Elm Waterhole Creek, 200 m south of the 1978 41 BX 300 central datum (Fig. 1). Site size was estimated at 50 x 75 m, but only after it was disturbed by construction activity. The site is in a flat area slightly elevated above the stream. A scatter of flakes, two **Guadalupe** tools, and a small collection of Late and Early Archaic projectile point types were collected at this site (Table 4).

Site 41 BX 299

Site 41 BX 299 is located approximately 100 m southeast of the 41 BX 300 central datum, across what was once a small intermittent stream (Fig. 1) which has since been enlarged by borrow activities. Cultural material covered a surface area 30 x 45 m adjacent to the bank, with the major axis running east to west. The soil is a thin, brown clay loam with limestone and chert exposed throughout the site.

A strip of six contiguous 5- x 5-m units, or an area of 150 m^2, was laid out through the long axis of the site and then surface collected. Given the original site size estimates, this surface collection represents a 9% sample of the site area. All humanly altered chert was collected, and subsequent analysis indicated that every available piece of chert had been altered in one manner or another (Kelly 1975).

The artifact inventory included a **Fairland** projectile point, quarry blanks, unifaces, preforms, and large chunks of chert, probably representing exhausted cores and core fragments. Additionally, 952 flakes were collected (Table 4).

Analysis indicated that flake type frequency decreased from primary flakes to secondary flakes to interior flakes (Table 4). Combined with the high incidence of roughly chipped stone tool forms, such as preforms and quarry blanks, and the relative scarcity of finished tools (only one dart point was recovered), the site was designated a quarry workshop.

Site 41 BX 301

During the 41 BX 300 Phase I survey, 41 BX 301 was recognized as a very large chert quarry on the southern slope of a hill 700 m west of the 41 BX 300 central datum and across a shallow drainage (Fig. 1). Site size is 400 x 300 m. During Phase II activities (Katz 1978), a grid of 100- x 100-m units was established for the site, and all lithic use and source localities were mapped by unit. During this activity, a parallel-flaked bifacial blade, a **Pedernales** point base, and an **Edgewood**-like projectile point were recovered. Additionally, a grid was laid out for a 25-m^2 dense use and source locality for detailed field analysis of lithic materials. Eleven of the 25 units were investigated (a 44% random sample). A virtual absence of quarry blanks and tools was recorded; the most common artifacts present were "tested cobbles" and primary flakes (Table 4).

Katz (1978:7) suggested a "test and retrieve" behavioral pattern for this site. Whether or not the artifacts were removed to another work (use) area within the site or the tested cobbles were completely removed to another locality (perhaps 41 BX 300) is unknown.

Site 41 BX 300

When 41 BX 300 was first recorded in 1975, it was immediately recognized as a major open campsite with extensive boundaries (Fig. 1). Two small units (0.50 x 1 m) were excavated in the side of a SCS geological test pit (Fig. 11) to obtain profiles and to gain some perspective on the extent and nature of cultural depositions. In addition, a small surface collection was made, and small shovel tests were located around the site to assist in estimating the boundaries. The soil profiles indicated dark clayey soils, minimally 50 cm deep, overlying sterile bedded yellow gravels. Two **Frio**, two **Montell**, and four **Pedernales** projectile points were recovered from the test pits. Also, one biface, two retouched flakes, and 1107 unretouched flakes were recovered.

Phase II activities carried out in 1976 resulted in 29 additional 1-m^2 units, widely spaced around the site (Fig. 5,a,b). In addition, a program of extensive power augering was conducted across the site in an attempt to establish its periphery. The excavations located one burned rock midden (designated Area Red) and a Late Archaic and Late Prehistoric activity area (designated Area Green). Diagnostic artifacts in identifiably distinct horizontal and vertical contexts were projectile points relatively dated from the Early Archaic to the Late Prehistoric periods. Table 4 provides a summary of all material recovered during the Phase I (reconnaissance) and Phase II (testing) activities at 41 BX 300.

Immediately after completion of the testing program, borrow activities at the site began. Through negotiations between the SCS and the CAR-UTSA it was agreed to modify the proposed borrow area which would have resulted in the destruction of the site. Circumferential borrowing continued around the remaining three areas of the site area, resulting in a pedestal 12 feet above the surrounding floodpool areas.

Profiles exposed around the periphery of the remaining site showed an even more complex and deeper site than the Phase II testing had indicated. Deep sections were revealed in the northwest portion (later designated Area Blue), and more evidence of horizontally separate components was suggested by artifacts eroding from all sides of the site. It soon became apparent that erosion of the pedestaled sides of the site would lead to its rapid destruction. Due to its National Register status (41 BX 300 was nominated to the National Register of Historic Places in 1976), funds for archaeological mitigation were provided by the National Park Service, Rocky Mountain Region under the provisions of Public Law 93-291.

SUMMARY

Although only limited work was conducted at the six sites, evidence of a prehistorically popular area was indicated. Of the six sites, two (41 BX 299 and 41 BX 301) are chert quarry areas, apparently serving 41 BX 300 and the other sites in different capacities. Sites 41 BX 300, 41 BX 484, and 41 BX 486 show ample evidence of being open campsites; and it is likely that 41 BX 485, with its high concentration of tool forms, also represents a campsite. However, the amount and diversity of the cultural deposits at, and the physical extent of, 41 BX 300 indicated that it was the primary locus of activity in the area.

The most significant aspects of prehistoric human behavior brought to light by the previous research in the area are: (1) the clustering of occupational sites around Elm Waterhole (Fig. 1); and (2) the differences reflected within the inventories of the chert quarries in the area.

The sites occurring along the stream channel in the immediate vicinity of 41 BX 300 indicate a preferred habitation area extant during the Archaic and Late Prehistoric cultural periods. A series of burned rock middens reported by the Menger family just outside of the study area of 41 BX 300 tends to support this view. This pattern is further reflected in other areas along the Edwards Plateau boundary in Bexar County (Gerstle, Kelly, and Assad 1978:195-213; Fig. 4).

The quarry sites reflect different resource utilization patterns, possibly relating to their proximity to adjacent sites and/or the quality of the material available. The distance between 41 BX 301 and 41 BX 300 is 700 m. This distance may be a factor in the differential utilization patterns expressed between 41 BX 301 and 41 BX 299, the latter located less than 100 m from 41 BX 300.

Katz (1978) demonstrates that the proportionally high occurrence of primary flakes and tested cobbles, and an unusual absence of quarry blanks, rough tools, and cores, probably reflect what he terms "a test and retrieve" resource procurement strategy at 41 BX 301. This contrasts with the increase in secondary flakes and the more common occurrence of rough tool forms and cores noted at 41 BX 299 (Table 4), which indicates some tool processing prior to transporting the chert resources to other locations. It may be that there was a tendency for specific trips to 41 BX 301 to gather cobbles and return them, essentially unaltered, to a campsite, while the closer (and smaller) quarry (41 BX 299) may have been utilized more often, resulting in heavier concentrations of lithic reduction debris. In other words, the minimum amount of effort needed to quickly retrieve material from 41 BX 299 and the ability to do so without losing contact with a nearby camp area may have made the site a more desirable location for small, quickly needed supplies of chert. To obtain larger amounts of raw materials for major tool production, however, it is suggested that planned procurement trips to 41 BX 301 may have been necessary.

RESEARCH DESIGN

Mitigation activities at 41 BX 300 represented the last opportunity to retrieve valuable cultural and behavioral data before the dual effects of flooding and erosion took their toll. Earlier phases of investigation had indicated that the site was as potentially complicated as it was rich. There was depth to the site, with definite evidence for multiple episodes of human occupation. In addition, different areas of the site yielded chronologically different material, which suggested horizontally distinct components as well. As a final complication, different types of burned rock features, such as a midden, hearths, and a scatter, were identified in distinct areas of the site.

A detailed research design was developed to guide the field investigations, structure the subsequent analyses, and provide a framework for the interpretations. There are three components, or dimensions, to the design. First, there are a series of 10 objectives which the project intended to achieve through field work and subsequent analysis of recovered artifacts, ecofacts, and special samples. One or more of these objectives was also subsumed within at least one of four hypotheses, which the project proposed to test. These two dimensions of the design are graphically presented as a matrix in Table 5. The third dimension is space, in that the different areas of the site which were suspected of representing chronologically distinct occupation episodes were identified and individually investigated.

RESEARCH OBJECTIVES

Of the following 10 objectives, the first nine were provided in the scope of work prepared by the National Park Service for this mitigation project. Some are considered problems important for south-central Texas archaeology, and others are presented as more general anthropological issues. It is clearly stated in the scope of work that these problems, both local and general, represent only a minimal set of problems that could be addressed by this research project. However, we considered this list to be fairly comprehensive, and only one additional objective was added. Our primary expansion of the scope of work was to reformulate these objectives into four testable hypotheses. Each of the 10 objectives was considered achievable in its own right, and they retained their identity during the field work, analysis, and interpretive phases of the project. The 10 research objectives are briefly stated; the degree of their achievement will be considered in the Summary and Evaluation section of this report.

1. To define the function(s) of burned rock features, including middens, concentrations, and scatters, identified at the site.

2. To reconstruct the accumulation processes of these features.

3. To define the functions of specific artifacts and tool kits recorded during the investigation.

4. To identify and chronologically order artifact assemblages identified at the site.

5. To conduct functionally oriented lifeway analyses employing material recovered during the investigation.

6. To identify specific activities by means of activity area analyses.

7. To determine the relative sizes of population aggregates occupying the site through time.

8. To identify subsistence organization and land and resource utilization at different periods of site occupation.

9. To conduct diachronic studies of sociocultural stability and change in hunting-gathering groups frequenting the site and its vicinity.

10. To reconstruct climate and the natural environment of the site vicinity through time.

TABLE 5. RESEARCH DESIGN MATRIX: OBJECTIVES AND HYPOTHESES

	Hypotheses:			
Objectives	A	B	C	D
1		X		X
2	X			
3		X		X
4		X	X	
5		X		X
6		X		X
7			X	X
8	X			X
9		X	X	X
10			X	X

Research Hypotheses

The following hypotheses were developed by Dr. Joel Gunn, of The University of Texas at San Antonio, one of the co-principal investigators of this project, as part of the ongoing research being conducted by the UTSA Center for Archaeological Research which is concerned with central and south-central Texas. The hypotheses are presented in the light of testable objectives to be achieved by the subsurface investigations at 41 BX 300. The research hypotheses are again examined in the Summary and Evaluation section of this report in order to assess the data obtained through mitigation activities at 41 BX 300.

A. Positive Sedimentation Hypothesis

This hypothesis investigates the relationships between physiography and the amount of deposition, both cultural and natural, at archaeological sites. An inverse relationship has been demonstrated between the presence of physiographic restraints and the concentration of human activity. Where the terrain is relatively flat and open, sites tend to be extensive but shallow. By contrast, where there are slopes, bluffs, and terraces, the sites tend to be smaller in area and more extensive in depth. These relationships have been empirically demonstrated by several extensive surveys conducted by the UTSA Center for Archaeological Research, such as that for the 201 Wastewater Treatment project (Fox 1977; Gunn, Ivey, and Hester 1977) and the Fort Sam Houston project (Gerstle, Kelly, and Assad 1978).

The buildup of sediment at sites characterized by physical restraints is thought to occur as follows. The limited physical space results in repeated occupation in a small area, perhaps even the same spot. This intensity of human activity results in more intensive and luxuriant plant growth, due to reasons such as the disturbed soil, chemical additives, and the introduction of additional plant material through human agents. More vegetation in this restricted space, coupled with the presence of burned rock debris deposited at certain cultural phases, act as a sediment trap, and soil accumulates at a faster rate than would normally be the case.

Site 41 BX 300 represents a good test of this hypothesis. It is a deeply stratified site situated in a very restricted physical space. Burned rock is known to be present. What will be tested is not so much the basic relationship, which seems to be well in evidence, but rather the corollary that more intensive human occupation will result in a faster buildup of soil. This quantitative relationship can be tested by studying the relationship between different phases of cultural occupation and the dimensions of their associated soil zones.

B. Occupation Floor Trajectory Hypothesis

Previous research in the region has demonstrated the ability of researchers to recognize aggradation floors within nonstratified burned rock features associated with habitation activities (Gunn and Mahula 1977). This requires employment of what has been called the "rock bottom" microstrata excavation technique, involving the careful peeling of individual layers of rock and the recording of cultural material, ecofacts, and burned rock morphology associated with each microstratum.

Some of the results of this technique have indicated that a single burned rock midden is able to demonstrate a change in tool orientation from core tool/biface to flake tool/blade-and-core from the bottom (earlier) to the top (later) portions of the feature. As these tool orientations are associated with a climatic change from mesic to xeric conditions, the data potential of the longevity of the feature's use as a habitation platform becomes even more valuable.

Preliminary investigation at 41 BX 300 has recognized several types of burned rock features. One is a "domed" midden similar to that which yielded the preceding interpretation when subjected to microstrata excavation. This technique will be applied to a portion of the burned rock midden at 41 BX 300. In addition, intrasite comparison of burned rock features will be conducted, with the objective of identifying habitation and nonhabitation types or examples within types. Complementing this refined excavation technique will be a battery of analyses conducted on recovered cultural and natural material to obtain functional, chronological, and environmental data.

C. Population Variation on a Broad Ecotone Hypothesis

South-central Texas is part of the broad plains/forest ecotone which transects Texas from north to south and which is affected by changes in both temperature and moisture which move in east-west shifts. Human populations exploiting the resources of this ecotone are expected to exhibit characteristics of either the desert west or the humid east at different phases of occupation, depending on which climatic regime is dominant in the region at the time of the occupation.

Reconstruction of historic Indian demographic structure in south Texas (Campbell 1975, 1977) has enabled archaeologists to correlate population estimates and rainfall amounts and then extrapolate this index into prehistoric times (Gunn and Hester n.d.). If a reasonable reconstruction of climate during a specific prehistoric period can be made, then it is possible to suggest comparable demographic characteristics as well (Gunn 1979).

Several avenues of investigation for the reconstruction of climate and environment are being pursued at 41 BX 300, including the collection of a variety of organic samples and the analysis of phytoliths. Changes in climate and environment are expected to be documented by integrating the climatic data with the culture historic sequence to be developed at the site. Following from this, relative demographic changes through time can be postulated by reference to changes in climate.

D. General Occupation Density Hypothesis

In order to gather base line data and to provide a control for both field and analytical investigations, a linear physiographic/ecological transect has been established by the UTSA Center for Archaeological Research through the region in which most of its archaeological work is conducted. The transect spans

> microhabitats--from terraces adjacent to water courses, through valley slopes, upland margins, uplands, upland slopes and hilltops. The transect trends linearly from low and wet to high and dry, and reflects, in general outline, the relative usefulness of each

microhabitat to hunter and gatherer exploitation (Hester, Gunn, and Katz 1977:29).

The definition and isolation of microhabitats are crucial for an analysis of hunter-gatherer exploitation. We are operating under the hypothesis that, given a specific climatic regime, subsistence procurement time is apportioned between microhabitats according to a seasonal schedule of resource availability within each microhabitat.

Site 41 BX 300 is situated at the lower and wetter end of the physiographic transect. It can be hypothesized that the site would have been occupied by relatively dense hunter-gatherer populations during wetter climatic regimes, when subsistence was relatively easy due to abundant resources in the aquatic and riparian zones and on the nearby slopes and terraces of the small valley. By contrast, during drier regimes, the site would have been less attractive and consequently less utilized; reduced subsistence resources are presumed to have resulted in more nomadism by smaller groups of people, exploiting a more extensive area for a broader spectrum of subsistence items.

Research Areas

While the exact extent and depth of the site could not be determined until the mitigation phase of investigation, a great deal of data about artifact distribution and tentative chronological periods were available from a number of sources. These include the Phase I and Phase II activities; a large collection of projectile points and other chipped stone artifacts donated to UTSA by the Menger brothers of San Antonio, and occasional visits to the site during and after SCS construction activities by UTSA and NPS staff members.

The conclusions drawn from all these data sources permit the subdivision of the site remnant into four preliminary sectors. Each has its own stratigraphic and culture content character, suggesting that each should be independently investigated with methods and techniques appropriate to the specific area. The following descriptions are taken from the proposal submitted by the UTSA Center for Archaeological Research to the National Park Service (Hester, Gunn, and Katz 1977):

Southern Sector

The bulldozer cuts have exposed burned rock lenses (perhaps living floors) and isolated hearths. Soil changes from a brown, culture-bearing alluvium, to a tannish-clay, containing patinated flakes (such patina has been found, based on other excavation in the region, to indicate relative antiquity--to Pre-Archaic times and earlier).

Central Sector

In this area there is a "classic" central Texas domed burned rock midden, essentially buried. Portions were tested in 1976; it appears to date from the Middle Archaic, and to be underlain by an Early to Pre-Archaic occupation. Testing was not sufficiently refined to determine whether or not the entire midden dated to the Middle Archaic, or if, in fact, deeper portions had accumulated prior to that time.

Northeastern Sector

To the northeast of the burned rock midden is a high area adjacent to the west bank of Elm Waterhole. Test excavations in 1976 revealed abundant cultural debris from Late Archaic and Late Prehistoric occupations. In addition to lithics and burned rock debris, an **in situ** hearth was uncovered. Deposits in this area are shallow (± 30-40 cm), overlying a cobble-gravel formation. The Late Archaic and Late Prehistoric occupations at the site appear to be mainly restricted to this midden area.

Northwestern Sector

This area is thought to be 3-4 m in depth, and is exposed by a borrow pit cut. Stratigraphy is variable, and has not yet been systematically studied. This area, and its potential for deep, chronologically-significant, deposits was not recognized until after the borrow pit had been dug. In one area, about a meter of gray-brown alluvium (with flakes and other debris) overlies a clay formation. Weathering from that formation, 2-3 m below the surface, was a **Guadalupe** tool (Pre-Archaic) and a fragment of bison bone.

EXCAVATION PROCEDURES

(Paul Lukowski and Paul Katz)

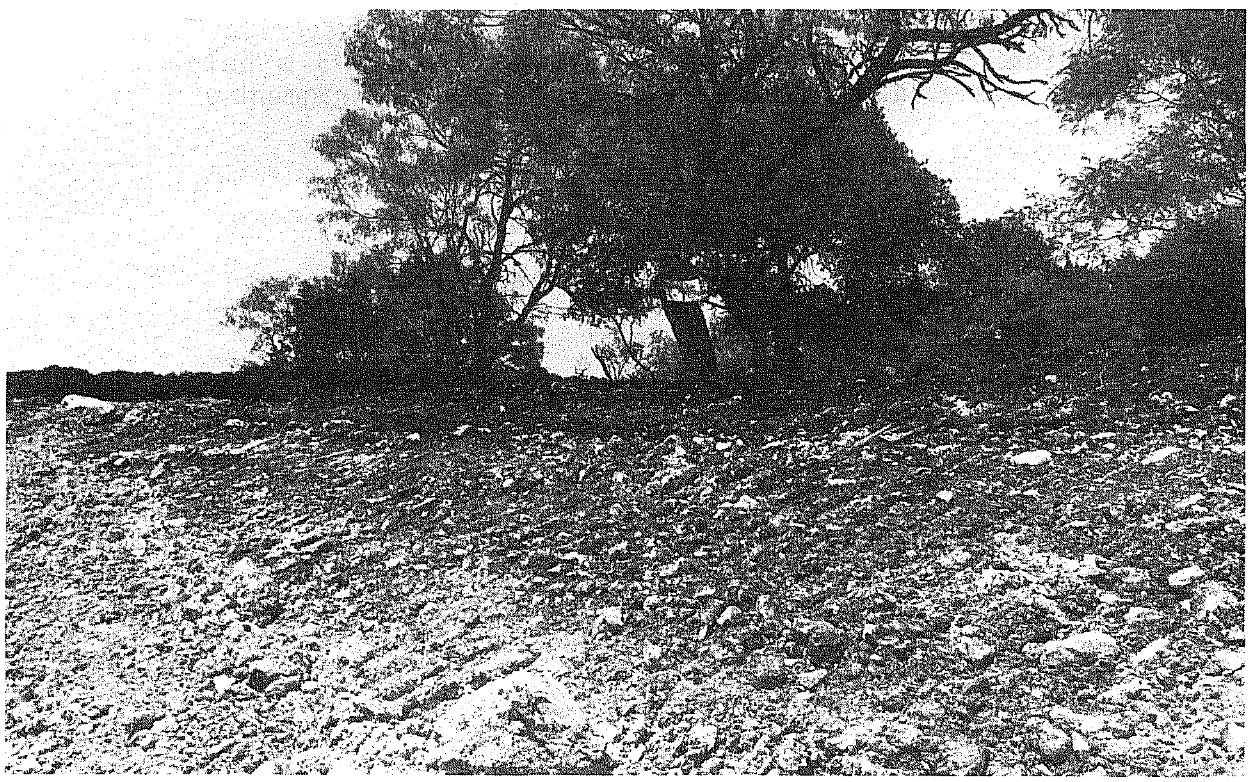
EXCAVATION CONTROL

HORIZONTAL

As previously mentioned, the construction of the eastern dam and emergency spillway berms for Floodwater Retarding Structure 13-A necessitated the borrowing of soil from the periphery of site 41 BX 300 (Figs. 1; 6,a). When the project was finished, the site had been completely pedestaled. With Elm Waterhole on the north end, cattle ponds along the west side, and the channel of Elm Waterhole Creek running along the east and south peripheries, the remnant of 41 BX 300 took on the aspect of an island, especially after a heavy or prolonged rain (Figs. 2,b; 7,a,b; 8).

The subsequent water erosion at the base of the pedestal was actually a mixed blessing. In time, of course, irreparable damage will be done to the site; and this fact accounts in large measure for the funding provided for mitigation by the National Park Serivce. At the same time, however, stratigraphic

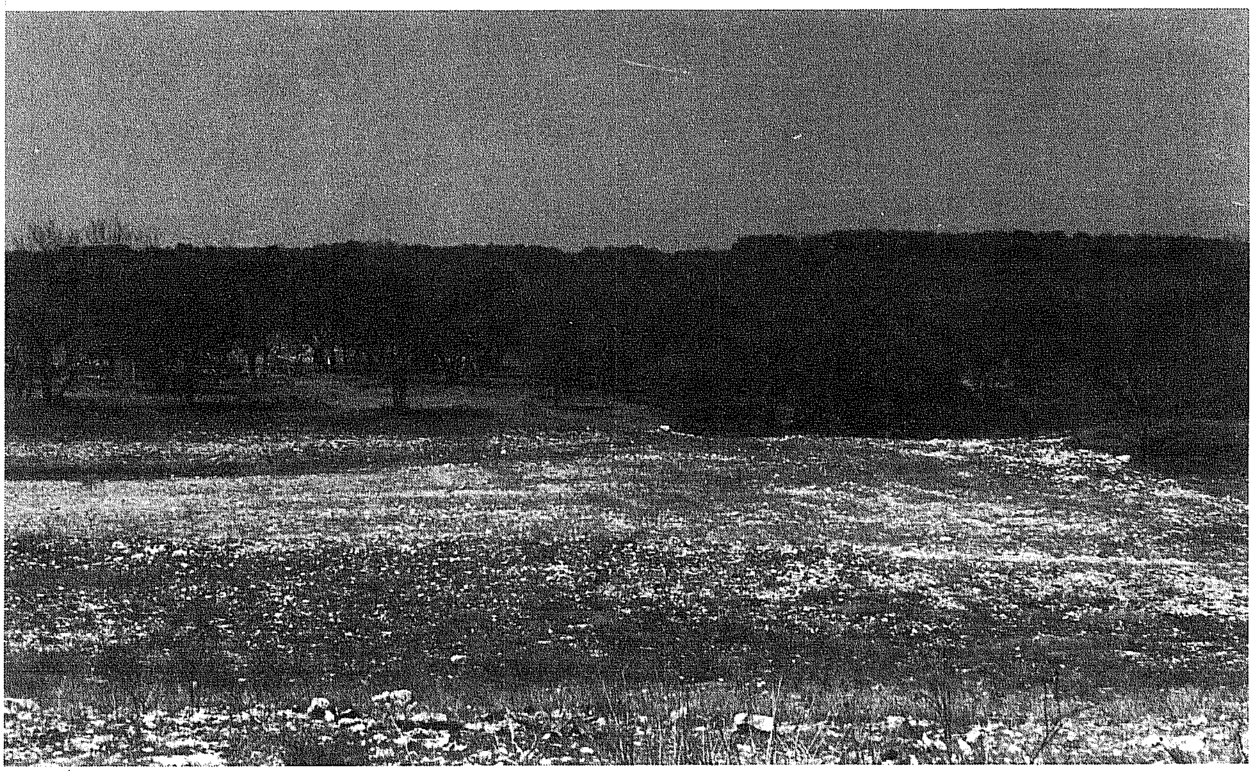
a



b

Figure 6. **Excavation at Site 41 BX 300.** a, construction activity between Phases II and III; b, steep embankment at northwest corner (Area Blue).

a



b

Figure 7. **Southern and Northern Views of 41 BX 300.** a, south portion of site during Phase III; b, north portion of site; note waterhole at right.

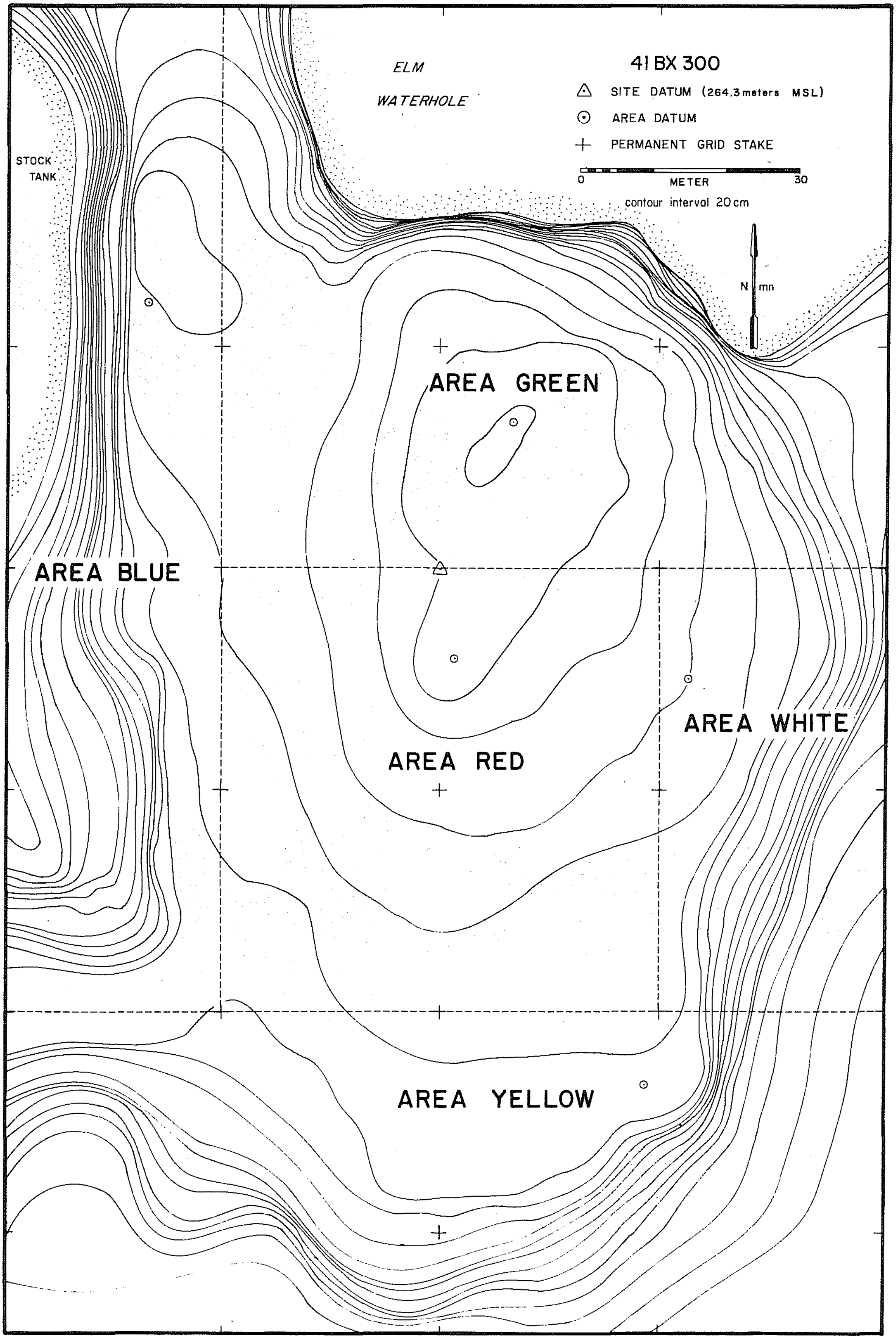


Figure 8. **Site Contours and Phase III Excavation Areas.**

exposures and uncovered artifactual material, especially on the northwestern margin (Figs. 6,b; 8), strengthened the case for mitigation activity and provided valuable data for excavation strategy and documentation.

Pedestaling of the remaining portion of the original site area produced one additional advantage: the exact boundaries of the excavation were sharply delineated. It was thus possible to calculate the remnant site area to be 13,800 m^2 (1.38 hectares), or 3.41 acres.

Horizontal control of the excavation was maintained by means of two completely independent systems. First a Point Designation System was established by selecting a single point to be the Site Datum (denoted ST) and assigning coordinates to this unique point. As the anticipated computerization of the data base necessitated avoiding negative coordinates or letters representing compass directions, the Site Datum was consequently assigned the coordinates of 1000 m east and 1000 m north (Fig. 9) of an arbitrary and inconsequential point. Any point on the site could then be assigned corresponding coordinates by ostensibly measuring from the Zero point, but in actuality measurements were taken from the Site Datum. Coordinates were always recorded as east and north of the Zero point, and in this specific order, again for computerization consistency. Site points with coordinates smaller than 1000 m were located either west and/or south of the Site Datum, those greater than 1000 m were east and/or north of the Site Datum.

A more elaborate Unit Designation System was also established. First a grid of 10 x 10 m blocks was laid down over the entire site, keyed into the Point Designation System and the Site Datum (Fig. 9). Each block was assigned a three-digit identification, beginning in the northwest corner of the site with "001." Numbers were assigned consecutively in rows from west to east, moving progressively from north to south. One hundred and fifty block designations were assigned, although some blocks did not actually exist (Fig. 9). Subsequently, identified blocks around the periphery of the initial 150 were numbered in a clockwise manner, beginning with "151" in the northwest corner (Fig. 9).

Each block could then be subdivided into 100 1 x 1 m squares, or Units. These were also individually numbered in the same manner, row by row, beginning with "001" in the northwest corner of each block and terminating with "100" in the southwest corner. A unique six-digit designation was thus available for any 1-m^2 unit anywhere on the site, the first three digits representing a 10-m^2 block, and the second three digits identifying the specific interior 1-m^2 unit. Units could also be identified by the coordinates of their southwest corner, using the Point Designation System. Because the entire site was gridded down to the square meter, it was possible to incorporate Phase II excavation units into the Phase III system of control, excavation, and analysis.

The Unit Designation System was found to be more convenient in daily excavation activities than was the Point Designation System. It was easier to refer to, and record data about, a unit designated by a six-digit number than it would have been using two alpha-numeric coordinates. Furthermore, an

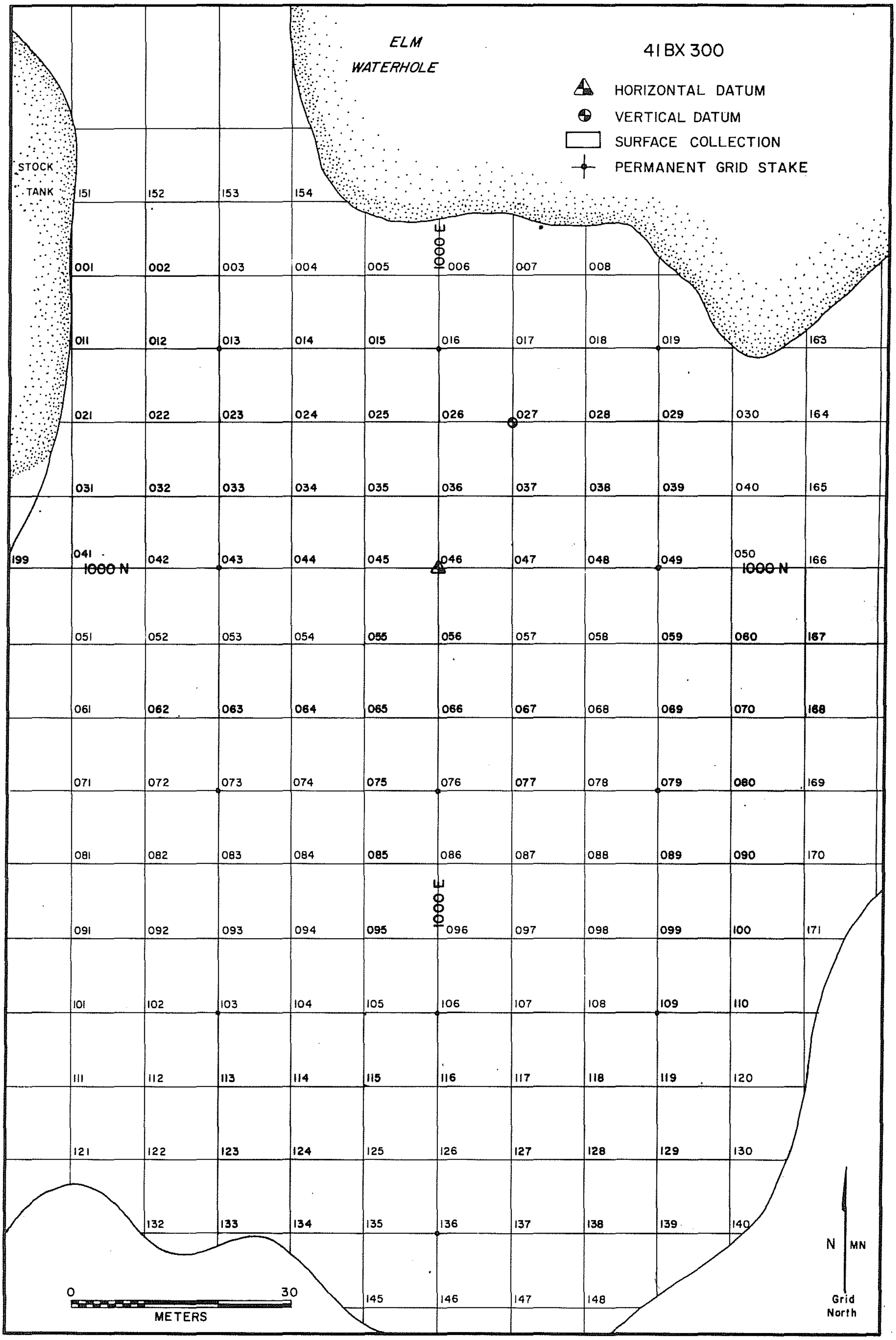


Figure 9. **System of Designating 10-m Blocks, and Blocks Surface Collected.**

inevitable confusion would have developed in trying to refer to a block and its southwesternmost interior unit (Unit 091) by the same coordinates.

