

# **An Archaeological Survey of 35 Acres Near Eagle Pass, Maverick County, Texas**

**David L. Nickels, Steve A. Tomka,  
and Bradley J. Vierra**

Center for Archaeological Research  
The University of Texas at San Antonio  
Archaeological Survey Report, No. 292  
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**David L. Nickels, Steve A. Tomka,  
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**Robert J. Hard and C. Britt Bousman  
Principal Investigators**

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Archaeological Survey Report, No. 292

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## **Abstract**

On April 22 through 24, 1998, staff archaeologists from the Center for Archaeological Research (CAR) conducted a 100 percent pedestrian survey with limited shovel and backhoe testing on two parcels near Eagle Pass, Texas (Figure 1). The archaeological investigation was conducted at the request of the Eagle Pass Independent School District as part of a plan to construct two new elementary schools on the parcels (Figures 2 and 3). The purpose of the survey was to identify archaeological sites visible on the surface as well as areas where sites are potentially buried. CAR archaeologists recorded 27 isolated finds on the 20-acre parcel south of the city. On the 15-acre parcel north of the city they discovered and recorded one archaeological site, with an additional nine isolated finds (Figures 2 and 3). The site has been heavily disturbed due to natural and artificial causes; therefore CAR recommended that the planned construction should be allowed to proceed with no further consultation with the State Historical Preservation Office (SHPO) or the Texas Historical Commission (THC).

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## Introduction

In April 1998, Assistant Superintendent for Support Services Floyd L. Kocher, acting on behalf of the Eagle Pass Independent School District, contracted with the Center for Archaeological Research (CAR) of The University of Texas at San Antonio to conduct an ar-

chaeological site assessment via a pedestrian survey and limited shovel and backhoe testing of a 15-acre parcel of land south of the city known as the Balcones Heights project area, and a 20-acre parcel north of the city known as the Elm Creek project area (Figure 1). The city asked for the assessment as part of an overall development plan which included the use of public

funds to construct a new elementary school in each area. Planned development of the two pieces of land as elementary school campuses included construction of the schools, paved parking areas, ball fields, and fencing (Figures 2 and 3). CAR conducted the project from April 22 through 25, 1998 under Texas Antiquities Permit #1994, issued by the Texas Historical Commission Department of Antiquities Protection (THC-DAP). The survey documented one archaeological site and 36 isolated finds (Figures 2 and 3).

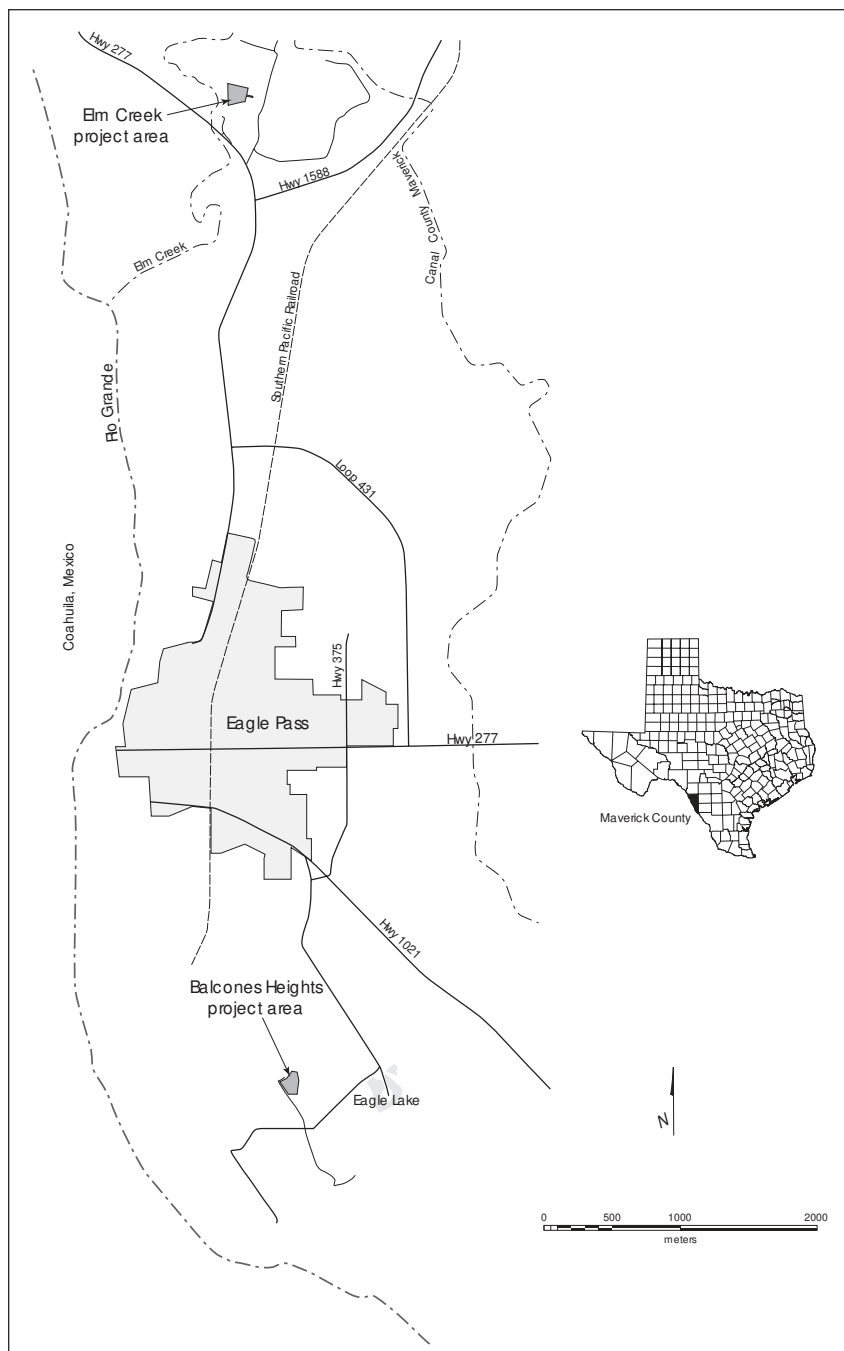


Figure 1. Location of the Elm Creek and Balcones Heights project areas.

## Descriptions of the Project Areas

The Balcones Heights and Elm Creek project areas lie in the northwestern edge of the Rio Grande plain, in the South Texas archaeological region (Black 1989a; Stevens and Arriaga 1977). The geographic region of South Texas covers roughly 80,000 km<sup>2</sup> and is bounded on the west by the Lower Pecos region, on the north by the Edwards Plateau, on the east by the Lower Gulf of Mexico coast, and the south by the Rio Grande (Norwine 1995:138). This region can be further divided into the South Texas (or Rio Grande) Plain and the Coastal Plain (Arbingast et al. 1973:Figure 4). South Texas is characterized by a gently rolling to flat topography dissected by intermittent streams. The region is most commonly referred to as the Brush Coun-



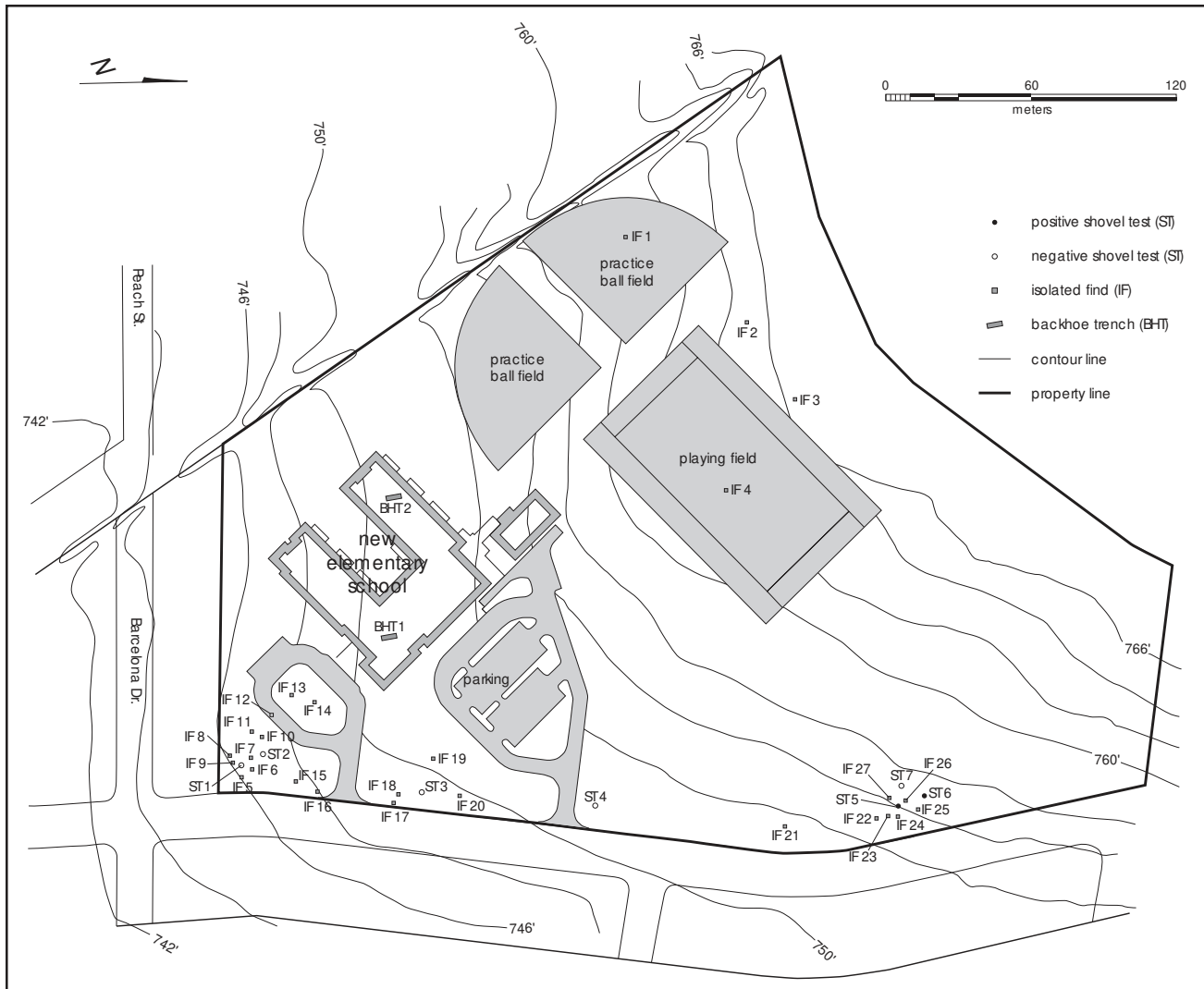


Figure 2. Balcones Heights project area showing planned construction, with archaeological investigations and discoveries.

try due to a heavy cover of brushy vegetation. It is a hot and dry land, with a mixed biota including Neotropical with Sonoran and Austroriparian species (Blair 1950). The following environmental description provides a brief baseline study for understanding the context of hunter-gatherer land use in the arid South Texas region.

### Climate

South Texas is a transition zone between the arid west and moist east, the winterless tropical climates to the south, and the seasonal middle latitudes to the north. The mean annual temperature for South Texas ranges

from 66°–73°F, with the coolest temperatures in January and the hottest in July. Average temperatures for January range from 38°–60°F and in July from 82°–86°F. Roughly one-third to one-half of the year exhibits “hot days,” with temperatures above 90°F. The average number of freezing days is only 10 for the region (Norwine 1995). The weather station in Eagle Pass has a 40-year climatic record from 1939 to 1980 (Office of State Climatology 1987:339–340). The recorded high is 115°F and the low is 10°F. The area exhibits a 285-day growing season, with frost-free days running from February 21 to December 3. The length of the growing season decreases from south to north with increasing seasonality and cooler temperatures.

