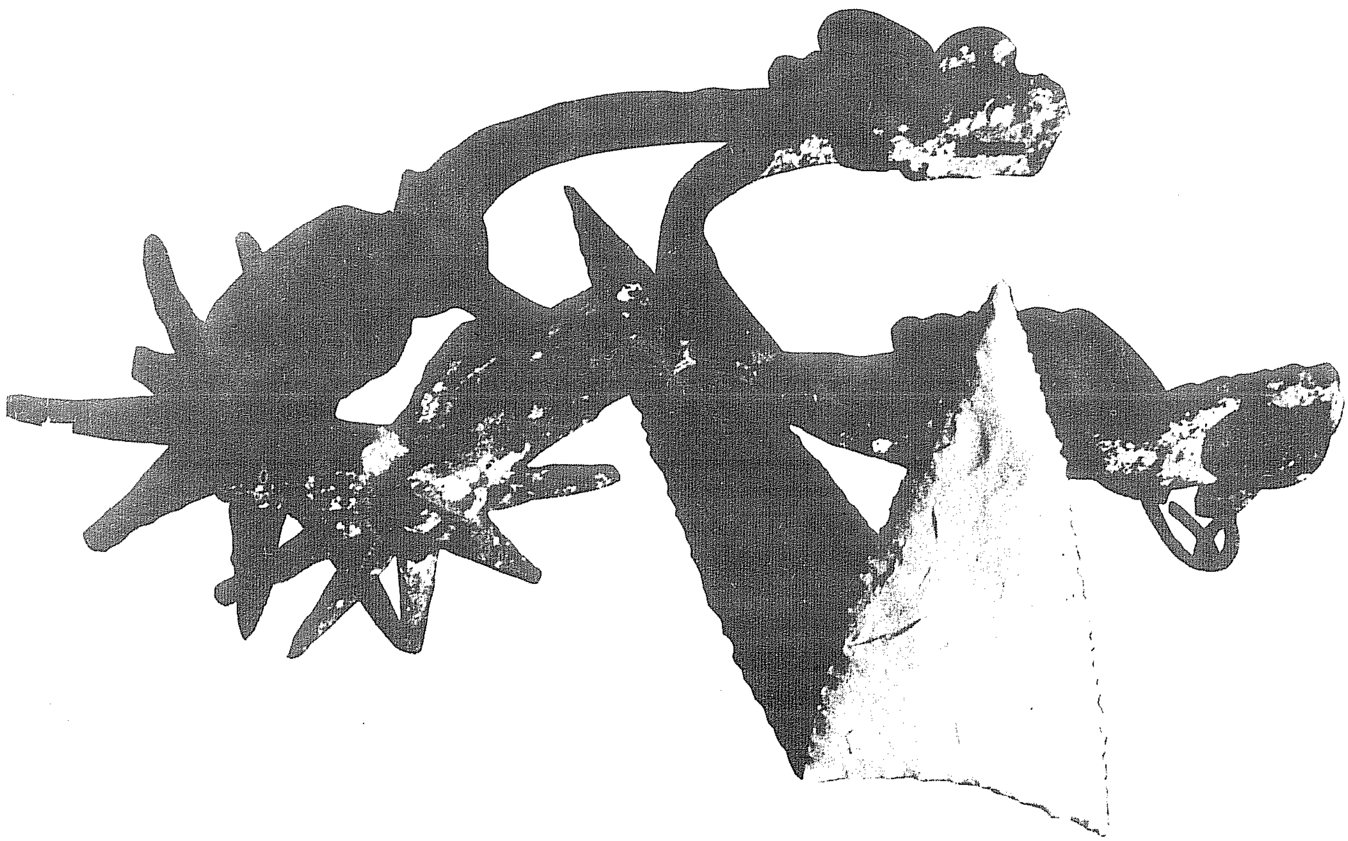
ARCHAEOLOGICAL INVESTIGATIONS AT CHOKE CANYON RESERVOIR, SOUTH TEXAS: THE PHASE I FINDINGS

By

Grant D. Hall, Stephen L. Black, and Carol Graves

With contributions by:

Russell C. Bunker, Philip Dering, Curtis L. Dusek,
Elizabeth G. Frkuska, Joel D. Gunn, Thomas R. Hester,
Richard Jones, Royce A. Mahula, Harold D. Murray,
and Ralph L. Robinson



Center for Archaeological Research
The University of Texas at San Antonio
Choke Canyon Series: Volume 5

1982

Center for Archaeological Research

The University of Texas at San Antonio

78285

Thomas R. Hester, Director

Volumes in the Phase I Choke Canyon Series.