The Site Datum, and every coordinate point at 30 m intervals from it in every cardinal direction, were permanently marked on the ground by metal rods (Fig. 8). These permitted the rapid location of any block or unit.

A third system of subdividing the horizontal area of the site was employed, although it functioned more for convenience and quick reference than it did for strict control. Based on the Phase II investigations and subsequent monitoring of site periphery erosion and artifact occurrences, a tentative pattern of horizontally distinct, diachronic occupations was recognized (see preceding section). The site was consequently apportioned into five different areas, and each was designated by a different color (Fig. 8). Area Blue represents the western edge of the site, in particular the northwestern corner where artifacts of Early Archaic, and possibly Late Paleo-Indian affiliation, were recovered by monitoring the eroding slope (Fig. 6,b). The northern and northeastern portion, abutting Elm Waterhole, was designated Area Green (Fig. 7,b); Phase II testing recovered evidence of Late Archaic and Late Prehistoric activity in this area. Area White, along the eastern side of the site (Fig. 7,a,b), exhibited small limestone hearths eroding from the subsoil. The southern end of the site (Fig. 7,a), Area Yellow, consistently yielded Early and Middle Archaic artifacts when surveyed. Finally, the center of the site, characterized by the single observable burned rock midden, was designated as Area Red.

VERTICAL

While ultimate vertical control of the excavation was maintained from the Site Datum (coordinates 1000 E, 1000 N), measurements of excavation depth could be taken from any of three different types of control points. The Site Datum itself was one such point; and whether or not it was employed directly in the field, all depth measurements were eventually related to the Site Datum for intra-site comparisons and overall excavation consistency. In practice, however, the size of the site and the extensive distribution of excavation units made direct depth measurement from the Site Datum impractical, even with a telescopic level and stadia rod. Furthermore, the Site Datum was not the point of highest site elevation (Figs. 8, 10), as it was selected with the primary consideration of establishing the horizontal grid system. It was located in a central east to west position, close to the midden which was the focus of the research design, and it was situated in a cleared portion of the site to facilitate the taping of the initial 10-m blocks (Figs. 8, 9).

A series of intermediate-level depth control points was established to assist in the daily recording of excavation data and to facilitate the establishment of new excavation units. The highest point of elevation in each of the five-colored designated areas became a secondary, or Area Datum, point (Fig. 8). All excavation depths not determined directly by instrument from the Site Datum were measured with respect to the ground surface level of the appropriate Area Datum. All depths so measured were subsequently recalculated in the laboratory to reflect depth below the Site Datum for

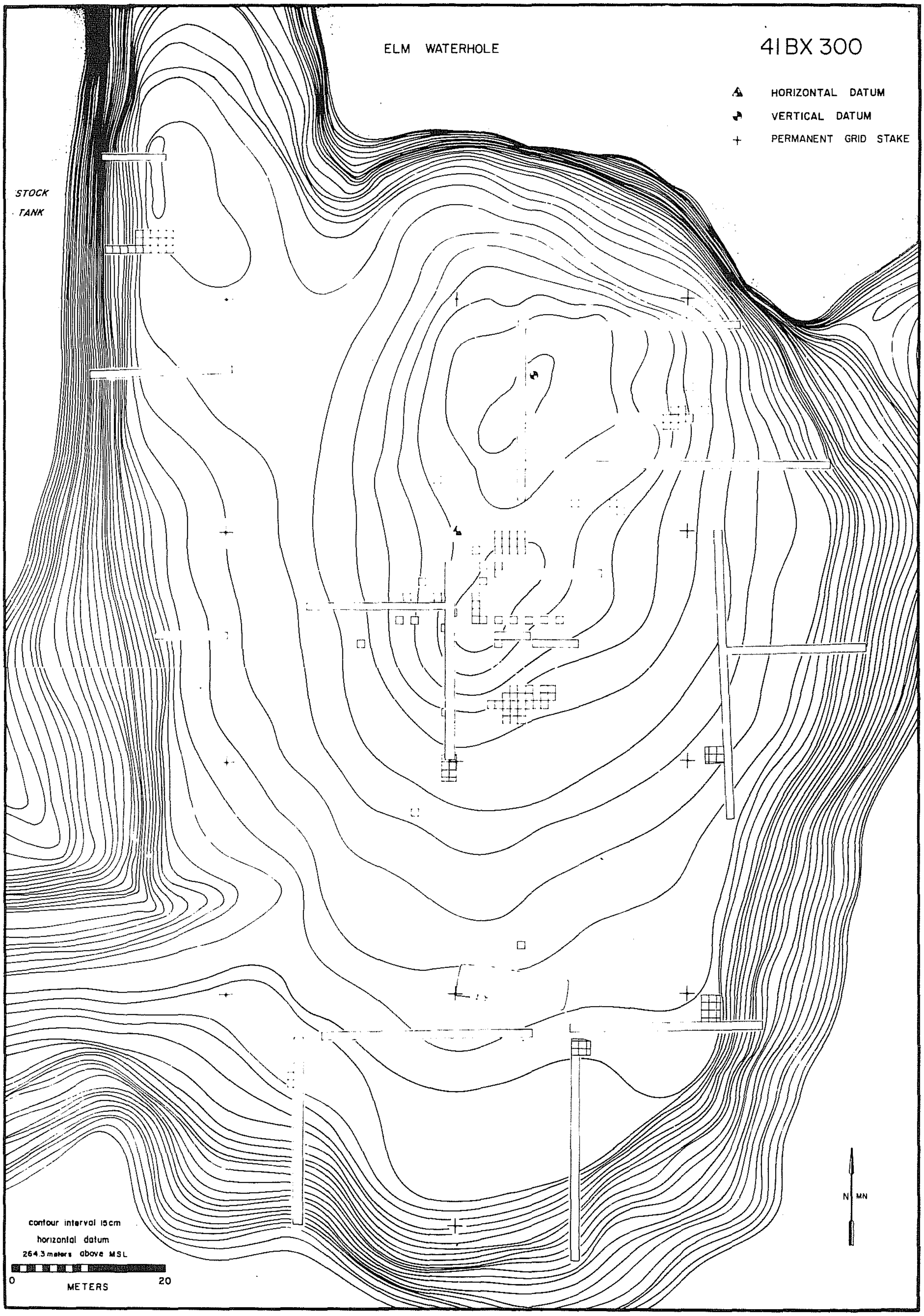


Figure 10. **Contour Map of Site, Showing All Trenches and Units Excavated During All Phases.**

mutual comparability between areas. The Area Green Datum is the point of highest elevation on the site (Figs. 8, 10). Table 6 provides the relationships between the Site Datum elevation and the five surrounding Area Datum points, as well as the relative elevational differences between the five Area Datum points.

During the course of excavations, depth measurements were usually recorded manually with string, line level, and folding rule. The southwest corner was consistently employed, this being the corner with unit designation coordinates. Depth below ground surface at the southwest corner was initially recorded as depth below ground surface at the appropriate Area Datum, later to be further converted to depth below ground surface at the Site Datum.

TABLE 6. ELEVATIONAL RELATIONSHIPS BETWEEN SITE DATUM AND AREA DATUM POINTS

Area Datum	Centimeters Above (-) or Below (+) Site Datum	Centimeters Below Green Datum
Green	-22.0	0.0
Red	-13.5	8.5
White	+40.0	62.0
Blue	+44.0	66.0
Yellow	+86.5	108.5

As the field work progressed, natural and cultural stratigraphic levels were identified and integrated into the excavation design. Whenever possible thereafter, the stratigraphic level being excavated was recorded along with the metric depth below datum as a further means of vertical control. After all Area Datum measurements were converted to depths below Site Datum, the stratigraphic level designations recorded everywhere in the excavations significantly aided the comparisons and interpretations of stratigraphic profiles drawn in selected, but less numerous, locations around the site.

A final aspect of vertical control was the special consideration accorded features whenever one was so designated. As feature excavation proceeded holistically and typically overrode local arbitrary levels, depth controls were established which pertained specifically to the feature under investigation. Usually a special tertiary datum point was established for the duration of the feature's excavation. The ground surface of this point was visually related directly to the ground surface of the Site Datum, if possible; if not, then the nearest Area Datum point was employed as an intermediate point of reference, with depth measurements converted to Site Datum ground surface as usual.

EXCAVATION METHODS AND TECHNIQUES

METHODS

Six distinct methods of excavation were employed during the course of Phase III investigations at 41 BX 300. These included the backhoe trench, trench section, block, isolated unit, and two varieties of feature excavation.

Eighteen backhoe trenches were cut, all one meter wide (Fig. 15,b), and their combined lengths totaled 381 m (Tables 7 and 9). Average trench depths varied from 55 cm in Omega-E (Fig. 23) to 217 cm in November (Fig. 21). All trenches were cut into the subsoil to a depth definitely below any cultural manifestations identified in the respective trench. Area Red contained the largest number with six trenches (Fig. 12), followed by Areas Green and Yellow with four each, then Areas Blue and White with two each (Figs. 10 and 11). Trenches were cut along lines of the grid system (Fig. 11) to facilitate their mapping and the recording of their associated artifacts by exact coordinates (Fig. 13,a). Trenches were assigned names in the order they were cut, employing the words associated with the phonetic alphabet of the armed services and aeronautics. Components of a broken or offset trench line were designated by the same name, but distinguished by compass letters (Fig. 11). Table 7 provides the names of the various trenches, their respective areas, maximum lengths, average depths, and orientation.

A trench section was a small area cut away from the side of a trench for the purpose of investigating an anomaly identified in the trench wall (Fig. 13,b). The size and extent of extra-trench penetration was determined entirely by the anomaly and whatever measures were needed for its exploration. For easier mapping and data recording, trench sections were incorporated into the grid system and, upon completion, took on the appearance of block excavations. Four trench sections were cut during Phase III investigations, all designed to pursue lenses of burned rock in their associated trench walls (Fig. 11). Three trench sections uncovered concentrations of rock that were later accorded feature status: Feature 8, at the south end of Hotel trench (Figs. 12; 34,a; 41); Feature 10, on the west side of Kilo trench (Figs. 36,a; 37); and Feature 11, at the north end of Charlie trench (Figs. 36,b; 39). The fourth trench section, on the north side of Alfa-E trench, revealed burned rock in too dispersed a configuration to be considered a feature (Fig. 13,b).

The various block excavations conducted during the 41 BX 300 mitigation activities should not be confused with the 10-m "blocks" comprising the framework of the site grid system. The excavated block grew by accretion, representing a series of contiguous one-meter units (Fig. 14,b). A block of excavated units usually resulted either from the search for something specific or from the expansion from something previously located. "Search" blocks characterize the excavations in Areas Blue and Green (Figs. 8, 10, 11), where surface collection and limited testing in previous phases produced artifacts of several distinct chronological periods. While technically a block excavation, one series of contiguous units in Area Blue took on the appearance of a trench when completed (Figs. 10; 11; 15,a). The objective of precise artifact recording necessitated digging by hand; but difficulties

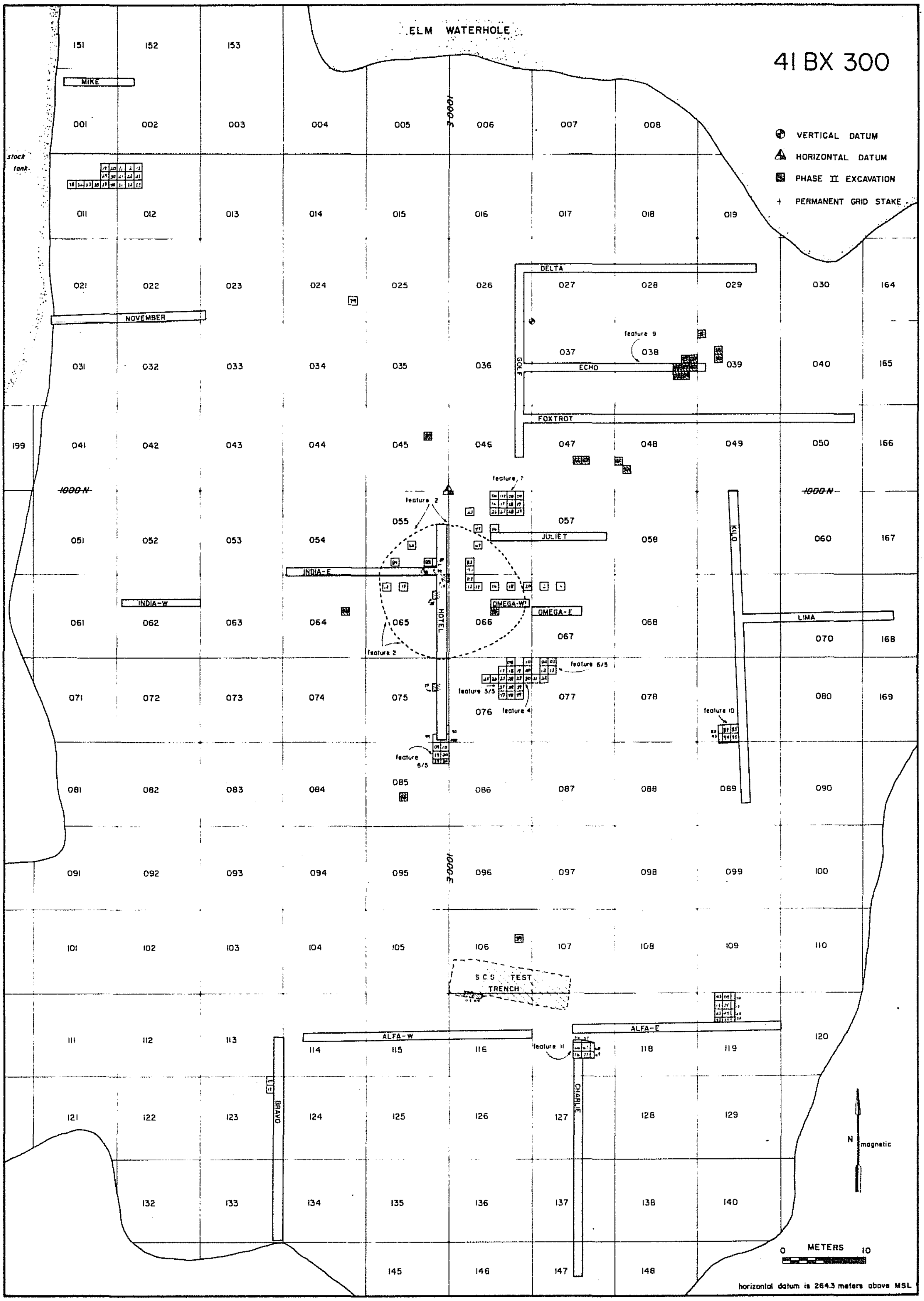


Figure 11. **Trenches and Units Excavated During All Phases, With Phase III Features Indicated.**

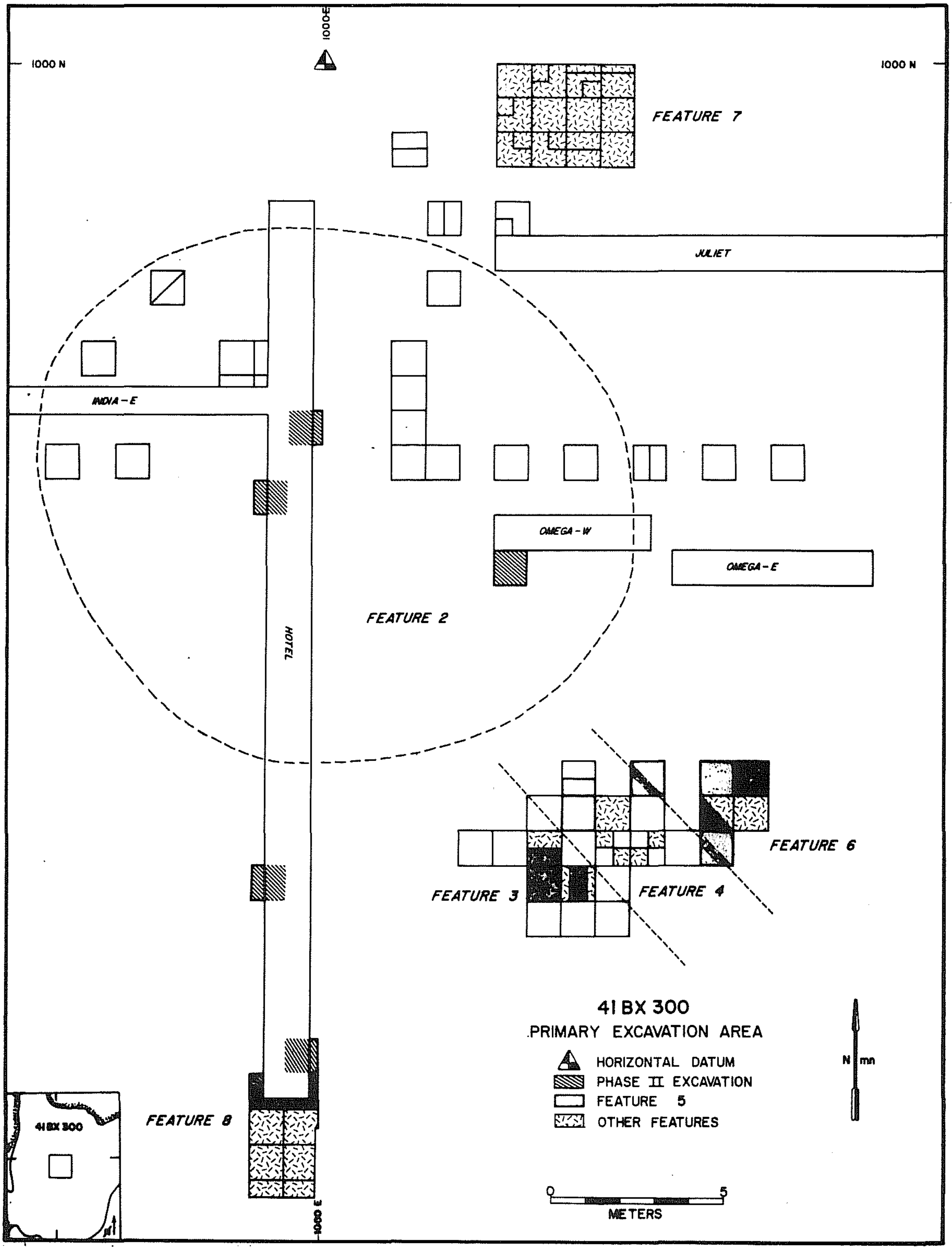
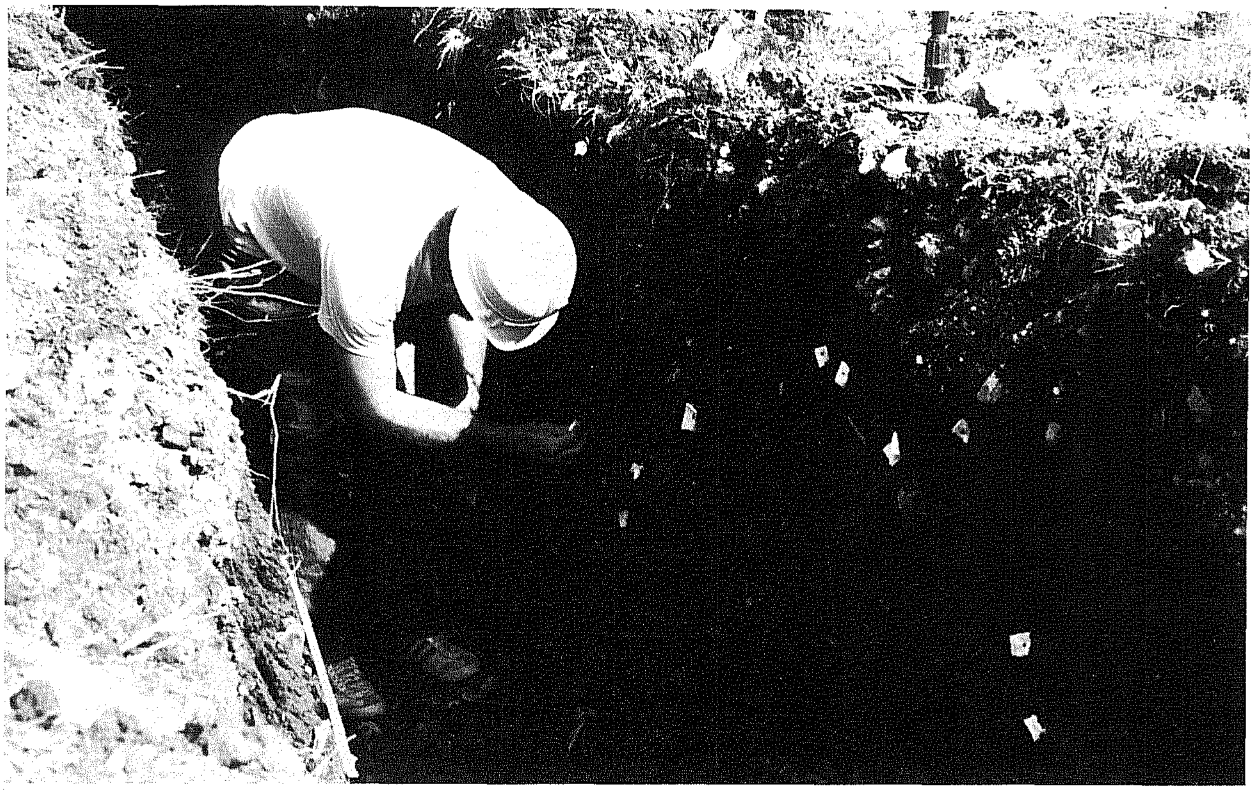
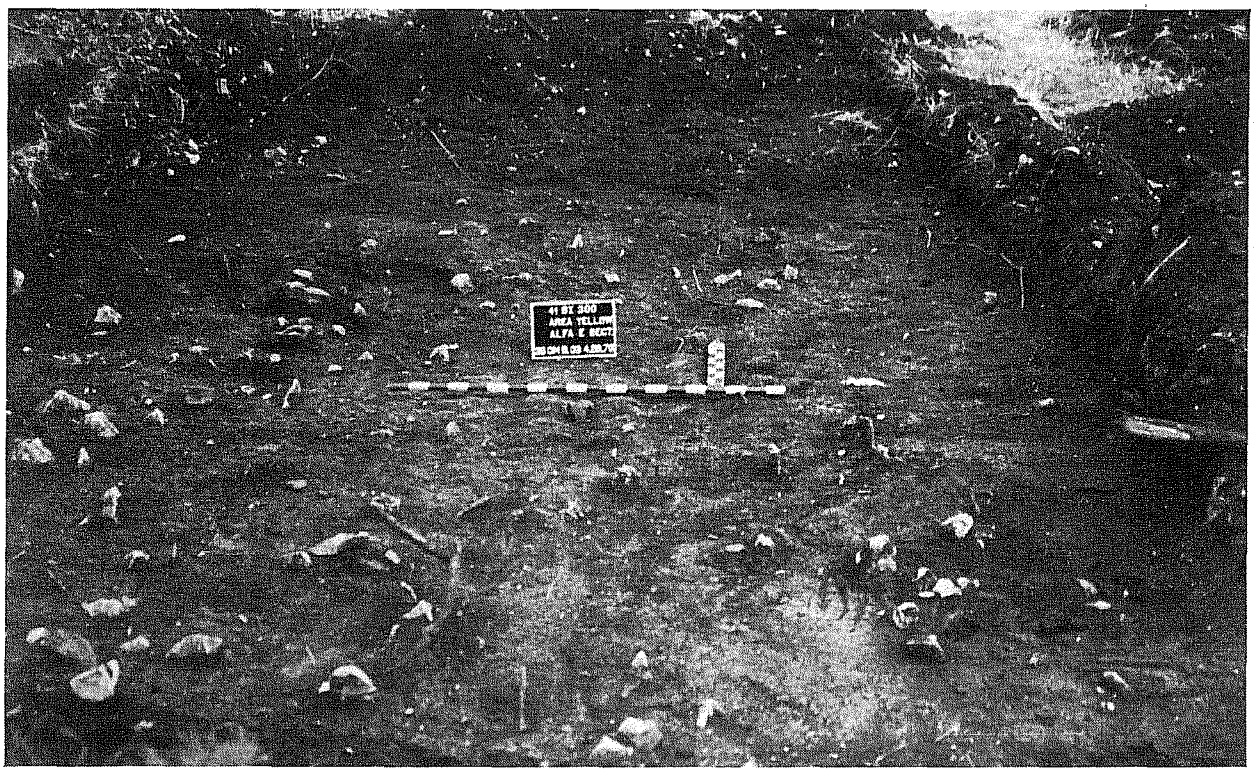


Figure 12. **Excavation Units, Trenches, and Features in Area Red.**

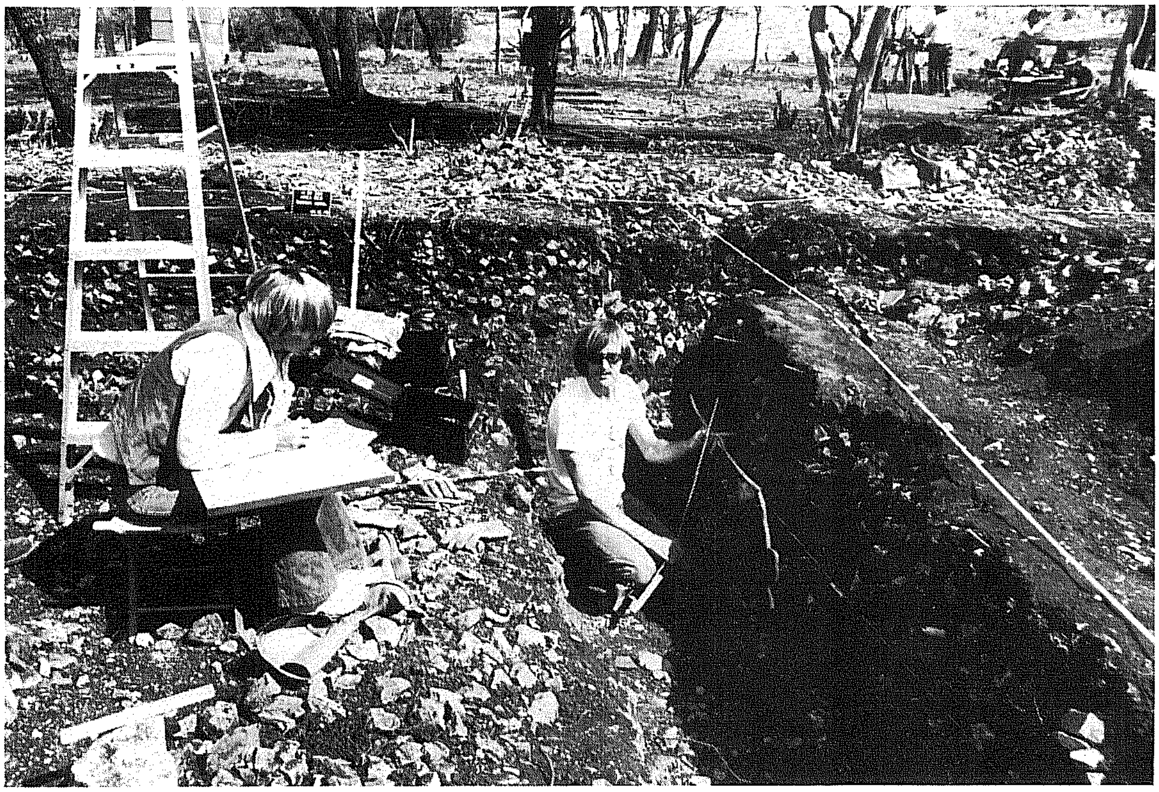


a

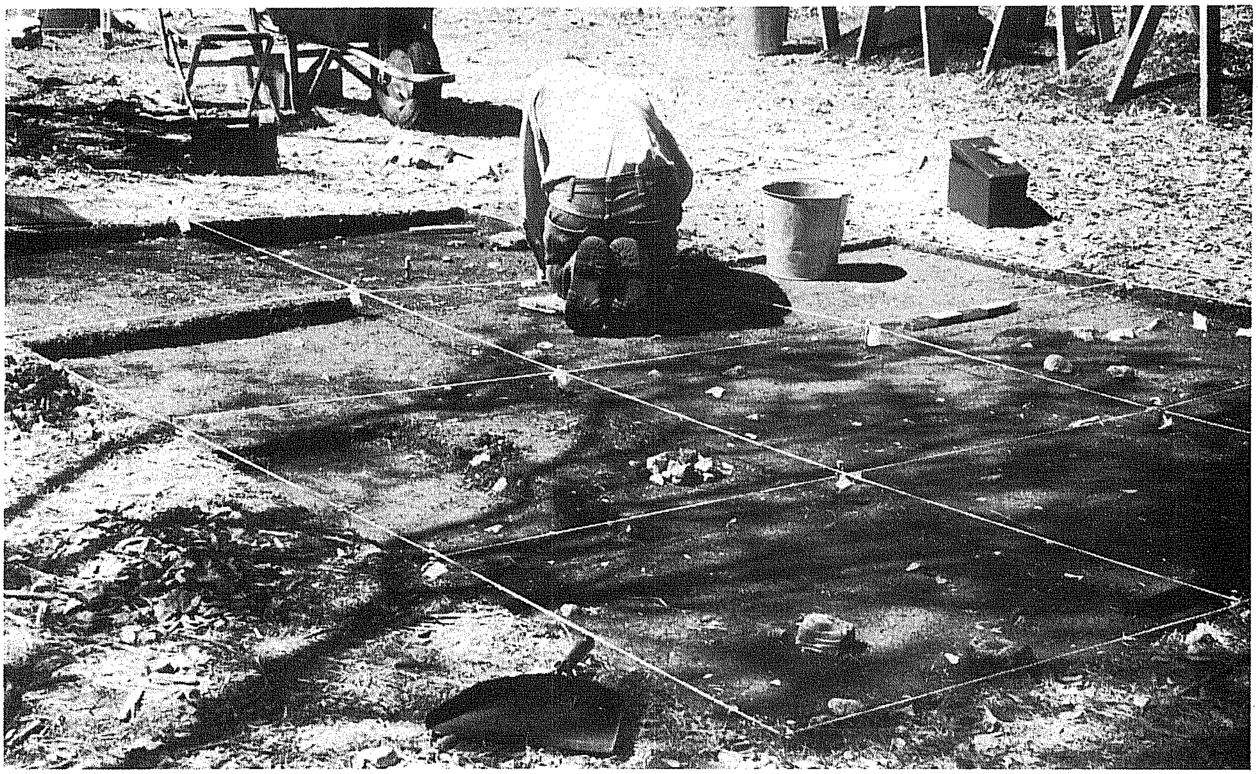


b

Figure 13. **Alfa-E Trench.** a, artifact recording along trench wall (Alfa-E); b, exploratory backhoe section beside trench (Alfa-E).

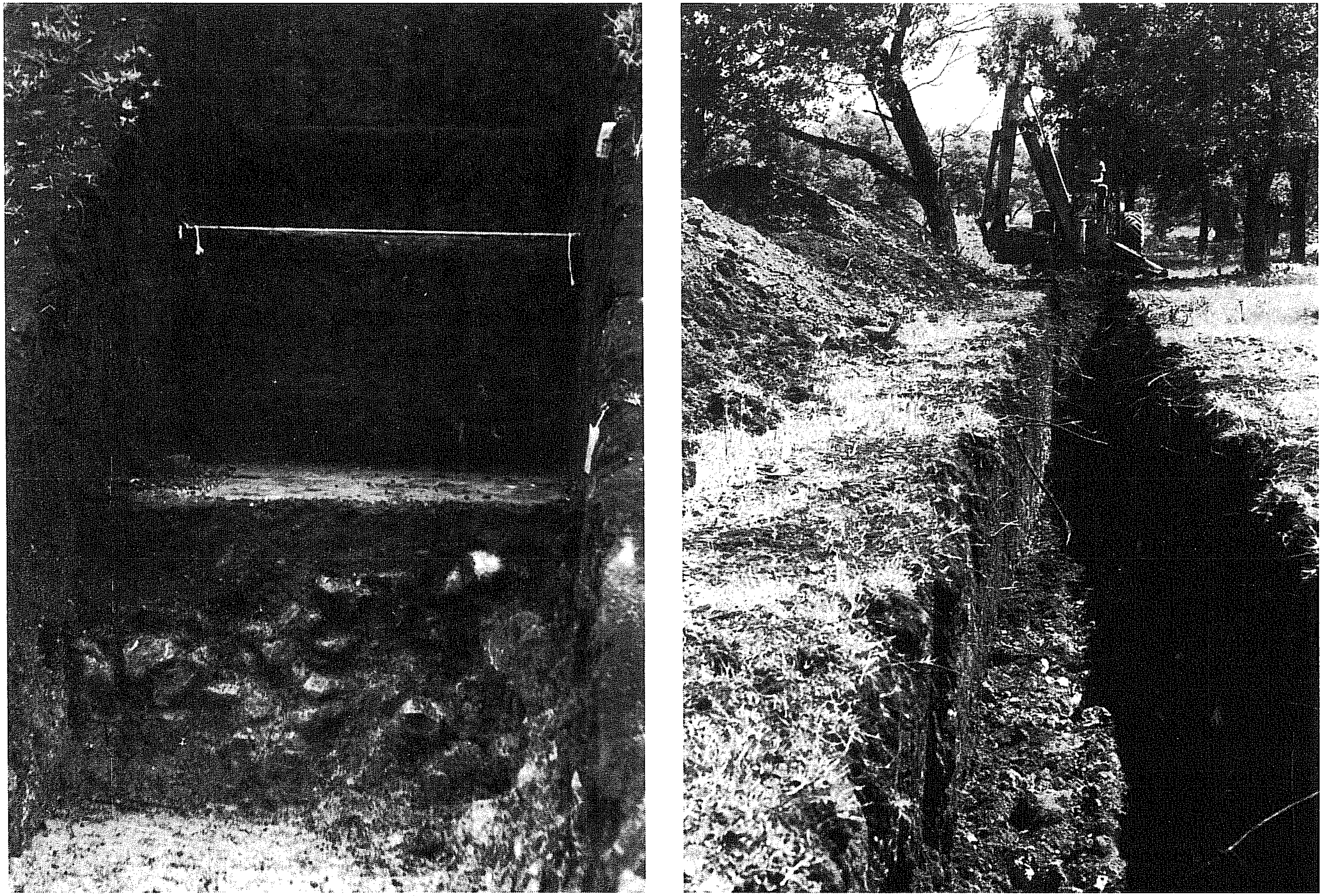


a



b

Figure 14. **Views of Feature 2 and Feature 7.** a, trench wall profile (recording Feature 2 in India-E); b, Feature 7, during excavation (Area Red).



a b

Figure 15. **Views of Area Blue and Area White.** a, hand-excavated trench in Area Blue; b, machine-excavated trench in Area White (Kilo).