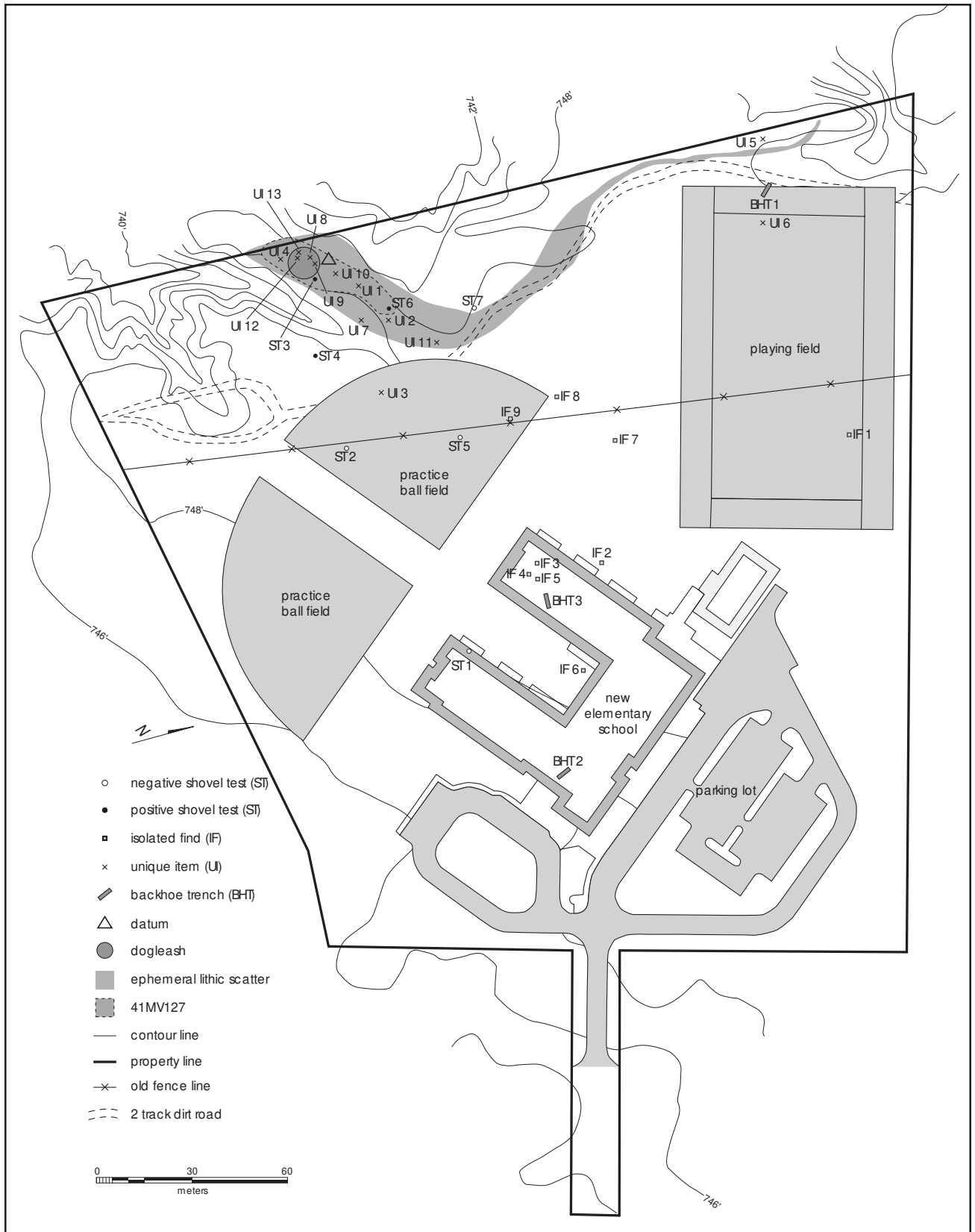


Figure 3. Elm Creek project area showing planned construction, with archaeological investigations and discoveries.

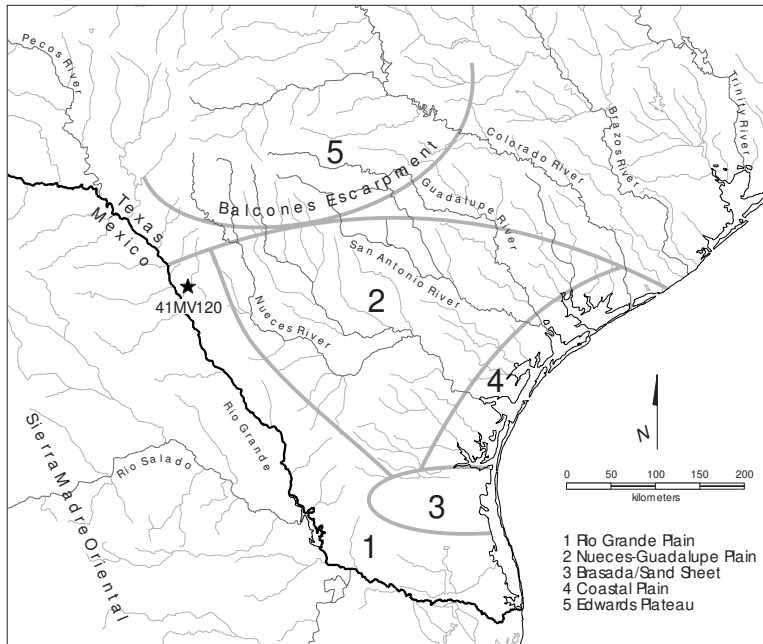


Figure 4. *Biogeographical regions of Texas.* (After Arbingast et al. 1976; adapted from Vierra 1998.)

## Hydrology

The South Texas region is drained by the Nueces River and the Rio Grande, which trend southeast toward the Gulf of Mexico. The Nueces River, with the Frio River as a major tributary, is part of a watershed originating on the Edwards Plateau. Other streams that are part of this drainage system eventually flow into the Nueces River. A few streams west of Eagle Pass drain directly into the Rio Grande or the Pecos River, which runs into the Rio Grande above Del Rio. Smaller intermittent streams seasonally drain toward the Rio Grande from the adjacent upland areas to the west and east of the river; Elm Creek, located adjacent to site 41MV127, is one of these. In addition to the Rio Grande and local intermittent streams, springs in Maverick County provide sources of water (Brune 1981). Few springs are actively flowing in the county today, primarily due to the geological substrate being shales, and the easterly dip of the rock formation which carries underground water away from the area. In contrast, these features have produced a series of springs on the Mexican side of the border. The local Maverick County springs are found in sand and gravel terraces along the Rio Grande. Brune (1981:306–307) identifies five springs in the county—Frenchman

Springs, Wipff Springs, Rosita Springs, Indio Springs, and Ojo Encinal—all but one of which are situated adjacent to the Rio Grande. More springs were undoubtedly present in the past, but have since dried up due to irrigation and overgrazing. All five springs were visited by Brune, who states that “many metates, manos and projectile points” were associated with several of them (Brune 1981:307). This indicates that springs were an important source of water for the prehistoric inhabitants of the area, and that they were probably repeatedly used as temporary campsites.

## Geology

Most of Maverick County is covered by two Upper Cretaceous geologic formations: the Escondido Formation and the Olmos Formation (Barnes 1976). The former contains clay, sandstone, siltstone, and limestone ranging from 60–270 m in thickness. Whereas the upper portion of the deposit is dominated by siltstones and limestones, the lower section contains mostly mudstones and sandstone. The Olmos Formation consists of clay, sandstone, and coal, with some silicified wood ranging from 120–150 m in thickness. Quaternary fluvatile terrace gravel deposits are also present along the Rio Grande (Barnes 1976). Field inspections by CAR indicate that the gravels consist mostly of chert, with some rhyolite, limestone, basalt, chalcedony, quartzite, volcanic breccia, sandstone, and silicified wood. Uvalde gravels are also present in a north-south trending band in the western section of the county. These lag gravels occur in the soils on upland interfluves which are underlain by the Escondido Formation. They typically contain chert, quartz, quartzite, limestone, and silicified wood. These gravels do not have a local origin, but probably originated through ancient alluvial processes across eastern New Mexico to central and southern Texas (Byrd 1971). CAR’s field inspections of lag gravels along Highway 57 east of Eagle Pass indicate that they are primarily composed of chert, with less quartzite, basalt, limestone, silicified wood, chalcedony, andesite, and volcanic breccia.

These all appear to have been derived from west, central, or south Texas sources.

## Soils

The soils of the Rio Grande Plain in the area of Maverick County vary in respect to context. The uplands are generally characterized by deep sandy clay loams (Copita-Pryor-Dant association), deep silty clay loams (Elindio-Montell association), and deep clays (Catarina-Maverick association). Shallow gravelly loams and loams (Jimenez-Olmos-Zapata association) are present in terrace settings. In the floodplains of ephemeral drainages, the soils are characterized by deep sandy loams and loams (Brundage-Dant association); the Rio Grande valley floodplain, however, contains deep sandy loams and silty clay loams (Lagloria-Laredo association) (Stevens and Arriaga 1977). The Balcones Heights parcel south of the city is made up of fluvial terrace deposits (Qt) forming a contiguous alluvium composed of gravel, sand, silt, and clay gently sloping from north to south (Barnes 1976). The northern edge is composed of undulating Verick association soils (VKC) which consist of Maverick, Copita and Zapata loams and clays, while the remainder is Copita (CoB) sandy clay loam. Neither of these types of soils are significantly affected by erosion (Stevens and Arriaga 1977:Sheet 35 inset). The nearest flowing water is the Rio Grande, approximately 1.3 km to the west. The Elm Creek parcel north of the city is made up of Montell clay (MoA), which normally occurs on less than 1 percent slopes and therefore is usually only minimally affected by erosion. However, intermittent tributaries of Elm Creek have created small finger-like incisions on the extreme western edge of the project area. Elm Creek, a first order tributary of the Rio Grande, is 250 m to the west.

## Flora

The regional flora of South Texas has been classified as being part of the Tamaulipan biotic province extending out from northeast Mexico. This is the only part of Texas where some vegetation exhibits growth throughout the year (Blair 1950). Thorny brush is the dominant vegetation today, but this is a relatively re-

cent occurrence, with a mix of woody and grassland species providing a savanna environment during pre-historic times (Archer 1995; Black 1989b; Hester 1980, 1995; Inglis 1964).

On sandy soils, the brush includes mesquite with mixed grasses. In contrast, clay soils support mesquite (*Proposis juliflora*), various species of *Acacia*, and mimosa, granjeno or desert hackberry (*Celtis pallida*), lignum vitae (*Porliera angustifolia*), cenizo (*Leucophyllum texanum*), white brush (*Aloysia texana*), prickly pear (*Opuntia lindheimeri*), tasajillo (*Opuntia leptocaulis*), and species of *Condalia* and *Castela* (Blair 1950).

## Fauna

The South Texas Plains exhibit some of the greatest mammalian species diversity in the state; other areas with high diversity include the Trans-Pecos, the Edwards Plateau, and the Rolling Plains. In contrast, the eastern areas of the state exhibit lower species diversity (Davis and Schindler 1994). Sixty-one species of mammals, 36 snakes, 19 lizards, and several species of turtles, salamanders, and frogs are present in the region (Blair 1950). Approximately 50 species of fish have been identified in the Lower Rio Grande (Lee et al. 1980), and numerous species of birds, cottontail and jackrabbits, and a horned toad lizard were observed while surveying the two project areas that are the subject of this report.

## Paleoenvironment

Little information is available concerning the paleoenvironmental conditions of South Texas. This is in part due to poor preservation conditions (e.g., high soil pH and low organic content) and the lack of environmental features conducive to preservation (e.g., dry caves, peat bogs, or lake deposits) (Bryant and Holloway 1985:60). Although some preliminary work has been done in the Choke Canyon Reservoir area (Hall et al. 1982, 1986), most of the regional paleoenvironmental studies have been conducted in Central Texas (Bousman 1998; Bryant 1977; Collins 1995; Holloway and Bryant 1984; Holloway et al.