Volume 1 Historic Indian Groups of the Choke Canyon Reservoir and Surrounding Area, Southern Texas. By T. N. Campbell and T. J. Campbell, 1981.

Volume 2 Part I - Historical Resources of the Choke Canyon Reservoir Area in McMullen and Live Oak Counties, Texas. By Dianna Everett, 1981.

Part II - Historical Archaeological Resources of the Choke Canyon Reservoir Area in McMullen and Live Oak Counties, Texas. By Philip A. Bandy, 1981.

Volume 3 An Archaeological Survey of a Portion of the Choke Canyon Reservoir Area in McMullen and Live Oak Counties, Texas. By Alston V. Thoms, John L. Montgomery, and Alice W. Portnoy, 1981.

Volume 4 The 1979 Archaeological Survey of Portions of the Choke Canyon Reservoir in Live Oak and McMullen Counties, Texas. By Erwin Roemer, Jr., 1981.

Volume 5 Archaeological Investigations at Choke Canyon Reservoir, South Texas: The Phase I Findings. By Grant D. Hall, Stephen L. Black, and Carol Graves, 1982.

Volume 6 Archaeological Testing and Collecting at Choke Canyon Reservoir, Nueces River Project, Texas. By Carol S. Weed and Harry J. Shafer, 1981.

Volume 7 Excavations at 41 LK 67, A Prehistoric Site in the Choke Canyon Reservoir, South Texas. By Kenneth M. Brown, Daniel R. Potter, Grant D. Hall, and Stephen L. Black, 1982

Volume 8 Excavations at Sites 41 LK 31/32 and 41 LK 202 in the Choke Canyon Reservoir, South Texas. ~~By Robert F. Scott IV and Daniel E. Fox.~~, Part I: Prehistoric Investigations, by Robert F. Scott IV. Part II: Historic Investigations, by Daniel E. Fox, 1982.

ARCHAEOLOGICAL INVESTIGATIONS AT CHOKE CANYON RESERVOIR, SOUTH TEXAS: THE PHASE I FINDINGS

By

Grant D. Hall, Stephen L. Black, and Carol Graves

With contributions by

Russell C. Bunker, Philip Dering, Curtis L. Dusek,
Elizabeth G. Frkuska, Joel D. Gunn, Thomas R. Hester,
Richard Jones, Royce A. Mahula, Harold D. Murray,
and Ralph L. Robinson

Center for Archaeological Research
The University of Texas at San Antonio
Choke Canyon Series: Volume 5

1982

ABSTRACT

Findings resulting from archaeological investigations at 116 prehistoric sites located in Live Oak and McMullen Counties, southern Texas, are reported. All of the sites occur within or alongside the basin of Choke Canyon Reservoir, an impoundment formed by damming the Frio River. Sponsored by the U.S. Bureau of Reclamation, the research effort constitutes Phase I of a two phase program intended to partially compensate for adverse alterations and/or destruction of cultural resources resulting from dam construction and subsequent filling of Choke Canyon Reservoir.

Data collection methods applied during the Phase I archaeological investigations at Choke Canyon included extensive excavations, intensive and minimal testing, and provenienced and unprovenienced surface collections. Information obtained as these various procedures were carried out provides evidence for the presence of humans in the area from Paleo-Indian through Late Prehistoric times.

Remains of human activity dating to the Paleo-Indian and Early Archaic periods were found only along the valley margins and on old, high terrace remnants down in the Frio River valley. Beginning about 3400 B.C., settlement patterns shifted to include sites along sloughs and channels in the deeper reaches of the valley. In later Archaic times and during the Late Prehistoric, primary habitational activity took place at sites beside the sloughs and channels, but peripheral terrace, valley margin, and upland edge sites also bear signs of specialized and/or short-term activities during these same periods.