TABLE 7. PHASE III TRENCH DATA

Name	Site Area	Maximum Length (m)	Average Depth (cm)	Orientation
Alfa-E	Yellow	25.1	133	east-west
Alfa-W	Yellow	27.7	119	east-west
Bravo	Yellow	24.5	63	north-south
Charlie	Yellow	28.6	126	north-south
Delta	Green	28.0	58	east-west
Echo	Green	21.9	65	east-west
Foxtrot	Green	39.9	61	east-west
Golf	Green	23.2	56	north-south
Hotel	Red	25.7	87	north-south
India-E	Red	18.2	113	east-west
India-W	Red	9.6	73	east-west
Juliet	Red	14.1	93	east-west
Kilo	White	38.1	202	north-south
Lima	White	18.3	182	east-west
Mike	Blue	8.5	195	east-west
November	Blue	18.7	217	east-west
Omega-E	Red	6.2	55	east-west
Omega-W	Red	4.7	70	east-west

Total number: 18; total length: 381.0 meters.

presented by both the steep slope and the compacted soil resulted in a minimum of excavation over a maximum of ground, i.e., a "trench." "Expansion" blocks resulted from the enlargement of trench sections, such as those associated with Alfa-E, Charlie, Hotel, and Kilo trenches (Figs. 11; 13,b), or features, such as Features 3 and 7 in Area Red (Figs. 11; 12; 14,b). In both situations, a small area was enlarged in an orderly manner, and integrated into the site grid system, by the excavation of adjacent units in whatever number and direction was necessary to fully investigate the particular cultural manifestation.

The isolated unit was the basic search instrument. A point on the ground deemed necessary to investigate was subsumed within a 1-m unit, determined by the inclusive site grid system. In some instances, an isolated unit became the initial unit of a subsequent block excavation (Fig. 24,a), but most remained as discontinuous squares (Fig. 24,b). The primary function of the isolated unit during the Phase III excavations at 41 BX 300 was to locate the periphery of the burned rock midden, designated Feature 2 (Figs. 11, 12, 24). The Phase II testing program also employed the isolated unit as the primary investigative device.

The method of feature investigation necessarily depended upon the nature of the feature itself. The extensive size of the burned rock midden (Feature 2) required a combination of isolated units, to identify points on its circumference and trenches and to investigate its internal character (Figs. 11, 12). Other features, however, could be divided into either a hearth or occupation floor category. Hearth features were excavated as a complete excavation unit whenever identified, regardless of the eventual depth and extent. Associated units and excavation levels were recorded, but these artificial constructs were only a secondary means of control. Due to the fact that this type of feature exceeded the size of a single unit, the final configuration took on the appearance of a block excavation; Features 3 (Figs. 12; 28,a,b; 27) and 6 (Figs. 12; 30; 31,b) are in this category. Occupation floors provided a difficult excavation problem, in that a single centimeter below ground surface was designated the feature, and investigation in a series of adjacent or isolated units attempted to locate this plane. The final configuration of Feature 7 was a block excavation (Figs. 12; 14,b); but Feature 4 resulted in several small blocks (Figs. 12; 31,a) and Feature 5, a series of isolated units (Figs. 12; 25,b).

TECHNIQUES

All 18 of the trenches were excavated by means of a backhoe. The initial machine was a Ford 4500 with a two-foot wide bucket, but the trench was too narrow to work in, and the machine was not powerful enough to cut straight trenches through the rocky subsoil. This machine's single advantage was its maneuverability in among the trees. A replacement was quickly obtained, a Case 580, with a three-foot bucket (Fig. 15,b). Not only was the extra foot of trench width more convenient for profiling and artifact recording (Fig. 13,a), but the essentially meter-wide trenches were positioned so that they corresponded to the grid system imposed on the site (Fig. 11). Once cut, however, all subsequent work associated with the trenches was conducted by hand, employing hand tools. Both machines were able to excavate sufficiently deep to pass below all cultural material and into the subsoil; average trench depths varied from 55 cm (Omega-E) to 217 cm (November).

Trench sections were initially excavated by backhoe, in that their function was purely exploratory. Overburden above a possible feature observed in the wall of a trench was mechanically removed, to facilitate investigation of the nature and extent of the anomaly. In all four instances where trench sections were opened, continued excavation was conducted by using hand tools. In the case of the Alfa-E trench section (Fig. 13,b), this simply entailed cleanup for photography and artifact recording; in the case of Features 8 (Figs. 12; 34,a; 41), 10 (Figs. 36,a; 37), and 11 (Figs. 36,b; 39), the hand work was more extensive.

All other types of investigations were conducted by using hand tools. These included the excavation of isolated units (Fig. 24,b), units subsumed into block excavations (Fig. 14,b), the line of contiguous units in Area Blue having the appearance of a trench (Fig. 15,a), and both the hearth (e.g., Fig. 28,a) and occupation floor (e.g., Fig. 25,b) types of feature.

The three most commonly employed hand tools were the long-handled shovel, folding entrenching tool, and trowel. Special conditions of rocky soil or sensitive recovery problems necessitated the use of other tools ranging from a pick-mattock to dental probes.

After the completion of the field work portion of the project, all excavated units and trenches were backfilled using the front-end loader of the Case 580 which cut the trenches.

DATA RECOVERY

CLEARING

Extensive clearing of the brush cover was undertaken prior to the initiation of data collection. Brush cover at 41 BX 300 was heavy (Fig. 5), consisting primarily of agarita and whitebrush (see Appendix II). To do the minimum amount of damage to the ground surface, and yet proceed with the clearing as quickly as possible, gasoline-powered weed trimmers with circular cutting blades were employed. The preliminary phases had indicated that all portions of the site would be under investigation, so the entire site area, 3.41 acres, was cleared of brush; this task took three days to accomplish. A completely cleared site allowed for good lines of sight when establishing the grid system and for maintaining both horizontal and vertical controls by telescopic instrument; also surface collection would be facilitated, as would general administration of the project activities. Much of the site was heavily wooded (Fig. 7), predominantly with cedar elm, Texas persimmon, and mesquite (see Appendix II). Trees were left undisturbed as much as possible, however, so as to provide shade, subdued lighting for photography and soil color resolution, and to retard the drying of exposed subsoils. Only when a tree blocked a line of sight, or was physically located in a unit to be excavated, was it removed; and cedar elm branches overhanging work areas were pruned to eliminate ticks dropping onto personnel below.

SURFACE COLLECTION

Every unit selected for investigation was intensively collected prior to excavation. As the material recovered was associated with a specific unit, it was recorded as if it represented the first level of excavation and analyzed accordingly.

A more general, and extensive, program of surface collection utilized the skeletal grid system composed of 10-m blocks. At irregular intervals throughout the period of field work, one or more of these blocks would be intensively collected by the crew; this activity usually took place during or immediately after inclement weather, when excavation was not possible. Material recovered from one block was kept separate from other blocks, although blocks within the same color area were analyzed together. Figure 9 indicates the location of all blocks intensively surface collected, and Table 8 provides collection statistics. While not much more than one-half of the entire site was collected (about two acres), at least one-third and usually at least one-half of every area was thoroughly investigated in this

TABLE 8. STATISTICS FOR CONTROLLED SURFACE COLLECTION BY 10-METER BLOCKS

Site Area	Total Number of 10-Meter Blocks per Area	Percentage of Site	Total Number of Blocks Collected	Percentage of Area Collected	Percentage of Site Collected
Blue	25	18	12	48	9
Green	39	28	24	62	17
Red	36	26	12	33	9
White	14	10	14	100	10
Yellow	24	18	17	71	12
Site Total	138	100	79	N/A	57

manner. The material collected substantially augmented the excavated material, thus benefitting both analyses and interpretations.

EXCAVATION

Data, in the form of artifactual and ecofactual material, were recovered during the course of both hand and machine excavations. Trenches were closely monitored as they were being cut; freshly turned trench backdirt was collected for horizontally provenienced items; trench walls were carefully scrutinized for **in situ**, vertically provenienced items (Fig. 14,a); and finally, backfilled trench lines were walked in a last collection effort.

The hand excavation of all units permitted the recovery of most material items with their exact provenience known. Items recovered from each level within a unit, or from a distinct and designated feature, were packaged separately, and different types of material (e.g., flakes, burned rock, gastropods) were separated in the field during the collection process. This not only facilitated laboratory processing, but damage in transit was minimized.

SCREENING

All excavated soil was passed through 1/4-inch mesh screening, assisted by water pumped from the nearby stock tank (Fig. 8). After hand recovery of all visible material was completed, soil from the excavated unit-level was bucketed, barrowed, and bathed in a processing area well away from all excavation activity. The same packaging distinctions were maintained between material types, so that both screened and provenienced materials could be more easily cataloged, and processed together for more efficient analysis.

SPECIAL SAMPLES

A very focused and specific source of data was the collection of a series of special samples, each type of sample characterized by its own collection technique.

Samples of burned earth and associated burned rock were collected from several hearth features (Fig. 28,a) for archaeomagnetic dating. Charcoal from hearth features and from several loci within the midden (Feature 2) was collected for radiocarbon dating. Burned rock from hearth features and from the midden were collected for thermoluminescence dating. A series of soil samples in a columnar array (Fig. 21) was taken from the walls of November trench in Area Blue (Fig. 16,b) and Kilo trench in Area White for analysis to identify phytoliths. A constant volume of soil (CVS), the size of sample being 2500 cc, was collected from a variety of unit-levels and features throughout the site. The quantity of soil was sufficient to allow each lot to be processed in a number of different ways to maximize the information retrieved. The specific recovery methods and subsequent analyses for each of the above-mentioned special samples will be discussed in detail in following sections.

TABLE 9. EXCAVATION STATISTICS: PHASE III (MITIGATION)

Phase III Site Areas	Size of Area (m^2)	Number of Units Excavated	Square Meters Excavated	% of Area Excavated	Number of Trenches Excavated	Square Meters Excavated	% of Area Excavated	Total Square Meters Excavated	Total % of Area Excavated	Cu. Meters Excavated Units	Cu. Meters Excavated Trenches	Total Excavated Volume
Blue	2500	19	17.00	0.7	2	27.20	1.1	44.20	1.8	4.95	28.56	33.51
Green	3900	4	0.28	0.0	4	112.96	2.9	113.24	2.9	0.06	59.31	59.37
Red	3600	67	62.38	1.7	6	78.43	2.2	140.81	3.9	15.13	66.11	81.24
White	1400	9	5.13	0.4	2	56.40	4.0	61.53	4.4	1.59	55.27	56.86
Yellow	2400	22	14.63	0.6	4	105.77	4.4	120.40	5.0	9.83	94.12	103.95
Project Total	13,800*	121	99.42	0.7	18	380.76	2.8	480.18	3.5	31.56	303.37	334.93

*13,800 m^2 = 1.38 ha = 3.41 acres

EXCAVATION STATISTICS

Table 9 provides data on the number of units and trenches excavated, the area disturbed, and the volume of soil removed for each colored area and for this phase of investigation in total. Summarizing, of the 13,800 m^2 estimated for the size of the site, 480 m, or 3.5% of the site, was excavated by units and trenches combined. Three hundred and thirty-five cubic meters of soil were removed. In that the project was scheduled for 60 days, the statistics indicate an average of 8 m^2 excavated and 5.6 m^3 of soil removed each day. Crew size was so variable that rates per person-day cannot be calculated.

Table 10 combines the data from Phases I and II (Table 3) with that from Phase III (Table 9) to provide a summary of all archaeological activity at 41 BX 300.

TABLE 10. EXCAVATION STATISTICS: SUMMARY OF ALL PROJECTS

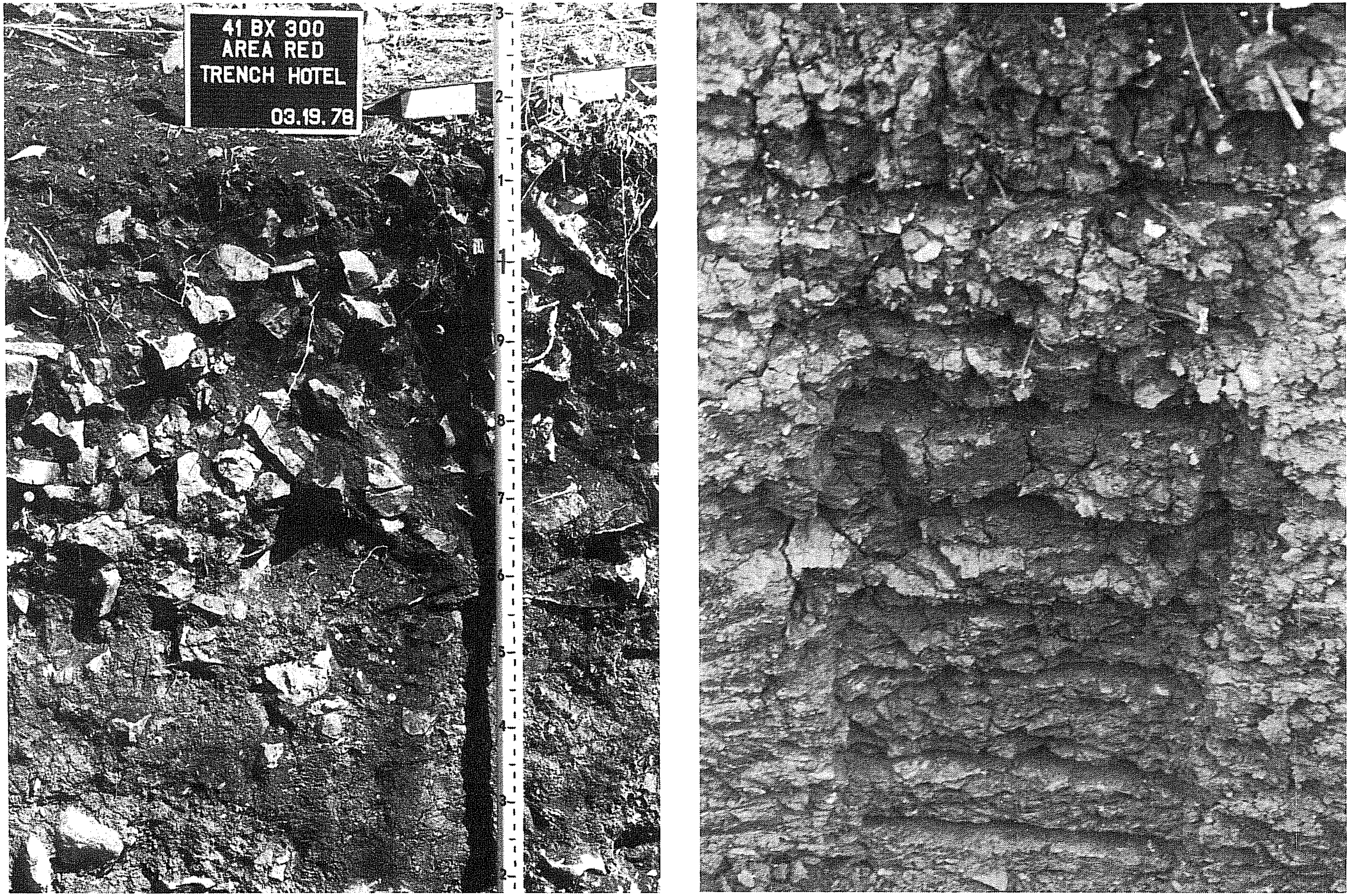
On/Off Site	Number of Excavated Units	Number of Excavated Trenches	Excavated Area (m^2)	Percentage of Site	Excavated Volume (m^3)
On-Site	145	18	503.18	3.6	346.27
Off-Site	8	0	8.00	N/A	2.79
Total	153	18	511.18	N/A	349.06

DATA RECORDING

FORMS

Data recording during the field work portion of the project fell into three general categories: summary data on the various excavation activities, provenience data on all material recovered and samples collected, and pictorial data.

The basis of the field proveniencing system was a prenumbered form, or ticket. Using an automatic numbering machine to avoid duplicated numbers,



a b

Figure 16. **Views of Hotel and November Trenches.** a, Feature 2 profile in wall of trench (Hotel); b, phytolith samples removed from trench wall (November).

batches of provenience slips were numbered and distributed in the field. To further assist with processing and analysis, the slips were colored according to the areas in which the material was recovered, i.e., a blue slip was only used to record items in Area Blue. The item, whether artifact, ecofact, or special sample, was packaged individually with its slip enclosed; and the number assigned to the item by virtue of its slip was recorded on the appropriate unit-level or feature summary form. The field number became the item's catalog number and could be permanently affixed early in the laboratory processing operation.

This system of assigning catalog numbers in the field and recording them directly on both the package and the summary form proved to be so successful for individually provenienced items that it was expanded to screened material. Screened material recovered from an entire 10 cm level of a 10-m unit would be recorded as having recovery dimensions and thickness rather than coordinates and a depth below datum or ground surface. The quantity of material would naturally be more than a single item, and this was determined by a count in the laboratory.

Surface collections from 10-m blocks or trench backdirt generally included only items which, if excavated, would be individually provenienced, i.e., chronologically, morphologically, or functionally diagnostic artifacts. As such, assignment of a field number and individual packaging was usually carried out if the item had been excavated. A surface recovery slip, pre-numbered and color-coded similar to the excavation recovery slips, was employed in like manner.

CLASSIFICATION TYPE CODES

The determination as to whether an item was assigned a permanent field number rested in large part on an object inventory developed by the CAR-UTSA. Designated "Classification Type Codes" (see Appendix I.A, this list assigned unique numbers to historic, prehistoric, and ecofactual types of objects that previous archaeological work in the region had identified. While the final determination of an item's classification type code was made in the laboratory only after processing (similar to "quantity" for screened items), anything on the list even tentatively identified in the field could be assigned a field number in anticipation of subsequent cataloging. A cataloged item could have only <u>one</u> classification type code. Individually provenienced items were automatically given a field number, and usually a tentative classification type code was also noted. Screened material was separated into general classification types (e.g., flakes, shells, burned rock) and provisional field numbers assigned to each group. The same system was employed for surface collections, which included both individual items and less often groups of similar items. For analytical purposes, the classification type code equaled provenience in importance and was a primary sorting criterion for computer manipulation of the project data.

SPECIAL SAMPLES

The samples of soil collected from various parts and levels of the site departed from the standardized recording procedures described above. As no attempt was made to deal with material included within the soil samples at the time of collection, multiple classification type codes were always associated with a single sample. For this reason, while distinctive field numbers were assigned to each soil sample, the numbers represented a different system from that which generated permanent catalog numbers for each material type code. The form, which recorded the sample provenience and assigned it its number, was similar to the item recovery form, but the "CVS" number pre-assigned to the slip was prefixed by a triple "9" to differentiate it from the consecutive integer field numbers ("FN"). During or after laboratory analyses, items retrieved from the soil sample matrix were assigned catalog number and classification type codes, processed like excavated material, and analyzed accordingly.

Other samples, being unique entities devoid of material inclusions and having a classification type code of their own, were assigned a field number just like any other item. Individualized inventory sheets were designed, however, to record those data elements unique to the particular sample. Archaeomagnetic samples required a compass direction; radiocarbon samples required the recording of sample weight; and phytolith soil samples needed a known and constant volume of soil recorded, while thermoluminescence samples were associated with a volume of burned rock.

Feature numbers were assigned consecutively as they were identified, and an inventory sheet listed the features in numerical order to avoid duplicating feature numbers. The type of feature being investigated was given the appropriate code number from the classification type code list, similar to any artifact or ecofact type.

TOTAL INVENTORY RECOVERY EXPERIMENT

The recording of an artifact's exact provenience included determination of the east and north coordinates of the grid system and a measurement of the depth relative to unit ground surface or one of the various datum points. Exact provenience was normally determined only for artifacts identified in the field as having some analytical importance, i.e., diagnostic of something. As a general rule, all manufactured stone tools (defined as retouched flakes and all items intentionally shaped) were provenienced, as well as all ground stone and ceramic items. All unretouched flakes were bagged together. The utilization of an artifact was considered too technical and time-consuming for field determination. All ecofactual material was sorted in the field into similar classification types, and each type was bagged together by excavation unit-level.

The one exception to the above procedure was an experiment in total recovery. In two units at the site, <u>all</u> material was individually provenienced, thus allowing the computer generation of distribution maps at depths varying by only a single centimeter. This total inventory recovery experiment (TIRE) was carried out in conjunction with two features: (1) the 14 cm immediately below the burned rock of the midden (Feature 2); and (2) eight centimeters associated with the Feature 4 occupation floor. In both operations, each flake, shell, rock, and fleck was recorded, assigned a field number, and individually packaged.

PICTORIAL RECORDING

Plan drawings were made of those features characterized by burned rock, with the exception of the midden (Feature 2). These include Features 3 (Fig. 27), 6 (Fig. 30), 8 (Fig. 41), 10 (Fig. 37), and 11 (Fig. 39). The occupation floor Features 4 (Fig. 31,a), 5 (Fig. 25,b), and 7 (Fig. 14,b) were documented by photographs only, as was the midden because of its large size.

All trenches were drawn in profile at a point considered typical of their stratigraphy and for an extent sufficient to include any subsurface horizontal variability (see Figs. 17-23).

Plane table maps were drawn of the contours of the entire site and of all excavated units and trenches (Figs. 8, 10, 11, 12).

In addition to report-oriented photographs of all features and trenches, both color slides and black-and-white prints were taken in quantity to document all activities and progress during the course of the 41 BX 300 mitigation project. Field notes, photographs, and original maps and drawings are on file at the UTSA Center for Archaeological Research.

STRATIGRAPHY

The nature and extent of the various natural strata exposed during mitigation activity at 41 BX 300 are discussed. Stratigraphy at the site can be summarized as having three general strata (Fig. 21). These include the topsoil and the two bedrock formations previously discussed by Evans: the Edwards limestone and the overlying Del Rio clay. Both the Edwards and Del Rio strata have one, or even two, substrata in localized areas of the site, but their general characteristics remain the same throughout the stratum. Table 11 provides comparative data for these three strata obtained from soil samples collected from November trench. Actual values, rather than site means, are presented, thus giving considerable weight to the stratigraphic relationships demonstrated.

TOPSOIL

Topsoil at the site is represented by alluvial soil from Elm Waterhole (or Long) Creek, an intermittent stream flowing immediately to the east (Figs. 1, 3). Topsoil depth is variable across the site, but it is shallowest in the southwest and northeast portions and deepest in the northwest and southeast portions (Fig. 11). Profiles from Bravo trench in the southwest (Fig. 17) and the Area Green trenches in the northeast (Figs. 18-20) reflect the bottom of the topsoil at depths between 20-35 cm below the ground surface. By contrast, Alfa and Kilo trenches in the southeast (Figs. 17, 21) exhibit a

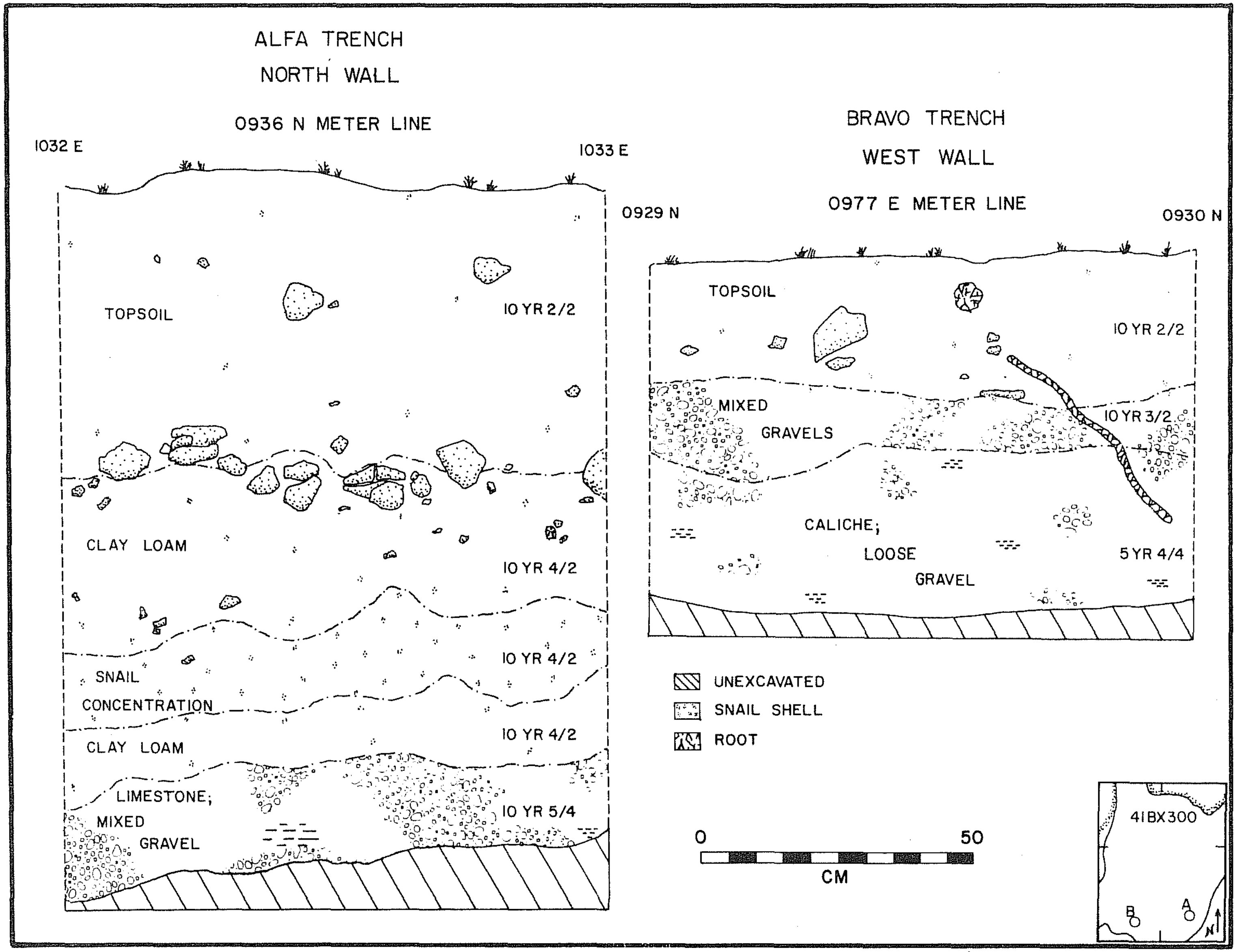


Figure 17. **Profile Drawings of Alfa and Bravo Trenches, Area Yellow.**

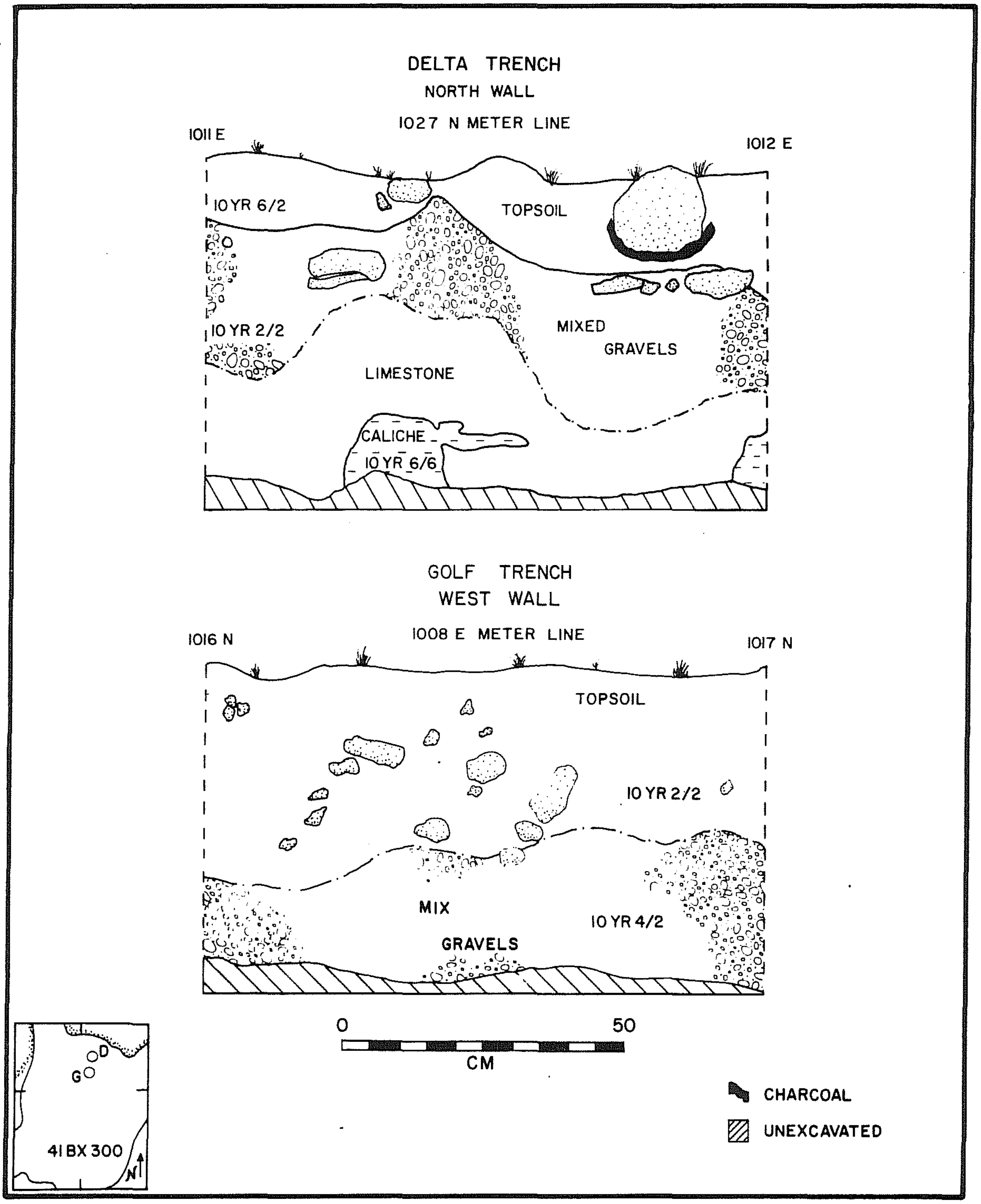


Figure 18. **Profile Drawings of Delta and Golf Trenches, Area Green.**

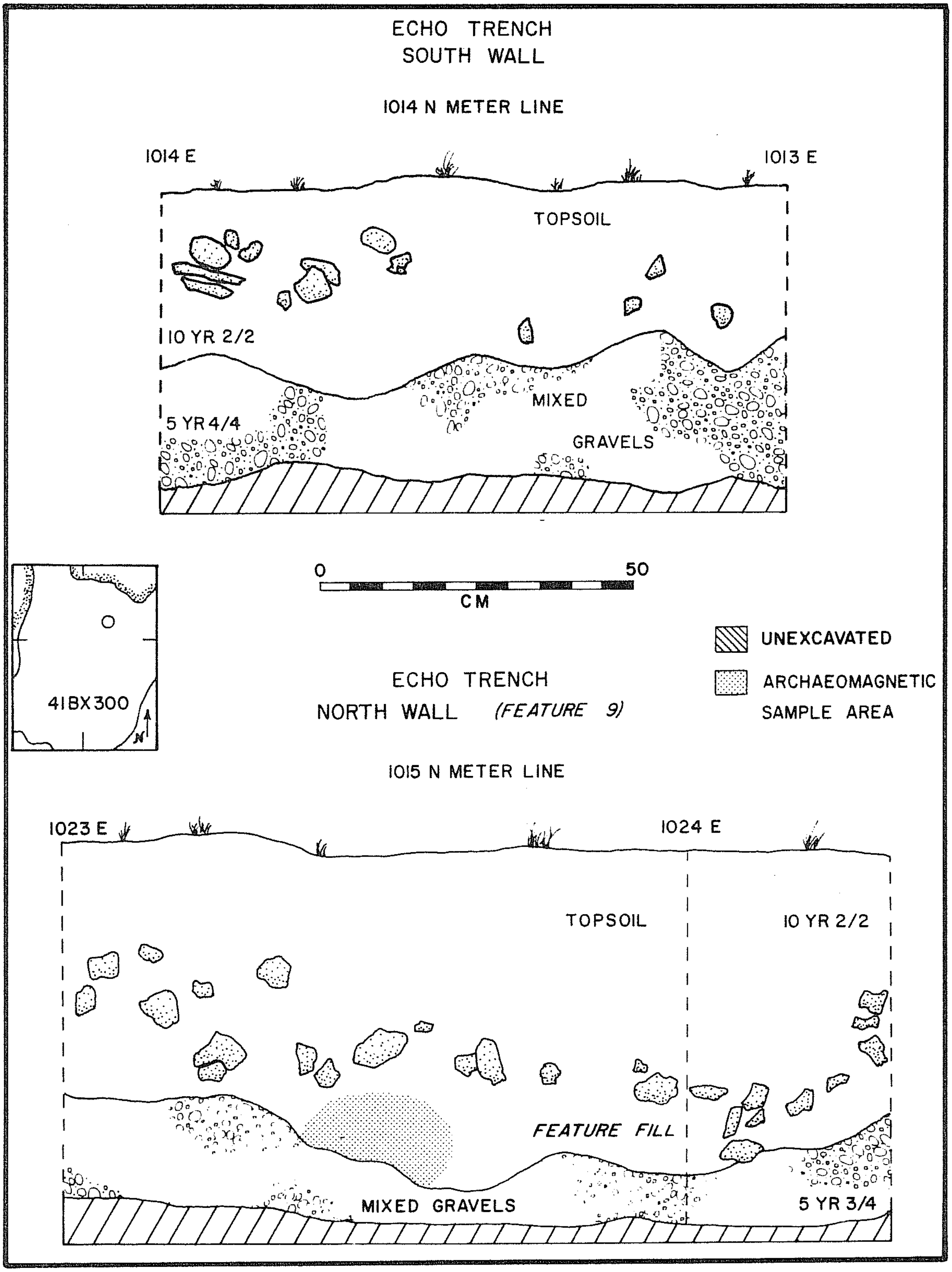


Figure 19. **Profile Drawings of Echo Trench, Area Green, Indicating Feature 9.**