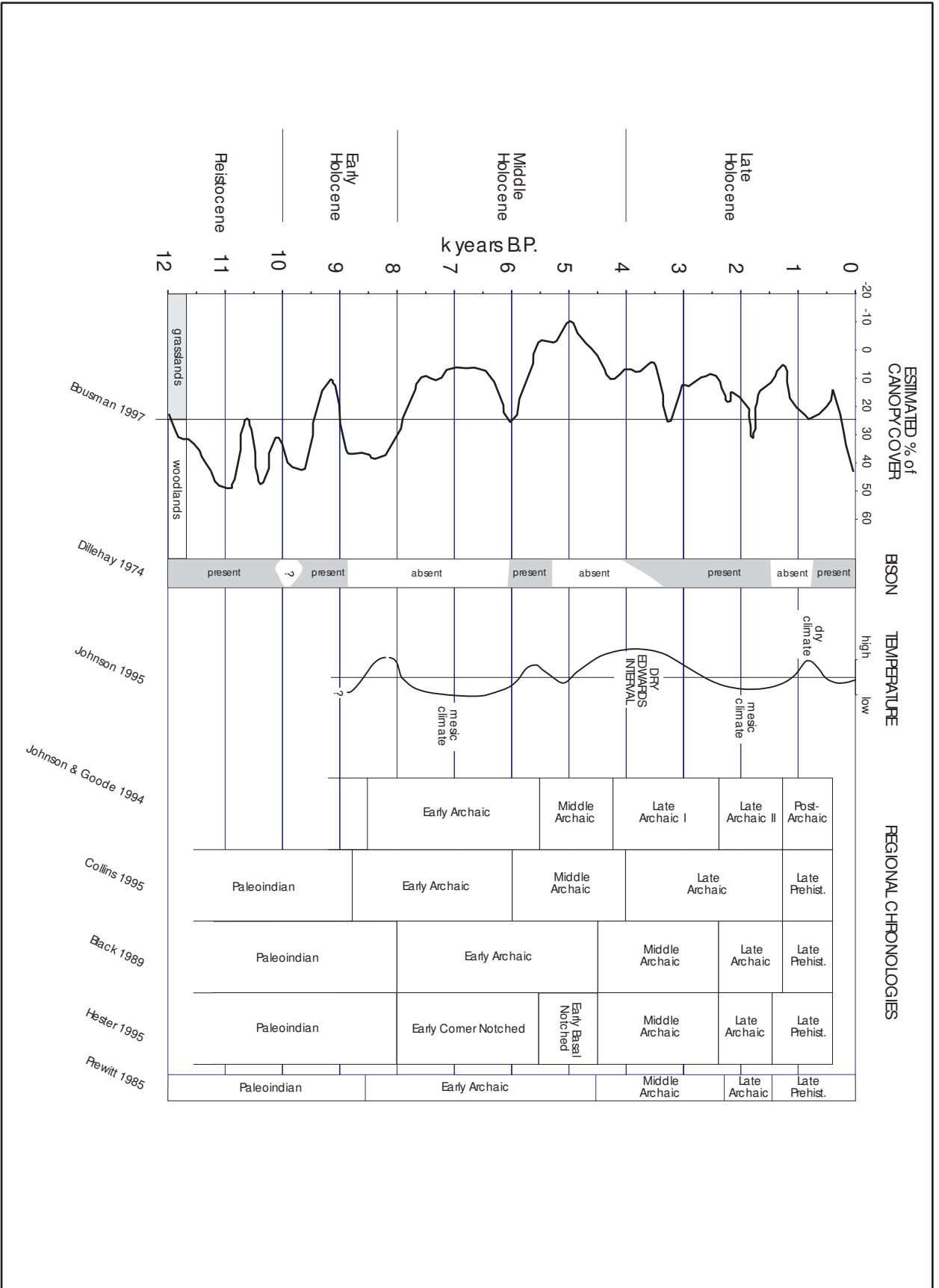


Figure 5. Paleoenvironmental and regional chronology for South and Central Texas. (Adapted from Vierra 1998).



1987; Johnson and Goode 1994; Nordt et al. 1994), with some in the Trans-Pecos (Shafer and Bryant 1977), and northeastern Mexico (Bryant and Riskind 1980; Van Davender 1990). In a tree-ring study, Stahle and Cleaveland (1995) were able to identify similarities in changing climatic conditions between northeastern New Mexico, South Texas, and Central Texas.

The general pattern outlined for Central Texas is broadly applicable to South Texas. The environment from ca. 12,000–800 B.P. (B.P.—years before 1950) is characterized by mesic conditions associated with the end of Pleistocene and beginning of the Holocene (Figure 5). This is followed by a period of xeric conditions from about 8000–4500 B.P., during which the region witnessed a moist peak at ca. 6000 B.P., and then an extreme dry and warm low denoted as the Altithermal ca. 5000 B.P. A general trend toward more mesic conditions is seen from about 4500 B.P. to the present, with peaks at ca. 3000, 2000, and recent. Holloway's (1986) study of charcoal samples from the Choke Canyon Reservoir sites indicated a stable environment for the past 6,000 years. This was based on the continual presence of several species from two habitats which were exploited for fuel wood. One of these habitats contained *Acacia* and *Proposis* (mesquite), and the other was a riparian setting with hickory, willow, and persimmon. This indicates that mesquite was already present in the area during prehistoric times and then later expanded out of the valleys into upland areas during historic times (Hester 1995).

Robinson's (1982) study of phytoliths from the Choke Canyon Reservoir sites provides a detailed paleoenvironmental reconstruction for the South Texas region. Based on his analysis of samples from several archaeological sites, Robinson was able to define a long-term sequence of climatic change from 5300–1000 B.P. This sequence was generally characterized by xeric conditions, separated by two major mesic periods. The first mesic interval occurred from about 5330–4300 B.P.

This corresponds with the longer sequence defined in his earlier study of sites in Goliad County (Robinson 1979). The phytoliths from trees and palms show a marked depression in their presence at ca. 5500 B.P.

(Altithermal), bounded by peaks at about 5500 B.P., and 2500 B.P. to the present. These latter patterns are evident in the Choke Canyon study.

## Cultural Chronology

This section provides only a brief cultural and historical context for south Texas. For a more detailed discussion the reader is referred to Black (1995), Hester (1995), Tomka et al. (1997), and Vierra (1998).

### Prehistoric

#### *Paleoindian*

This phase spans the period estimated at between 11,200–7,950 B.P. in south Texas (Hester 1995:433–436). Diagnostic artifacts include Clovis and Folsom projectile points. Certainly the wide distribution of Clovis points across most of North America and even into Central America suggests a wide dispersal of the people who made them (Kelly 1983; Wenke 1990:201). Within Texas's political boundaries, Meltzer and Bever (1995:47–81) have documented the presence of 406 Clovis points in 128 of 254 counties. Other artifacts associated with the Clovis culture include bifaces, prismatic blade cores and blades, engraved stones, bone and ivory points, stone bolas, ochre, and shaft straighteners.

#### *Early Archaic*

Hester (1995:436–438) identifies the Early Archaic with Early Corner Notched and Early Basal Notched dart points roughly dating between 7950 to 4450 B.P. The extinction of large herds of megafauna and the changing climate at the beginning of the Holocene stimulated a behavioral change by the Prehistoric inhabitants of South Texas (McKinney 1981). Weir (1976) speculates that Early Archaic groups were small and highly mobile, an inference from the fact that Early Archaic sites are thinly distributed and that diagnostic types are seen across a wide area, including most of Texas and northern Mexico. Story (1985) believes that population densities were low during this

period, and that groups consisted of related individuals in small bands with “few constraints on their mobility” (Story 1985:39). Their economy was based on utilization of a wide range of resources, especially such year-round resources as prickly pear, as well as rodents, rabbits, and deer (Story 1985:38).

### *Middle Archaic*

Hester (1995:438–441) suggests that the period between 4450 and 2350 B.P. correctly reflects the Middle Archaic in south Texas. The Middle Archaic appears to have been a time of increased population, based on the large number of sites from this period in south Texas (Story 1985:40; Weir 1976:125, 128). The reasons for this increase are not known, but the amelioration of a very dry period (Altithermal) during the Middle Archaic is often seen as the primary cause (Sollberger and Hester 1972:338; Story 1985:40). On the South Texas Plains, exploitation of widely scattered, year-round resources such as prickly pear continued (Campbell and Campbell 1981:13–15), as did hunting deer and rabbit. Bison bone is encountered in archaeological sites in central and south Texas, at least occasionally, during all but the earliest part of the Middle Archaic (Dillehay 1974).

### *Late Archaic*

Hester believes the Late Archaic in south Texas may better be defined as between 2350–1250 B.P. Although inhabitants of the South Texas Plain near Brownsville and Rockport had begun to make pottery by about 1750 B.P., the northern part of the plain was still “pre-ceramic” until 1,000 years later (Story 1985:45–47). Late Archaic points tend to be much smaller than Middle Archaic points. The most common are Ensor and Frio types (Turner and Hester 1993:114, 122), both of which are short, triangular points with side notches. The Frio point also has a notched base (Turner and Hester 1993:122).

### *Transitional Archaic*

A late subperiod or interval of the Late Archaic is frequently referred to as the Terminal Archaic or Transitional Archaic. Weir (1976) defines the Terminal Archaic as 1650–1150 B.P., while Turner and Hester

(1993) cite data placing the Transitional Archaic as 2250–1250 B.P. Although Hester may lump current data into a Late Archaic period, he cautions that more evidence will likely result in what may be termed as a “Terminal Archaic” period during the latter part of the Late Archaic in south Texas. This Terminal Archaic period is represented by diagnostic projectile points such as Ensor, Frio, and Matamoras points which appear to overlap the Late Archaic and Late Prehistoric periods (Hester 1995:442). Weir (1976) believes this marked a transition period to localized area sites, a disappearance of burned rock middens and bison, and a reappearance of highly mobile hunters and gatherers. Others (Black and McGraw 1985; Peter 1982; Skelton 1977) argue that in some locations burned rock middens did not disappear and sites were more intensely occupied during the Transitional Archaic period.

### *Late Prehistoric*

Collins (1995:385) recognizes that the commonly used date of 1200 B.P. for the end of the Archaic and beginning of the Late Prehistoric in central Texas is arbitrary, and Hester (1995:442) acknowledges the problematic issue of selected tools appearing at both Late Archaic and Late Prehistoric sites. A series of distinctive traits marks the shift from the Archaic to the Late Prehistoric period, including the technological shift to the bow and arrow and the introduction of pottery to central Texas and the northern South Texas Plain (Black 1989a:32; Story 1985:45–47). Most researchers agree the early Late Prehistoric period was a time of population decrease (Black 1989a:32). Even though small burned rock middens associated with Scallorn and Edwards points have been found (Goode 1991:71; Houk and Lohse 1993:193–248), they are rare. Settlement shifts into rockshelters such as Scorpion Cave in Medina County (Highley et al. 1978), Classen Rockshelter in northern Bexar County (Fox and Fox 1967), and Timmeron Rockshelter in Hays County (Harris 1985) have been noted.

Beginning rather abruptly at about 650 B.P., a shift in technology occurred. This phase is characterized by the introduction of blade technology, the first ceramics in central Texas (bone-tempered plainwares), the appearance of Perdiz arrow points, and alternately

beveled bifaces (Black 1989a:32; Huebner 1991:346). Prewitt (1985) and Black (1989a) suggest this technology encroached from north-central Texas. Patterson (1988), however, notes the Perdiz point was first seen in southeast Texas by about 1350 B.P., and was introduced to the west some 600–700 years later. Hester (1995:444) recognizes this phase as the “best documented Late Prehistoric pattern” throughout south Texas, with dates ranging between ca. 650–700 to 300–350 B.P.

Steele and Assad Hunter (1986) argue for the occurrence of a distinct change in diet between the Late Archaic and the Late Prehistoric components in two sites in Choke Canyon Reservoir in south Texas. Analysis of the number of identified specimens (NISP) shows a marked increase in artiodactyla elements present during the late Late Prehistoric, an increase largely due to the addition of bison to the “menu” (Steele and Assad Hunter 1986:468). Huebner (1991) suggests that the sudden return of bison to south and central Texas resulted from a more xeric climate in the plains north of Texas, and increased grassiness in the Cross-Timbers and Post Oak Savannah in north central Texas, forming a “bison corridor” into the South Texas Plain along the eastern edge of the Edwards Plateau (Huebner 1991:354–355).

## Historic

The end of the Late Prehistoric and beginning of the Historic period in both central and south Texas should be characterized by written accounts of European contact with indigenous groups. Collins (1995:386–387) offers that the Historic period then begins ca. 260 B.P. in central Texas. However in south Texas, Hester (1995:450–451) agrees with Adkins and Adkins (1982:242) when he suggests that the indigenous groups may have been affected by European influence but we are only able to observe the materials in the archaeological record because the written accounts simply are not available. He would rather label this largely unknown period “Protohistoric.”