Through all periods of Choke Canyon's prehistory, humans subsisted by hunting and gathering natural food resources available in the area, although presumed food residues are scarce at the majority of the sites. Mussel shells and shells of large land snails were the subsistence remains most commonly recovered. Vertebrate faunal remains were recovered in appreciable amounts at only a few of the sites investigated. These limited remains suggest that Archaic populations placed a great emphasis on small animals, fish, mussels, and snails as meat sources. In the Late Prehistoric, a greater variety of animals was consumed, including bison, antelope, javelina, and deer. Grinding slabs and manos found in all areas of Choke Canyon indicate that plant foods, probably seeds, beans, and nuts, were relied upon by people during all periods of local prehistory.

Floral species identified from carbonized wood specimens include mesquite, acacia, spiny hackberry, oak, juniper, ash, and willow, indicating all were present at Choke Canyon at various times in prehistory. The recognition of mesquite remains in deposits radiocarbon dated to 1300 B.C. is considered especially significant.

These findings will be used to formulate plans for the Phase II archaeological research effort at Choke Canyon Reservoir.

KEYWORDS: Texas, archaeology, prehistory, Archaic, Late Prehistoric.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

PREFACE

> . . . Some steps ought to be taken to provide for the preservation of our ancient National Antiquities . . . we should watch over them where they are; and even if the destruction . . . should become necessary, careful drawings ought first to be made, and their removal should take place under proper superintendence.
>
> Sir John Lubbock
> *Introduction to the Study of Prehistoric Archaeology* 1879

The creation, by the Bureau of Reclamation, of the Choke Canyon Reservoir on the Frio River in southern Texas has meant that the former habitats of the ancient Indian and early Anglo-Hispanic peoples of that region would be flooded and, we presume, lost. As a result, however, of federal antiquities statutes, cultural resource investigations have preceded the construction of the dam and filling of the reservoir. Phase I archaeological investigations at Choke Canyon were funded by the Bureau of Reclamation and were administered by the Center for Archaeological Research of The University of Texas at San Antonio. Collaborating in the Phase I efforts were colleagues from Texas Tech University and Texas A&M University. The major aim was to identify the nature and extent of the historic and prehistoric remains, to conduct test excavations at certain sites, and to set priorities for further studies in Phase II. Earlier volumes in the Choke Canyon Series have detailed the ethnohistoric and historic research, and have also presented accounts of survey activities within the reservoir basin by teams from Texas Tech and the Center.

The present volume presents a vast body of data on 116 sites investigated by Grant D. Hall and a Center research team during Phase I. It is more than just a cataloging of their finds, although these important data are presented here in detail. The volume also provides a wide range of analyses, including geomorphology, climatic change, paleobotany, molluscan studies, etc.,--all of which serve to interpret, even at the Phase I level, many aspects of previous lifeways and earlier environments in the region.

This corpus of information has taken much time to assemble in manuscript form. It is a lesson both to archaeologists and sponsoring agencies that the level of data analysis and clear thinking necessary for this type of study is much more time-consuming than the routine of "contract archaeology" normally allows. This concern for professional standards sometimes means that the conscientious archaeologist cannot meet the deadlines set by principal investigators and government archaeologists in "pre-award" meetings prior to the actual inception of the project. The senior author of this volume has resisted the urge, despite my continued prodding to "meet deadlines," to throw together a basic and minimally acceptable archaeological report. Rather, Mr. Hall and his collaborators have patiently and methodically analyzed, reviewed, and reported the great quantity of data obtained during their Phase I field work.

The quote from Sir John Lubbock, now more than a century old, epitomizes, in my opinion, the character of this report. The archaeological remains faced inevitable destruction. The research team made their "careful drawings"--by conducting sound field work and thorough laboratory analysis. These are exemplified in the detailed site analyses, the systematic treatment of the chipped stone artifacts, and a major effort at synthesizing information on south Texas prehistoric ceramics. Archaeologists working in southern Texas will long use this volume for its tremendous data content. But they, and perhaps others from adjacent areas, will also review it for information and innovative approaches on the study of landforms, paleoclimate, botanical research, prehistoric diet, and the host of other interpretative materials contained in the volume.