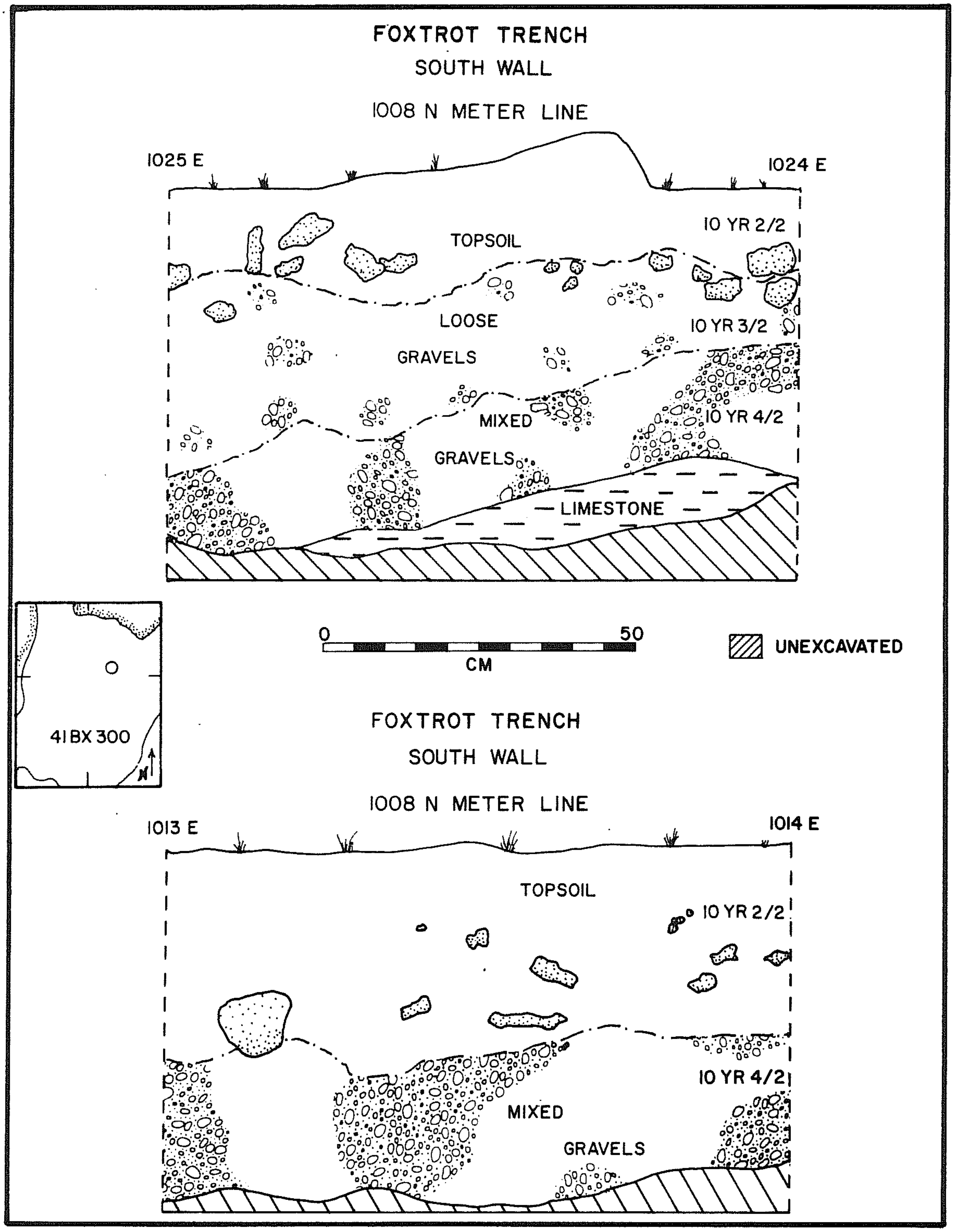


Figure 20. **Profile Drawings of Foxtrot Trench, Area Green.**

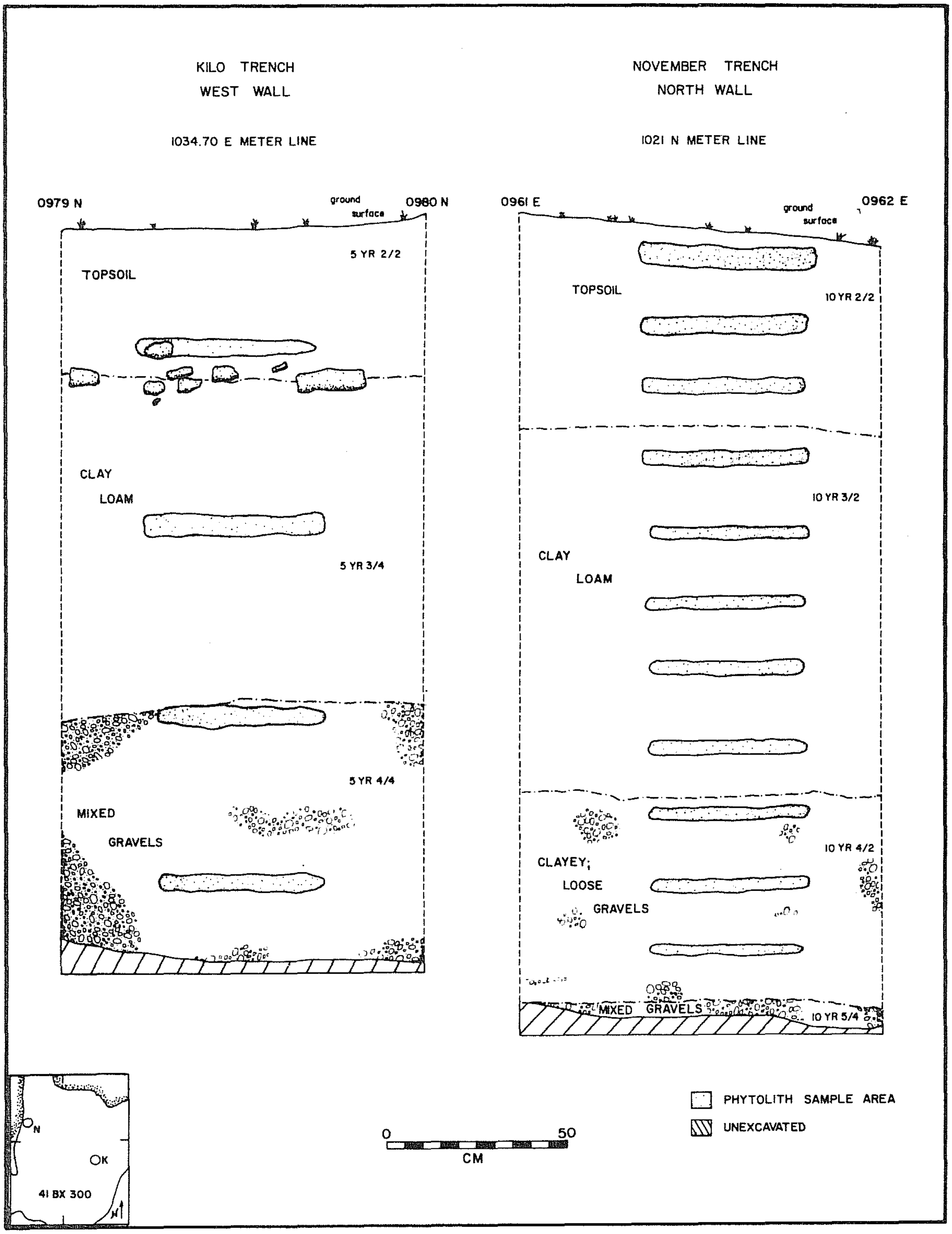


Figure 21. **Profile Drawings of Kilo and November Trenches, Areas White and Blue, Respectively.** The location of phytolith samples taken from the walls is indicated.

topsoil thickness of 55 cm and 40 cm, respectively, and November trench in the northwest (Fig. 21) had 50 cm of topsoil.

Topsoil color trends to be dusky yellowish brown, 10 YR 2/2 (Rock Color Chart Committee 1948), with about a 3% organic content. It is mildly alkaline, having an average pH of 7.7. The overall texture of the topsoil is clay, as it is characterized by a 60% clay content. As a consequence, the topsoil becomes blocky when dry, developing fissures into which artifacts or ecofacts may fall. Excavation is equally difficult whenever this soil is too wet or too dry; only when freshly damp is digging reasonable and colors true.

TABLE 11. STRATUM CHARACTERISTICS

Soil Characteristics*	Topsoil	Del Rio Clay	Edwards Limestone
Texture	clay	clay	clay
Percentage of sand	30.0	20.0	16.0
Percentage of silt	10.0	19.0	19.0
Percentage of clay	60.0	61.0	65.0
pH level	7.7	8.3	8.7
Calcium level	very high	very high	very high
Magnesium level	high	high	high
Phosphorus level	very high	medium	high
Potassium level	very high	very high	very high
Zinc (ppm)	>20.0	8.6	>20.0
Iron (ppm)	11.2	13.0	11.0
Manganese (ppm)	>10.0	9.4	4.0
Organic content (%)	3.1	1.0	0.5
Average color	10 YR 2/2 (dusky yellowish brown)	10 YR 4/2 (dark yellowish brown)	5 YR 4/4 (moderate brown)

*Soil characteristics obtained from November trench (Fig. 21) in centimeters below ground surface: topsoil, 26; Del Rio clay, 103; Edwards limestone, 182.

DEL RIO CLAY

Trench profiles indicate the presence of the Del Rio clay in quantity only in the northwest and southeast portions of the site; thicknesses range from one meter in Alfa trench (Fig. 17) and 120 cm in Kilo trench (Fig. 21) in the southeast to 150 cm in November trench (Fig. 21) in the northwest. The entire stratum is absent in the southwest, as indicated by Bravo trench (Fig. 17) and in the northeast, as shown by all Area Green trench profiles (Figs. 18-20). In Area Red, the site center, the stratum designated "sub-midden" or "subsoil" immediately beneath the midden in the profiles of Hotel (Fig. 22), India, and Omega (Fig. 23) trenches represents a remnant of the Del Rio clay. It is relatively thin here by comparison with the northwest and southeast representations, averaging less than 20 cm thick.

The Del Rio clay stratum is lighter in color than the topsoil, averaging dark yellowish brown, 10 YR 4/2 (Rock Color Chart Committee 1948). It has a clay texture, with 61% clay content and a 1.0% organic content. The pH is moderately alkaline, averaging 8.3; and it is characterized by a high iron (13 ppm) and low zinc (8.6 ppm) content.

EDWARDS LIMESTONE

The Edwards limestone formation is considered to be the typical bedrock in the locality of the site, and excavation terminated after modest penetration. The Edwards limestone is the lightest of the three strata in color, appearing yellow or reddish in places but averaging moderate brown, 5 YR 4/4 (Rock Color Chart Committee 1948). It has the highest clay content, 65%, the highest pH, 8.7 (strongly alkaline), and the lowest organic content, 0.5%. In the profiles from around the site (Figs. 17-23), this formation is variously referred to as "limestone," "mixed gravel," "caliche," or "loose gravel." In some profiles there will be indicated substrata of more than one of these terms, but this is considered a combination of microvariation and archaeological enthusiasm rather than completely different geological formations; the analytical characteristics are identical.

STRATUM COMPARISONS AND DISTRIBUTION

The three strata at the site, well represented in November trench in the northwest (Blue) area, exhibit a series of trends which reflect the stratigraphic relationship between them (Table 11). While all have an overall clay texture, the proportion of clay and silt increase below the surface at the expense of sand. Inclusive rock size and amount increase with depth. The color becomes lighter as one progresses deeper; the pH increases, and the organic content decreases with depth as well. Individual variations in mineral content, such as the higher iron and lower phosphorus and zinc content of the Del Rio clay, help to identify this formation and give it some distinctiveness; but the overall similarity in composition reflects close geological relationships between the three strata.

The geomorphological history of 41 BX 300, and the fact that the Del Rio clay is easily eroded, account for the fact that it is not present in all portions of the site. Evans' postulation of two streams until middle post-Pleistocene times would result in constant erosional activity on <u>both</u> sides of the site simultaneously (Fig. 3). The interfluvial, or interchannel, divide between the two streams would be the area most likely to retain evidence of the Del Rio clay, and this area should reflect a linear orientation. The presence of

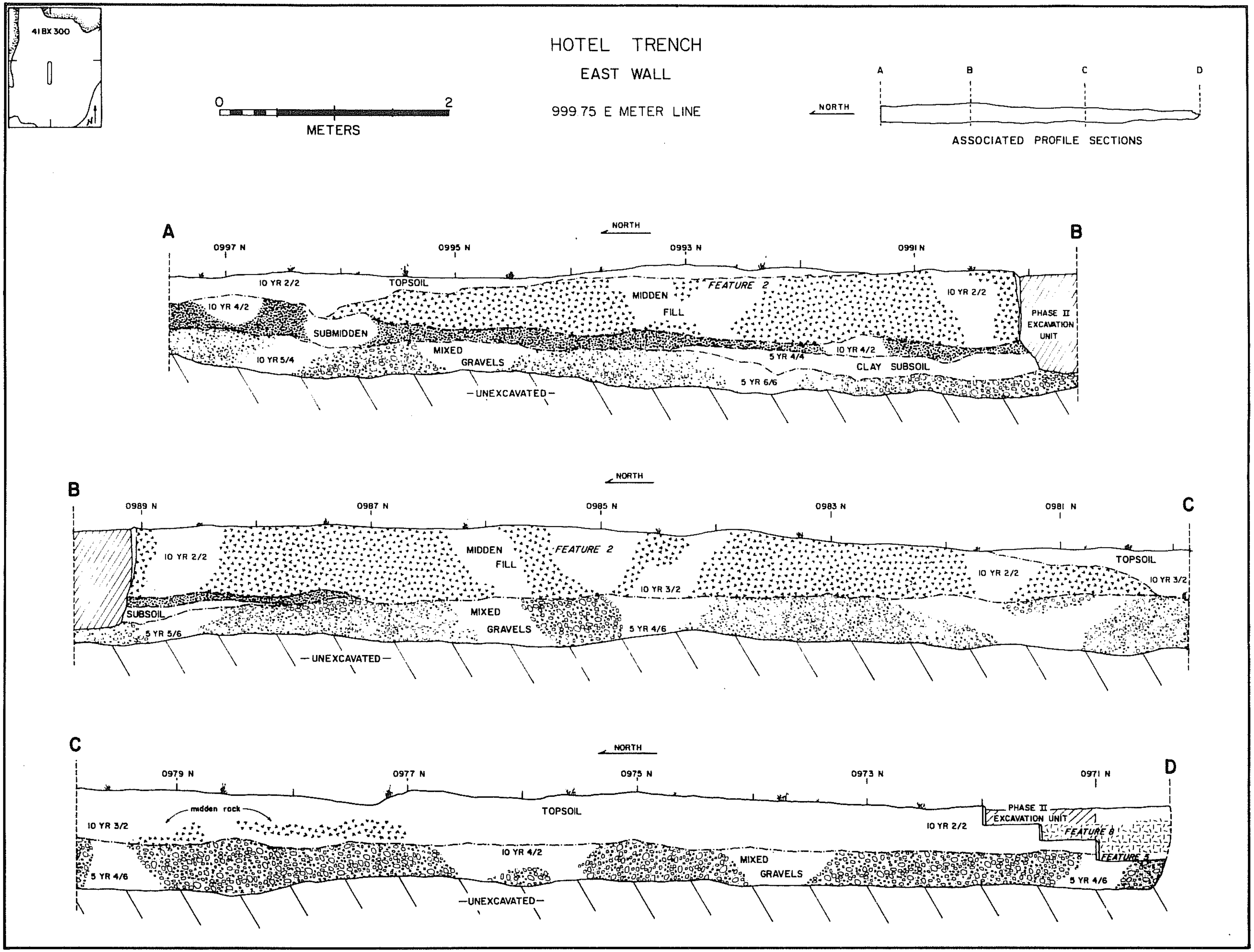


Figure 22. **Profile Drawings of Hotel Trench, Area Red, Indicating Feature 2.**

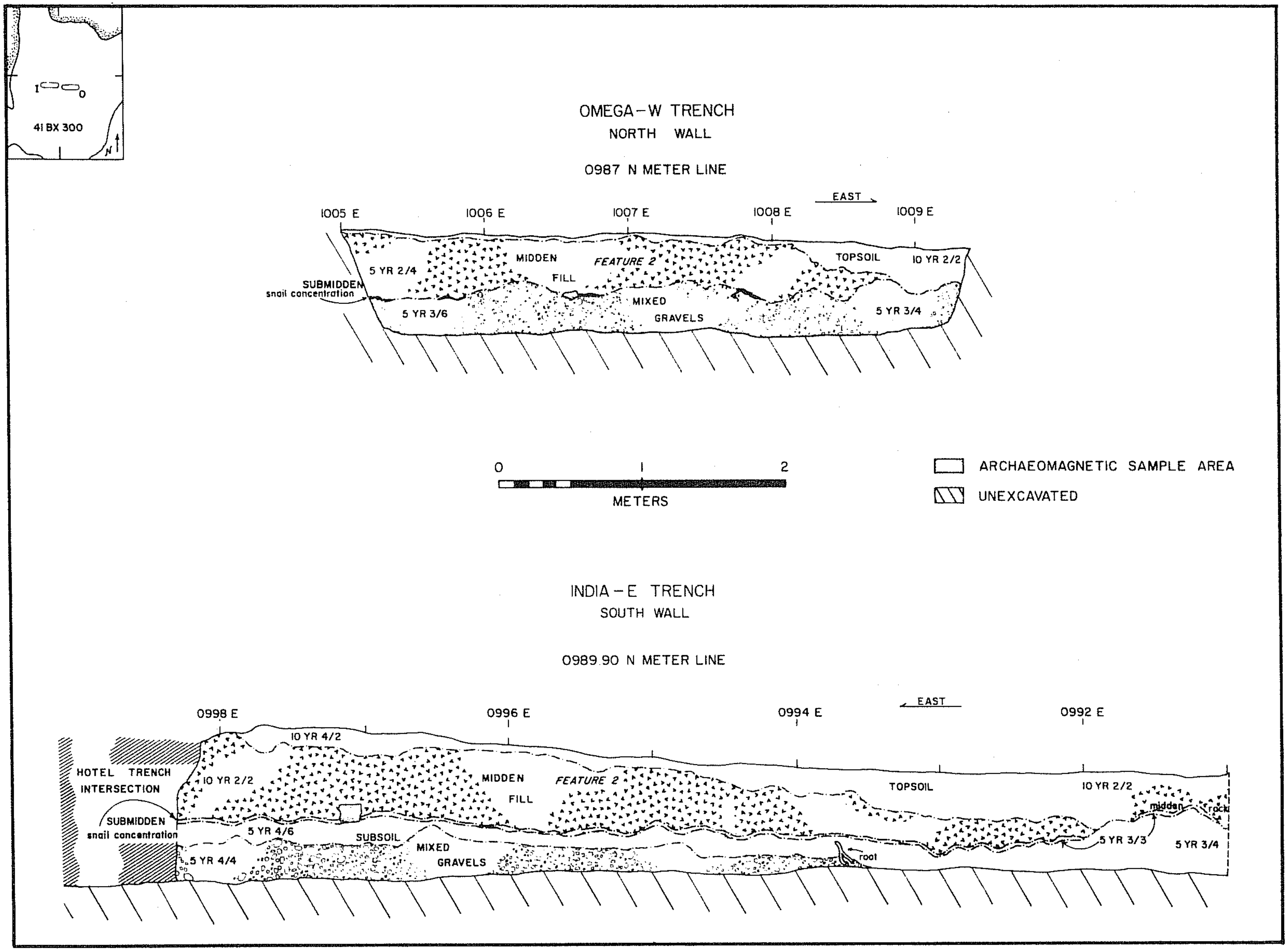


Figure 23. **Profile Drawings of Omega-W and India-E Trenches, Area Red, Indicating Feature 2.**

this stratum only in profiles extending across the site from southeast to northwest supports this reconstruction. This line also marks the highest elevations of the site (Figs. 8, 10), likewise suggesting a remnant "spine" from bilateral erosion. Subsequent alluvial buildup from the remaining intermittent stream to the east would crest on the remnant Del Rio clay; the thinnest alluvial topsoil is in the southwestern portion of the site (see Bravo trench profile, Fig. 17), sheltered behind the central "ridge" of Del Rio clay.

According to Evans (this report), the site became habitable about the middle of the post-Pleistocene. At that time, the ground surface would have been characterized by a thick stratum of clayey soil in the northwest and southeast and a thin layer of clay over limestone bedrock in the center of the site. Limestone rock would have been the surface of the ground in the northeast and southwest portions of the site.

The differential buildup of topsoil, for geomorphological reasons previously discussed, makes relative dating by comparative depth below present ground surface inadvisable. The best chronometric base line is the postulated surface of the ground in middle post-Pleistocene times, when the stream channels were rearranged and the site became habitable; this is the point in time preceding the buildup of topsoil. Artifacts and features identified in contextual association within the top of the limestone or clay formations are both roughly contemporaneous among themselves and earlier in time than other material and features recovered from within the topsoil stratum. Stratigraphic dating of all cultural material within the topsoil must be corroborated by other means, although the topsoil stratum is sufficiently thick as to suggest material closer to the surface is younger than material closer to the topsoil/clay or limestone transition zone.

DESCRIPTION AND ANALYSIS OF ECOFACTS AND SPECIAL SAMPLES

SOIL SAMPLES

The collection of samples of soil during the mitigation activities at 41 BX 300 served four distinct purposes.

1. The recovery of micro-ecofactual and artifactual material from the samples helped to provide a more complete representation of the cultural activities within the site. These were specimens which would otherwise have been lost, as the laboratory processing procedures for soil samples were much more rigorous and of a higher resolution than was the water screening procedure employed in the field.

2. A portion of each soil sample was submitted for analyses to determine the chemical content and the mechanical composition of the sample, and thus the matrix from which it was obtained.

3. The samples, because of their similar and constant volumes, provided statistically comparable proportions of both soil charactertistics and associated material throughout the site.

4. The samples provided an unbiased and adequate amount of soil on which to experiment with methods for the cleaning and sorting procedures used for obtaining materials for analysis.

COLLECTION AND PROCESSING OF CONSTANT VOLUME SAMPLES
(Rebekah E. Halpern and Paul Katz)

Seventy-nine samples were collected during the mitigation phase, each composed of a constant volume of 2500 cm^3 of soil. Experiments early in the field work phase determined that this size sample was large enough to provide a series of smaller subsamples for various analyses, yet small enough to pose no problems in collection, packaging, and transport.

Sixty-four (81%) of the samples were associated with cultural features. At least two samples were collected either directly from or in close proximity to every one of the ten features investigated during the mitigation phase. As the features were located in all areas of the site and associated with all three of the soil zones, the samples are considered representative of site variability with respect to soil characteristics. Moreover, it was assumed that the features were the focus of site activity at the time the feature was in use; samples taken from them were expected to provide additional data for feature, and thus site activity, interpretation.

In addition, a stratigraphic series of samples was collected from two trenches, one series from November trench in the northwest area (Blue) and the other from Kilo trench on the east (White) side of the site (Figs. 11, 12). These 15 (19%) additional samples were not directly associated with cultural activity, and they provided an accurate picture of the natural soil characteristics and stratigraphic relationships. Table 12 provides data on the distribution of these 79 constant volume samples (CVS).

Laboratory processing of the CVS samples initially consisted of dry screening, first through 1/8-inch and then through 1/16-inch mesh. This procedure removed the larger specimens of artifacts and ecofacts, not recovered in the field because of the direct bagging of the sample. Dry-screened items were subsequently processed as if they were field-recovered specimens, however. Soil passing through both screens was mechanically seaparated using a geological sample splitter, so as to produce a series of unbiased and comparably -sized subsamples. Subsample size was 480 cm^3, determined by the volume of a Texas A&M Soil Testing Laboratory sample bag. Four subsamples were produced: one for particle size analysis; one for constituent analyses, and one each for further separation by water and chemical flotation techniques.

Experimentation concluded that hydrogen peroxide performed better than water flotation for the recovery of carbonized materials from the 41 BX 300 soil matrix. This is due to the high clay content of the soil, which was more effectively broken down by hydrogen peroxide, releasing larger amounts of whole pieces of charcoal and seeds. Sorting time of the resultant fractions was shortened as well, as the material from the chemical flotation was cleaner than similar material resulting from water flotation. The details of this experiment are on file at the CAR-UTSA (Halpern 1978).

TABLE 12. DISTRIBUTION OF CONSTANT VOLUME SAMPLES

Catalog Number	Area	Unit or Trench	Depth Below Ground Surface (cm)	Associated Feature	Stratum
999500	Red	076037	22	3	Feature zone
999501	Red	076037	23	3	Feature zone
999502	Red	076037	24	3	Feature zone
999503	Red	076037	25	3	Feature zone
999504	Red	076037	26	3	Feature zone
999505	Red	076037	28	3	Feature zone
999506	Red	076030	10	4	Occupation zone
999507	Red	076037	33	3	Feature zone
999508	Red	076030	11	4	Occupation zone
999509	Red	076037	36	3	Feature zone
999510	Red	076038	26	3	Feature zone
999511	Red	076038	33	3	Feature zone
999512	Red	076029	10	4	Occupation zone
999513	Red	076038	40	3	Feature zone
999514	Red	077012	35	6	Feature zone
999515	Red	076029	11	4	Occupation zone
999516	Red	076037	45	3	Feature zone
999517	Red	065005	75	(2)	Submidden zone
999518	Red	085009	30	8	Feature zone
999519	Red	076010	39	5	Occupation zone
999520	Green	037044	45	9	Feature zone
999521	Green	037044	71	(9)	Mixed gravel
999522	Red	077012	53	5	Occupation zone
999523	Red	077012	47	5	Occupation zone
999524	Red	077002	34	5	Occupation zone
999525	Red	077003	32	6	Feature zone
999526	Red	077003	38	5	Occupation zone
999527	Red	056008	5	7	Occupation zone
999528	Red	085009	49	8	Feature zone
999529	Red	056016	9	7	Occupation zone
999530	Red	056008	8	7	Occupation zone
999531	Red	056016	11	7	Occupation zone
999532	Red	056007	5	7	Occupation zone
999533	Red	056027	8	7	Occupation zone
999534	Red	056008	10	7	Occupation zone
999535	Red	056007	8	7	Occupation zone
999536	Red	077012	35	6	Feature zone
999537	Red	077012	40	6	Feature zone
999538	Red	055066	8	2	Midden fill
999539	Red	055066	20	(2)	Submidden zone
999540	Red	055084	23	2	Midden fill
999541	Red	056084	33	2	Midden fill
999542	Red	056008	14	7	Occupation zone

TABLE 12. (continued)

Catalog Number	Area	Unit or Trench	Depth Below Ground Surface (cm)	Associated Feature	Stratum
999543	Red	056016	14	7	Occupation zone
999544	Red	056016	17	7	Occupation zone
999545	Red	056007	11	7	Occupation zone
999546	Red	056027	11	7	Occupation zone
999547	Red	056027	13	7	Occupation zone
999548	Red	055084	43	2	Midden fill
999549	Red	055084	50	(2)	Submidden zone
999550	Red	055084	60	(2)	Submidden zone
999551	Red	085010	30	8	Feature zone
999552	Red	075100	30	8	Feature zone
999553	Red	075099	28	8	Feature zone
999554	Red	075100	35	8	Feature zone
999555	Red	085010	35	8	Feature zone
999556	Red	075009	30	8	Feature zone
999557	Red	075009	32	8	Feature zone
999558	Red	075009	34	8	Feature zone
999559	Red	075009	36	8	Feature zone
999560	Red	075009	38	8	Feature zone
999561	Red	075099	43	8	Mixed gravel
999562	Yellow	117062	35	11	Feature zone
999563	White	079095	35	10	Feature zone
999582	Blue	November	8	1	Topsoil
999583	Blue	November	26	1	Topsoil
999584	Blue	November	43	1	Topsoil
999585	Blue	November	63	1	Subsoil
999586	Blue	November	84	1	Subsoil
999587	Blue	November	103	1	Subsoil
999588	Blue	November	121	1	Subsoil
999589	Blue	November	143	1	Subsoil
999590	Blue	November	162	1	Mixed gravel
999591	Blue	November	182	1	Mixed gravel
999592	Blue	November	199	1	Mixed gravel
999593	White	Kilo	134	1	Mixed gravel
999594	White	Kilo	180	1	Mixed gravel
999595	White	Kilo	33	1	Topsoil
999596	White	Kilo	81	1	Subsoil

Note: Parentheses indicate indirect feature association.

Organic material recovered from the flotation procedure was assigned the same catalog number as its CVS sample matrix, i.e., consecutively assigned in the field and prefixed by a triple "9." Light and heavy fractions of each sample, i.e., that material which floated and that which did not, were kept separated and designated by either an "L" or "H" suffix to the catalog number, as appropriate. This material was given to a botanist for identification, and the analysis is provided later in this section.

PARTICLE SIZE AND CONSTITUENT ANALYSES

Subsamples of 480 cm^3 of soil from each of the 79 CVS samples collected during mitigation were submitted to the Oklahoma State University (OSU) and the Texas A&M (TAMU) Soil Testing Laboratories. At OSU, the samples were mechanically analyzed for particle size; and at TAMU analyses were conducted to determine the pH, organic content, and chemical constituents. Tables 13 and 14 present the results of these analyses, keyed to the provenience of the samples provided in Table 12 by catalog number.

A discussion of the general site soil characteristics and the stratigraphic relationships between them has been provided in the previous section. Table 11 presents data from three samples taken from each of the primary soil strata at the site, well represented in the profile of November trench in the northwest area (Blue) of the site (Fig. 21). The major characteristics of each stratum, and such stratigraphic relationships as the increase in clay content and the decrease in organic content with depth, are clearly evidenced.

As most of the soil samples were collected from individual cultural features, these data will be presented and analyzed in conjunction with the discussion of these features. Of general interest is the nature of the soil with respect to the potential for the preservation of organic material. The outlook is gloomy, as evidenced by the data for organic content presented in Table 14. Of the 79 samples, most from cultural features, only three exceed 3.0% in organic content. Despite the mild to moderate alkalinity of the soil (6.8-8.8 pH, Table 14), the high clay content and the unusual hydrologic features of the site are factors which are attributed to poor organic preservation.

ECOFACTUAL MATERIAL

Only molluscan remains were recovered in any quantity during the mitigation activities. Faunal material was poorly preserved, and botanical remains were extremely limited in quantity. The rigor with which we collected and processed soil samples and then sorted the floated and cleaned organic residue left no doubt that this type of material was not missed; rather, it was never present in any appreciable quantity or, what is most likely, did not survive in the soil matrix at 41 BX 300. Factors of soil composition and continually high moisture content are suggested as most likely to account for this situation. The following reports from the respective consultants responsible for the various identifications and analyses of ecofactual

TABLE 13. PARTICLE SIZE ANALYSIS

Catalog Number	Sand	Silt	Clay	Texture
999500	30.00	18.00	52.00	Clay
999501	29.80	17.50	52.80	Clay
999502	28.00	20.50	51.50	Clay
999503	29.00	18.25	52.75	Clay
999504	27.50	20.75	51.75	Clay
999505	29.50	17.50	53.00	Clay
999506	28.25	17.25	54.50	Clay
999507	29.00	16.50	54.50	Clay
999508	30.00	17.00	53.00	Clay
999509	29.50	17.50	53.00	Clay
999510	29.75	18.00	52.25	Clay
999511	27.75	18.25	54.00	Clay
999512	28.00	19.50	52.50	Clay
999513	25.50	20.75	53.75	Clay
999514	28.50	18.75	52.75	Clay
999515	28.50	18.50	53.00	Clay
999516	28.75	17.25	54.00	Clay
999517	22.50	17.50	60.00	Clay
999518	27.50	17.00	55.50	Clay
999519	26.50	20.00	53.50	Clay
999520	28.50	17.00	54.50	Clay
999521	22.25	19.25	58.51	Clay
999522	24.25	21.25	54.50	Clay
999523	26.50	18.00	55.50	Clay
999524	26.50	19.00	54.50	Clay
999525	26.50	19.00	54.50	Clay
999526	23.50	23.00	53.50	Clay
999527	28.50	17.00	54.50	Clay
999528	27.50	16.50	56.00	Clay
999529	29.50	14.75	55.75	Clay
999530	27.25	16.75	56.00	Clay
999531	26.00	18.00	56.00	Clay
999532	28.50	18.00	53.50	Clay
999533	28.50	18.00	53.50	Clay
999534	30.00	16.25	53.75	Clay
999535	27.00	18.50	54.50	Clay
999536	30.00	17.50	52.50	Clay
999537	30.50	18.00	51.50	Clay
999538	28.00	17.25	54.75	Clay
999539	25.50	18.75	55.75	Clay
999540	30.25	18.00	51.75	Clay

TABLE 13. (continued)

Catalog Number	Sand	Silt	Clay	Texture
999541	26.50	18.75	54.75	Clay
999542	25.50	19.75	54.75	Clay
999543	27.75	17.75	54.50	Clay
999544	27.00	18.50	54.50	Clay
999545	29.00	16.50	54.50	Clay
999546	28.00	19.50	52.50	Clay
999547	28.00	19.50	52.50	Clay
999548	26.00	19.50	54.50	Clay
999549	23.25	18.50	58.50	Clay
999550	24.75	17.45	57.50	Clay
999551	25.50	20.00	54.50	Clay
999552	27.50	19.50	53.00	Clay
999553	27.50	19.75	52.75	Clay
999554	29.75	17.25	53.00	Clay
999555	29.50	16.50	54.00	Clay
999556	28.00	18.75	53.25	Clay
999557	27.00	20.00	53.00	Clay
999558	29.50	19.00	51.50	Clay
999559	27.50	21.00	51.50	Clay
999560	30.00	18.75	51.25	Clay
999561	30.00	26.50	43.50	Clay
999562	25.50	19.00	55.50	Clay
999563	29.50	19.00	51.50	Clay
999582	00.00	00.00	00.00	Not enough sample
999583	30.50	10.00	59.50	Clay
999584	25.00	9.50	65.50	Clay
999585	31.50	9.00	59.50	Clay
999586	28.50	12.00	59.50	Clay
999587	20.00	19.00	61.00	Clay
999588	20.00	17.00	63.00	Clay
999599	19.50	15.00	65.50	Clay
999590	17.00	43.50	39.50	Silt clay loam
999591	16.50	19.00	64.50	Clay
999592	16.00	17.00	67.00	Clay
999593	29.00	16.00	55.00	Clay
999594	24.50	18.50	57.00	Clay
999595	50.00	14.50	35.50	Sandy clay
999596	40.00	22.50	37.50	Loam