## Previous Archaeological Investigations

Professional archaeology has been conducted in Texas for over 60 years, but some regions have been more intensely studied and documented than others. The formative groundwork for Texas archaeology was laid almost 45 years ago with the publication of the Handbook of Texas Archeology (Suhm et al. 1954). Although a limited number of excavations have occurred in Maverick County, several archaeological surveys have been conducted. Four years ago, Gross and Nickels (1994) conducted a survey of 6.4 acres for the Eagle Pass Independent School District. The largest survey was conducted in the Dos Republicas Coal Mine area northeast of Eagle Pass which recorded 54 archaeological sites from the late Paleoindian through Late Prehistoric periods (Uecker 1994). The latest intensive excavations were conducted at 41MV120, an Archaic site north of Eagle Pass near Elm Creek (Vierra 1998).

## The Current Project

### Project Goals

The project goals focused on archaeological issues that could be addressed by the types of data obtained through pedestrian survey, along with limited shovel and backhoe testing. The topics addressed were site type, distribution, density, size, depth, and stratigraphy. The theoretical framework is structured around patterns of settlement, mobility, subsistence, and social systems for the south Texas region.

The goals of the project were to:

- 1) locate and record cultural locations and sites in the project area using a systematic survey methodology;
- 2) measure, quantify, and analyze site type, site distribution, site density, and site size, as well as depth, and stratigraphy; and,
- 3) measure and quantify the lithic collection and to place the diagnostic artifacts within the regional time frame.



## Methodology

### *Prefield Preparation*

A thorough review of the literature pertaining to the area was conducted. Site and survey reports from the area were examined. USGS 7.5 quadrangle maps, a Maverick County soils survey book, and a geological atlas sheet were consulted. Finally, the Texas Archaeological Research Laboratory (TARL) was queried to check for any previously recorded sites in the area.

### *The Survey*

The pedestrian survey began in the southwest corners of the project areas. Surveyors were spaced 30-m apart and walked transects on a specified compass bearing. The ends of each transect were marked with orange flagging tape, showing the compass bearing, date, and transect letter. Surveyors meandered between stations to insure better surface coverage. When an artifact was found, orange flagging tape was placed under the artifact. Distance between surveyors was such that there was constant communication regarding discovered artifacts and the project archaeologist was able to examine all finds. If the artifacts present were not sufficient in number to constitute a site by definition (five artifacts in a five-square meter area), they were recorded on a special form as isolated finds. The only prehistoric materials collected from the surface were diagnostic projectile points, and formal stone tools. All chipped stone recovered from shovel tests was collected.

Upon completion of the pedestrian survey the only site found was revisited for documentation. The site was intensely examined to further determine the extent of cultural material present on the surface. Six shovel tests were placed on and around the site to determine the approximate depth of the cultural material. A concentration of artifacts within a five-meter radius dogleash were inventoried. Fire-cracked rock within the dogleash greater than 4 cm in length was collected. A length of rebar was driven into the ground as a site datum. Universal Transverse Mercator (UTM) coordinates were obtained at the datum using a handheld Trimble Navigation Global Positioning System. An aluminum tag was attached to the datum bearing

the field site number for the project, UTM coordinates, date, and "CAR-UTSA." Finally, the site was mapped using a pace and compass method.

### *Shovel Tests*

After the pedestrian survey was completed, shovel tests were conducted to determine the possibility of subsurface cultural materials. Seven tests were conducted on each of the two parcels surveyed (Figures 2 and 3). They were placed within the proposed building imprints, adjacent to isolated surface artifacts, or, in and around the one site discovered. All shovel tests were excavated in 10 cm levels to a maximum depth of 50 cm, and all sediments were screened through ¼-inch steel mesh.

### *Backhoe Trenches*

Three backhoe trenches were dug on each of the parcels to examine the underlying stratigraphy as well as confirm any possibilities of buried cultural material. Four were placed within the proposed building imprints, and the other two were near surface artifacts. In addition, archaeologists periodically monitored trenching operations and examined backfill dirt for cultural materials. The trenches were dug to an arbitrary length of 5 m. Trenching operations were carefully monitored for the presence of cultural material. No cultural material was found in any of the BHTs, nor in their backdirt. The trench walls were profiled and photographed, and the BHTs backfilled. Sediments and soils descriptions and stratigraphic profiles are included in Appendix A.

### *Laboratory Methods*

Artifacts were washed by laboratory personnel using tapwater and toothbrushes. After the artifacts were washed, they were allowed to air dry on mesh racks before being transferred to cardboard flats for temporary storage. These flats were placed on shelves and organized by site. Throughout this process the provenience information was kept with the materials. CAR laboratory personnel catalogued the artifacts using an Excel spreadsheet.

## Results of the Current Investigations

### Balcones Heights Project Area

The 20-acre parcel known as the Balcones Heights project area (Figure 2) had recently been deeply plowed to about 35 cm, providing 100 percent surface visibility. Partially burned wood mixed within the plow zone provided evidence that the area had

recently been cleared and burned. Twenty-seven isolated finds spread over an area approximately 300 m-long were recorded and left on the surface, including interior and exterior flakes, a chopper, a quarry blank, a core and core fragment, and two bifaces (see Table 1). No diagnostic artifacts were found. One shovel test (#5) contained one interior flake (along with partially burned wood) in the upper 10 cm, and one flake between 10–20 cm below the surface; a second shovel test (#6) contained two flakes in the disturbed, upper 10 cm. No evidence of cultural material was found in

Table 1. 41MV127 artifact inventory.

<b>41MV127 - Inside Dog Leash Surface</b>					
	<3 cm	>3 cm	>5 cm	>7 cm	Total
<b>Flakes</b>					
Exterior	35	37	11	1	84
Interior	141	45	3		189
<b>Cores</b>		5	5		10
<b>Scrapers*</b>			2		2
<b>Formally Retouched Flake</b>			1		1
<b>Perdiz Preform Fragment*</b>	1				1
<b>41MV127 - Outside Dog Leash Surface*</b>					
<b>Scrapers</b>		1	2		3
<b>Unfinished Folsom Point</b>		1			1
<b>Langtry Point Fragment</b>		1			1
<b>Perdiz-like Point Fragment</b>	1				1
<b>Arrow Point Blank</b>		1			1
<b>Arrow Point Fragment</b>	1				1
<b>Blade Fragment</b>		1			1
<b>Ceramic Sherd</b>	1				1
<b>41MV127 Shovel Test Results*</b>					
<b>Shovel Test #3 (0-5 cm)</b>					
<b>Flakes</b>					
Exterior	1				1
Interior	2	1			3
<b>Shovel Test #4 (0-5 cm)</b>					
<b>Core Fragment</b>			1		1
<b>Shovel Test #6 (0-5 cm)</b>					
<b>Flakes</b>					
Exterior		1			1
Interior	2	1			3

\* Collected

the three backhoe trenches, and no features were observed during the survey.

### Elm Creek Project Area

Most of the 15-acre parcel known as the Elm Creek project area (Figure 3) was covered with sparse to moderately dense grasses and young woody vegetation. The western edge appeared to have been graded at one time, had concrete-lined postholes running across it, and two-track roads. The gullies along the western edge have recently been used as trash dumps. One prehistoric site (41MV127) was documented on the western edge of the project area. Four shovel tests were placed on the site; three additional shovel tests, and three backhoe trenches placed across the remainder of the 15 acres provided no further evidence of cultural material, and no surface features were observed during the survey.

### 41MV127

41MV127 (Figure 6) lies on the edge of a flat plain between the terraces and intermittent tributaries of Elm Creek and the uplands above the Rio Grande. Vegetation consists of pasture grasses and a young growth of mesquite. Overlooking Elm Creek valley to the west, the site has been heavily disturbed due to erosion and deflation, with remnants of the site laying on the scoured narrow ridges and steep slopes between finger-like gullies secondary to Elm Creek. CAR crew members were able to identify an ephemeral surface lithic scatter covering an area approximately 190 m (n-s) x 50 m (e-w). However, it appears that the site extends outside the project area boundary,

west onto private property (see Figure 3). Four diagnostic projectile points representing the Paleoindian, Middle Archaic, and Late Prehistoric periods were recovered from the surface of 41MV127. They are an unfinished Folsom point, a Langtry proximal fragment, and two Perdiz-like arrow point fragments. A 100 percent surface inventory was conducted within a 10-m diameter dogleash placed over an area of highest artifact concentration. A total of 286 chipped stone artifacts was recovered from within the dogleash. In addition, four shovel tests were placed on the site. Artifacts, consisting of eight flakes and a core fragment, were found in the upper 5 cm in three (#s 3, 4, 6) of the four shovel tests (see Table 1). Vertical cracks  $\frac{1}{8}$ -inch wide were observed in the shovel test walls. Fire-cracked rock was present on the surface, particularly in the dogleash area, but in no apparent pattern. The site has been badly damaged from historic trash dumping, concrete-lined fence post holes, two-track roads, and possibly machine blading.

### Fire-Cracked Rock

Seventy-nine fire-cracked rock fragments were collected from the 5-m radius dogleash at 41MV127; Although admittedly problematic because of its small



Figure 6. *Photograph of eroded surface of site 41MV127.*

sample size and disturbed nature, some limited analysis and comparatives of 73 of the 79 (92.4 percent) that were either sandstone, limestone, or chert was conducted. Thirty-five of the 73 (47.9 percent) pieces analyzed were limestone, 23 (31.5 percent) were sandstone, and 15 (20.6 percent) were chert. Six “other material” pieces were not used in the study. The rock type frequencies and mean weights, as a general indicator of artifact size, were compared to those found during excavations at 41MV120 (Vierra 1998) along Elm Creek, approximately 1.2 km to the southwest. The data in Table 2 shows that the fire-cracked sandstone fragments recovered from 41MV127 are larger

while the fragmented chert and limestone are relatively similar.

### The Artifacts

Twenty-seven isolated finds were recorded in the 20-acre Balcones Heights project area and nine at the 15-acre Elm Creek project area (see Figures 2 and 3, and Table 1); none were collected. Thirteen unique items (UIs) were collected from 41MV127 (see Table 3) and are described below. Because of their special qualities, a more detailed discussion, description and measurements are presented for an unfinished Folsom point (UI#7) and a Paleoindian spurred scraper (UI#9).

Table 2. Fire-cracked mean weights and frequencies.

Material Type	41MV120	41MV127
Sandstone	53.4 g n=327 (45.6%)	32.0 g n=23 (31.5%)
Chert	27.9 g n=237 (33.1%)	30.7 g n=15 (20.6%)
Limestone	30.9 g n=153 (21.3%)	37.1 g n=35 (47.9%)
Totals	n=717 g (100%)	n=73 g (100%)

UI#1 (Figure 7a) is a Perdiz-like medial fragment made from a light brown chert flake. Its flat ventral surface has been flaked only adjacent the neck and along one lateral edge near the shoulder. Although the stem, and both barbs appear to have been broken during use; the blade exhibits a perverse fracture characteristic of manufacture fail-

Table 3. Isolated Finds.