The concern that these investigations ". . . take place under proper superintendence" reflects the personal feelings that Mr. Hall and the research staff have had for the land and the inhabitants--past and present--of what is now Choke Canyon Reservoir. This is a measure of what Sir Mortimer Wheeler had in mind in 1954 when he said ". . . we cannot properly understand the past unless we have a living sympathy with the human stuff which its relics represent."

Thomas R. Hester
Principal Investigator

ACKNOWLEDGMENTS

The authors gratefully acknowledge contributions made by the following individuals as the data presented in this volume was gathered, analyzed, and reported.

FIELD CREW

Robert L. Stiba
Kenneth M. Brown
Erwin Roemer, Jr.
Daniel R. Potter
David O. Brown
Curtis Dusek
James Carter
James T. Escobedo, Jr.

LABORATORY STAFF

Janet Stock
Lynn Highley
Shirley Van der Veer
Courtenay Jones
Rebekah Halpern
Cristi Assad

OFFICE STAFF

Mary Lou Ellis
Kathy McCauley
Sylvia Bento
Beverly Ewald
Mary Lehr

EDITORS

Sharon Quirk
Al B. Wesolowsky

GRAPHICS

David Barrera
John Poindexter
Olivia Lemelle
Kathy Bareiss Roemer
Kerry Bartel
Fernando Fernandez
Kenneth M. Brown
John Graves

U.S. BUREAU OF RECLAMATION

Allen C. Gates
Stephen Ireland
Peter Aberle
Robert Oram
Ronald Mills
Bob Rowell
Don Hildebrand
Chuck Hill
Jim Bayne
Asa Davis
Meeks Etchieson
Mary Barger
Bobbie Ferguson
Van Button
Norma Armstrong
Matilda Cuevas
Rudy Olivo
Fred Robinson
Weldon Spinks
Don McCabe

LOCAL RESIDENTS

Hank and Fay Hester
Bill Tullis
Sam Bracken
Henry Dusek
Melvin Dusek

SOIL DATA

Joe Coughran - Soil Conservation Service

RADIOCARBON ASSAYS

Salvatore Valastro - Radiocarbon Laboratory, The University of Texas at Austin

FAUNAL IDENTIFICATIONS

H. G. (Woody) Wooldridge

ROCK TYPE IDENTIFICATIONS

Weldon W. Hammond - Division of Earth and Physical Sciences, The University of Texas at San Antonio

CERAMIC ANALYSIS

Harding Black
T. C. Hill
Bob Fromme

Donald R. Lewis

Mrs. Jack Klatt
Alan Dulaney
Daniel Fox

TYPING

Patricia Wallace

Ann Young

UTSA ADMINISTRATION

James W. Wagener
Gordon H. Lamb
Gary L. Hammon
Rudolph Gomez

Joe A. Powell
William E. Stern
Lynwood C. Siebold
Dwight F. Henderson

Special thanks are extended to Thomas R. Hester, Joel Gunn, Jack Eaton, Anne Fox, and Mary Lou Ellis of the Center for Archaeological Research for the many ways in which they have supported, from beginning to end, the Phase I archaeological research at Choke Canyon.

INTRODUCTION

The research effort documented in this volume was carried out under terms of Contract No. 7-07-50-V0897 issued to the Center for Archaeological Research, The University of Texas at San Antonio (CAR-UTSA), by the U.S. Bureau of Reclamation (USBR). The program was initiated to lessen the impact that construction of the Choke Canyon Dam will have on the cultural resources around the dam site and throughout the area to be flooded by the reservoir. The dam will impound waters of the Frio River and form an 18 mile-long lake in Live Oak and McMullen Counties of southern Texas.

A scope of work detailing the basic contract requirements is included as Appendix I to this report. These requirements are based on recommendations made following initial archaeological survey of the reservoir by personnel from the Texas Historical Commission (THC). Results of this investigation are detailed in *Cultural Resource Survey of Choke Canyon Reservoir, Live Oak and McMullen Counties, Texas* (Lynn, Fox, and O'Malley 1977). The field work documented herein was originally scheduled to include investigations at 103 prehistoric sites. Three of these were to undergo intensive recovery, 36 were to be minimally tested, and 64 were to be surface collected. The other requirements for field work, historic research, and ethnohistoric research were carried out by other organizations and individuals under subcontractual arrangements made with the CAR-UTSA. A crew from the Anthropology Research Laboratory, Texas A&M University (ARL), was to conduct intensive testing at 12 prehistoric sites. Crews from the Cultural Resources Institute, Texas Tech University (CRI-TTU), were to conduct a 6000-acre archaeological survey, perform testing and surface collections at 10 historic sites, and research archival documents pertaining to historic settlement. Dr. T. N. Campbell of The University of Texas at Austin was retained as a consultant to report on the area's ethnohistory. Designated as Phase I of the cultural resource investigation at Choke Canyon, the information gathered as the tasks outlined above were performed was used to formulate plans for Phase II, a final period of research prior to dam closure.