TABLE 14. CHEMICAL CONSTITUENT ANALYSIS

Catalog Number	PH	CA/A	C/L	MG/A	M/L	NIT	PO/A	P/L	KO/O	K/L	SALIN	ZINC	IRON	MANG	ORG
999500	6.8	>6000	VH	=425	H	=14	=395	VH	=570	HH	NONE	>20.0	= 4.0	= 8.0	2.7
999501	7.8	>6000	VH	=400	H	= 8	=395	VH	=520	HH	NONE	>20.0	= 3.6	= 6.1	2.9
999502	7.9	>6000	VH	=365	H	< 8	=310	VH	=480	HH	NONE	>20.0	= 4.0	= 6.0	2.7
999503	7.9	>6000	VH	=375	H	=11	=328	VH	=480	HH	NONE	=19.0	= 3.6	= 4.9	2.9
999504	8.1	>6000	VH	=385	H	< 8	=259	VH	=470	HH	NONE	>20.0	= 4.2	= 5.3	2.9
999505	8.0	>6000	VH	=405	H	=10	=279	VH	=610	HH	NONE	=10.0	= 4.4	>10.0	2.7
999506	8.1	>6000	VH	=345	H	< 8	=310	VH	=680	VH	NONE	=14.6	= 3.2	= 6.1	2.7
999507	7.8	>6000	VH	=400	H	< 8	=172	HH	=510	HH	NONE	>20.0	= 4.6	= 6.3	3.1
999508	8.2	>6000	VH	=375	H	< 8	=348	VH	=***	VH	NONE	>20.0	= 3.2	= 6.8	2.6
999509	7.8	>6000	VH	=365	H	< 8	=194	HH	=480	HH	NONE	=19.4	= 4.2	= 6.4	3.4
999510	7.8	>6000	VH	=365	H	< 8	=373	VH	=420	HH	NONE	=18.8	= 3.4	= 7.7	2.7
999511	8.1	>6000	VH	=375	H	< 8	= 83	HH	=380	HH	NONE	=19.6	= 3.0	= 5.5	2.0
999512	8.1	>6000	VH	=385	H	< 8	=297	VH	=450	HH	NONE	= 9.0	= 2.8	= 6.2	2.2
999513	8.1	>6000	VH	=380	H	< 8	= 38	LL	=390	HH	NONE	>20.0	= 3.4	= 5.7	2.0
999514	8.2	>6000	VH	=435	H	< 8	=107	HH	=420	HH	NONE	=15.6	= 3.0	= 7.0	2.4
999515	8.2	>6000	VH	=420	H	< 8	=194	HH	=410	HH	NONE	=18.0	= 3.0	= 5.0	2.7
999516	8.2	>6000	VH	=420	H	< 8	=194	HH	=410	HH	NONE	=18.0	= 3.0	= 5.5	2.7
999517	8.1	>6000	VH	=430	H	= 8	= 51	MM	=440	HH	NONE	=18.4	= 3.6	= 5.5	2.6
999518	8.1	>6000	VH	=305	H	< 8	= 5	VL	=350	HH	NONE	= 5.0	= 3.0	= 4.3	1.1
999519	8.0	>6000	VH	=425	H	< 8	= 56	MM	=510	HH	NONE	>20.0	= 4.2	= 9.8	2.3
999520	8.2	>6000	VH	=420	H	< 8	= 42	MM	=560	HH	NONE	=12.4	= 4.0	= 8.5	2.6
999521	8.2	>6000	VH	=485	H	< 8	=288	VH	=650	VH	NONE	=13.2	= 2.0	= 5.4	2.7
999522	8.6	>6000	VH	=440	H	< 8	=181	HH	=630	VH	NONE	=14.0	= 2.0	= 5.5	2.2
999523	8.2	>6000	VH	=375	H	< 8	= 34	LL	=490	HH	NONE	=19.4	= 3.4	= 7.0	2.0
999524	8.1	>6000	VH	=440	H	< 8	= 34	LL	=450	HH	NONE	=11.0	= 3.0	= 6.6	2.3
999525	8.0	>6000	VH	=380	H	< 8	= 38	LL	=530	HH	NONE	>20.0	= 3.2	= 8.9	2.3
999526	8.0	>6000	VH	=300	H	< 8	= 56	MM	=420	HH	NONE	>20.0	= 2.2	= 5.5	2.0
999527	8.3	>6000	VH	=325	H	< 8	= 38	LL	=440	HH	NONE	>20.0	= 2.4	= 4.7	1.9
999528	7.8	>6000	VH	=440	H	=16	=529	VH	=900	VH	NONE	>20.0	= 3.6	= 6.7	1.2
999529	7.7	>6000	VH	=440	H	< 8	= 38	LL	=530	HH	NONE	=12.6	= 3.8	= 6.0	2.2
999530	7.8	>6000	VH	=440	H	=12	>640	VH	=***	VH	NONE	=14.4	= 4.0	>10.0	1.3
999531	6.9	>6000	VH	=455	H	< 8	>640	VH	=850	VH	NONE	=18.6	= 5.0	= 7.2	0.8

TABLE 14. (continued)

Catalog Number	PH	CA/A	C/L	MG/A	M/L	NIT	PO/A	P/L	KO/O	K/L	SALIN	ZINC	IRON	MANG	ORG
999532	7.6	>6000	VH	=420	H	< 8	>640	VH	=900	VH	NONE	=12.4	= 5.0	= 8.5	1.3
999533	7.2	>6000	VH	=395	H	< 8	>640	VH	=900	VH	NONE	>20.0	= 3.8	= 7.6	1.7
999534	8.0	>6000	VH	=345	H	< 8	>640	VH	=550	HH	NONE	>20.0	= 3.8	= 7.5	2.0
999535	7.6	>6000	VH	=390	H	< 8	=580	VH	=680	VH	NONE	>20.0	= 4.4	= 7.5	2.2
999536	8.0	>6000	VH	=350	H	< 8	>640	VH	=600	HH	NONE	>20.0	= 4.2	= 5.9	1.8
999537	7.7	>6000	VH	=435	H	< 8	= 94	HH	=450	HH	NONE	=17.0	= 3.2	= 5.6	2.2
999538	8.0	>6000	VH	=475	H	< 8	=201	VH	=510	HH	NONE	>20.0	= 3.8	= 9.0	2.8
999539	7.8	>6000	VH	=360	H	< 8	= 13	VL	=450	HH	NONE	=12.0	= 3.4	= 5.3	2.5
999540	8.2	>6000	VH	=360	H	< 8	= 13	VL	=420	HH	NONE	=11.4	= 3.4	= 6.4	1.7
999541	7.8	>6000	VH	=340	H	= 8	=297	VH	=550	HH	NONE	=15.6	= 5.0	= 6.3	2.3
999542	8.2	>6000	VH	=345	H	< 8	= 56	MM	=500	HH	NONE	=13.0	= 4.0	= 5.2	2.0
999543	7.9	>6000	VH	=380	H	< 8	=268	VH	-700	VH	NONE	>20.0	= 5.0	= 5.6	2.7
999544	7.7	>6000	VH	=395	H	< 8	>640	VH	=810	VH	NONE	= 9.0	= 5.2	= 7.8	2.1
999545	7.9	>6000	VH	=370	H	< 8	>640	VH	=650	VH	NONE	=11.4	= 3.8	= 7.9	2.1
999546	8.0	>6000	VH	=330	H	< 8	=529	VH	=510	HH	NONE	=14.6	= 3.6	= 5.8	1.9
999547	7.9	>6000	VH	=335	H	< 8	=540	VH	=490	HH	NONE	= 6.8	= 3.4	= 6.2	2.0
999548	8.0	>6000	VH	=375	H	= 8	=453	VH	=470	HH	NONE	= 5.4	= 3.4	= 7.6	1.9
999549	8.0	>6000	VH	=390	H	= 8	= 60	MM	=500	HH	NONE	=11.8	= 3.8	= 5.7	2.2
999550	8.2	>6000	VH	=385	H	= 8	= 18	VL	=480	HH	NONE	>20.0	= 3.6	= 7.0	1.4
999551	7.9	>6000	VH	=415	H	= 8	= 16	VL	=440	HH	NONE	=16.6	= 3.8	= 5.7	1.1
999552	8.1	>6000	VH	=415	H	< 8	= 83	HH	=550	HH	NONE	>20.0	= 4.2	= 6.2	2.1
999553	8.0	>6000	VH	=405	H	< 8	= 78	MM	=610	HH	NONE	>20.0	= 8.0	=10.0	2.7
999554	8.0	>6000	VH	=410	H	< 8	= 94	MM	=550	HH	NONE	=20.0	= 5.8	= 8.0	2.0
999555	8.0	>6000	VH	=395	H	< 8	= 42	MM	=560	HH	NONE	=13.0	= 6.0	= 7.0	1.9
999556	8.0	>6000	VH	=500	H	< 8	= 60	MM	=580	HH	NONE	=19.6	= 6.8	= 7.5	2.1
999557	8.0	>6000	VH	=460	H	< 8	= 69	MM	=590	HH	NONE	=16.0	= 7.2	= 9.4	2.5
999558	8.2	>6000	VH	=410	H	< 8	= 42	MM	=560	HH	NONE	>20.0	=11.6	= 5.4	2.5
999559	7.6	>6000	VH	=380	H	< 8	= 51	MM	=510	HH	NONE	=12.0	=20.0	>10.0	1.9
999560	7.8	>6000	VH	=420	H	< 8	= 31	LL	=570	HH	NONE	=10.0	=10.0	= 8.0	1.9
999561	8.0	>6000	VH	=390	H	< 8	= 27	LL	=510	HH	NONE	= 5.6	= 6.8	= 5.2	2.1
999562	8.0	>6000	VH	=385	H	< 8	= 18	VL	=530	HH	NONE	= 4.0	=11.6	= 7.3	1.9
999563	8.2	>6000	VH	=460	H	< 8	=150	HH	=730	VH	NONE	= 6.0	=18.6	= 5.9	1.5

TABLE 14. (continued)

Catalog Number	PH	CA/A	C/L	MG/A	M/L	NIT	PO/A	P/L	KO/O	K/L	SALIN	ZINC	IRON	MANG	ORG
999582	8.0	>6000	VH	=395	H	< 8	=156	HH	=730	VH	NONE	>20.0	=11.0	= 8.8	1.6
999583	7.7	>6000	VH	=455	H	= 9	=303	VH	>***	VH	NONE	>20.0	=11.2	>10.0	3.1
999584	7.7	>6000	VH	=480	H	< 8	=357	VH	>***	VH	NONE	=10.8	>20.0	= 9.0	1.9
999585	8.2	>6000	VH	>500	H	< 8	=150	VH	=950	VH	NONE	=13.0	>20.0	>10.0	1.4
999586	8.2	>6000	VH	=460	H	< 8	= 69	MM	=730	VH	NONE	=11.8	>20.0	>10.0	1.1
999587	8.3	>6000	VH	>500	H	< 8	= 60	MM	=780	VH	NONE	= 8.6	=13.0	= 9.4	1.0
999588	8.6	>6000	VH	=490	H	< 8	= 69	MM	=760	VH	NONE	=10.6	=11.0	= 4.3	0.7
999589	8.6	>6000	VH	+450	H	=11	= 87	HH	=720	VH	NONE	>20.0	=11.0	= 3.5	0.7
999590	8.8	>6000	VH	=455	H	= 8	=132	HH	=770	VH	NONE	>20.0	=11.0	= 1.9	0.5
999591	8.7	>6000	VH	=435	H	< 8	=156	HH	=750	VH	NONE	>20.0	=11.0	= 4.0	0.5
999592	8.4	>6000	VH	=450	H	< 8	=279	VH	=900	VH	NONE	>20.0	=11.0	= 2.3	0.3
999593	8.5	>6000	VH	=405	H	< 8	=417	VH	=800	VH	NONE	>20.0	=11.0	= 4.3	0.3
999594	8.1	>6000	VH	=400	H	< 8	=187	HH	=700	VH	NONE	>20.0	=11.0	= 2.7	1.4
999595	8.2	>6000	VH	=450	H	< 8	= 18	VL	=550	HH	NONE	>20.0	=11.0	= 3.5	0.5
999596	8.2	>6000	VH	>500	H	< 8	= 22	LL	=570	HH	NONE	>20.0	=11.0	= 3.5	0.3

Key:
CA/A - Calcium lbs. per acre
C/L - Calcium level
MG/A - Magnesium lbs. per acre
M/L - Magnesium level
NIT - Nitrogen lbs. per acre
PO/A - Phosphorus (P_2O_5) lbs. per acre
P/L - Phosphorus (P_2O_5) level

KO/A - Potassium (K_2O) lbs. per acre
K/L - Potassium (K_2O) level
SALIN - Salinity hazard
ZINC - Zinc ppm
IRON - Iron ppm
MANG - Manganese ppm
ORG - Percentage organic content

VL - Very low
L,LL - Low
M,MM - Medium
H,HH - High
VH - Very high

Conversion Factors: lbs. per acre at 6 inches below grand surface = ppm x 2
$K_2 \times 0.83 = K$
$P_2O_5 \times 0.347 = P$

material are thus correspondingly brief; they are presented here in their entirety, with only minor editorial changes.

BOTANICAL IDENTIFICATION AND ANALYSIS* (Dr. Donald McLain, Department of Biology, Incarnate Word College, San Antonio, Texas)

Botanical materials recovered by excavation were, as would be expected, mostly fragments of charcoals. These were only partially burned; they were usually heavily permeated with calcium carbonate; and on occasion they were saturated with unsaponified lipids (e.g., Charcoal Sample No. 999613; see Table 15). To me, this would indicate almost immediate covering of a low temperature fire with soil, rather than long exposure to the weather. Such exposure would permit saponification by the action of rain and wood ashes on the fatty materials.

Charcoal Sample No. 1089 consists of fragments of angiosperm wood which are dusted with pollen grains of **Juniperus** sp. Assuming a similar climate to that of today, this charcoal was exposed during the first quarter of the year when clouds of juniper pollen are shed.

Several other collections of seeds and other uncharred plant materials (e.g., Soil Sample Nos. 999505-L, 999514-L, 999519-L, 999520-L, see Table 16) indicate deposition during the last or first quarter of the year. These collections contain nearly intact winter buds of **Ulmus** sp., **Juniperus** sp. pollen, short shoots, immature inflorescences of grasses, and **Capsella** and other crucifer seeds, all of which are produced only in cold weather.

PHYTOLITH ANALYSIS

In 1971, Rovner published a position paper detailing the potential of opal phytolith analysis in paleoecological reconstruction. Nine years later, Rovner was able to organize the first symposium specifically on the subject of plant opal phytolith analysis in archaeology at the 1980 Annual Meeting of the Society for American Archaeology. In the keynote paper for this symposium, Rovner (1980:1) states the following:

> Opal phytoliths are biogenous plant particles comprised predominantly of opaline silica precipitated by the living parent plant in, around and/or between plant cells, variously throughout some plants, more localized in others. Study of the mineralogical nature of these particles indicates that the opal is "surprisingly pure" and of "gemstone quality." Significantly, hydrocarbons--

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*Author's note: Two collections of material were submitted to Dr. McLain for identification. One consisted of charcoal samples not used for radiocarbon dating; their provenience and identification are provided in Table 16. The other collection consisted of the light and heavy fractions of floated feature soil; the identifiable specimens are listed in Table 17, with provenience keyed to Table 12 by means of the catalog number.

TABLE 15. IDENTIFICATION OF CHARCOAL SAMPLES

Catalog Number	Area	Unit or Trench	Depth Below Ground Surface (cm)	Associated Feature	Identifiable Material or Item(s)
118	Red	066020	21-31		Elm (**Ulmus** sp.); charcoal and uncharred wood
1089	Yellow	123009	0-15		Unidentifiable charcoal fragments with quantities of Juniper (**Juniperus** sp.) pollen
1694	Red	085009	0-20		Not identifiable
1696	Red	085009	0-20		Not identifiable
1697	Red	085009	0-20		Not identifiable
4031	Red	076037	0-10		Charred xylem of angiosperm plant
4137	Red	085009	30-43	8	Well-preserved fragments of hackberry (**Celtis** sp.) seed and fruit; charcoal fragments of live oak (**Quercus virginianus**)
4627	Red	055088	38-51	2	Baked earth; unidentifiable vegetal fragments
6347	Red	Hotel	Backdirt		Burned soil with some highly calcified charred xylem in minute fragments
6431	Yellow	Bravo	Backdirt		Uncharred pecan (**Carya pecan**) hull; well-preserved hackberry (**Celtis** sp.) charcoal
7251	Red	076038	20-40	3	Baked earth; unidentifiable vegetal fragments
7334	Red	076037	20-40	3	Baked earth; slightly charred pecan (**Carya pecan**) hulls
999713	Red	056026	9-12	7	Fat-saturated, powdered charcoal

TABLE 16. IDENTIFICATION OF ECOFACTUAL MATERIAL ASSOCIATED WITH FEATURE SOIL SAMPLES

Catalog Number	Associated Feature	Identifiable Material or Item(s)
999505-L	3	Unknown item; elm (**Ulmus** sp.) bud scales; mustard (**Crucifereae** family); snail
999505-H	3	Elm (**Ulmus** sp.) winter bud scales; snails
999508-L	4	Snail; unknown seed, sedge (**Carex** sp.) seed; elm (**Ulmus** sp.) winter bud scale
999508-H	4	Snail; pigweed (**Chenopodium** sp.) seeds
999514-L	6	Snail; elm (**Ulmus** sp.) winter bud scale; grass (**Poaceae** family) inflorescence fragment
999514-H	6	Snail; juniper (**Juniperus** sp.) shoots
999516-L	3	Snail
999516-H	3	Snail; unknown item, not plant material
999517-L	(below 2)	Snail; oak (**Quercus** sp.) acorn; hackberry (**Celtis** sp.); shepherds purse (**Capsella** sp.)
999517-H	(below 2)	Prickly poppy (**Argemone** sp.) seed
999519-L	5	Snail; mustard (**Crucifereae** family); elm (**Ulmus** sp.) winter bud scales; orchard grass (**Dactylis** sp.) inflorescence; unknown seeds
999519-H	5	Juniper (**Juniperus** sp.) shoots: dock or sorrel (**Rumex** sp.)
999520-L	9	Snail; grass (**Poaceae** family) inflorescence; shepherds purse (**Capsella** sp.); dock or sorrell (**Rumex** sp.); unknown item
999520-H	9	Snail
999527-L	7	Amaranth (**Amaranthaceae** family); juniper (**Juniperus** sp.) buds; unknown fragments
999527	7	Beard, broom or sand grass (**Andropogon** sp.); eroded seed fragment
999538-H	2	Hackberry (**Celtis** sp.); gourd (**Curcurbita** sp.) seed

TABLE 16. (continued)

Catalog Number	Associated Feature	Identifiable Material or Item(s)
999540-L	2	Amaranth (**Amarantheceae** family); mustard (**Cruciferae** family)
999541-L	2	Plant fragment, but not a seed
999541-H	2	Sedge (**Carex** sp.) seed
999546-L	7	Unknown item; beard, broom or sand grass (**Andropogon** sp.) seed; grass (**Poaceae** family) bar seed
999546-H	7	Unknown item; juniper (**Juniperus** sp.) needles and buds; gourd (**Curcurbita** sp.) seed
999551-L	8	Senna (**Cassia** sp.) seed
999551-H	8	Dock or sorrel (**Rumex** sp.); clover (**Trifolium** sp.) seed
999562	11	Beard, broom or sand grass (**Andropogon** sp.); fruit wall (does not appear to be "ancient" species)
999563	10	Rush (**Juncus** sp.); unknown seed

L = light fraction (see Collection and Processing of Constant Volume Samples Section)
H = heavy fraction (see Collection and Processing of Constant Volume Samples Section)

> organic molecules--are virtually absent in the composition of opal phytoliths making them totally invulnerable to organic decay. Soil phytolith assemblages contributing to this study vary in age from 2000 years to more than 9000 years ago, and come from tropical forest, semiarid prairie and mixed hardwood forest environments. R. L. Hay (personal communication) reported opal phytoliths as the only ubiquitous plant fossil found at Olduvai Gorge. George Baker (1959) reports phytoliths in Pleistocene and Pliocene deposits. Opal phytoliths still retaining their morphological integrity have even been extracted from Cenozoic sedimentary rock. Phytoliths, then, are preserved over the total range of archaeological history . . . [and] are categorically the most durable biogenous plant fossil known, bar none. Pollen is no exception.

The interest and excitement in opal phytolith analysis which culminated in the 1980 symposium was quite strong in 1977 when the proposal to mitigate 41 BX 300 was written. Years of continued attempts with consistently disappointing results had forced the conclusion that the identification and analysis of pollen from archaeological sites in south-central Texas was inconsistent and generally inconclusive. "Additionally, UTSA testing has shown faunal remains to be few and poorly preserved at the site [i.e., 41 BX 300]. However, we place our greatest expectations on the rapidly developing potential of phytolith studies in central Texas" (Hester, Gunn, and Katz 1977:32).

We wish to thank the National Park Service for their foresight and generosity in providing funding as part of the 41 BX 300 mitigation project for opal phytolith analysis. We hope that it is understood and appreciated that this method of analysis was, and still is, in the research and development stage. Like the thermoluminescence dating of burned rock to be discussed later, our enthusiasm for the potential of the analytical method was always greater than our expectations of interpretable data.

Twenty-nine soil samples were collected specifically for phytolith identification and analysis. Fourteen were associated with features, intended to provide additional data on feature use or associated activities and to benefit from whatever chronological information was forthcoming from the feature analyses. The remaining 15 were taken from the walls of two trenches on different sides of the site to provide stratigraphic as well as comparative data on the paleoenvironment of the site (Figs. 16,b; 21). Table 17 provides provenience data for these samples. The phytolith samples were collected from the same features and trenches as were CVS samples intended for the various soil analyses and botanical identification previously discussed. This redundance was intentional, to provide a cross-check on the respective results and to provide a backup for the still experimental phytolith analysis.

The laboratory analysis was conducted by Ralph Robinson, a research associate of the UTSA Center for Archaeological Research. Robinson employed a modified version of Rovner's (1971) method for separating the opal phytoliths from their soil matrix. This methodology is detailed in two reports by Robinson (1979, n.d.), in which the paleoenvironment at several archaeological sites in Goliad County, Texas, is reconstructed and compared by means of opal

TABLE 17. DISTRIBUTION OF PHYTOLITH SAMPLES

Catalog Number	Area	Unit or Trench	Depth Below Ground Surface (cm)	Associated Feature	Stratum
999700	Red	076038	13	3	Feature zone
999701	Red	076038	23	3	Feature zone
999702*	Red	076038	26	3	Feature zone
999703	Red	076038	33	3	Feature zone
999704	Red	076038	40	3	Feature zone
999705	Red	077012	36	6	Feature zone
999706	Red	India-E	85	(2)	Submidden zone
999707	Green	038054	110	(9)	Mixed gravel
999708	Green	038054	85	9	Feature zone
999709	Red	085009	44	8	Feature zone
999710*	Red	077003	30	6	Feature zone
999711*	Red	077003	40	5	Occupation zone
999712*	Red	085009	49	8	Feature zone
999713	Red	056026	12	7	Occupation zone
999714	Blue	November	10		Topsoil
999715	Blue	November	25		Topsoil
999716	Blue	November	42		Topsoil
999717	Blue	November	62		Subsoil
999718	Blue	November	82		Subsoil
999719	Blue	November	102		Subsoil
999720	Blue	November	121		Subsoil
999721	Blue	November	142		Subsoil
999722	Blue	November	161		Mixed gravel
999723	Blue	November	179		Mixed gravel
999724	Blue	November	197		Mixed gravel
999725*	White	Kilo	48		Topsoil
999726*	White	Kilo	100		Subsoil
999727*	White	Kilo	150		Mixed gravel
999728*	White	Kilo	200		Mixed gravel

Note: Parentheses indicate indirect feature association

*Analyzed

phytolith analysis. The techniques which enabled Robinson to reach this stage were worked out in part during the 41 BX 300 project.

Among the primary difficulties which Robinson faced when attempting to extract the phytoliths from 41 BX 300 soil samples was the high clay content of the soil matrices, regardless of provenience. Reference has already been made to this fact, relative to the necessity of extracting and cleaning organic material from the CVS samples with hydrogen peroxide rather than with water. Several laboratory accidents occurred during the course of the phytolith extraction process, one of which caused physical injury to Robinson and each of which resulted in some damage and loss to the samples.

Once extracted, moreover, Robinson was literally overwhelmed by the sheer number of phytoliths in need of identification and classification. Their preservation is truly remarkable. Robinson, however, is the pioneer in this type of research in south-central Texas; there is no comparative collection available, either locally or regionally. It was necessary to build a "type collection" of phytolith specimens, not just for genus and species but for each part of each genus and species (e.g., leaf, stem, root). Robinson worked at this task long after the available funds were exhausted.

In order to reduce the quantity of material needed to be looked at, and to compensate for the loss of some matrix material, a selection of the remaining samples was made. The four samples from Kilo trench were considered, in order to provide a relative stratigraphic sequence of data. In addition, five samples from different features were selected, features which by this time had been assigned to chronologically distinct phases. The nine samples are indicated on Table 17.

The absence of comparative phytolith collections at the time Robinson conducted his identification necessitated a fairly gross classification level. He was able to make a general distinction between grasses and trees. Further, within grasses, tall could be distinguished from short; and within trees, the riverine species could be distinguished from upland or prairie. To these qualitatively identifiable phytoliths, he added data on quantity and chronology, resulting in the broad sequence of paleoclimatic change shown in the first column of Table 1.

The phytolith sequence indicates that the environment at the site was either wooded with tall grass on the uplands or exhibited a savanna-like setting with grassy areas between groves of trees. This time corresponds to the Central Texas Oakalla phase/Local Period 5 (see Table 1), which, representing the several hundred years prior to the beginning of the Central Texas Clear Fork phase/Local Period 6, marks the transition from the Early to the Middle Archaic period. Fifteen hundred years later, about 1500 B.C., the conditions seem to have deteriorated, with fewer trees and a shorter species of grass in evidence. This is the time of the beginning of the Central Texas Round Rock phase/Local Period 7, the cultural peak of the Middle Archaic period in terms of population and number of sites. Fairly soon afterward, by about 800 B.C., the climate changes to one similar to that of 3000 B.C., with a return of tall grass and riverine forest trees. This particular time corresponds approximately to the Central Texas San Marcos phase/Local Period 8, which initiates the transition from Middle to Late Archaic. No phytolith data are available from the 41 BX 300 samples for the period prior to 3000 B.C. or after 500 B.C.

FAUNAL ANALYSIS (Harold Wooldridge, Austin, Texas)

Analysis of the faunal material recovered from site 41 BX 300 was undertaken in order to assess the importance of the vertebrate fauna in the subsistence strategies employed by the aboriginal occupants. The small amount of bone recovered, however, prevented detailed cultural inferences. Poor bone preservation negated such analysis goals as determining aboriginal exploitation patterns and habitat selection, seasonality, and explanation of cultural practices forced upon the fauna as evidenced by burning, cutting, shaping and the breakage of bone. The possible reasons for the apparent rapid deterioration of bone at 41 BX 300 are explored. It is indeed unfortunate that the small sample of faunal materials recovered restricts our analytical methods and limits our understanding of the role played by the vertebrate fauna in the aboriginal subsistence system.

Methodology

Identification of the specimens was accomplished by using the vertebrate collections of the Texas Archeological Research Laboratory and The University of Texas Vertebrate Paleontology Laboratory at Balcones Research Center, Austin, Texas, as comparative material. For each cultural unit identified, the species represented, age at death, sex, burning, and butchering marks were noted where possible. The minimum number of individuals within each unit was calculated according to the techniques recommended by Chaplin (1971:70-75), which involve the counting of specific skeletal elements with consideration given to symmetry (left versus right), size, age at death, and sex, where discernible. The criteria used to estimate the age at death of the animal represented by the elements recovered included the extent of epiphyseal fusion, presence of deciduous teeth, level of dental attrition, and the presence of horns and antlers in the deer and antelope. Correlation of these data provided the statistical base from which the spatial distribution of the fauna was determined and cultural inferences were developed.

Statistical Base

Three classes of fauna (reptiles, birds, mammals) were identified from 41 BX 300. Table 18 lists the faunal inventory, the number of specimens recognized, and the minimum number of individuals represented by this count. As can be seen, the inventory is sparse and may reflect the poor organic preservation within the site. Those species recovered from the surface and not contextually related to cultural causation are herein assumed to have occurred because of noncultural phenomena. This premise is strengthened by the occurrence of javelina and armadillo, two species that have expanded their range northward to include the area encompassing 41 BX 300 only within the last few hundred years. Those species recovered from the subsurface and those detected **in situ** within cultural features are more likely either the

TABLE 18. FAUNAL INVENTORY

Species	Number of Fragments	Minimum Number of Individuals
REPTILES		
Common snapping turtle (**Chelydra serpentina**)	2	
BIRDS		
Caracara (**Caracara cheirway**)	1	1
MAMMALS		
Pronghorn antelope (**Antelocapra americana**)	1	1
White-tailed deer (**Odocoileus virginianus**)	9	4
Cottontail rabbit (**Sylvilagus floridanus**)	1	1
Armadillo (**Dasypus novemcinctus**)	6	3
Raccoon (**Procyon lotor**)	2	1
Javelina (**Tayassu tajacu**)	2	1
Cotton rat (**Sigmodon hispidus**)	1	1

result of human enterprise or at least co-inhabitants of 41 BX 300 and, given a larger sample, might have been conducive to environmental reconstruction.

Of the ten distinct cultural features detected, only Features 2 and 7 from Area Red produced diagnostic elements for species identification (Table 19). An adult white-tailed deer was recognized from Feature 2, and an adult antelope was detected within Feature 7. Feature 2 was determined during excavation to be a burned rock midden, and Feature 7 was classified as an occupational living floor. In addition to these individuals, a juvenile white-tailed deer, an adult raccoon, and an adult cotton rat were recovered from various units also within Area Red. These species are all within their present-day natural ranges, and it is assumed that they, with the possible exception of the cotton rat, provided a portion of the meat protein for the site occupants. Area Green produced an additional white-tailed deer and a snapping turtle. From the surface was recovered a cottontail rabbit and a scavenging bird (**Caracara**), as well as the armadillos and the javelina remains. Disregarding for now the doubtful cultural association of the surface finds, we might infer that the major exploitation emphasis was on deer and antelope.

Two biotic zones are represented by these recovered species: a mixed scrub forest is favored by white-tailed deer and raccoons, while antelope are found in grassland prairies. Until better temporal placement of the various cultural features is ascertained, the site, taken as a whole, reflects exploitation of both habitats. Again, the sample size is too small to justify inferences but may be indicative of a pattern, although supported by the data in only a limited way.

TABLE 19. DISTRIBUTION OF IDENTIFIED FAUNAL ELEMENTS

Area	Unit or Trench	Level	Species	Element	Symmetry	Age	Part
Blue	001000	Surface	Deer/Antelope	Metatarsal	Left	Adult	Proximal
Green	036000	Surface	Deer/Antelope	Femur	Right	Adult	Distal
Green	045037	1	Snapping Turtle	Carapace	?	?	Fragment
Green	Foxtrot	Backdirt	Javelina	Molar, premolar	?	Adult	Fragment
Green	Foxtrot	Backdirt	Javelina	Canine	?	Adult	Fragment
Green	Golf	Backdirt	White-tailed Deer	Calcaneus	Left	Adult	Medial
Green	038069	2	Deer/Antelope	Ulna, metacarpal	Right	Adult	Fragment
Red	095000	Surface	Cottontail Rabbit	Femur	Right	Adult	Proximal
Red	056064	Feature 2	Armadillo	Metatarsal	Left	Adult	Complete
Red	056064	Feature 2	Armadillo	Phalanx	?	Adult	Complete
Red	056064	Feature 2	Armadillo	Carapace	?	?	Fragment
Red	055084	Feature 2	White-tailed Deer	Astragulus	Right	Adult	Fragment
Red	056016	Feature 7	Deer/Antelope	Metapodial	?	Adult	Distal
Red	056016	Feature 7	Antelope	Metacarpal	Right	Adult	Medial
Red	085066	1	Raccoon	Isolated molar	Right	Young adult	Complete
Red	085066	1	Raccoon	Isolated molar	Right	Young adult	Complete
Red	085066	1	Armadillo	Phalanx	Left	Juvenile	Complete
Red	085066	1	Deer/Antelope	Second phalanx	?	Juvenile	Complete
Red	076030	2	Cotton Rat	Isolated molar	?	Adult	Complete
White	069000	Surface	White-tailed Deer, female	Skull fragments	-	Adult	Fragment
White	069000	Surface	White-tailed Deer	Third phalanx	?	Adult	Complete
White	069000	Surface	White-tailed Deer	Metapodial	?	Adult	Distal
White	069000	Surface	White-tailed Deer	Mandible, M1-M3	Right	Adult	Medial
White	068000	Surface	Caracara	Humerus	Left	Adult	Distal
Yellow	Bravo	Backdirt	Armadillo	Carapace	?	?	Fragment

The lack of rabbits and other smaller mammals within the assemblage may be attributed to poor preservation, screen-size bias, or to their absence from the area during the span of the 41 BX 300 occupation. This last possibility is unlikely, as a well-rounded faunal assemblage which includes these smaller animals was reported from nearby 41 BX 36 (Jerry Henderson, personal communication).

Fine screening was accomplished on those samples primarily intended for soil analysis, and recovery included only one identifiable element, a cotton rat molar. Altogether, the sample size is too small to justify many cultural inferences. The absence of migratory birds, hibernating or estivating species, and antlers or diagnostic skull parts precludes seasonality studies. Those elements that were species diagnostic did not exhibit any form of cultural modification, hence no data on butchering practices or bone tool manufacturing are available. Those data compiled concerning the weight of the unidentifiable fragments are listed in Table 20 and concentrate, naturally, within the cultural features detected.

The poor preservation of bone at 41 BX 300 cannot easily be explained. The soil analysis conducted at Texas A&M University indicates soil pH was basic, usually conducive to good organic preservation. The length of time that the bone remains exposed to the elements before being covered also affects the preservation and should be investigated as a possible explanation for the condition of the recovered material. Even granting the poor preservation, the limited number of species recovered is surprising if 41 BX 300 represents a major long-term occupation. Other artifactual data need to be consulted to see if the above reflects reality or if 41 BX 300 actually represents (a succession of) sporadic, short-duration occupation(s).

Summary

Faunal data from site 41 BX 300 were analyzed in order to determine the basic subsistence strategies utilized by the site occupants. A pattern of exploitation of both the mixed scrub forest and grassland prairie is indicated, but conclusive inferences are precluded by the limited sample. The range of elements recovered indicates the entire carcass was returned to the site, but again the limited sample size and absence of butchering evidence makes this interpretation only speculation. The lack of recovered species amenable to seasonality studies negated inference of the time of occupation of 41 BX 300. All species represented within the assemblage are found in the area today; from the data at hand, it would appear that conditions were much the same as today.

MOLLUSCAN ANALYSIS (Dr. Harold Murray, Department of Biology, Trinity University, San Antonio, Texas)

The mollusks obtained from the collections of 41 BX 300 are primarily gastropods (snails), with the exception of 31 specimens of **Crassostrea virginica** and 704 specimens of **Exogyra**.