Balcones Heights Project Area			Balcones Heights Project Area		
Isol. #	Category	Remarks	Isol. #	Category	Remarks
1	Interior Flake >3 cm		21	Core >7 cm	Heavy Patina; 70% Cortex
2	Interior Flake >3 cm		22	Exterior Flake <3 cm	
3	Interior Flake >3 cm		23	Interior Flake >3 cm	Heavy Patina
4	Interior Flake >5 cm		24	Snapped Biface >5 cm	Heavy Patina; Middle Stage
5	Interior Flake >5 cm	Retouched	25	Interior Flake <3 cm	Heavy Patina; Snapped
6	Interior Flake >3 cm	Heavy Patina	26	Interior Flake >3 cm	
7	Interior Flake >3 cm	Heavy Patina	27	Biface >3 cm	Early Stage Cobble
8	Chopper >7 cm	Heavy Patina; 40% Cortex			
9	Interior Flake >3 cm				
10	Interior Flake >3 cm	Heavy Patina			
11	Exterior Flake >5 cm				
12	Exterior Flake >3 cm				
13	Exterior Flake >3 cm				
14	Exterior Flake >5 cm	Heavy Patina			
15	Core Fragment > 5 cm	30% Cortex			
16	Exterior Flake >5 cm	Heavy Patina			
17	Interior Flake <3 cm	Heavy Patina			
18	Quarry Blank > 8 cm	Heavy Patina; Early Stage			
19	Interior Flake >7 cm	Heavy Patina			
20	Interior Flake >5 cm	Heavy Patina			
			Elm Creek Project Area		
			Isol. #	Category	Remarks
			1	Exterior Flake >7 cm	Heavy Patina; Utilized
			2	Exterior Flake <3 cm	
			3	Exterior Flake >3 cm	
			4	Exterior Flake >3 cm	Heavy Patina
			5	Exterior Flake >3 cm	Heavy Patina
			6	Exterior Flake >5 cm	Heavy Patina
			7	Interior Flake >3 cm	Heavy Patina
			8	Exterior Flake >5 cm	
			9	Exterior Flake >5 cm	

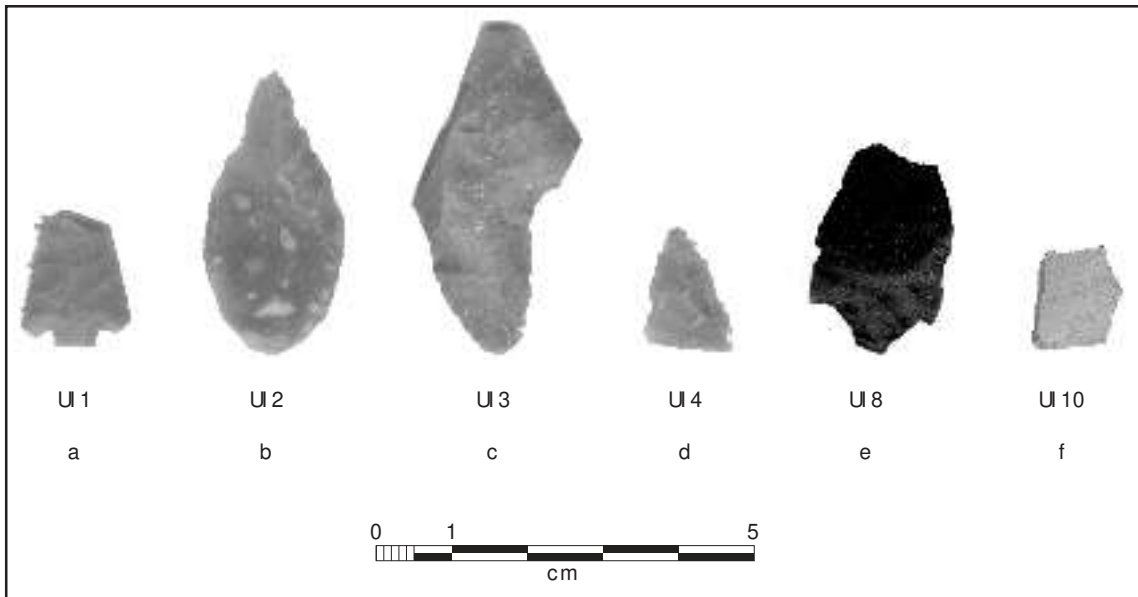


Figure 7. *Unique Items (UI) collected from site 41MV127: (a) Perdiz-like arrow point; (b) arrow point blank; (c) Langtry dart point; (d) probable arrow point; (e) probable Perdiz preform; (f) ceramic sherd.*

ures. The left lateral edge is heavily serrated. The specimen does not appear to have been heat treated.

UI#2 (Figure 7b) is an arrow point blank made from a fine-grained (with inclusions) tan chert, with no cortex present. It has marginal retouch along the ventral face. Its dorsal face has been flaked only adjacent the distal end. It has been discarded due to failure to thin a ridge on the flake blank.

UI#3 (Figure 7c) is a proximal fragment of a Langtry dart point. It is made from a flake of tan, fine-grained chert, and has been broken longitudinally through the blade. The cause of the break cannot be determined but it appears to have occurred post-depositionally.

UI#4 (Figure 7d) is a probable arrow point distal fragment made from a flake of tan chert with a pink shade to it. Minimal edge sharpening has occurred along the lateral edges of its otherwise smooth ventral surface. Both edges are roughly serrated. The blade has been broken in manufacture.

UI#5 (Figure 8a) is an end scraper made from a flake of fine-grained (with inclusions), brown chert. There is no cortex on the specimen.

UI#6 (Figure 8b) is a distal blade fragment which was collected because of the unique blue hue of the chert or chalcedony from which it was made. This was the only artifact observed on the site made from this type of material. The two parallel ridges on its dorsal face suggest that it was removed from a prepared blade core.

UI#7 (Figure 9) is an unfinished Folsom point broken during manufacture. Although Folsom points are relatively common in Texas (Chandler and Rogers 1996; Chandler and Hinds 1995; Chandler and Kumpe 1994; Largent 1995; Largent et al. 1991), because of its temporal significance, a detailed description is merited. This specimen has a broad leaf-shaped outline with convex blade edges and a concave base. One face (Figure 9a) has two channel flake scars. The longer of the scars appears to have actually over-shot and removed a small portion of its tip. The second, very thin, channel flake terminates in a very shallow step fracture at a small knot along the left edge of the point. The second face (Figure 9b) also exhibits two fluting scars. The first channel flake is significantly narrower than the ones on the opposite face and does not extend the entire length of the specimen. Following this fluting attempt a second channel flake removal was attempted from a platform set up on the right cor-



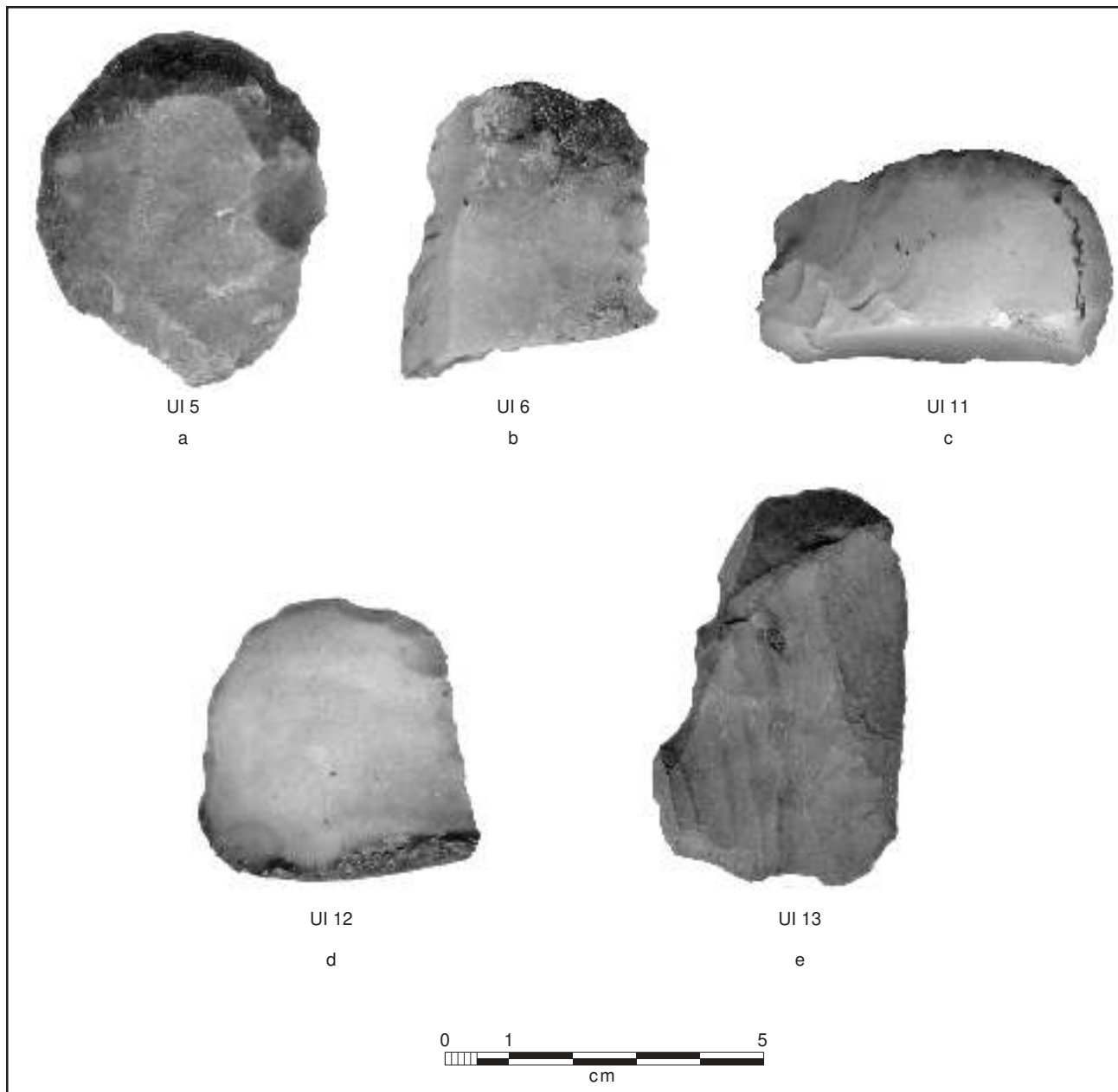


Figure 8. *Unique Items (UI) collected from site 41MV127: (a, c-e) scrapers; (b) blade.*

ner of the base. This removal also terminated in a thin step fracture (Figure 9b). Next, the preform was again turned over in an attempt to remove a third flake to widen and further thin the original channel scar on the second face (Figure 9b). Judging from the morphology of the break surface, the platform used for the third removal was the corner of the base and the removal was oriented toward the center of the point as was the second channel scar removed from this face. The removal was unsuccessful resulting in the break-

age of the left corner of the point. The specimen was discarded at this point.

Using Bradley's manufacture sequences developed for fluted points from the Hanson Site, the earliest manufacture sequence exhibited by the projectile point is Stage 4, specialized pressure shaping and thinning of the faces (Frison and Bradley 1980:52). The latest manufacture sequence present on the specimen is Stage 9, channel flake removal. Post-fluting retouch and marginal polish characteristic of Bradley's Stage

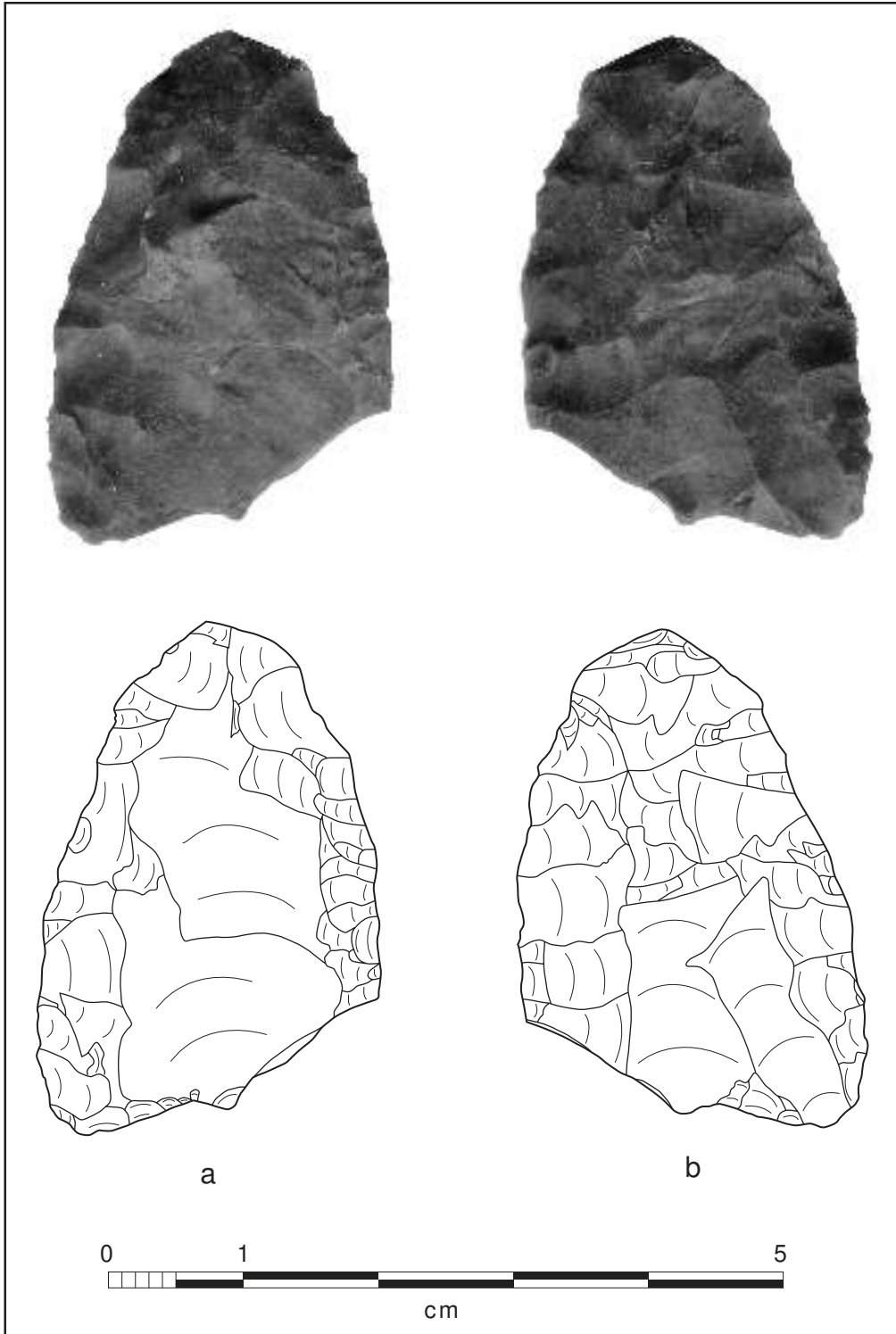


Figure 9. *Unfinished Folsom point.*

10 and 11, are missing on the point. However, since it exhibits sufficient morphological and technological characteristics to associate it with a known type, it is identified as a Folsom preform (Bradley 1975). This

specimen has a maximum length of 38 mm, a maximum width of 25 mm above the break, and a maximum thickness of 5.5 mm. The second channel flake scar on the first face extends 18 mm from the base.