As Phase I field operations at Choke Canyon commenced in July 1977, not all of the land in the reservoir basin had been acquired by the USBR. Six of the prehistoric sites to be intensively tested by the ARL crew were located on properties still under private control, and the owners would not permit access for the required archaeological testing to proceed. Likewise, the CRI crew responsible for historic archaeology could not enter the property containing one of their sites. Local USBR officials projected that acquisition of these properties would take anywhere from six months to two years. From a practical standpoint, it was not possible for the ARL and CRI crews to postpone work at these sites for such protracted lengths of time. A site exchange was arranged whereby the CAR-UTSA assumed responsibility for investigations at the seven sites not accessible in 1977. In return, the ARL crew did minimal testing or surface collections at 12 other Phase I prehistoric sites immediately available for study. Additional sites to be worked by the CAR-UTSA crew included 41 LK 13, 41 LK 51, 41 LK 73, 41 LK 85, 41 LK 87, 41 LK 94, and 41 MC 75. Findings made at these sites are reported in this volume. The 13 sites taken on by the ARL were 41 LK 56, 41 MC 60, 41 MC 61, 41 MC 62, 41 MC 70, 41 MC 173, 41 MC 178, 41 MC 180, 41 MC 181, 41 MC 184, 41 MC 187, and 41 MC 188. This brought to 18 the total number of sites studied by the ARL.

The Phase I contract was modified in January 1978 to include testing and evaluation of 11 newly discovered sites located in the borrow area of the dam and along the relocated route of State Highway 72. Among these sites were 41 LK 31, 41 LK 32, 41 LK 197, 41 LK 201, 41 LK 202, 41 LK 203, 41 LK 204, 41 LK 205, 41 LK 206, and 41 LK 207. Except as noted below, results of investigations at these sites are also reported here.

Four sites dealt with under terms of the Phase I Scope of Work and subsequent modification were recommended for immediate and extensive excavations due to their location along the dam centerline or in the borrow area. Investigations at 41 LK 31, 41 LK 32, 41 LK 67, and 41 LK 202 are reported in two separate volumes (Scott and Fox 1982; Brown, Potter, Hall, and Black 1982). However, the prehistoric artifacts (except debitage) from these sites are included in the artifact description section of this report. Presentation of these materials here as well as in the individual site reports is intended to bring some consistency to the artifact analysis and to permit viewing of each site's materials in a project-wide context. The work at these sites qualified technically as Phase II investigation.

A final outgrowth of the Phase I archaeological research program at Choke Canyon was the formulation of plans for surveying approximately 10,500 acres in the reservoir basin and along its margin. This survey was carried out by personnel from the CAR-UTSA in 1979. With completion of this survey, the entire reservoir had been inspected for archaeological remains.

The results of these various investigations are presented in a series of reports. Volume 1 (Campbell and Campbell 1981) contains the ethnohistory. Volume 2, Part 1 (Everett 1981) and Part 2 (Bandy 1981) documents results of historical research and historic site archaeology. Volume 3 (Thoms, Montgomery, and Portnoy 1981) contains findings made by the CRI crew as they surveyed a 6000-acre area of the basin in 1977. In Volume 4 (Roemer 1981), the CAR-UTSA survey of 1979 is detailed. This report constitutes Volume 5. Volume 6 (Weed and Shafer 1981) presents findings made by the ARL crew at 18 prehistoric sites. Volumes 7 (Brown, Potter, Hall, and Black 1982) and 8 (Scott and Fox 1982) report findings made during intensive excavations at 41 LK 67 and 41 LK 31/32, respectively.