TABLE 20. DISTRIBUTION OF UNIDENTIFIED FAUNAL FRAGMENTS

Area	Unit or Trench	Level	Unburned (g)	Burned (g)
Phase III Excavations				
Blue	011029	1	2.4	0.0
Blue	011026	2	2.8	0.0
Green	Foxtrot	Backdirt	1.7	0.0
Green	Echo	Backdirt	1.2	1.8
Green	024079	1	0.3	0.0
Green	049016	1	0.8	0.0
Red	Juliet	Backdirt	0.5	0.0
Red	056008	1	0.1	0.0
Red	056009	1	0.0	0.5
Red	056064	1	0.9	0.0
Red	056083	1	0.0	0.2
Red	065002	1	0.0	0.4
Red	065013	1	0.0	0.5
Red	066003	1	0.3	0.0
Red	066014	1	0.4	0.0
Red	066018	1	0.4	0.5
Red	067012	1	0.3	0.3
Red	067014	1	0.2	0.3
Red	076010	1	0.0	0.3
Red	076038	1	0.0	0.5
Red	055088	2	6.6	2.7
Red	055089	2	0.3	0.0
Red	067012	2	0.7	0.8
Red	067014	2	0.2	0.4
Red	075099	2	1.3	0.0
Red	075100	2	0.0	0.4
Red	076047	2	0.0	0.4
Red	076048	2	0.1	0.0
Red	077003	2	2.4	0.6
Phase III Excavations (continued)				
Red	077022	2	0.4	0.0
Red	056023	3	1.0	0.5
Red	056044	3	0.0	0.2
Red	056046	3	1.1	0.0
Red	066020	3	0.2	0.4
Red	077002	3	0.2	2.5
Red	056019	4	0.3	0.6
Red	056044	4	1.5	0.3
Red	056046	4	0.1	0.4
White	100000	Surface	0.1	2.0
White	168000	Surface	0.5	0.0
White	059054	1	0.3	0.0
Yellow	Bravo	Backdirt	0.0	0.5
Yellow	138000	Surface	4.4	0.0
Yellow	118050	2	0.0	0.4
Yellow	119045	2	0.0	0.4
Yellow	123009	2	0.3	0.0
Yellow	117039	3	0.1	0.0
Yellow	118042	3	0.2	0.0
Yellow	118045	3	0.0	0.5
Yellow	118047	3	1.0	0.0
Phase II Excavations				
Green	038068	1	2.4	0.3
Green	038069	1	3.6	0.0
Green	038049	1	2.9	0.0

TABLE 20. (continued)

Area	Unit or Trench	Level	Unburned (g)	Burned (g)
	Phase II Excavations (continued)			
Green	045037	2	2.9	2.0
Green	038060	2	9.2	0.0
Green	038049	2	0.0	1.5
Green	038059	2	6.1	0.0
Green	048072	2	0.0	0.7
Green	048072	2	0.0	0.8
Green	038059	2	0.0	0.8
Green	038069	2	0.0	0.2
Green	038069	3	2.9	0.0
Green	038068	3	4.7	0.5
Green	038069	4	4.8	0.0
Green	045037	4	0.0	0.7
Red	085066	1	0.3	0.0
Red	055099	1	0.1	0.0
Red	066046	2	4.1	0.0
Red	075099	3	0.2	0.3*
Red	077012	3	0.0	0.2**
Red	065010	5	0.5	0.0
Yellow	138096	2	0.1	0.0
Yellow	138096	3	0.0	0.1
	CVS Fine Screen			
Green	038069	2	0.1	0.0
Green	038069	3	3.9	0.0

Area	Unit or Trench	Level	Unburned (g)	Burned (g)
	CVS Fine Screen (continued)			
Green	038069	4	0.3	0.0
Green	038069	3/4	9.1	0.0
Red	065029	1	0.4	0.0
Red	065029	2	0.1	0.0
Red	076037	3	0.0	0.1
Red	075099	3	0.1	0.1
Red	076038	3	0.1	0.1
Red	056008	4	0.1	0.0
Red	056027	5	0.1	0.0
Red	065029	1/2	0.0	0.2
	Associated Features			
	Feature 3		9.6	1.6
	Feature 4		0.4	0.6
	Feature 5		13.7	0.0
	Feature 6		3.9	0.0
	Feature 7		5.9	1.0
	Feature 8		0.5	0.8
	Feature 11		19.9	0.0

*Feature 8
**Feature 6

C. virginica, the eastern oyster, is a marine pelecypod. None of the **C. virginica** is a fossil specimen. Twenty-nine of the specimens were obtained from the surface up to 22.99 cm in depth, one specimen was obtained from 23 to 42.99 cm below the surface, and one specimen from 53 to 53.99 cm below the surface. Because specimens occurred from the surface up to 53.99 cm, and because none is a fossil, I judge that all were transported from the Texas coast either live or dead and deposited in the site.*

Exogyra sp. is a fossil pelecypod common to the area. The presence of **Exogyra** sp. in this collection is probably the result of either normal excavating procedures uncovering the fossil from its original stratum or the result of cultural interest on the part of the original inhabitants who discarded the specimens in the site when they were finished with them.

The only freshwater mollusks recovered from the site were 22 specimens of **Helisoma** sp., a pulmonate snail. Because of the small number recovered, and because 19 of the 22 specimens were in the upper 23 cm of the site, it is possible that **Helisoma** is an accidental contaminate to the site as a result of freshwater material (plants, etc.,) being carried into the site from a nearby stream or body of water.

All of the remaining mollusks from 41 BX 300 are land gastropods which occur at present in the local fauna. Ten genera of land gastropods were removed from the site and are as follows: **Rabdotus, Polygyra, Helicina, Succinea, Praticolella, Vertigo, Carychium, Euglandina,** Pupoides, and the shell of one slug.

From the above list of land gastropods, the following are eliminated because of small numbers recovered, lack of ecological information on the group, inability to determine the species, or any combinations of the above reasons: **Pupoides** sp., **Carychium** sp., **Vertigo** sp., **Succinea** sp., and the shell of one slug. **Euglandina singleyana** is a gastropod which feeds on other snails. Its presence in the site is to be expected, and at present it occurs in the area in small numbers.

The remaining species of land gastropods--**Rabdotus dealbatus, Polygyra texsiana, Helicina orbiculata**, and **Praticolella berlandieriana**--occur in sufficient numbers and at sufficient depths to arrive at suggestions concerning the ecology of the area at time of deposition.

Rabdotus dealbatus is a species common to the area today. The 3114 specimens recovered from the site at depths of up to 165.5 cm from the surface indicate the broad length of time the species has occurred in the area. The large

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*Author's note: All these specimens of **C. virginica** are considered to belong to a single cache of shells deposited quite recently at the site. Of the 31 specimens, 29 were recovered in a tight cluster on the surface in Block 123 in the southwest corner of the site (Fig. 11). The two subsurface specimens were excavated (one each) from the two units placed in this same block to investigate a possible feature appearing in the side of Bravo trench (Fig. 11). The feature was determined to be a recently dug pit associated with the shells. The pit and associated molluscan material are interpreted as a modern clambake.

number recovered indicates it was a common snail in the past. Pilsbry (1946:13, 15) states that **R. dealbatus** is ". . . in mesquite chaparral, hibernating in the earth, estivating upon bushes, adhering to bark . . .,"and ". . . in estivation may be sealed to large cactus, mesquite, coarse grass and shrubs. . . ." **R. dealbatus** is clearly adapted to a semiarid, wooded grassland area which indicates an early habitat similar to the present.

Polygyra texsiana is also a species common to the geographic area today. This species comprises over 13% of the gastropods collected; therefore, it is a significant part of the past and present fauna. Unfortunately, there is little critical information on the habitat of **P. texsiana**; however, since it is a species common to the area today and is obviously well adapted to the semiarid, wooded grassland habitat, it is judged the previous habitat of the area was of this condition.

Pilsbry (1948:1084) stated that **Helicina orbiculata** ". . . is a snail that is especially hardy and has a great resistance to drought, individuals appear to be abundant in exposed areas as in protected woodlands." **H. orbiculata** is common to the area today and comprises over 32% of the land gastropods collected at the site. Also, **H. orbiculata** was obtained (one specimen) from 165.5 cm below the surface, indicating its early occurrence in the area. Other specimens occurred at shallower depths of excavations and in numbers sufficient to suggest that the semiarid, wooded grassland habitat of today existed in the past.

Praticolella berlandieriana occurs in the semiarid division of the Lower Sonoran Zone of Texas. During the rainy season, it is common on bushes such as mesquite and some grasses, and during dry spells it burrows in the soil and under wood or rubbish (Pilsbry 1940). Although small numbers of **P. berlandieriana** were recorded (84 specimens, or 1.1% of the total), this species confirms the ecological conditions of the area in conjunction with the three preceding species. The fact that this species also occurred to depths of at least 80 cm from the surface strengthens the case that this area was ecologically similar in the past as it is today.

There appears to be a concentration of the four above species from units in Area Red. I am unable to determine if this is the result of more thorough excavation in these units, the result of human transport to these areas during site activity, or the result of snail movement to the area of human debris and habitation. Of the four species, only **Rabdotus dealbatus** could be considered a possible food source, as it is the largest species present in significant numbers.

In summary, the molluscan fauna from 41 BX 300 suggests that the ecology of the site at the time of habitation was similar to the area today. These data indicate that the area was a semiarid, wooded grassland habitat.*

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*Author's note: Over 5500 mulluscan specimens were recovered during the mitigation activities. While most are cataloged by lots according to the unit-level of their recovery, many, especially in conjunction with the T.I.R.E. procedure, are individually cataloged. It was not considered feasible to include provenience data for this class of specimens in the actual report of investigations. A computer printout with complete provenience data is on file at the UTSA Center for Archaeological Research.

CHRONOLOGICAL SAMPLES

RADIOCARBON DATING SAMPLES

Wood charcoal recovered during the mitigation of 41 BX 300 was generally very sparse; and where it was present, it was characterized by small pieces scattered throughout a unit-level. Most charcoal specimens were relegated to species identification (see "Botanical Identification and Analysis"), but four samples were considered large enough to attempt radiocarbon dating. Table 21 provides provenience data. Samples were submitted to the Center for Applied Isotope Studies at the University of Georgia, Athens, Georgia.

TABLE 21. DISTRIBUTION OF RADIOCARBON DATING SAMPLES

Catalog Number	Area	Unit or Trench	Associated Feature	Stratum
118	Red	066020	(2)	Topsoil
4137	Red	085009	8	Feature zone
4627	Red	055088	2	Midden fill
4676	Red	055088	2	Submidden zone

Note: parentheses indicate indirect feature association

Unfortunately, all four samples proved to be too small for dating purposes. Three were returned immediately without even having been cleaned. The fourth, Catalog No. 4676, was processed. Dr. Betty Lee Brandau, Associate Director of the facility, stated the results as follows (letter of September 20, 1978):

> We burned your sample 41 BX 300 and as I feared it was really too small, yielding less than 0.1 gram of benzene.
>
> The calculations yield
>
> UGa - 2284 2020 ± 845 B.P.
> 70 B.C.
>
> . . . theoretically the date should be O.K. but so much can affect small samples.

The chronology of occupation and activity at 41 BX 300 will be presented and discussed in the Summary and Evaluation section of this report. Suffice it to say at this point that this radiocarbon date is not "O.K." The "submidden" zone (Figs. 22, 23) from which the charcoal was recovered is part of the Del Rio clay stratum, and occupation associated with this soil is assigned to the early part of the Middle Archaic period, dating between 2600 and 2000 B.C.

ARCHAEOMAGNETIC DATING SAMPLES

Thirty-seven samples of burned rock were collected from features at 41 BX 300 for the purposes of archaeomagnetic dating (Fig. 35,a). The samples were personally collected by Tim Hunkapillar, a graduate student of Dr. Robert DuBois, Director of the University of Oklahoma's Archaeomagnetic Laboratory of the Earth Sciences Observatory, Norman, Oklahoma, where the samples were processed. Table 22 provides provenience data for these samples.

Analysis

The following statements were dictated to the author by Dr. DuBois via telephone:

1. Measurements of paleomagnetic direction indicated drastic movements within features from which rock samples were recovered. Therefore, directional component of analysis is not fruitful. Measurements were taken for inter-rock comparisons.

2. Measurement of intensity of remnant paleomagnetism also not fruitful, as rocks heated to temperatures insufficiently high to align magnetic field for measurement purposes. Measurements taken for intra-rock investigation.

Conclusion

Internal feature movement and low firing temperature precluded any possibility of dating limestone rocks, either relatively or absolutely.

THERMOLUMINESCENCE DATING SAMPLES

Thirty-nine samples of burned rock were collected from features and several nonfeature locations at 41 BX 300 for the purpose of thermoluminescence dating. This technique is still highly experimental for burned limestone, and at best only a relative date could have been expected. The project had available the expert services of Dr. Donald Lewis, who developed the thermoluminescence analysis equipment while associated with the Shell Oil Company research laboratory in Houston, Texas. Table 23 provides data on the locations of these samples.

TABLE 22. DISTRIBUTION OF ARCHAEOMAGNETIC DATING SAMPLES

Catalog Number	Area	Unit	Associated Feature	Stratum
999597	Red	085009	8	Feature zone
999598	Red	085009	8	Feature zone
999599	Red	085009	8	Feature zone
999600	Red	085009	8	Feature zone
999601	Red	085009	8	Feature zone
999602	Red	085009	8	Feature zone
999603	Red	085009	8	Feature zone
999604	Red	085009	8	Feature zone
999605	Green	037044	9	Feature zone
999606	Green	037044	9	Feature zone
999607	Green	037044	9	Feature zone
999608	Green	037044	9	Feature zone
999609	Red	065005	2	Midden fill
999610	Red	065005	2	Midden fill
999611	Red	065005	2	Midden fill
999612	Red	065005	(2)	Mixed gravel
999613	Red	077003	6	Feature zone
999614	Red	077003	6	Feature zone
999615	Red	077003	6	Feature zone
999616	Red	077003	6	Feature zone
999617	Red	077003	6	Feature zone
999618	Red	077003	6	Feature zone
999619	Red	077003	6	Feature zone
999620	Red	077012	6	Feature zone
999621	Red	077012	6	Feature zone
999622	Red	077012	6	Feature zone
999623	Red	077012	6	Feature zone
999624	Red	077012	6	Feature zone
999625	Red	077012	6	Feature zone
999626	Red	076038	3	Feature zone
999627	Red	076038	3	Feature zone
999628	Red	076038	3	Feature zone
999629	Red	076038	3	Feature zone
999630	Red	076038	3	Feature zone
999631	Red	076038	3	Feature zone
999632	Red	076038	3	Feature zone
999633	Red	076038	3	Feature zone

Note: Parentheses indicate indirect feature association

TABLE 23. DISTRIBUTION OF THERMOLUMINESCENCE DATING SAMPLES

Catalog Number	Area	Unit	Associated Feature	Stratum
1102	Green	038054	9	Feature zone
1103	Green	038054	9	Feature zone
1105	Green	038054	(9)	Mixed gravel
1104	Green	038054	(9)	Mixed gravel
5085	Red	055066	2	Midden fill
5084	Red	055084	2	Midden fill
5091	Red	055084	2	Midden fill
5092	Red	055084	2	Midden fill
2558	Red	075099	8	Feature zone
2559	Red	075100	8	Feature zone
3295	Red	076037	3	Feature zone
3297	Red	076037	3	Feature zone
3827	Red	076037	3	Feature zone
4539	Red	076037	3	Feature zone
3294	Red	076037	3	Feature zone
4573	Red	076037	3	Feature zone
3299	Red	076038	3	Feature zone
3298	Red	076038	3	Feature zone
4572	Red	076038	3	Feature zone
3303	Red	076038	3	Feature zone
5164	Red	077003	6	Feature zone
5163	Red	077003	6	Feature zone
5167	Red	077003	5	Occupation zone

TABLE 23. (continued)

Catalog Number	Area	Unit	Associated Feature	Stratum
5166	Red	077003	5	Occupation zone
4568	Red	077012	6	Feature zone
3304	Red	077012	6	Feature zone
4151	Red	077012	6	Feature zone
4143	Red	077012	6	Feature zone
4134	Red	085009	8	Feature zone
4135	Red	085009	8	Feature zone
5171	Red	085009	8	Feature zone
5172	Red	085009	8	Feature zone
5380	Red	085010	8	Feature zone
3560	Yellow	123009		Topsoil
3570	Yellow	123009		Subsoil-gravel transition
3572	Yellow	123009		Subsoil-gravel transition
3571	Yellow	123009		Subsoil-gravel transition
3565	Yellow	123019		Topsoil
3573	Yellow	123019		Topsoil

Note: Parentheses indicate indirect feature association

The dating technique required the pulverization of the burned limestone under carefully controlled conditions of light and heat. This was accomplished by Dr. John E. Funnell of the Department of Materials Sciences at the Southwest Research Institute, San Antonio, Texas, as follows:

The procedure employed in obtaining powders made for thermoluminescence examination from portions of the rock specimens that you left with us is outlined below. The bulk of the work was done in a dark room where the only source of light was a horizontal ventilation shaft that led to a vertical roof outlet; no direct light reached the materials.

Step 1: In turn, each specimen was unwrapped and fragments not extending deeper than about 1/4-inch below the surface were carefully chipped from the rock with a hammer and chisel. These were saved for further processing. If excessive soil was detected on the specimens, it was removed as completely as possible with a stiff-bristle brush prior to chipping.

Step 2: The chips were reduced by crushing to about 1/16-inch size in a steel mold.

Step 3: The reduced material was placed in a clean, small porcelain jar with clean alumina pebbles which was then placed in a vibrating shaker for 10 to 15 minutes. This powdered the material.

Step 4. The powdered material was screened on a 200-mesh screen and retained on a 325-mesh screen. Two fractions of at least 5 grams each were thus obtained, one being -200 and the other being -325 mesh.

Step 5: The powder fractions were placed in small amber glass containers. After identifying labels were placed on the inside and outside, the containers were tightly capped and placed in a cardboard box.

Step 6: All surplus powdered materials were placed in larger amber glass bottles and, with the remaining wrapped rock specimens, were placed in boxes.

Throughout the materials preparation procedure, none of the materials were exposed to temperatures more than a few degrees above ambient.

Once the specimens were pulverized, Dr. Lewis undertook to date the material. Mechanical difficulties with his equipment necessitated the transfer of the specimens to Dr. James McAttee of the Department of Chemistry at Baylor University in Waco, Texas.

As was the case with the archaeomagnetic samples, dating of burned limestone by thermoluminescence was not successful, and for exactly the same reason: the firing temperature of the rock was too low for this dating method to work.

DESCRIPTION AND ANALYSIS OF ARTIFACTS

INTRODUCTION

The number of artifacts recovered in the field and processed in the laboratory totaled 101,598 specimens. Of these, 101,563 (99.97%) were prehistoric specimens, and 38 specimens (0.03%) were of contemporary manufacture (Table 24).

The system employed in this report for classifying the collection consists of a series of mutually exclusive and equally weighted major categories: chronological period, raw material, technology of manufacture, and morphology and function. A hierarchial element is introduced among the categories by virtue of the order in which they are considered for organization. As other arrangements are possible, it is not the intention to attribute undue weight or importance to any particular category with respect to the others.

The chronological component of the classification system is essentially binary, distinguishing between historic items of contemporary, Euro-American manufacture and prehistoric artifacts manufactured by aboriginal inhabitants of the site prior to ca. A.D. 1750.

All prehistoric material can be subdivided into a few, more manageable groups on the basis of the raw material from which it was manufactured. The vast majority of prehistoric artifacts (101,533, or 99.93%) are stone. Only 30 specimens (0.04%) are manufactured of other materials: five are of shell, 25 of clay, and no bone tools were recovered. Comparably, historic items are first subdivided by material of manufacture; glass predominates with 29 items, followed by metal (five) and ceramic pieces (four).

A collection of over 100,000 prehistoric stone pieces necessitated several additional classificatory subdivisions before a group of manageable analytical size resulted. A technological distinction was made between chipped stone and stone tools manufactured by grinding or utilized in a rough state; the latter usually are denoted as hammerstones, handstones, and grinding slabs. Prehistoric chipped stone objects, totaling 101,519 specimens (99.2% of the total artifact inventory), were distinguished by an admittedly mixed array of categories representing technological, morphological, and functional criteria. Quarry blank and core, uniface and biface, projectile point and perforator, for example, do not make for a consistent classificatory system; but as the categories are both descriptive and commonly employed, the advantages of communicability and comparability far outweigh any analytical irregularities.

The number in the parentheses immediately following the descriptive name for each group of artifacts refers to the classification type code for that particular group. A complete listing of these codes is provided as Appendix I.A.

TABLE 24. SUMMARY OF ARTIFACTS COLLECTED DURING PHASE III INVESTIGATIONS

Classification	Quantity	Percentage
CHIPPED STONE	101,519*	99.92
Manufactured tools	1,311	
Projectile points	154	
Bifaces	675	
Unifaces	35	
Typed tools	9	
Specialized tools	94	
Retouched flakes	344	
Tool by-products	100,208	
Tested nodules	20	
Production blanks	167	
Unretouched flakes	95,935	
With cortex	14,213	
Without cortex	81,722	
Cores	76	
Chunks	4,010	
ROUGH STONE	14	0.01
Hammerstone	1	
Handstones	2	
Grinding slabs	9	
Unidentifiable fragments	2	
SHELL	5	0.01
PREHISTORIC POTTERY	25	0.03
HISTORIC SPECIMENS	38	0.03
Ceramic		
Glass		
Metal		
TOTAL SPECIMENS	101,601	100.00

*Includes complete and fragmentary specimens

CHIPPED STONE

VARIETIES OF RAW MATERIAL

Chert

Over 99% of the chipped stone specimens in all classes of artifacts, both tools and tool by-products, have been identified as chert. The almost exclusive use of this material is not surprising, given its occurrence and accessibility within close proximity to 41 BX 300. Nodules of chert, eroded out of the Edwards limestone formation by the cutting action of the creeks immediately adjacent to the site, would have provided a constant, albeit fortuitous and often damaged, source of chert. The intentional exploitation of surficial outcroppings at nearby 41 BX 299 and 41 BX 301 (Fig. 1) provided a more substantial quantity of this material, however, with the additional benefits of a knapper being able to select for grade, control the recovery procedures, and minimize internal fracturing.

Data gathered from the two adjacent chert procurement sites (41 BX 299 and 41 BX 301) during field work and analyses of materials collected (Hester, Katz, and Kelly 1977; Katz 1978) were compared with chipped stone specimens recovered from 41 BX 300. Consistencies were noted between the range of colors, textures, cortex characteristics, nodule size, and nature of impurities. Despite the lack of trace element analysis data, the overwhelming similarity in the raw material outcropping at sites 41 BX 299 and 41 BX 301 and the artifactual material at 41 BX 300, plus the fact of close proximity, leads to the conclusion that the chert at the latter site was locally procurred. The presence of this resource was undoubtedly one of the primary attractions of the 41 BX 300 locality.

Other Crystalline Materials

Less than one percent of the chipped stone specimens collected during Phase III activities at 41 BX 300 was not identified as chert. These include chalcedony, quartzite, and quartz. Their minimal occurrence in the collection seems to be in direct proportion to the limited extent of their natural occurrence in the locality, a fact observed by other researchers at nearby comparable sites (e.g., Black and McGraw 1985:59).

Obsidian

One flake of obsidian was recovered during these investigations, a material so rare and so obviously exotic as to merit special consideration. The flake has a small amount of steep retouch flaking along one edge of the dorsal face; and it was recovered from the topsoil zone in the central portion (Area Red) of the site. Trace element analysis conducted at the Lawrence Berkeley Laboratory has determined that the probable derivation of the obsidian from which the flake was manufactured was the Malad source in southeastern Idaho (Hester 1986). Other obsidian specimens recovered in Texas and Oklahoma and linked to this source are dated to the Late Prehistoric period. They are thought to represent a long-distance trade network documented on the southern

Plains during this period (Spielmann 1983). The provenience of the 41 BX 300 specimen would not be inconsistent with a Late Prehistoric dating.

Limestone and Dolomite

The few nonchipped stone artifacts, as well as all the burned rock comprising the cultural features, are either limestone or dolomite. These minerals are the prime components of the Edwards limestone bedrock formation, which is exposed in the stream bed and erodes out of its banks immediately adjacent to the site. The ready availability of this resource, highly suitable for hearth rocks and boiling stones, was another of the prehistoric attractions of the 41 BX 300 locality.

MANUFACTURED TOOLS

The artifacts classified as chipped stone tools are characterized by the presence of intentional retouching on one or more edges or faces. The purpose of this chipping is to create a functionally efficient overall shape and working edge(s). Separately considered are those chipped stone artifacts which are not tools themselves, but rather represent stages of manufacturing or the debris from manufacturing and maintenance activities.

Projectile Points

Typological Identification

Although projectile points are basically only one of many mutually exclusive artifact categories, in point of fact they assume an importance far exceeding even their functional interpretation of piercing tools employed for faunal procurement. Distinctive stylistic variations in morphological configuration are associated with fairly well-documented parameters of time, and to some extent, of space, so as to produce a powerful diagnostic element for culture historical interpretations.

Three separate methods of projectile point typological identification were employed with the collection of 154 Phase III specimens from 41 BX 300. First, published summaries of projectile point descriptions were consulted. Criteria for selection of these references included degree of descriptive detail, inclusion of many types, reputability of the author(s), number and quality of illustrations, and an appropriate relationship to the geographical region in which the site is situated. Primary sources consulted include Suhm and Jelks (1962), Gerstle, Kelly, and Assad (1978), Hester (1980), Woerner and Highley (1983), Black and McGraw (1985), and Turner and Hester (1985).

Another method of typological identification was the expert opinion, in particular Dr. Thomas R. Hester, director of the CAR-UTSA. His extensive experience with this category of artifact in this specific region allowed him to quickly refine initial groupings based solely on literature descriptions and photographic comparisons.

The third option available for point typing was a computer program which compared attributes from untyped points against a data base of attributes of known types. The unknown specimens were assigned the type of the previously recorded type with which they most tightly clustered through multivariate statistical analyses. Developed by Gunn and Prewitt (1975), both individuals have continued to refine the clustering programs and the attributes in the data base, and the number of typological comparisons in the data base have been increased. The primary difficulty with employing the collection from 41 BX 300 with Gunn and Prewitt's analysis was due to a lack of interface between Prewitt's data base and Gunn's UTSA computer programs. A small number of previously untyped dart points were successfully clustered with known point type attributes; but in general, comparison with published typological descriptions and expert assistance proved far more successful with this particular collection at the time that analyses were being conducted.

Angostura (203)

Number of specimens: 1

Provenience: This point was recovered from the topsoil zone in the northwest portion (Area Blue) of the site. It was removed from the north wall of November trench (Fig. 11).

Metrics: See Appendix I.B, Part 1.

Description (Fig. 24,a): This single specimen has a thin, lanceolate outline, with weak shoulders and a slightly contracting stem. The lateral edges are convex and the stem edges straight. The tip and the basal edge are broken off. The sides of the stem are ground. Flake scars are oblique, transverse ribbons.

Date range: Late Paleo-Indian/early part of the Early Archaic period; Central Texas Circleville phase; Salado Creek Watershed Local Period 3; 6500-4800 B.C.

References: Suhm and Jelks (1962:167-168), Black and McGraw (1985:124-125), Turner and Hester (1985:66-67).

Bulverde (205)

Number of specimens: 13

Provenience: These specimens were recovered predominantly in the central (Area Red) and southern (Area Yellow) portions of the site. Depth of recovery ranges from the surface to 45 cm below ground surface, including four feature associations (Features 3, 6, 7, 11). Appendix I.B, Part 1 provides individual provenience data.

Metrics: See Appendix I.B, Part 1.

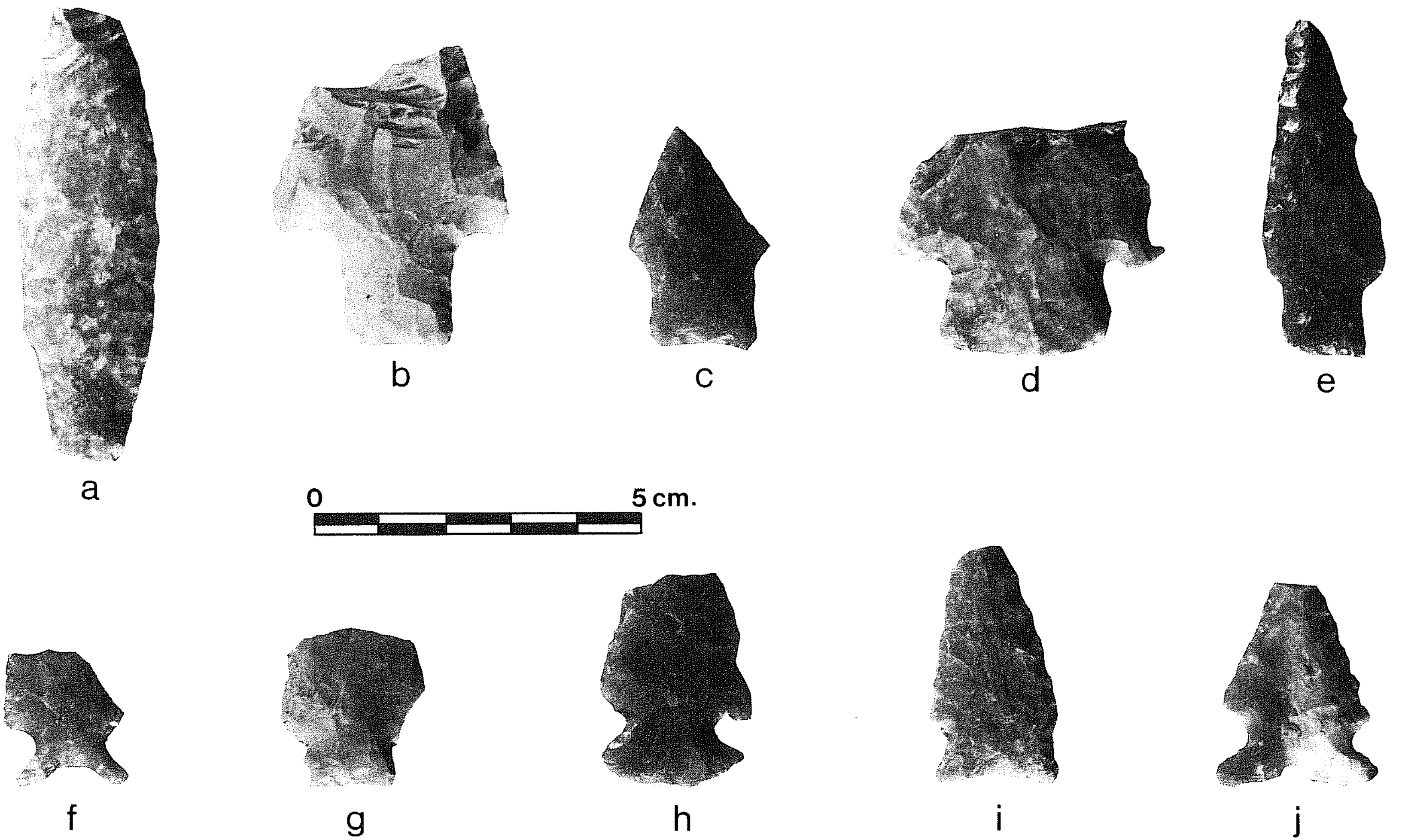

Figure 24. **Projectile Points..** a, **Angostura;** b,c, **Bulverde;** d, **Castroville;** e, **Darl;** f, **Edwards;** g, **Ellis;** h, **Ensor;** i, **Fairland;** j, **Frio.**

Description (Fig. 24,b,c): These specimens are characterized by triangular blades with generally straight lateral edges. Most distinctive is the rectangular stem, with straight sides and either straight or slightly concave basal edges. Prominent shoulders or small barbs mark the transition from blade to stem. Overall size is quite variable. Since the stem remains consistent in size in time, the smaller specimens (Fig. 24,c) are likely reworked from larger originals.

Date Range: Middle portion of the Middle Archaic period; Central Texas Marshall Ford phase; Salado Creek Watershed Local Period 7 (early); 2100-1500 B.C.

References: Suhm and Jelks (1962:169-170), Black and McGraw (1985:115-116), Turner and Hester (1985:73).

Castroville (207)

Number of specimens: 11

Provenience: These specimens were recovered predominantly from the central (Area Red) and northeast (Area Green) portions of the site. Depth of recovery varied from the surface to 40 cm below ground surface, but all came from the topsoil zone. One was associated with Feature 3. Appendix I.B, Part 1 provides individual provenience data.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 24,d): These are broad-bladed points, subovate in overall form. Most characteristic is the stem, which is trapezoidal in shape; the stem sides are straight, and the basal edge is straight to slightly convex. The neck width is very broad. Deep corner notches, cut at an angle between 45ø and 90ø from the line of the base, create prominent barbs.

Date range: Early in the Late Archaic period; Central Texas Uvalde phase; Salado Creek Watershed Local Period 9 (early); 250 B.C.-A.D. 200.

References: Suhm and Jelks (1962:173-174), Black and McGraw (1985:109, 111), Turner and Hester (1985:76-77).

Darl (212)

Number of specimens: 3

Provenience: These three specimens were found widely scattered at the site, one each was recovered from the northeast (Area Green), central (Area Red), and southern (Area Yellow) portions. The single subsurface recovery was from the topsoil zone, between 20-40 cm below the ground surface, and associated with Feature 3. Individual proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 24,e): The blades are long, narrow triangles with slightly convex lateral edges. Stems are rectangular, with straight sides and slightly convex basal edges. Shoulders are small and turned up toward the tip. No beveling or grinding of blade or stem edges are present on these three specimens. Based on the size, shape, and lack of grinding, these specimens are considered representative of Prewitt's (1981) **Mahomet** variety.

Date range: Late in the Late Archaic period; Central Texas Driftwood phase; Salado Creek Watershed Local Period 10 (early); A.D. 600-750.

References: Suhm and Jelks (1962:179-180), Black and McGraw (1985:108), Turner and Hester (1985:84).

Edwards (216)

Number of specimens: 2

Provenience: Both specimens were recovered on the surface, one from the central (Area Red) and the other from the northeast (Area Green) portion of the site. Exact provenience is provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 24,f): Small subovate forms with straight lateral blade edges. Most distinctive are the deep side notches and broad concavity in the base, which combine to create a boomerang-shaped stem.

Date range: Early in the Late Prehistoric period; Central Texas Austin phase; Salado Creek Watershed Local Period 10 (late); A.D. 750-1350.

References: Black and McGraw (1985:101), Turner and Hester (1985:173).

Ellis (218)

Number of specimens: 1

Provenience: This specimen was recovered from the surface in the central (Area Red) portion of the site.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 24,g): A small triangular form characterized by corner notching and a straight basal edge, creating an expanding, triangular-shaped stem. The primary distinction between this type and the **Ensor** is the side notching of the latter; otherwise they are considered varieties of the same general form of small, triangular dart point.

Date range: Middle in the Late Archaic period; Central Texas Twin Sisters phase; Salado Creek Watershed Local Period 9 (late); A.D. 200-600.

References: Suhm and Jelks (1962:187-188), Turner and Hester (1985:93).

Ensor (219)

Number of specimens: 20

Provenience: The **Ensor** is the most numerous projectile point type recorded during mitigation activities, and specimens were recovered in all parts of the site. The northern half of the site produced the most, however, especially the northeast (Area Green) and central (Area Red) portions. Individual proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 24,h): These are small triangular forms, with substantial variation in overall outline; some specimens are long and narrow while others are short and squat. All are characterized by shallow to prominent side notches, which produce an expanding stem. Basal edges are straight to slightly convex. The method of stem production and the resultant stem morphology distinguish this type from the corner-notched **Ellis**, the basal-notched **Frio**, and the shallow side-notched and concave-based **Fairland.** In overall size and shape, these four types can be considered varieties of the same general form, however.

Date range: Middle in the Late Archaic period; Central Texas Twin Sisters phase; Salado Creek Watershed Local Period 9 (late); A.D. 200-600.

References: Suhm and Jelks (1962:189-190), Black and McGraw (1985:105-106), Turner and Hester (1985:94).

Fairland (221)

Number of specimens: 7

Provenience: Five of these seven specimens were recovered from the northeast (Area Green) portion of the site. None of the seven were excavated; three were surface finds, and four were from trench backdirt, although all these trenches were located in Area Green. Individual proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 24,i): Small triangular forms with straight lateral edges. The short expanding stem is created by shallow side notching, and the long concave basal edge results in very prominent stem corners. The flaking is well controlled and rather delicate.