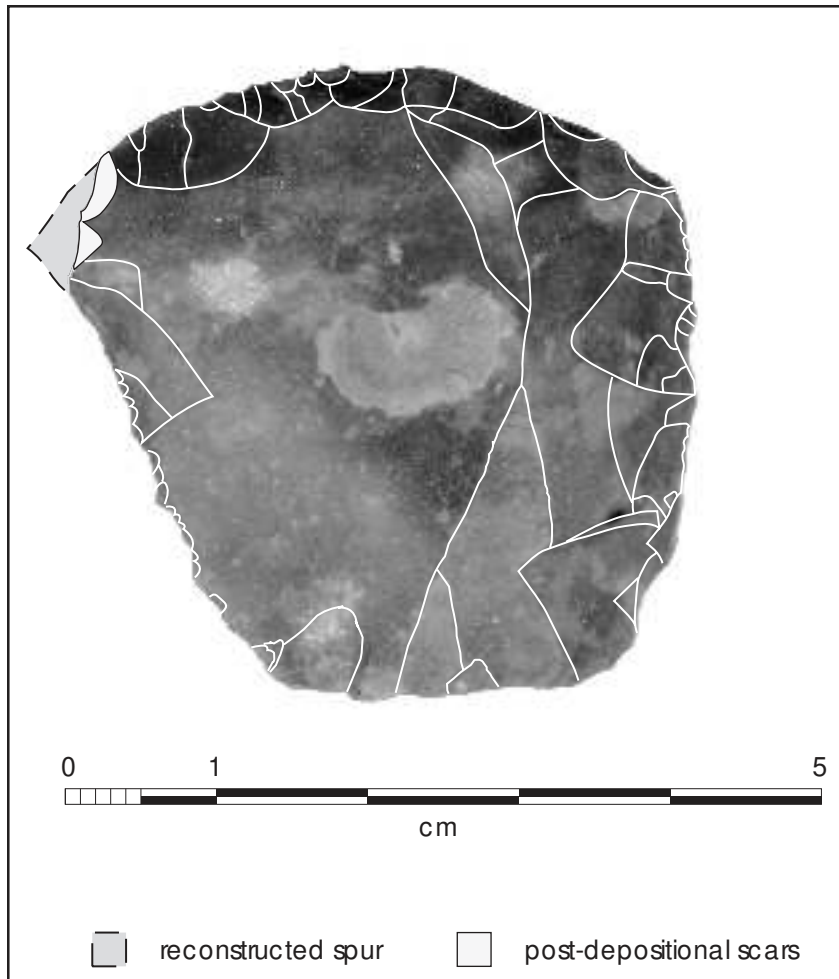


Figure 10. *Paleoindian spurred scraper.*

Both step fractured channel flake scars on the second face are 18 mm long.

UI#8 (Figure 7e) is an arrow point blank made from a flake of black and heat-treated rhyolite. Its distal tip has been broken due to an indeterminate cause, with evidence of minimal flaking on its proximal end. It is similar in characteristics to the other arrow point fragments from the site. It probably represents a Perdiz preform broken in manufacture.

UI#9 (Figure 10) is an end scraper made from a flake of fine-grained (with inclusions) reddish brown chert. The spurred end-scraper is made on a relatively thick tertiary blade. Although it does not fit the classic definition of a blade (Crabtree 1972), the pattern of previous removal scars on the dorsal face, the dorsal ridge, and the longitudinally expanding outline indicate that

it was produced using a blade manufacture technology. The blade has a single faceted striking platform and was removed by a hard hammer percussor. Its right margin is slightly convex and meets the distal working edge in a rounded corner. Its left margin is straight to slightly convex to the distal end where it begins to recurve toward the outside. Examination of the point where the distal end and the left margin meet under long-wave ultra-violet light indicates that two recent flake removals, probably post depositional in nature, have removed what would otherwise have been a pointed spur at this corner. The distal working edge is convex and asymmetrical “leaning” to the left. Morpho-functionally, the specimen fits within the “spurred end-scraper” category often recovered at other Folsom sites (Boldurian 1990; Hofman et al. 1990). It measures 42 mm in max. length, 41 mm in max. width although it was originally slightly wider, and it is 12 mm thick. The single faceted platform is 22 mm wide and 11 mm thick. Its right margin is moderately retouched while the

left margin is retouched adjacent the distal spur. The angle of the working edge ranges from 79 degrees along the right side, to 76 degrees in the center, and 46 degrees along the left margin. Based on the slight curvature evident at the distal end, it appears that the original blade blank was not much longer than the present specimen.

UI#10 (Figure 7f) is a 42 mm-thick x 83 mm-long, tan ceramic sherd with rounded, white quartzite temper. Although it was collected from the dogleash area of 41MV127, its hard baked, and blackened interior suggest a temporal affiliation with the modern trash recently dumped on the site.

UI#11 (Figure 8c) is a unifacial scraper, finely flaked on the end and side. It has been made from a fine grained, white/gray/pink chert blade with no cortex



present. Only a small remnant of cortex is still present on its dorsal surface.

UI#12 (Figure 8d) is a unifacially flaked side scraper made on a short and wide hinge-fractured flake. It is made from a flake of light tan, fine-grained chert. The prehistoric knapper has attempted to remove the rounded hinge termination, but appears to have discarded the specimen before completing the task. Cortex is present on its proximal end.

UI#13 (Figure 8e) is a unifacially flaked end and side scraper made from dark gray, banded slate, an uncommon raw material type observed at the site. Cortex remnants are present on its left lateral edge.

## **Conclusions and Recommendations**

Although prehistoric cultural materials were encountered on both parcels of land, their integrity is not considered significant. The heavily disturbed nature of the Balcones Heights isolated finds, coupled with a lack of cultural materials below 20 cm supports our recommendation that no further testing be conducted. Fire-cracked rock from 41MV120, approximately 1.2 km to the southwest was compared to a small sample of fire-cracked rock from 41MV127. Functionally, Nickels et al. (1998) suggest that the fire-cracked sand-

stone recovered from 41MV120 may have been used to line hearths, using chert and limestone as the primary heating elements, and that sandstone should not fracture as easily as chert and limestone when heated. The smaller sandstone fragments found at 41MV127 suggest that this type of material may have been used for a different function and raises an issue of further research concerning the usage of different types of rock for cooking or heating elements. The high degree of natural and artificial disturbance that has occurred at the Elm Creek site has significantly reduced its potential to yield any additional archaeological data with integrity. Collins (1990:13–15) argues that Early through Late Archaic occupations become palimpsest on higher elevation sites as artifacts become mixed when the same sites are used through time and little or no deposition occurs. The presence of Paleoindian through Late Prehistoric diagnostics on the surface of 41MV127 suggest a lag palimpsest of repeated occupations has occurred at the site. Our opinion is that the sampled inventory of surface artifacts and shovel testing have effectively mitigated the site. No cultural material was encountered below the surface on the remaining acreage in the Elm Creek project area and no further testing is recommended. CAR recommended that the planned construction should be allowed to proceed without further archaeological investigations.

## References Cited

- Adkins, L., and R. A. Adkins  
1982 *A Thesaurus of British Archaeology*. David and Charles, London.
- Arbingast, S. A., L. G. Kennamer, R. H. Ryan, J. R. Buchanan, W. L. Hezlep, L. T. Ellis, T. G. Jordan, C. T. Granger, and C. P. Zlatkovic  
1973 *Atlas of Texas*. Bureau of Business Research, The University of Texas at Austin.
- Archer, Steve  
1995 Tree-grass dynamics in a *Prosopis*-thornscrub Savannah Parkland: Reconstructing the Past and Predicting the Future. *Ecoscience* 2(1):84–99.
- Barnes, V. E.  
1976 *Geologic Atlas of Texas: Crystal City – Eagle Pass Sheet*. Bureau of Economic Geology. The University of Texas at Austin.
- Black, S. L.  
1989a Central Texas Plateau Prairie. In *From the Gulf Coast to the Rio Grande: Human Adaptation in the Central, South, and Lower Pecos Texas*, edited by T. R. Hester, S. L. Black, D. G. Steele, B. W. Olive, A. A. Fox, K. J. Reinhard, and L. C. Bement, pp. 17–38. Research Series No. 33. Arkansas Archeological Survey, Fayetteville.  
1989b Environmental Setting. In *From the Gulf Coast to the Rio Grande: Human Adaptation in the Central, South, and Lower Pecos Texas*, by T. R. Hester, S. L. Black, D. G. Steele, B. W. Olive, A. A. Fox, K. J. Reinhard, and L. C. Bement, pp. 5–17. Research Series No. 33. Arkansas Archeological Survey, Fayetteville.  
1995 Archaeological and Historical Background. In *Archaeological Investigations at the Loma Sandia Site (41LK28): A Prehistoric Campsite in Live Oak County, Texas*. 2 volumes. Studies in Archeology No. 20, pp 31–45. Texas Archeological Research Laboratory, The University of Texas at Austin.
- Black, S. L., and A. J. McGraw  
1985 *The Panther Springs Creek Site: Cultural Change and Continuity in the Upper Salado Creek Drainage, South-Central Texas*. Archaeological Survey Report, No. 100. Center for Archaeological Research, The University of Texas at San Antonio.
- Blair, W. F.  
1950 The Biotic Provinces of Texas. *Texas Journal of Science* 2(1):93–117.
- Boldurian, A. T.  
1990 Lithic Technology at the Mitchell Locality of Blackwater Draw: A Stratified Folsom Site in Eastern New Mexico. In *Plains Anthropologist* (35)130:1–103.
- Bousman, C. B.  
1998 Paleoenvironmental Change in Central Texas: The Playnological Evidence. In *Plains Anthropologist* (43) 164:201–219.