Date range: Middle of the Late Archaic period; Central Texas Twin Sisters phase; Salado Creek Watershed Local Period 9 (late); A.D. 200-600.

References: Suhm and Jelks (1962:191-192), Black and McGraw (1985:106), Turner and Hester (1985:96).

Frio (224)

Number of specimens: 12

Provenience: These specimens were recovered from all areas of the site, although the northeast (Area Green) and central (Area Red) portions produced two-thirds of the total number. Half were excavated under controlled conditions, and none of these were excavated deeper than 20 cm below the ground surface. One is associated with Feature 4. Individual proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 24,j): Small triangular forms with slightly convex blade edges. The stem is the most distinctive feature, characterized by small side and basal notches to produce an eared or bifurcated appearance to the stem.

Date range: Middle of the Late Archaic period; Central Texas Twin Sisters phase; Salado Creek Watershed Local Period 9 (late); A.D. 200-600.

References: Suhm and Jelks (1962:195-196), Black and McGraw (1985:103, 105), Turner and Hester (1985:100).

Gower (226)

Number of specimens: 1

Provenience: This specimen was recovered from the surface in the southwest (Area Yellow) portion of the site.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,a): A small lanceolate form with slightly convex lateral blade edges. Although both missing, this specimen had small barbs above a rectangular stem form with straight sides. Most characteristic is the carefully retouched deep concavity in the base, forming a perfect semicircle.

Date range: Middle of the Early Archaic period; Central Texas San Geronimo phase; Salado Creek Watershed Local Period 4; 4800-4100 B.C.

References: Turner and Hester (1985:105).

La Jita (229)

Number of specimens: 1

Provenience: This specimen was recovered from the backdirt of Echo trench, located in the northeast (Area Green) portion of the site.

Metrics: See Appendix I.B, Part 1.

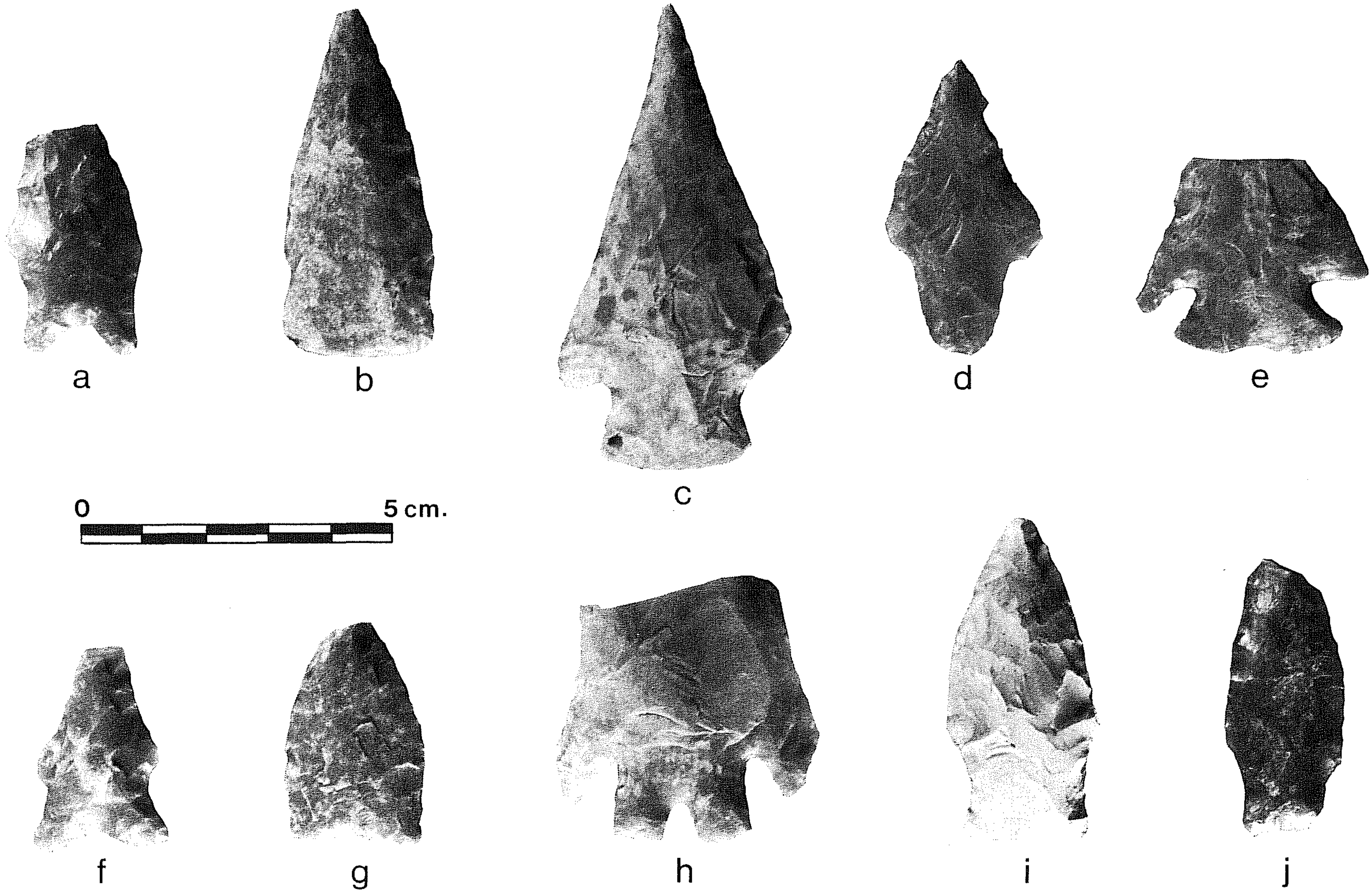

Figure 25. **Projectile Points.** a, **Gower**; b, **La Jita**; c, **Lange**; d, **Langtry**; e, **Marcos**; f, **Martindale**; g, **Matamoros**; h, **Montell**; i, **Nolan**; j, **Palmillas.**

Description (Fig. 25,b): A large subtriangular form, with slightly convex sides and base. The stem is slightly expanding, with weak shoulders and rounded basal corners. The stem is thinned by the removal of a single large longitudinal flake from both faces of the stem.

Date range: Early in the Middle Archaic period; Central Texas Clear Fork phase; Salado Creek Watershed Local Period 6; 2600-2100 B.C.

References: Black and McGraw (1985:117-119), Turner and Hester (1985:112).

Lange (230)

Number of specimens: 1

Provenience: The single specimen was excavated in association with Feature 5, between 20-40 cm below ground surface in the central (Area Red) portion of the site.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,c): A large and broad triangular form with straight blade edges. The barbs are small but sharp. The expanding stem has straight sides and a convex base.

Date range: Late in the Middle Archaic period; Central Texas San Marcos phase; Salado Creek Watershed Local Period 8; 600-250 B.C.

References: Suhm and Jelks (1962:203-204), Black and McGraw (1985:111-112), Turner and Hester (1985:113).

Langtry (231)

Number of specimens: 4

Provenience: Three of these specimens were recovered from the central (Area Red) portion of the site, and the fourth in the northwest (Area Blue). Three were excavated, all from the topsoil zone between 0-20 cm below ground surface. Individual proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,d): A diamond-shaped form, with straight lateral blade edges. The distinctive contracting stem begins below upturned, prominent shoulders on three specimens; on the fourth, the shoulders are large and pointed, almost barblike. The contracting stem truncates in a straight basal edge.

Date range: Middle part of the Middle Archaic period; Central Texas Round Rock phase; Salado Creek Watershed Local Period 7 (late); 1500-600 B.C.

References: Suhm and Jelks (1962:205-206), Black and McGraw (1985:113, 115), Turner and Hester (1985:114-115).

Marcos (233)

Number of specimens: 5

Provenience: Three specimens were recovered in the central (Area Red) portion of the site, all excavated between 0-20 cm below ground surface. One is associated with Feature 7. The remaining two are from the northern half of the site, one in the northwest (Area Blue) and one in the northeast (Area Green). Specific proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,e): A broad triangular form with straight lateral blade edges. The corner notching is finely done and consistently at a 45ø angle, creating a short expanding stem. Basal edges tend to be straight, although several are slightly concave.

Date range: Early in the Late Archaic period; Central Texas Uvalde phase; Salado Creek Watershed Local Period 9 (early); 250 B.C.-A.D. 200.

References: Suhm and Jelks (1962:209-210), Black and McGraw (1985:112), Turner and Hester (1985:117-118).

Martindale (235)

Number of specimens: 2

Provenience: Both specimens were recovered on the surface in the central (Area Red) portion of the site.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,f): A small triangular form with straight to slightly convex blade edges. The stem is formed by means of broad side notches or large corner notches, resulting in concave stem edges. Additional retouching from each basal corner inward toward the center of the base creates a concavity through the intersection of two convex curves. The resultant bifurcated stem is a characteristic of this point type.

Date range: Late in the Early Archaic period; Central Texas Jarrell phase; Salado Creek Watershed Local Period 5 (early); 4100-3100 B.C.

References: Suhm and Jelks (1962:213-124), Black and McGraw (1985:123), Turner and Hester (1985:120-121).

Matamoros (236)

Number of specimens: 1

Provenience: This specimen was recovered from the surface in the central (Area Red) portion of the site.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,g): A small subtriangular form with moderately convex lateral edges extending from tip to base. There is no stem modification. The base is broadly concave from corner to corner. Parallel flakes have been removed longitudinally on one face beginning at the basal edge, presumably to thin the proximal end to facilitate hafting.

Date range: Late part of the Late Archaic period; Central Texas Driftwood phase; Salado Creek Watershed Local Period 10 (early); A.D. 600-750.

References: Suhm and Jelks (1962:215-216), Turner and Hester (1985:122).

Montell (238)

Number of specimens: 10

Provenience: All but one of these specimens were recovered in the central (Area Red), northeast (Area Green), or eastern (Area White) portions of the site. Three were excavated, although the depths of recovery show great variation, from 0-39 cm below ground surface. Two of these excavated specimens are associated with Features 5 and 7. Exact proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,h): A large, broad-bladed point manufactured from a subtriangular preform. The lateral edges of the blade are straight or slightly convex. The stem modification begins like the **Castroville**, with nearly vertical notches removed from each end of the base to create large barbs and a long, almost rectangular stem. Distinctive of the **Montell** is the addition of a deep, narrow notch in the center of the base, which transforms the stem into a pair of small, rectangular appendages.

Date range: Early in the Late Archaic period; Central Texas Uvalde phase; Salado Creek Watershed Local Period 9 (early); 250 B.C.-A.D. 200.

References: Suhm and Jelks (1962:219-220), Black and McGraw (1985:109), Turner and Hester (1985:126).

Nolan (241)

Number of specimens: 10

Provenience: Half of these specimens were recovered in the central (Area Red) portion of the site; the others were scattered about the other four areas. Of the four excavated specimens, three were recovered within the topsoil zone, although the depths ranged from 10-29 cm below ground surface. The fourth excavated specimen was recovered between 51-65 cm below the burned rock midden (Feature 2). Specific proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,i): Manufactured from a subtriangular preform, the blade is long in relation to the stem. Blade lateral edges are distinctly convex. The stem is created by long, shallow retouching, resulting in weak shoulders and a slightly expanding stem. Basal edges are straight or slightly convex. Characteristic of this type is the steep alternate beveling of the stem edges.

Date range: Early part of the Middle Archaic period; Central Texas Clear Fork phase; Salado Creek Watershed Local Period 6; 2600-2100 B.C.

References: Suhm and Jelks (1962:225-226), Black and McGraw (1985:117), Turner and Hester (1985:132).

Pandale (224)

Number of specimens: 1

Provenience: This specimen was recovered in the backdirt of Golf trench in the northeast (Area Green) portion of the site.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 25,j): A small lanceolate form, with slightly convex lateral edges. The short expanding stem is achieved by shallow side notching, which also produces weak shoulders. The base is concave. Most characteristic is the longitudinally twisted blade, which produces a parallelogram cross section.

Date range: Early in the Middle Archaic period; Central Texas Clear Fork phase; Salado Creek Watershed Local Period 6; 2600-2100 B.C.

References: Suhm and Jelks (1962:231-232), Black and McGraw (1985:120), Turner and Hester (1985:135-136).

Pedernales (246)

Number of specimens: 13

Provenience: These points are well distributed at the site: two from the northwest (Area Blue), three from the northeast (Area Green), and four each from the central (Area Red) and the southern (Area Yellow) portions of the site. Of the four excavated specimens, three are within the first 10 cm of the topsoil; the fourth, associated with Feature 5, was recovered between 20-30 cm below ground surface. Specific proveniences are provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 26,a): A large leaf-shaped blade, with slight to strongly convex lateral edges. The rectangular stem is formed by retouching longitudinally from the basal corners, resulting in sharp barbs of varying lengths. Most characteristic is the deeply concave base, which varies from a U-shape to a V-shape. Both small and large blade forms have a similarly sized stem, suggesting that the small forms are reworked from larger ones in the same manner as **Bulverde** points (cf. Fig. 24,b,c).

Date range: Middle part of the Middle Archaic period; Central Texas Round Rock phase; Salado Creek Watershed Local Period 7 (late); 1500-600 B.C.

References: Suhm and Jelks (1962:235-237), Black and McGraw (1985:113), Turner and Hester (1985:139-140).

Perdiz (247)

Number of specimens: 2

Provenience: One specimen was excavated from the first 10 cm of topsoil in the central (Area Red) portion of the site, and the other was recovered from the backdirt of a northeast (Area Green) trench.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 26,b): Small triangular arrow points characterized by sharp, prominent barbs and a pointed contracting stem.

Date range: Late in the Late Prehistoric period; Central Texas Toyah phase; Salado Creek Watershed Local Period 11; A.D. 1350-1800.

References: Suhm and Jelks (1962:283-284), Black and McGraw (1985:99, 101), Turner and Hester (1985:187).

Scallorn (250)

Number of specimens: 1

Provenience: This specimen was recovered from the backdirt of a trench in the northeast (Area Green) portion of the site.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 26,c): A subtriangular, almost lanceolate form. The blade edges are convex, with fine serrations on both sides. The flaking is good

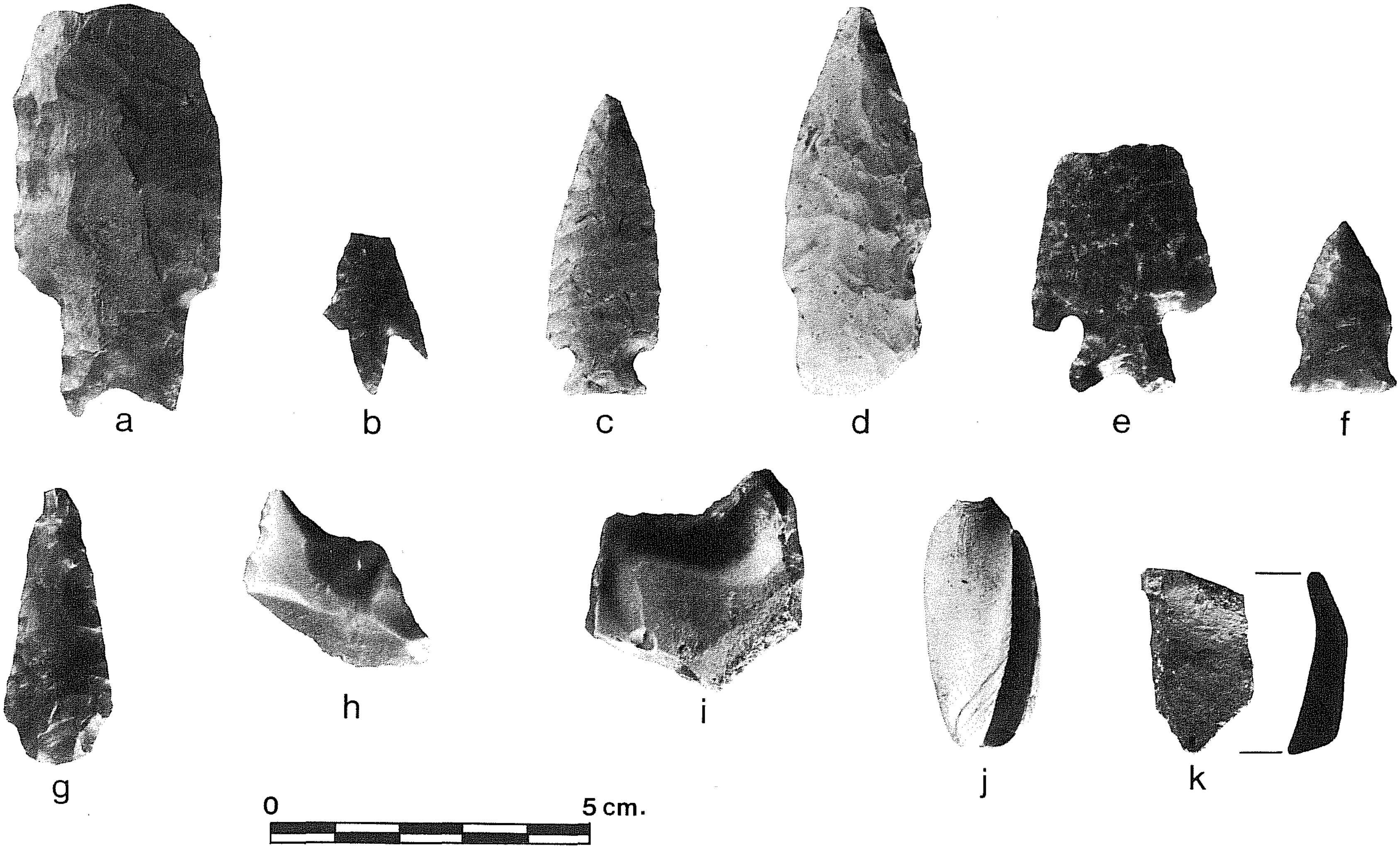

Figure 26. **Projectile Points, Specialized Tools, and Miscellaneous Artifacts.** a, **Pedernales**; b, **Perdiz**; c, **Scallorn**; d, **Travis**; e, **Uvalde**; f, **Zavala/Figueroa**; g, perforator; h, graver, i, notch; j, shell bead; k, ceramic rim sherd.

quality, characterized by diagonal ribbon scars. Well-formed corner notches have created a short expanding stem. The basal edge is straight.

Date range: Early in the Late Prehistoric period; Central Texas Austin phase; Salado Creek Watershed Local Period 10 (late); A.D. 750-1350.

References: Suhm and Jelks (1962:285-286), Black and McGraw (1985:101-102), Turner and Hester (1985:189).

Toyah (256)

Number of specimens: 1

Provenience: This specimen was recovered between 0-9 cm below ground surface in the central (Area Red) portion of the site, associated with Feature 7.

Metrics: See Appendix I.B, Part 1.

Description (not illustrated): All that remains of this specimen is the base of the stem, but it is the most characteristic part of this type of triangular arrow point. The base has a deep concavity which results in the bifurcated stem distinctive of the **Toyah** type.

Date range: Late in the Late Prehistoric period; Central Texas Toyah phase; Salado Creek Watershed Local Period 11; A.D. 1350-1800.

References: Suhm and Jelks (1962:291-292), Black and McGraw (1985:102), Turner and Hester (1985:193).

Travis (257)

Number of specimens: 10

Provenience: Five of the specimens were recovered in the central (Area Red) portion of the site, all from excavated contexts varying from 5-60 cm below ground surface. Four of these were associated with features: one each from Features 2 and 7 and two from Feature 5. Four of the remaining five specimens were recovered in trench backdirt, two in the northeast (Area Green) and two in the southern (Area Yellow) portions of the site; the fifth was a surface find in Area Yellow. Specific provenience for each specimen is provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 26,d): A long, slender subtriangular form, with convex lateral edges and a convex base. The shoulders are weak, and the straight-sided rectangular stem is almost as broad as the blade.

Date range: Early in the Middle Archaic period; Central Texas Clear Fork phase; Salado Creek Watershed Local Period 6; 2600-2100 B.C.

References: Suhm and Jelks (1962:251-252), Black and McGraw (1985:117), Turner and Hester (1985:153).

Uvalde (259)

Number of specimens: 3

Provenience: These three specimens were recovered in widely scattered areas of the site. Two were in trench backdirt, one in the northeast (Area Green) and one in the northwest (Area Blue); and the third was a surface find at the southern end (Area Yellow) of the site. Appendix I.B, Part 1 provides the exact provenience for each specimen.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 26,e): A subtriangular form with slightly convex lateral edges, the expanding stem is formed by deep corner notching, which results in prominent barbs. A deep concavity in the base produces the characteristic fish-tailed appearance of the stem.

Date range: Late in the Early Archaic period; Central Texas Jarrell phase; Salado Creek Watershed Local Period 5 (early); 4100-3100 B.C.

References: Suhm and Jelks (1962:255-256), Turner and Hester (1985:155).

Zavala/Figueroa (263)

Number of specimens: 3

Provenience: Two of these specimens were recovered in the northeast (Area Green) portion of the site, one from the backdirt of a trench and the other on the surface. The third specimen was from trench backdirt in the southern (Area Yellow) portion of the site. Exact provenience is provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (Fig. 26,f): A small triangular form with convex lateral edges and a straight base. Long, shallow side notches create an expanding stem and weak shoulders, with the corners of the base as wide as the width across the shoulders. There is great similarity in the overall morphology of the **Zavala** and **Figueroa** types. The generally smaller size and later dating of the **Zavala** usually results in its being classified as an arrow point, whereas the slightly larger and earlier **Figueroa** is classified as a dart point. The specimens under consideration fall within the size range of the **Zavala** but are within the geographical distribution of the **Figueroa**.

Date range: Late part of the Late Archaic or Late Prehistoric periods; Central Texas Driftwood, Austin, or Toyah phases; Salado Creek Watershed Local Periods 10 or 11; A.D. 600-1800.

References: Turner and Hester (1985:97, 197).

Unidentifiable Arrow Points (264)

Number of specimens: 5

Provenience: Four of these specimens were recovered in the central (Area Red) portion of the site and the fifth from the northeast (Area Green). Four were excavated: two were associated with Feature 7, and the other two were recovered between 0-20 cm below ground surface. Exact provenience is provided in Appendix I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (not illustrated): Enough remains of these broken specimens to designate them as arrow points on the basis of overall size, morphology, and workmanship. Two blades are intact, but enough of the stems are missing to prevent typological assignment; however, the general impression is that of **Perdiz**. There are also two midsections and one distal portion.

Date range: Late Prehistoric period; Central Texas Austin and Toyah phases; Salado Creek Watershed Local Periods 10 (late) and 11; A.D. 750-1800.

Unidentifiable Dart Points (265)

Number of specimens: 11

Provenience: See Appendix Part I.B, Part 1.

Metrics: See Appendix I.B, Part 1.

Description (not illustrated): These specimens have enough stem modification remaining to identify them as projectile points, but there is not sufficient data to assign them to a specific type. Their size indicates that they functioned as dart points, however. Nine of them belong to the family of broad-bladed points which include **Castroville, Marcos, Marshall, Montell, Lange**, and **Williams**. The other two are smaller and probably belong to the family of types which include **Edgewood, Ellis, Ensor, Fairland**, and **Frio**. Three of the broad-bladed specimens were reworked after breaking to function as scraping tools; two (Cat. Nos. 5934, 6144) have steep unifacial retouch along one blade edge, and the third (Cat. No. 1107) has the same type of retouch at its distal end.

Date range: Late in the Middle Archaic to the middle part of the Late Archaic periods; Central Texas San Marcos, Uvalde, and Twin Sisters phases; Salado Creek Watershed Local Periods 8 and 9; 600 B.C.-A.D. 600.

Bifaces

A biface is a chipped stone artifact characterized by overall primary retouching on both faces. This extensive modification is intended to provide a geometric shape and to thin the cross section of the blank. Secondary retouch along both lateral margins and both ends is also typical, resulting in straight, sharp edges, thinned bases, and usually pointed distal ends.

The characteristic long, thin sharp edges of bifaces account for their usual functional interpretation as cutting tools. A projectile point is a variety of biface which has had its proximal end further modified for hafting, resulting in a reorientation of the primary function to a piercing tool.

The manufacturing process is particularly straightforward with bifaces. A bifacial blank is created from the nodule by percussion flaking to remove the cortex and roughly thin and shape it. Successive operations of shaping, thinning, and sharpening are subsumed within the preform stage. Because biface manufacture is a process, however, the distinctions between stages are never as sharp as the analyst would like, especially between preform and completed tool.

Subcategorization of bifaces is accomplished by reference to their geometric shape, which is generally consistent despite variations in overall size. Circular, ovate and subovate, triangular and subtriangular, and lanceolate shapes have been identified in the 41 BX 300 mitigation collection. The same range of sizes characterizes each shape group: small has a maximum length less than 50 mm; medium has a maximum length between 50-80 mm; and large has a maximum length exceeding 80 mm.

The similarity in size regardless of geometric form suggests that technology is an important factor in the interpretation of the range of biface variability. Later stages of manufacture, i.e., preforms, are probably mixed in with completed tools; it is likely that larger sizes represent preforms of more diminutive but geometrically similar forms. However, because the larger forms exhibit the same attention to detail in shaping, edge straightening, and sharpening, they are more easily classified with the manufactured tools than with groups representing the stages of manufacture (e.g., nodules and blanks).

Complete, Circular (283)

Number of specimens: 7

Provenience: These specimens were widely distributed around the site, but recovery was limited to the peripheral areas. No circular bifaces were recorded in the central (Area Red) portion. All but one item was recovered from the surface; the exception was from the backdirt of a trench in the northeast (Area Green). Exact provenience is provided in Appendix I.B, Part 2.

Metrics: See Appendix I.B, Part 2.

Description (Fig. 27,a,b): The geometry of these specimens is circular. Primary flake scars originate around the entire margin and terminate at a point approximately in the center of each face. Maximum length and maximum width are very similar. They may represent an extreme variety of ovate biface; they do not appear to be functional tools in and of themselves, and there are no other tool forms which might have used these circular bifaces as a preform.

Complete, Ovate and Subovate (283)

Number of specimens: 17

Provenience: Most of these specimens were recovered in the central (Area Red) and northeast (Area Green) portions of the site. Only one or two were located in each of the other areas. Of the two excavated specimens, one came from the subsoil zone and the other from the topsoil; the latter was associated with Feature 3. Trench backdirt was a more common provenience than surface recovery, however, indicating some depth of deposit. The provenience of individual specimens is provided in Appendix I.B, Part 2.

Metrics: See Appendix I.B, Part 2.

Description (Fig. 27,c-e): The basic ovate form has a distinct convexity to both lateral edges, the distal end, and the proximal end. The proximal end is wider than the distal, with the maximum width in the proximal third of the specimen. The maximum length runs longitudinally from distal to proximal end. The subovate form is more pear-shaped, with a narrowing or even pointing of the distal end. Ovate and subovate forms most likely served as preforms for the broad-bladed Middle Archaic and Late Archaic projectile points.

Complete, Triangular and Subtriangular (283)

Number of specimens: 23

Provenience: As with the ovate and subovate forms, these specimens were recovered from all areas of the site but were also concentrated in the central (Area Red) and northeastern (Area Green) portions. Of the few that were excavated, most were recovered from the topsoil zone. One was associated with Feature 11. Individual proveniences are provided in Appendix I.B, Part 2.

Metrics: See Appendix I.B, Part 2.

Description (Fig. 28): The basic form has straight sides, a straight base, a pointed distal end, and distinct corners between the lateral edges and the proximal end. The maximum width is along the proximal edge. The more common subtriangular form may have slightly convex lateral edges and a rounded base; however, the corners are usually always distinct. Smaller triangular forms probably functioned as preforms for the smaller triangular Archaic projectile points, characterizing both the Early and Terminal Archaic periods.

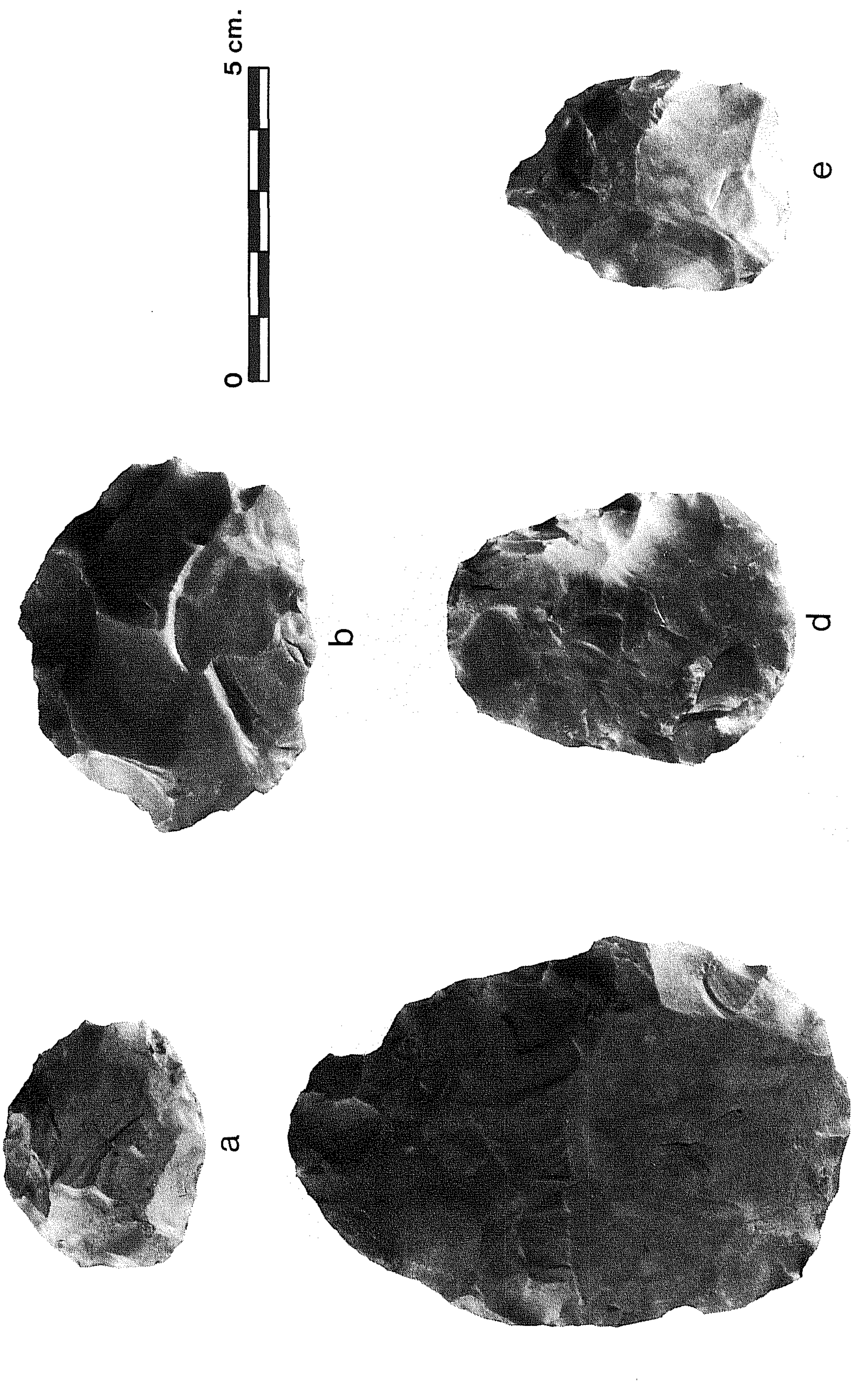

Figure 27. **Bifaces.** a,b, circular; c–e, ovate and subovate.

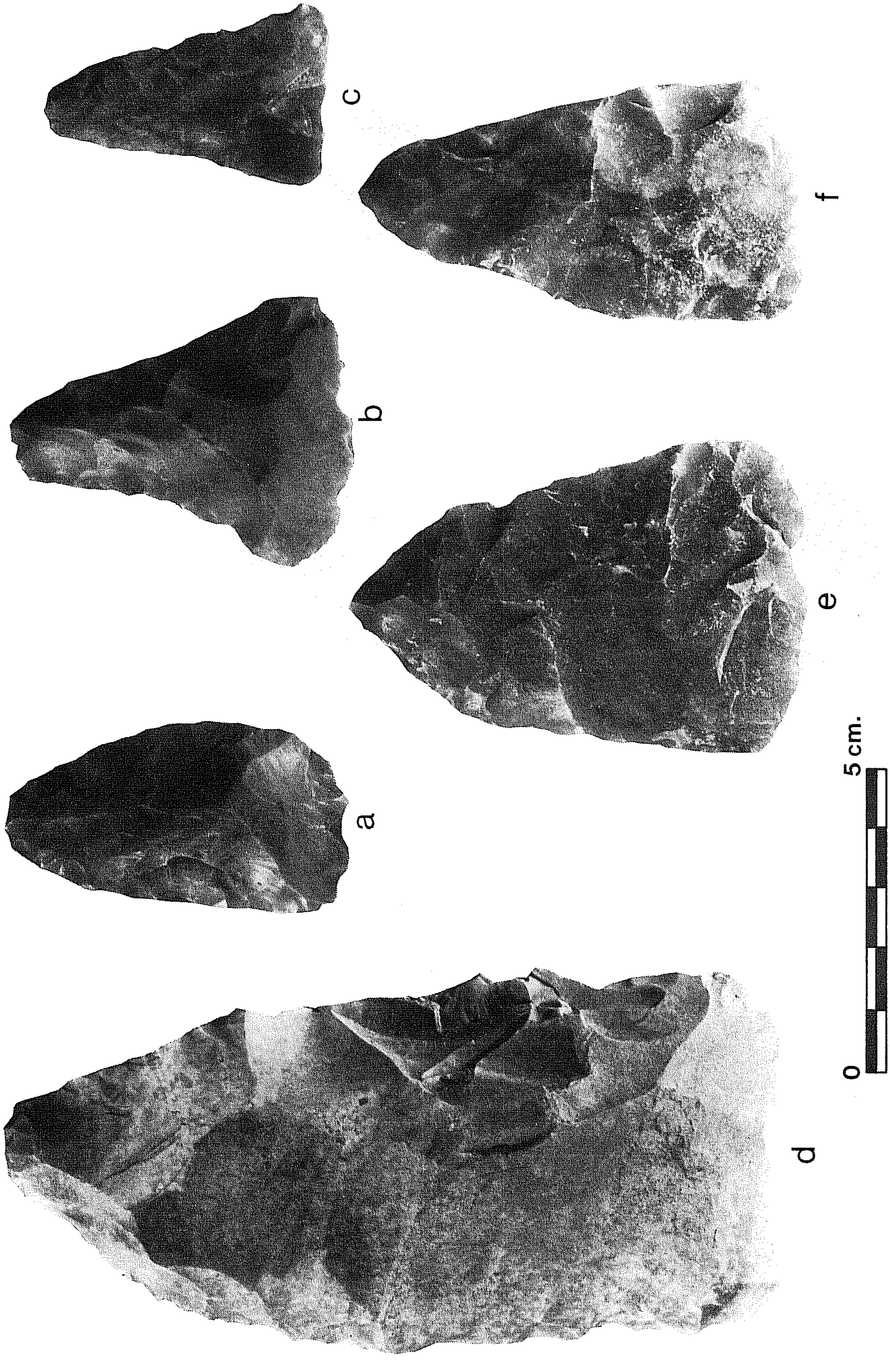

Figure 28. **Bifaces.** a-f, triangular and subtriangular.