- Bousman, C. B., M. B. Collins, and T. K. Perttula  
 1988 *Quaternary Geomorphology at Cooper Basin: A Framework for Archaeological Inquiry, Delta and Hopkins Counties, Texas*. Reports of Investigations, Number 55. Prewitt and Associates, Austin.
- Bradley, B. A.  
 1975 Lithic Reduction Sequences: A Glossary and Discussion. In *Lithic Technology: Making and Using Stone Tools*, edited by E. Swanson, pp. 5–14. Mouton Oublishing Company, The Hague.
- Brune, G.  
 1981 *Springs of Texas*, Volume 1. Branch-Smith, Fort Worth.
- Bryant, V.  
 1977 A 16,000 year Pollen Record of Vegetational Change in Central Texas. *Palynology* 1:143–156.
- Bryant, V. M., Jr., and R. G. Holloway  
 1985 A Late-Quaternary Paleoenvironmental Record of Texas: An Overview of the Pollen Evidence. In *Pollen Records of Late-Quaternary North American Sediments*, edited by V. M Bryant and R. G. Holloway, pp. 39–70. American Association of Stratigraphic Palynologists Foundation, Dallas.
- Bryant, Vaughn M., Jr., and David H. Riskind  
 1980 The Paleoenvironmental Record for Northeastern Mexico: A Review of the Pollen Evidence. In *Papers on the Prehistory of Northeastern Mexico and Adjacent Texas*, edited by J.F. Epstein, T.R. Hester, and C. Graves, pp.7–31. Special Report, No. 9. Center for Archaeological Research, The University of Texas at San Antonio.
- Byrd, C. L.  
 1971 *Origin and History of the Uvalde Gravel of Central Texas*. Bulletin No. 20. Baylor Geological Studies, Baylor University, Waco.
- Campbell, T. N., and T. J. Campbell  
 1981 *Historic Indians of the Choke Canyon Reservoir Surrounding Area, Southern Texas*. Choke Canyon Series, No. 1. Center for Archaeological Research, The University of Texas at San Antonio.
- Chandler, C. K., and K. Hinds  
 1995 Folsom Points from Atascosa, Frio, Live Oak, and McMullen Counties. *La Tierra* 22(3):4–9.
- Chandler, C. K., and D. Kumpe  
 1994 Folsom Points from Deep South and Southwest Texas. *La Tierra* 21(3):6–9.
- Chandler, C. K., and D. Rogers  
 1996 Folsom Points from Bell, Cochran, Limestone and Milam Counties, Texas. *La Tierra* 23(4):51–53.
- Collins, M. B.  
 1995 Forty Years of Archaeology in Texas. *Bulletin of the Texas Archeological Society* 66:361–400.
- Crabtree, D. E.  
 1972 *An Introduction to the Technology of Stone Tools*. Occasional Papers of the Idaho Museum of Natural History, Number 28. Pocatello, Idaho.

- Davis, R. B. and D.J. Schmidler  
1994 *The Mammals of Texas*. Texas Parks and Wildlife Press, Austin.
- Dillehay, T.  
1974 Late Quaternary Bison Population Changes on the Southern Plains. *Plains Anthropologist* 19(64):180–196.
- Fox, A. A., and D. E. Fox  
1967 The Classen Rockshelter, 41BX23. Manuscript on file. Center for Archaeological Research, The University of Texas at San Antonio.
- Frison, G. C., and B.A. Bradley  
1980 *Folsom Tools and Technology at the Hanson Site, Wyoming*. University of New Mexico Press, Albuquerque.
- Goode, G. T.  
1991 Late Prehistoric Burned Rock Middens in Central Texas, In *The Burned Rock Middens of Texas: An Archaeological Symposium*, edited by T. R. Hester, pp. 71–93. Studies in Archeology 13. Texas Archeological Research Laboratory, The University of Texas at Austin.
- Gross, K. J. and D. L. Nickels  
1994 *An Archaeological Survey of 6.4 Acres for the Eagle Pass Independent School District*. Letter Report No. 108. Center for Archaeological Research, The University of Texas at San Antonio.
- Hall, G. D., S. L. Black, and C. Graves  
1982 *Archaeological Investigations at Choke Canyon Reservoir, South Texas: The Phase I Findings*. Choke Canyon Series, No. 5. Center for Archaeological Research, The University of Texas at San Antonio.
- Hall, G. D., T. R. Hester, and S. L. Black (editors)  
1986 *The Prehistoric Sites at Choke Canyon Reservoir, Southern Texas: Results of the Phase II Archaeological Investigations*. Choke Canyon Series, No. 10. Center for Archaeological Research, The University of Texas at San Antonio.
- Harris, E. S.  
1985 *An Archaeological Study of the Timmeron Rockshelter (41HY95), Hays County, South Central Texas*. Special Publication 4. Southern Texas Archaeological Association, San Antonio.
- Hester, T. R.  
1980 *Digging into South Texas Prehistory: A Guide for Amateur Archaeologists*. Corona, San Antonio.  
1995 The Prehistory of South Texas. *Bulletin of the Texas Archeological Society* 66:427–459.
- Highley, L., C. Graves, C. Land, and G. Judson  
1978 Archeological Investigations at Scorpion Cave (41ME7) Medina County, Texas. *Bulletin of the Texas Archeological Society* 49: 139–194.
- Hofman, J. L., D. S. Amick, and R. O. Rose  
1990 Shifting Sands: A Folsom-Midland Assemblage from a Campsite in Western Texas. In *Plains Anthropologist* (35)129:221–253.

- Holloway, R. G.  
1986 Macrobotanical Analysis of Phase II Materials from the Choke Canyon Reservoir Area, Texas. Appendix II in *Prehistoric Sites at Choke Canyon Reservoir; Southern Texas: Results of Phase II Archaeological Investigations*, by G. Hall, T. Hester, and S. Black, pp. 437–451. Choke Canyon Series No. 10, Center for Archaeological Research, University of Texas at San Antonio.
- Holloway, R. G. and V.M. Bryant  
1984 *Picea glauca* Pollen from Late Glacial Deposits of Central Texas. *Palynology* 8:21–32.
- Holloway, R. G., L. M. Raab, and R. Stuckenrath  
1987 Pollen Analysis of Late-Holocene Sediments from a Central Texas bog. *The Texas Journal of Science* 39:71–79.
- Houk, B. A., and J. C. Lohse  
1993 Archaeological Investigations at the Mingo Site, Bandera County, Texas. *Bulletin of the Texas Archeological Society* 61:193–247.
- Huebner, J. A.  
1991 Late Prehistoric Bison Populations in Central and Southern Texas. *Plains Anthropologist* 36(137):343–358.
- Inglis, J. M.  
1964 *A History of Vegetation on the Rio Grande Plain*. Bulletin #45. Texas Parks and Wildlife Department, Austin.
- Johnson, L., and G. T. Goode  
1994 A New Try at Dating and Characterizing Holocene Climates, as well as Archaeological Periods, on the Eastern Edwards Plateau. *Bulletin of the Texas Archeological Society* 65:1–51.
- Kelly, R. L.  
1983 Hunter-gatherer Mobility Strategies. *Journal of Anthropological Research* 39:277–306.
- Largent, F. B. Jr.  
1995 Some New Additions to the Texas Folsom Point Database. *Plains Anthropologist* 40(151):69–72.
- Largent, F. B. Jr., M. R. Waters, and D. L. Carson  
1991 The Spatiotemporal Distribution and Characteristics of Folsom Projectile Points in Texas. *Plains Anthropologist* 36(137):323–342.
- Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, P. E. McAllister, J. R. Stauffer, Jr.  
1980 *Atlas of North American Freshwater Fishers*. North Carolina Biological Survey Publication 1980–12, North Carolina State Museum of Natural History.
- McKinney, W. W.  
1981 Early Holocene Adaptations in Central and Southern Texas: The Problem of the Paleo-Indian-Archaic Transition. *Bulletin of the Texas Archeological Society* 52:91–120.

- Meltzer, D. J., and M. R. Bever  
 1995 Paleoindians of Texas: An Update on the Texas Clovis Fluted Point Survey. *Bulletin of the Texas Archeological Society* 66:47–81
- Nickels, D. L., B. J. Vierra, and W. Gose  
 1998 Fire-cracked Rock. In *41MV120: A Stratified Late Archaic Site in Maverick County, Texas*. Archaeological Survey Report, No. 251, pp 147–159, Center for Archaeological Research, The University of Texas at San Antonio. Archeology Studies Program Report No. 7., Environmental Affairs Division, Texas Department of Transportation, Austin.
- Nordt, L. C.  
 1998 Geoarchaeology of the Rio Grande and Elm Creek in the Vicinity of Site 41MV120. In *41MV120: A Stratified Late Archaic Site in Maverick County, Texas*. Archaeological Survey Report, No. 251, pp 43–77. Center for Archaeological Research, The University of Texas at San Antonio. Archeology Studies Program Report No. 7., Environmental Affairs Division, Texas Department of Transportation, Austin.
- Nordt, L. C., T. W. Boutton, C. T. Hallmark, and M. R. Waters  
 1994 Late Quaternary Vegetation and Climatic Changes in Central Texas based on the Isotopic Composition of Organic Carbon. *Quaternary Research* 41:109–120.
- Norwine, J.  
 1995 The Regional Climate of South Texas: Patterns and Trends. In *The Changing Climate of Texas: Predictability and Implications for the Future*, edited by J. Norwine, J. Giardino, G. North and J. Valdes, pp. 138–155. Texas A&M University, College Station.
- Office of the State Climatologist  
 1987 *The Climates of Texas Counties*. University of Texas, Austin.
- Patterson, L. W.  
 1988 Intergroup Conflict in Prehistoric Texas. *Houston Archeological Society Journal* 90:8–10.
- Peter, D. E.  
 1982 Alternative Perspectives on Burned Rock Middens, In *Archaeological Investigations at the San Gabriel Reservoir Districts, Central Texas, Vol. 2*, compiled and edited by T. R. Hays, pp. 20.1–20.15. Archaeology Program, Institute of Applied Sciences, North Texas State University, Denton.
- Prewitt, E. R.  
 1985 From Circleville to Toyah: Comments on Central Texas Chronology. *Bulletin of the Texas Archeological Society* 54:201–238.
- Robinson, R. L.  
 1979 Biosilica and Climatic Change at 41GD21 and 41GD21A. In *Archaeological Investigations of Two Prehistoric Sites on the Coletto Creek Drainage, Goliad County, Texas*, edited by D. E. Fox, pp. 102–113. Archaeological Survey Report, No. 69. Center for Archaeological Research, The University of Texas at San Antonio.

- 1982 Biosilica Analysis of Three Prehistoric Archaeological Sites in the Choke Canyon Reservoir, Live Oak County, Texas: Preliminary Summary of Climatic Implications. In *Archaeological Investigations at Choke Canyon Reservoir, South Texas: The Phase I Findings*, edited by G. D. Hall, S. L. Black, and C. Graves, pp. 597–610. Choke Canyon Series, No. 5. Center for Archaeological Research, The University of Texas at San Antonio.
- Shafer, H. J. and V. M. Bryant  
 1977 *Archeological and Botanical Studies of Hinds Cave, Val Verde County, Texas*. Special Series 1. Anthropological Laboratory, Texas A&M University, College Station
- Skelton, D. W.  
 1977 *Archeological Investigations at the Fayette Power Project, Fayette County, Texas*. Research Report 60. Texas Archeological Survey, The University of Texas at Austin.
- Sollberger, J., and T. R. Hester  
 1972 The Strohacker Site: A Review of Pre-Archaic Manifestations in Texas. *Plains Anthropologist* 17(58):326–344.
- Stahle, D. W. and M. K. Cleaveland  
 1995 Texas Paleoclimatic Data from Daily to Millennial Time Scales. *The Changing Climate of Texas: Predictability and Implications for the Future*, edited by J. Norwine, J. R. Giardino, G. R. North, and J. B. Valdes, pp 49–69. GeoBooks, Texas A&M University, College Station.
- Steele, D. G., and C. Assad Hunter  
 1986 Analysis of Vertebrate Faunal Remains from 41MC222 and 41MC296, McMullen County, Texas. In *The Prehistoric Sites at Choke Canyon Reservoir, Southern Texas: Results of Phase II Archaeological Investigations*, edited by G. D. Hall, T. R. Hester, and S. L. Black. Choke Canyon Series, No. 10. Center for Archaeological Research, The University of Texas at San Antonio.
- Stevens, J. W., and D. Arriaga  
 1977 *Soil Survey of Maverick County, Texas*. United States Department of Agriculture, Soil Conservation Service. Washington, D.C.
- Story, D. A.  
 1985 Adaptive Strategies of Archaic Cultures of the West Gulf Coastal Plain. In *Prehistoric Food Production in North America*, edited by R. I. Ford, pp. 19–56. Anthropological Papers No. 75. Museum of Anthropology, University of Michigan, Ann Arbor.
- Suhm, D. A., A. D. Krieger, and E. B. Jelks  
 1954 An Introductory Handbook of Texas Archeology. *Bulletin of the Texas Archeological Society* 25.
- Tomka, S. A., T. K. Perttula, and R. J. Hard (editors)  
 1997 Archaeology of the Rio Grande and Central Coastal Plains, Texas: A Planning Document. Archaeological Survey Report, No. 266 (2 volumes in press). Center for Archaeological Research, The University of Texas at San Antonio.



Turner, E. S., and T. R. Hester

- 1993 *A Field Guide to Stone Artifacts of Texas Indians*. Second Edition. Texas Monthly Field Guide Series. Gulf, Houston.

Uecker, H. G.

- 1994 *The Dos Republicas Project: Phase II Archaeological Investigations at a Proposed Coal Strip Mine, Maverick County, Texas*. Archaeological Survey Report #215. Center for Archaeological Research, The University of Texas at San Antonio.

Van Davender, T. R.

- 1990 Late Quaternary Vegetation and Climate of the Chihuahuan Desert, United States and Mexico. In *Packrat Middens*, edited by J. Bettencourt, T. Van Davender, and P. Martin, pp. 104–133. University of Arizona Press, Tucson.

Vierra, B. J.

- 1998 *41MV120: A Stratified Late Archaic Site in Maverick County, Texas*. Archaeological Survey Report, No. 251, Center for Archaeological Research, The University of Texas at San Antonio. Archeology Studies Program Report No. 7. Environmental Affairs Division, Texas Department of Transportation, Austin.

Weir, F. A.

- 1976 *The Central Texas Archaic*. Unpublished Ph.D. dissertation. Anthropology Department, Washington State University. Pullman.

Wenke, R. J.

- 1990 *Patterns in Prehistory: Humankind's First Three Million Years*. 3rd Edition. Oxford University Press, Oxford, England.



## **Appendix A.**

### **Geoarchaeological Investigations**

#### **Introduction**

The focus of the geoarchaeological investigation was the upper late Quaternary fluvatile terrace deposits present along the Rio Grande and Elm Creek (Barnes 1976). Nordt's (1998) geologic study of the Rio Grande and Elm Creek identified periods of alluvial deposition, shifts in streambeds, erosion and soil formation in order to better understand the potential for preserving evidence of human occupation. Though limited in scope, this project allowed for the description of subsurface deposits along the Rio Grande and Elm Creek, and should complement any further geoarchaeological studies in the area. For field expedience and consistency, the distinct layers of deposits were designated "zones." A zone is considered to be a geologically neutral term acceptable for labeling sediment layers. Similar sediment layers receive the same zone designation; however these are not soil horizons (Bousman et al. 1988:39). Zones were defined using

a standard Munsell soil color chart. The six backhoe trenches placed in the Balcones Heights and Elm Creek project areas are described below.

#### **Backhoe Trench Descriptions**

##### *Balcones Heights Project Area*

Examination of the three backhoe trenches in the Balcones Heights project area (see Figures 2 and A1) revealed six distinct deposits separated either by changes in color, particle size, or structure. The zones are described in Table A1.

##### *Elm Creek Project Area*

Examination of the three backhoe trenches in the Elm Creek project area (see Figures 3 and A2) revealed three distinct deposits separated either by changes in color, particle size, or structure. The zones are described in Table A2.

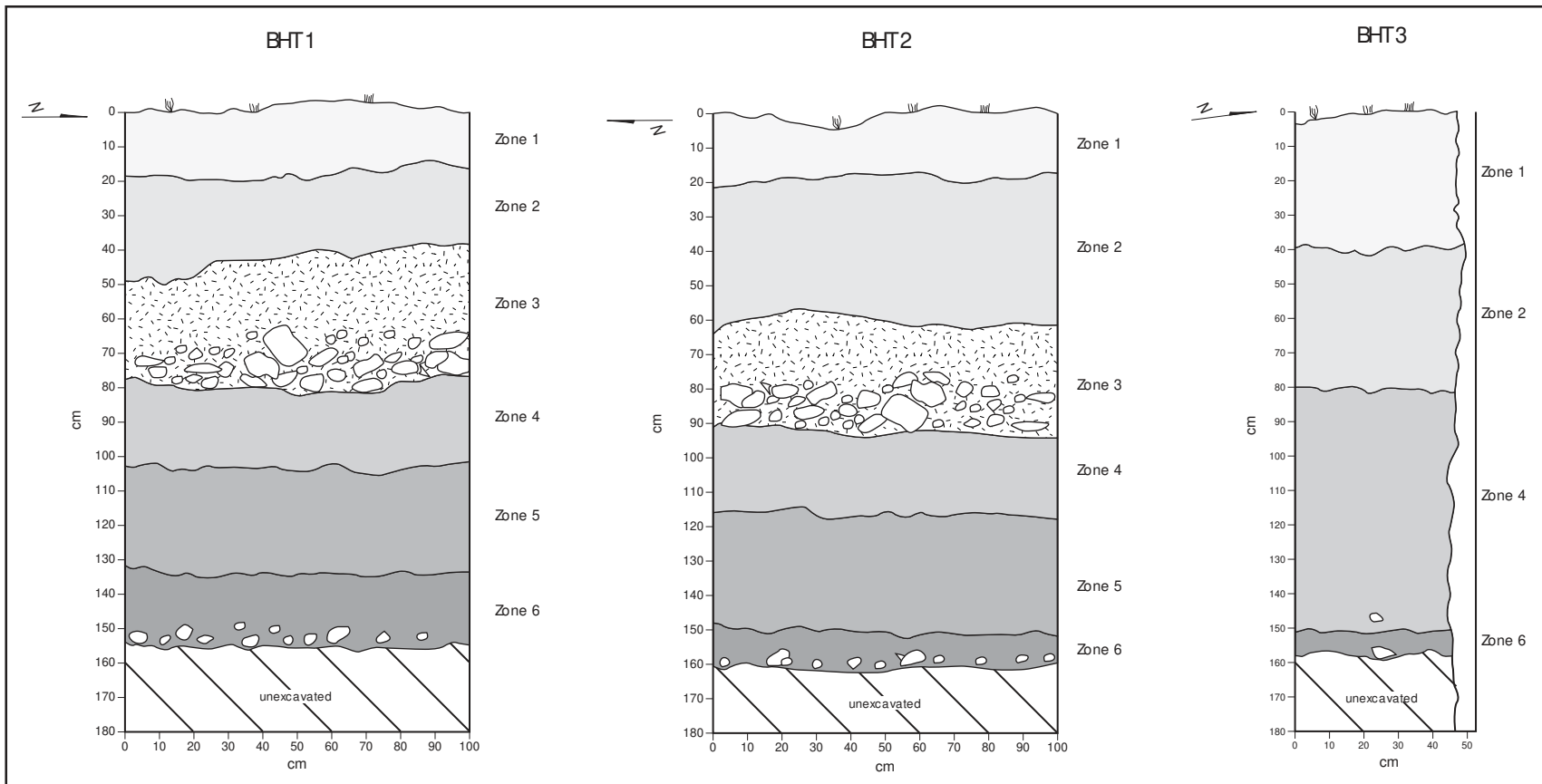


Figure A1. Backhoe trench profiles from the Balcones Heights project area.

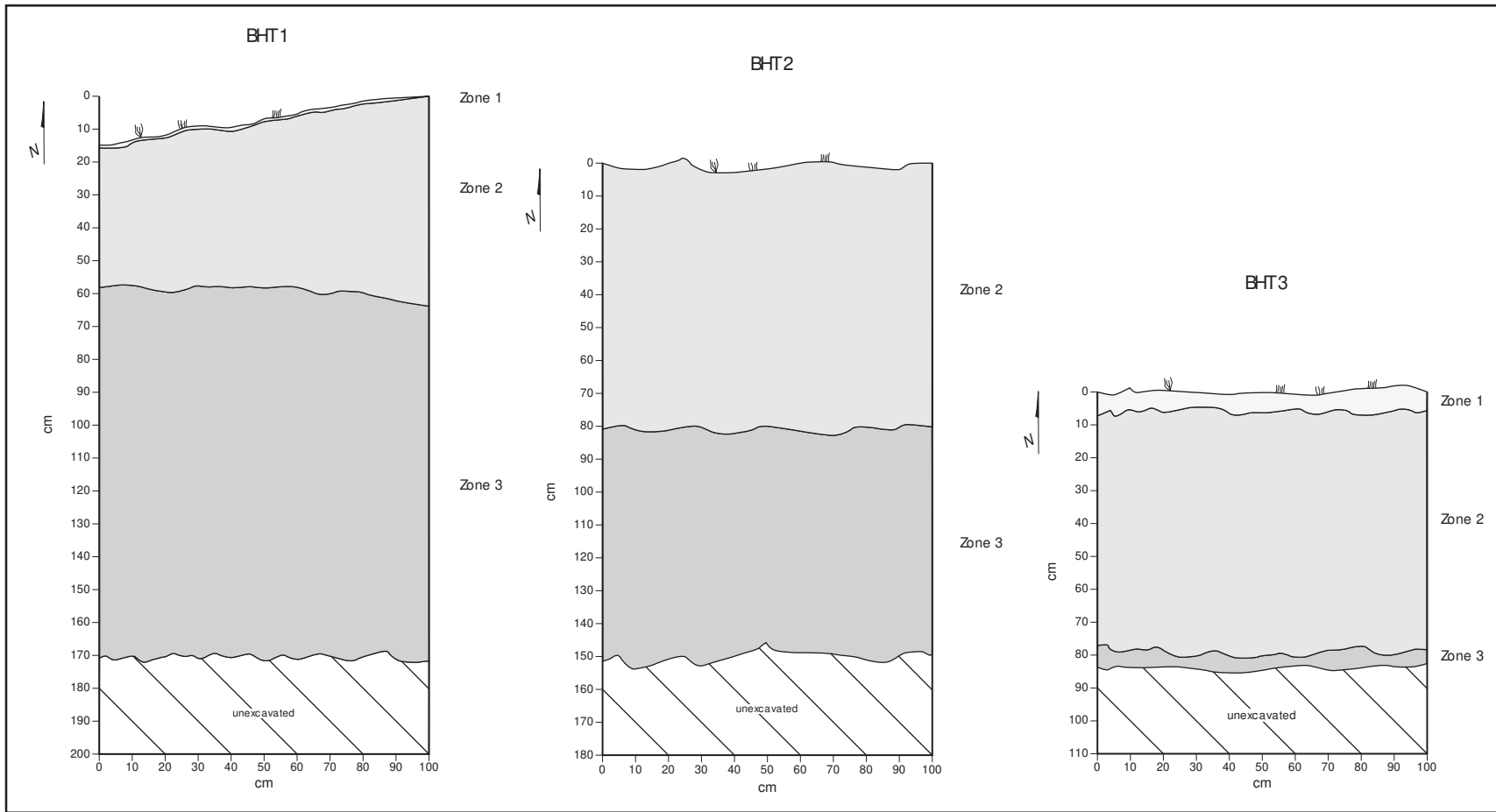


Figure A2. Backhoe trench profiles from the Elm Creek project area.

Table A1. Zones identified in Balcones Heights backhoe trench profiles

<b>Zone</b>	<b>Description</b>
1	Plow zone; brown (10YR 5/3) silt loam; blocky, medium, strong; common rootlets, few small limestone granules, few snails; clear, wavy lower boundary.
2	Brown (10YR 5/3) silt loam; blocky, coarse, strong; common rootlets, few small limestone granules, diffuse, irregular lower boundary.
3	Pale brown (10YR6/3) rounded limestone gravel and cobble clast matrix with silt loam supported interstices cemented hard with calcium carbonate; extremely firm; gradual, irregular lower boundary.
4	Very pale brown (10YR 7/3) silt loam; friable, loosely cemented with calcium carbonate; blocky, medium structure; clear to gradual, irregular lower boundary.
5	Transition zone; same as Zone 4, except commonly mottled with very pale brown (10YR 8/2) , medium, faint clay peds; clear, sloping lower boundary.
6	Light gray (10YR 7/2) weakly cemented silt clay with common, sorted, flat and rounded limestone gravels.

Table A2. Zones identified in Elm Creek backhoe trench profiles.

<b>Zone</b>	<b>Description</b>
1	Brown (10YR 5/3) loose, friable, sandy loam; blocky, fine; common rootlets; abrupt lower boundary.
2	Very dark gray (10YR 3/1) clay; blocky, coarse, strong; rare angular limestone granules, calcium carbonate film on ped facies; few hair rootlets, few to common insect castes; clear lower boundary.
3	Pale brown (10YR6/3) rounded limestone gravel and cobble clast matrix with silt loam supported interstices cemented hard with calcium carbonate; extremely firm; gradual, irregular lower boundary.