Complete, Lanceolate (283)

Number of specimens: 12

Provenience: These specimens follow the same distribution pattern as the circular bifaces. None were recovered from the central (Area Red) portion of the site, but were evenly distributed across the rest of the site. None were excavated; they were evenly divided between trench backdirt and surface recovery. Appendix I.B, Part 2 provides the exact provenience for each specimen.

Metrics: See Appendix I.B, Part 2.

Description (Fig. 29): The lanceolate form has two major varieties. One is parallel sided with rounded distal and proximal ends (Fig. 29,a,c); and the other is bipointed, with convex lateral edges (Fig. 29,b,d). The common characteristics are a maximum length at least twice as large as the maximum width, with the latter situated at the midpoint of the longitudinal axis. The usual functional interpretation is that of a cutting tool, and indeed some specimens look very much like contemporary knives (Fig. 29,e). One unique artifact from this investigation has steep unifacial retouch on the dorsal face of the distal end and probably functioned as a scraping tool. This is distinct from the bifacial **Guadalupe** tools, which have a beveled distal end.

Bifacial Fragments (284-288)

Number of specimens: 616

Provenience: These specimens reflect the distribution of the complete bifaces previously discussed. The majority were recovered from the central (Area Red) and northeast (Area Green) portions of the site. The fact that most of the specimens from Area Red were excavated and those from Area Green were recovered from trench backdirt is a function of the nature of investigations in these two areas. The other portions of the site are represented in the collection, but the quantities are significantly smaller. This is, in part, due to the relative amount of archaeological activity; but it is also interpreted as a measure of the relative amount of prehistoric activity as well. Where general forms are identifiable, the fragments also reflect the distribution of the complete specimens: circular and lanceolate tended to occur in the more peripheral areas, while ovate/subovate and triangular/subtriangular forms were most commonly recovered in the central (Area Red) and northeast (Area Green) portions. Appendix I.B, Part 2 provides the exact provenience of each specimen.

Metrics: See Appendix I.B, Part 2.

Description: Fragments of bifacially retouched artifacts are grouped according to the portion of the complete artifact they represent. These include the following:

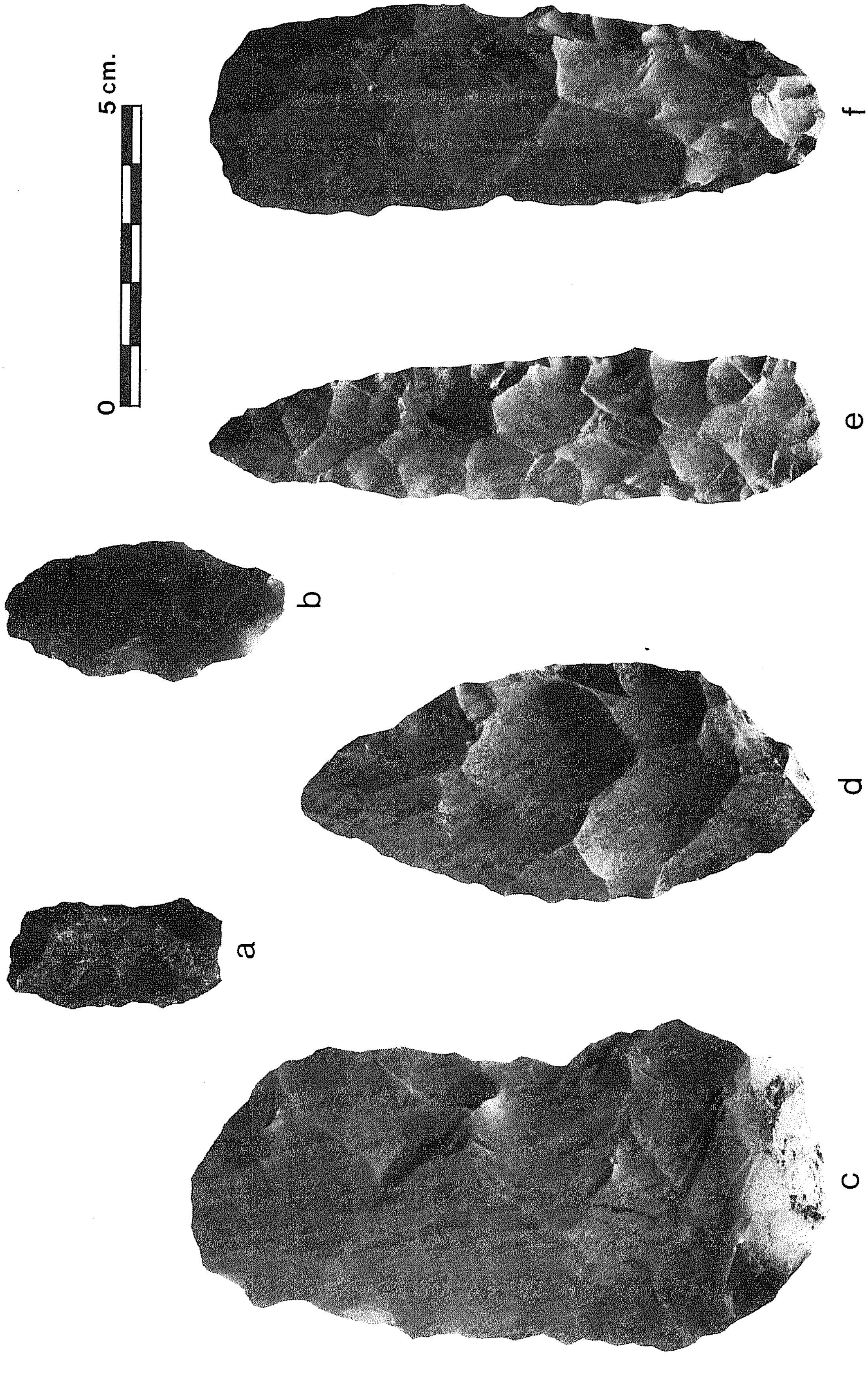

Figure 29. **Bifaces.** a-f, lanceolate.

Portion	Quantity
Distal (284)	182
Medial (285)	68
Proximal (286)	152
Lateral (287)	24
Unidentifiable (288)	190

In addition to making the collection more manageable during analysis, this method of subdivision has the advantage of facilitating the identification of the complete form in many instances. Comparison of especially the proximal portions provides data which indicates that each general form occurs in approximately the same proportion among the fragments as they do among the sample of complete specimens. Ovate/subovate and triangular/subtriangular forms account for approximately two-thirds of the total; the remaining third is divided among lanceolate and circular, with the former twice as prevalent as the latter.

Unifaces (300-313)

Number of specimens: 35

Provenience: Eighty percent of these specimens were recovered from the central (Area Red) portion of the site. The remaining seven artifacts were evenly distributed among the other areas. Excavated specimens were associated with both the topsoil and subsoil zones and with a range of features dating to the Archaic and Late Prehistoric periods. Exact provenience data is provided in Appendix I.B, Part 3.

Metrics: See Appendix I.B, Part 3.

Description (Fig. 30): Unifacial tools are a small but distinctive group of artifacts characterized by overall primary retouch on one face only, over which is applied steep secondary marginal retouch. The function of unifacial tools is usually presumed to be scraping and planing. As the morphology is almost always characterized by one flat face, a flake blank, as opposed to a core blank, is usually employed. Modification to the ventral surface of this flake is usually limited to bulb removal to further flatten this surface.

A system of subdividing unifaces was established prior to the initiation of field work. While it may seem overly detailed in light of the small collection, it was employed in anticipation of recovering larger numbers of this type of artifact. The system is based on the placement of the steep secondary retouch. The collection can be subdivided as follows:

Placement	Quantity	Figure
Single end (312)	2	30,a
Unilateral and single end (302)	5	30,b
Bilateral (301)	5	30,e
Bilateral and single end (303)	12	30,c
Semicircular (313)	2	

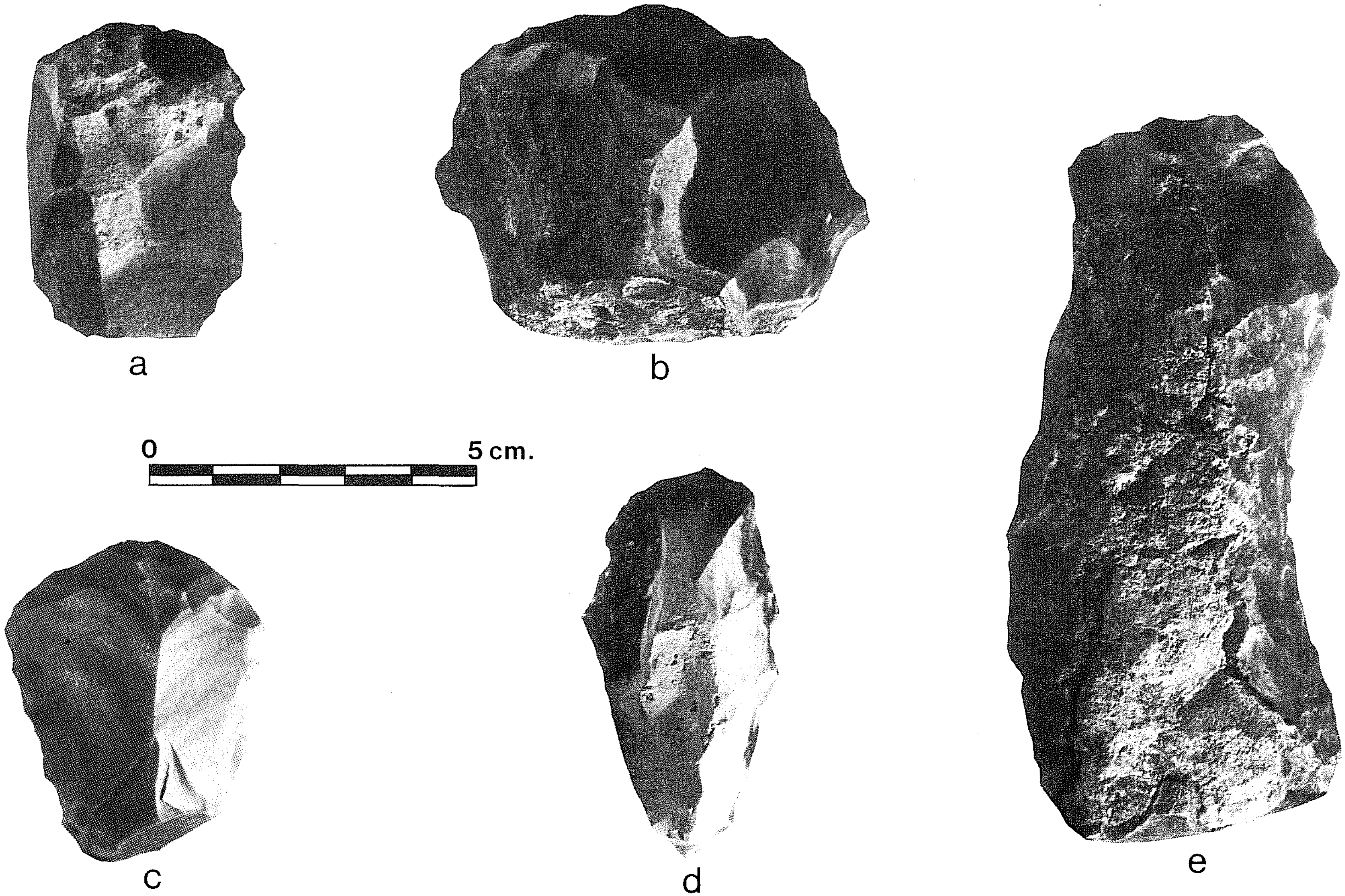

Figure 30. **Unifaces.** a, single end retouch; b, unilateral and single end retouch; c, bilateral and single end retouch; d, circumferential retouch; e, bilateral retouch.

Circumferential (306)	2	30,d
Irregular (308)	3	
Unidentifiable fragments (311)	4	

Despite the small size of the collection, it is obvious that the bilateral and single end variety is the most popular, representing fully one-third of the sample. Unifaces with retouch on one or both lateral edges of the flake, moreover, account for almost two-thirds of the entire collection.

Typed Tools

Clear Fork (346)

Number of specimens: 1

Provenience: This specimen was excavated from the mixed gravel zone beneath the burned rock midden in the central (Area Red) portion of the site.

Metrics: See Appendix I.B, Part 4.

Description (Fig. 31,a): The specimen exhibits all the characteristics of the "classic" unifacial **Clear Fork** tool. The outline is triangular, with overall primary retouching on the dorsal face. Secondary retouch has been applied to the distal end at an approximately 45ø angle, creating a chisel-like working edge; the edge shape is convex. The ventral face is flat, representing the unmodified ventral surface of the flake blank.

Date range: Late in the Early Archaic to early in the Middle Archaic periods; Central Texas Jarrell, Oakalla, and Clear Fork phases; Salado Creek Watershed Local Periods 5 and 6; 4100-2100 B.C.

References: Black and McGraw (1985:138-142), Turner and Hester (1985:205-208).

Guadalupe (349-350)

Number of specimens: 8

Provenience: Half the specimens were recovered in the southern (Area Yellow) portion of the site, and three of the remaining four came from the central (Area Red) area. Four were excavated, two from mixed gravels and the other two from the topsoil. Appendix I.B, Part 4 provides exact provenience data.

Metrics: See Appendix I.B, Part 4.

Description (Fig. 31,b-d): Six of these specimens are completed tools (349), and two are considered preforms for this type (350). The morphology is so distinctive that the latter can be identified with some confidence. The primary characteristics are bifacial primary retouching of a long, thick blank and a truncated distal end. Despite the small size of the sample, however, there is considerable variation in attributes. Figure 31,b

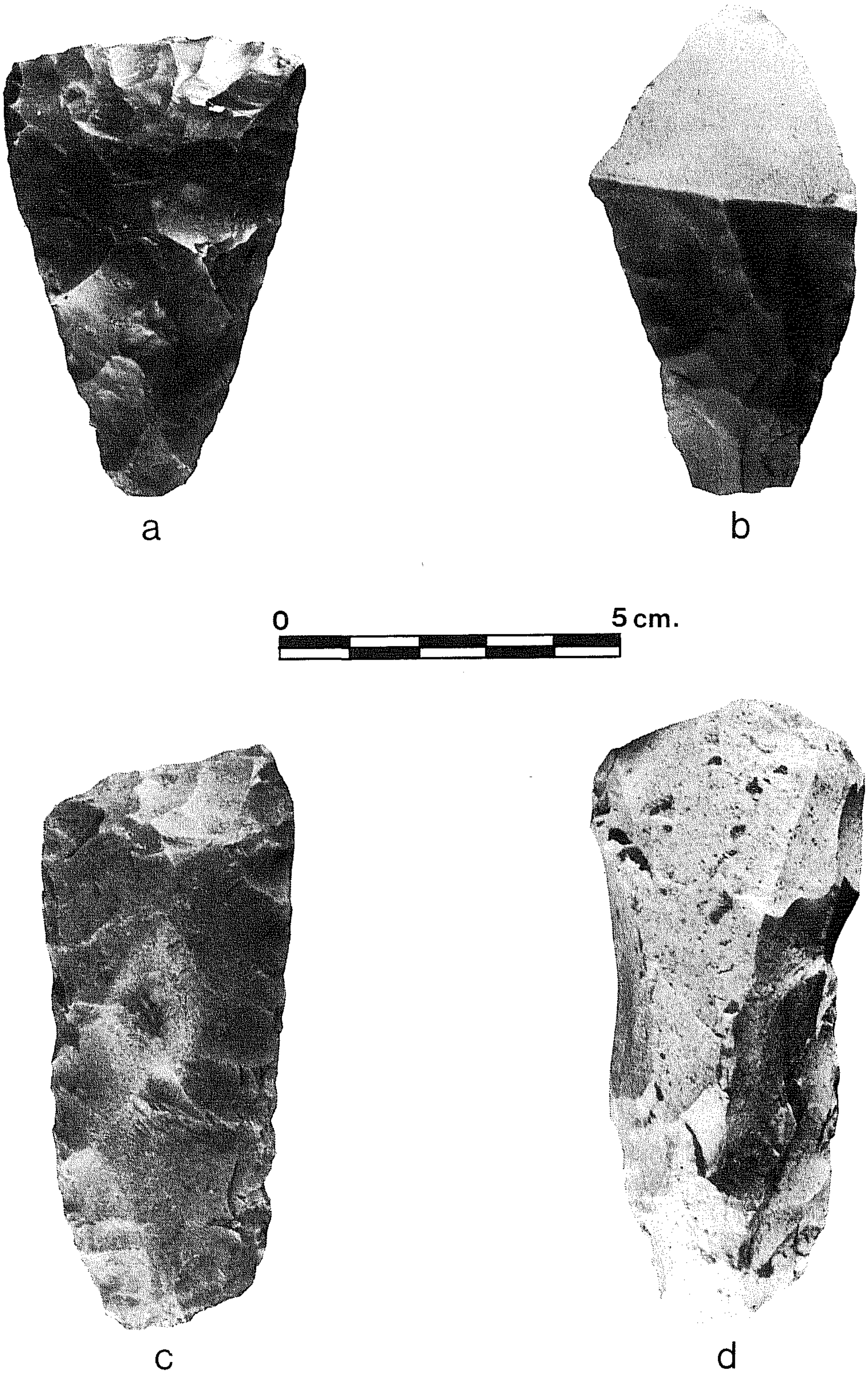

Figure 31. **Typed Tools.** a, **Clear Fork;** b-d, **Guadalupe.**

illustrates the expanding bit form. The truncated distal end angles toward the ventral face and was created by a single flake removal; the cross section is triangular. Figure 31,c is a narrow bit form, with multiple flakes removed to make the bit. This specimen is somewhat unusual in that the truncation angles toward the dorsal face rather than the ventral; the cross section is plano-convex. The third specimen illustrated (Fig. 31,d) has the ventrally oriented bit created by multiple flake scars and a triangular cross section.

Date range: Late in the Early Archaic period; Central Texas Jarrell and Oakalla phases; Salado Creek Watershed Local Period 5; 4100-2600 B.C.

References: Black and McGraw (1985:142-156), Turner and Hester (1985:216-218).

Specialized Tools

Perforators (357)

Number of specimens: 14

Provenience: Nine of these specimens were recovered from the central (Area Red) portion of the site; of the remaining five, three came from the southern (Area Yellow) and one each from the northwest (Area Blue) and the northeast (Area Green). Ten were excavated, eight from the topsoil and two from the subsoil zone; three of these from feature associations. Specific proveniences are provided in Appendix I.B, Part 5.

Metrics: See Appendix I.B, Part 5.

Description (Fig. 26,g): The distinctive element of these tools is a conical or cylindrical projection retouched out of a side or end portion of either a flake or biface. The presumed function is one of drilling or perforating, using the projection with a rotary motion. Eight of the specimens are bifaces, at least one is a reworked projectile point. The other six are irregular flakes, probably selected for having a fortuitous projection which facilitated modification.

Date range: Hester (1980:110) states the concensus that the bifacial drills are more characteristic of the Archaic period, and the flake perforators are more often associated with the Late Prehistoric period. Although the sample is small, the two specimens recovered below the topsoil (i.e., presumably Archaic in age) are both bifacial forms.

Gravers (358)

Number of specimens: 20

Provenience: The largest number of specimens (seven) were recovered in the southern (Area Yellow) portion of the site. The remaining specimens are equally divided among the other four areas. Only three were excavated, all from the topsoil zone. Appendix I.B, Part 5 provides the exact provenience data.

Metrics: See Appendix I.B, Part 5.

Description: The distinctive characteristic of these artifacts is a small, sharp, beaked projection. The presumed function is graving or incision of softer materials such as bone and wood. The blank from which the projection is chipped is a flake in all but one instance; this latter is an irregular biface. The flake blanks are quite variable in size, shape, and material, evidently selected because of an incipient projection on some edge which facilitated the production of the graver tip.

Notches (359)

Number of specimens: 60

Provenience: These specimens are evenly distributed across the site, with approximately similar quantities recovered in each of the five areas. All eight of the excavated specimens were associated with the topsoil zone. Of the remaining 52 specimens, 12 were recovered from trench backdirt and 40 (67%) from the surface. Proveniences are is provided in Appendix I.B, Part 5.

Metrics: See Appendix I.B, Part 5.

Description: The distinctive characteristic of this group of artifacts is a concavity chipped into the edge of a flake by means of steep unifacial retouching. The geometry of the notch tends to be semicircular. The flake blanks are extremely variable in size, shape, presence or absence of cortex, and material quality; the selection of a flake seems to have been quite expedient. The presumed function is one of scraping or shaving to shape and smooth a shaft or other curved surface of a softer material such as wood or bone.

Retouched Flakes (374-375)

Number of specimens: 344

Provenience: The distribution of retouched flakes reflects the nature of prehistoric human activity at the site as determined by other artifact categories and the presence or absence of features. The greatest number of specimens were recovered in the central (Area Red) and northeast (Area Green) portions of the site. Smaller quantities came from the eastern (Area White) and southern (Area Yellow) portions; and relatively few specimens were recovered in the northwest (Area Blue). Excavated specimens were recovered from all soil zones and in association with each of the 10 recorded features. Appendix I.B, Part 6 provides the specific provenience for each specimen.

Metrics: See Appendix I.B, Part 6.

Description: Retouched flakes are expedient tools. The range of sizes, shapes, material varieties, and stages of manufacture present in this collection suggest that the source of blanks was equally varied. Core decortication flakes were a primary source, as evidenced by the fact that the number of retouched flakes with cortex (175; 51%) slightly exceeds the number of retouched flakes without cortex (169; 49%). Flakes produced by the biface thinning process provide another source of flake blank, represented in this case primarily by those without cortex. It is doubtful whether blanks were intentionally produced so that they could be marginally retouched into unshaped tools.

Retouch was applied to any or all margins of the flake blank, but most commonly only along one lateral edge. Bifacial retouching occurs, but steep unifacial flaking is most frequent. As this is typically interpreted to represent a scraping function, the small number of unifaces may have been functionally augmented by the large number of steeply retouched flakes.

MANUFACTURED TOOL BY-PRODUCTS

Table 24 summarizes those chipped stone specimens which are not considered manufactured tools or tool fragments. It is not simply a matter of whether or not retouching has been applied, as every specimen in this particular assemblage bears some retouching scars. The distinction is rather one based on technological considerations, that is, whether a chipped stone specimen represents a completed functional form or not. If not, then it can be considered as either an intermediate stage in the manufacture of a completed tool or a waste product of the manufacturing process. Both aspects of chipped stone nontools are grouped together in this assemblage of manufacturing and maintenance debris.

The analysis of this group takes into account that the failure to achieve the status of completed tool does not preclude its use as a functional implement. Many of the unretouched flakes exhibit edge modifications which can be interpreted as use-wear, for instance. The behavioral differences between functional expediency and intentional manufacture are what distinguish a utilized flake from a chipped stone tool, even if it could be documented that both were employed for the same task.

Table 24 is organized in approximately the order in which the chipped stone manufacturing process is reconstructed; the first categories were accomplished earliest in the process, proceeding finally to waste products and manufacturing debris. Concerning provenience data, the quantities of these groups of artifacts are such that individual consideration in this report of the sort provided for tools, even as an appendix, is not practical. Provenience and other data for these components of the mitigation collection are available to interested researchers in a series of computer printouts maintained with the project records at the Center for Archaeological Research and on magnetic tape by the Computer Resources Center, both located on the main campus of The University of Texas at San Antonio. The printouts and computer files are cross-indexed by (1) catalog number; (2) provenience (unit/level/depth); (3) feature/non-feature association; and (4) classification type, to facilitate use of the collection.

Tested Nodules (377)

Twenty specimens (0.02% of the chipped stone nontool assemblage) are characterized by a few flakes removed in an unpatterned manner from a nodule of local chert. The specimens are interpreted as efforts to ascertain the quality and workability of the raw material without any significant expenditure of chipping time or effort. The very small number of specimens in this category is assumed to be due to the fact that this initial assessment step would normally take place at the raw material source. Tested nodules would thus be expected to occur in much greater frequency at lithic resource procurement sites such as 41 BX 299 and 41 BX 301 (see Fig. 1) than at a subsistence activity site such as 41 BX 300. Seventy percent of the specimens (14 specimens) were recovered from Area White (see Fig. 8), that portion of the site closest to the nearby site of 41 BX 299 and thus representing the shortest "carry" for the nodules prior to testing them.

Production Blanks (281,289)

Production blank specimens represent 0.16% of the chipped stone nontool assemblage. "Production blank" is a generic term for that stage in the manufacturing process of chipped stone bifacial tools between the nodule and the preform. Production blanks have been subjected to overall primary bifacial retouch; complete decortication is common but not necessary for inclusion in the category. Outlines are vaguely geometrical; cross sections are thick and roughly lenticular; margins are characterized by alternating retouch; and mass tends to be large. Mean weight for this assemblage of 167 specimens is 112.9 g; mean dimensions are 64.7 mm in length, 54.7 mm in width, and 22.5 mm thick.

A production blank, being an intermediate stage of manufacture, does not usually exhibit evidence of functional utilization; if it did, it would most likely be interpreted as a chopping tool. Provenience data shows a very high proportion (35.53%) of quarry blanks recovered from Area Green (see Fig. 8), a portion of the site which has been associated with the later periods of occupation on the basis of diagnostic projectile points (see Appendix I.B, Part 1). A substantial number of completed bifaces and biface fragments were also recovered from Area Green, the tool for which the production blank was directed.

Unretouched Flakes (370-373)

The largest category by far in the 41 BX 300 Phase III mitigation collection consists of chipped stone flakes with no evidence of intentional retouch once removed from their respective blanks. Unretouched flakes represent 95.74% of the nontool chipped stone assemblage, 94.50% of the total chipped stone assemblage, and 94.43% of the entire site collection. Unretouched flakes are produced as by-products during every stage of chipped stone tool manufacture: nodule testing, blank production, biface thinning, secondary shaping retouch, sharpening, and edge rejuvenation. Unretouched flakes with a remnant cortex, which includes primary and secondary decortication flakes and platform cortex, account for 14.82% of the category; interior flakes with no cortex remaining represent 85.18%. The proximity of lithic resource sites 41 BX 299 and 41 BX 301 (Fig. 1) and the predominance of cortex-bearing flakes in their respective collections (see Table 4) undoubtedly account for the proportions at 41 BX 300. The close spatial relationship between the sites makes it reasonable to assume that the early stages of manufacture were generally accomplished at the source localities, with tools completed and maintained at 41 BX 300.

Cores (330-338)

Cores are generally considered to represent the end product of the chipped stone manufacturing sequence, the exhausted remnant of a nodule after all usable flakes have been removed. Cores also carry with them several important implications about a group's chipped stone technology. The preparation of a striking platform and the attempt at regularity of flake removal in both direction and pattern argue for a planned, controlled approach to technology and consequently behavior. In addition, the core is associated with a flake industry, generating flake blanks for subsequent tool manufacture. Unfortunately, the 76 specimens (0.08% of the nontool assemblage) were recovered from most areas at the site in relative quantity, as well as from varying depths below ground surface. The small number of items, especially when compared to the next category, seems to suggest most strongly that the cores were not a technological end-product but rather were only the penultimate stage in the nontool production sequence. An analogy would be the bifacial preform, which still had one more stage to pass through before completion.

Chunks (376)

Chunks represent the largest category of nontool chipped stone apart from unretouched flakes (4.00%) and is considerably larger than the other categories. A chunk is what its name implies: a lump of chert, generally small (less than five centimeters in diameter), with flake scars over its entire surface. The scars are randomly distributed, exhibiting none of the patterned removal of a core; nor is there a prepared striking platform. The chunk is definitely an exhausted form, there being insufficient material to produce any more usable flakes and no purchase from which to detach them. The large number of chunks suggests that chipped stone raw material was at a premium, in that nodules and flake blanks were used down to a nubbin. The fact that two large resource areas (41 BX 299 and 41 BX 301) were situated adjacent to 41 BX 300 (Fig. 1) makes the quantity of chunks recovered difficult to interpret. The provenience distribution reflects the relative proportions of excavation, both horizontally by area and vertically by stratum, and thus no cultural or chronological pattern can be ascertained. What is apparent is that a great deal of chipped stone production took place at the site, and it was primarily of an expedient nature.

ROUGH STONE (380-388)

Only 14 specimens of nonchipped stone tools were recovered, representing 0.01% of the total collection from 41 BX 300 (see Appendix I.B, Part 7). One hammerstone was collected on the surface, a fist-sized quartzite specimen bearing evidence of battering on the ends and margins. A single hammerstone in association with chipped stone tool production yielding over 100,000 items might seem ridiculous if it was not so typical in this region. The soft limestone interspersed with chert outcrops are the only lithic materials; harder rocks suitable for percussion chipping are not locally available. Either aboriginal inhabitants used chert against chert, or they obtained an exotic material and treasured it, but traditional hammerstones do not occur in any appreciable quantity at sites along the margins of the Edwards Plateau.

Handstones, grinding slabs, and fragments are all pieces of fine-grained limestone which bear evidence of smoothing on one or both faces. The common interpretation is that these tools were used to process vegetal material, the moveable handstone crushing and pulverizing nuts and seeds against a stationary grinding slab.

Because these specimens utilized local materials, the small quantity recovered cannot be attributed to unavailability as was the case with hammerstones. Rather, the simplest interpretation is that vegetal processing, by grinding at least, was not a common activity at the site. One interesting situation might account for the destruction of an unknown number of these tools, however. An example of a grinding slab was recovered inside Feature 6, where it seemed to have functioned as a hearthstone (Fig. 36, bottom center; Fig. 37,b far right). If it was customary, at this time period at least, to dispose of exhausted grinding implements in a hearth where the limestone rock would crack and break up along with other hearthstones, there would be an unknown number of these tools that would never be recovered.

SHELL (403)

Only three specimens of shell were recovered, all examples of the marine **Olivella** shell fashioned into beads for stringing along their longitudinal axis (Fig. 26,j). Two of the five specimens were associated with Feature 7, an area of concentrated artifactual material on and immediately below the surface in Area Red (Figs. 11, 12). The stratigraphic position of these artifacts is consistent with their chronological association in the Late Prehistoric period (see Appendix I.B, Part 8).

BONE

No bone or antler tools were recovered during Phase III mitigation activities. The complete absence of antler flakers is at first surprising, in view of the extensive chipped stone assemblage generated by manufacturing and maintenance activities at the site. On the other hand, the poor preservation of faunal remains in general would affect bone tools in an equal manner; and the prevalence of the percussion mode of chipping stone would limit the initial number of flakers to begin with.

PREHISTORIC POTTERY (476)

Twenty-five sherds were recovered; 22 specimens were from Feature 7 in Area Red (see Appendix I.B, Part 9), reinforcing the chronological association of this feature with the Late Prehistoric period.

Attribute analysis of the sherds demonstrated that they were morphologically and technologically similar enough to be subsumed within the same type of pottery. Only one sherd was a rim fragment (Fig. 26,k), having a rounded lip 2.0 mm thick, slightly incurving orientation but with a straight form, and an estimated vessel diameter at the aperture of ca. 15 cm. The remaining specimens were body sherds, ranging in thickness from a maximum of 9.8 mm to a minimum of 1.9 mm; mean thickness is 5.9 mm. Tempering material is visible in most specimens, measuring from 0.25-1.0 mm in diameter; the temper has been identified as bone fragments. Exterior color is a moderate yellowish brown (10 YR 5/4), with interiors slightly darker (5 YR 5/4). There is no decoration. All characteristics justify inclusion of this assemblage in the **Leon Plain** pottery type.

HISTORIC ARTIFACTS

Only 38 specimens of Euro-American manufacture were recovered (see Appendix I.B, Part 10). Four items were sherds of undecorated whiteware, glazed on both sides. They are possibly fragments of the same vessel, as all were collected on the surface in Area Green. Five pieces of rusted metal from unidentifiable objects and 29 sherds of miscellaneous bottle glass complete the inventory. No component of historic activity is identified at the site.

SUMMARY ANALYSIS

Table 24 summarizes the counts and percentages of all major artifact categories in the 41 BX 300 Phase III mitigation collection. Nonchipped stone specimens account for less than one-tenth of one percent (0.08%), indicating that prehistoric activities utilizing chipped stone tools predominated at the site.

The relationship of chipped stone tools (1.29%) to manufacturing and maintenance debris (98.71%) is somewhat misleading, in that some of the almost 100,000 unretouched flakes undoubtedly functioned as expedient tools. Nevertheless, the enormous quantity of nontool material argues strongly for chipped stone workshop activity as one of the primary **raisons d'etre** for 41 BX 300.

Flintknapping cannot have been the sole activity performed at 41 BX 300, however, since the nearby sites of 41 BX 299 and 41 BX 301 would have been satisfactory for this, and perhaps they were the source of raw material. The balance of the tool assemblage provides directions for additional activity identification: a predominance of piercing, cutting, and scraping tools oriented toward faunal procurement and processing, and the conspicuous absence of woodworking and vegetal processing tools in any but the smallest quantities. The tool component of the artifact collection thus supports the preliminary interpretations made on the basis of feature and ecofactual analyses.

DESCRIPTION AND ANALYSIS OF FEATURES

The classic definition of features as "things that are not brought back to the laboratory or museum" (Hester, Heizer, and Graham 1975:131) prevailed during mitigation activities at 41 BX 300. Ten features were identified during the course of the field work, numbered consecutively as they were recorded from "2" through "11." The number "1" was not employed to designate a feature, as it was necessary to have some code for material not associated with a feature. Some of the field and laboratory forms had an entry for "feature number," and as the leaving of blanks was actively discouraged, "1" was entered to indicate a nonfeature provenience.

Within the total of 10 features was a surprising morphological variety, and it was helpful to establish a classificatory scheme despite the relatively small number of members. Two major categories were employed, one characterized by the concentrated presence of aboriginally burned rock, and one by its virtual absence. Three types of burned rock features were identified: one midden, five hearths, and one scatter. The three features without a significant amount of burned rock were all designated occupation floors.

Table 25 provides basic data in a comparative format for all 10 features, each of which is individually described later. Artifacts and ecofacts identified as associated with, and special samples collected from, each feature, are summarized in Table 27; more specific descriptions and analyses are provided in subsequent sections.

BURNED ROCK MIDDEN

FEATURE 2

Feature 2, the sole burned rock midden classified at 41 BX 300, was also the only feature identified prior to the initiation of Phase III mitigation activities.

Phase I activity in the fall of 1975 determined that the site needed further investigation based on the recording of an extensive scatter of chipped stone debris and the recovery of projectile points attributable to both the middle and later periods of the Central Texas Archaic. It was during the Phase II investigations early in 1976, however, that the presence of a burned rock midden was first ascertained (Kelly 1976; Hester, Katz, and Kelly 1977).