THE NATURAL SETTING

Choke Canyon Reservoir is located on the coastal plain of south Texas roughly midway between the southern margin of the Edwards Plateau and the Gulf of Mexico. The dam is situated about four miles west of the town of Three Rivers. This location is equidistant between the cities of San Antonio 90 miles to the north and Corpus Christi to the southeast. The reservoir is primarily intended to meet growing urban-industrial water needs in Corpus Christi. Secondary benefits will be a decrease in the severity of floods on the Nueces River below the dam and recreation for residents of the area and region.

The Frio River rises to the northwest of Choke Canyon in the limestone hill country of central Texas. Shortly after cutting down through the hills of the Edwards Plateau, the Frio River is joined on the coastal plain by three major tributaries: the Sabinal and Leona Rivers and Hondo Creek. Fed both by springs and runoff from the Edwards Plateau, much of the water from these drainages soaks down into aquifers on the coastal plain before reaching the Choke Canyon area. The Frio's other tributaries, the Atascosa River and San Miguel Creek, originate on the coastal plain and serve primarily as channels for runoff. As a consequence, the Frio River flows at Choke Canyon only when there has been substantial rain locally or in the headwaters. In times of little rain, the Frio is slow moving or still, but usually does contain water in pools along the channel (U.S. Department of the Interior 1975:B-1). In historic times, the river at Choke Canyon has been known to dry up completely during periods of severe drought.

A short distance downstream from the dam, the Frio River is joined by the Atascosa River. Slightly farther to the south, the Frio River meets the Nueces River. The town of Three Rivers is named for the confluence of these drainages. The general trend of these rivers, as for all major rivers on the Texas coastal plain, is southeasterly. As they approach Choke Canyon, however, the Nueces River and, to a lesser extent, the Frio River swing northeastward against the prevailing regional pattern. This divergence is caused by a line of low-lying hills trending northeast to southwest down the middle of the coastal plain roughly parallel to the shore of the Gulf. The hills are formed by an outcrop of resistant rocks called the Oakville-Bordas Escarpment. The Frio, Atascosa, and Nueces Rivers are forced by these resistant hills to converge into a single channel in finally breaching the barrier. From the constriction of these major river systems, the name "Choke Canyon" is derived (Lynn, Fox, and O'Malley 1977:6). At the escarpment, the Nueces River collects drainage from 17,000 square miles of southwestern Texas and then returns to the regional drainage pattern as it courses 90 miles southeast to its mouth in Nueces Bay at Corpus Christi. An excellent illustration of the major physiographic features of south Texas is provided in Figure 1 of the THC survey report by Lynn, Fox, and O'Malley (1977:5).

Choke Canyon is located on the Rio Grande Plain, a subdivision of the West Gulf Coastal Plain physiographic province. The climate of the region is described as semiarid or subtropical, with rain averaging 23 inches a year. The area is subject to the effects of hurricanes from August through October. Rainfall rates of from 25 to 35 inches in a five-day period have been recorded in south Texas following hurricane landfalls on the coast (Grozier *et al.* 1968). Winters are short and mild; the summers are long and hot (Orton 1964:3). Winds blow from the southeast during most of the year. Short-term bursts of cold north winds mark the passage of "northers" during the winter. Temperature averages 74°F through the year with heat extremes up to 105°F being much more common than very infrequent periods when temperatures below 20°F are experienced.

The Rio Grande Plain is level to gently rolling, with the exception of scattered lines of hills formed along resistant sedimentary rock outcrops. The Oakville-Bordas Escarpment along the eastern margin of the reservoir is one good example of hill terrain in south Texas. Other relief on the plain is the result of erosion along the vast network of drainages feeding into the major river valleys. The geologic background and geomorphology of the Choke Canyon area are discussed more thoroughly in Appendix II.

At Choke Canyon, the Frio River has carved a broad, low-relief alluvial valley into Tertiary sediments of varying resistances. Soil developed over these Tertiary deposits and alluvium covers almost all of the reservoir basin. Bedrock outcrops in some places: along the river channel, in gullies, and on high hills (U.S. Department of the Interior 1975:B-9). Gravels are distributed as lag pavements along the valley margins, as terrace deposits on the floodplain, and in bars along the river channel. Deep loams are the most common type of soil found in the area. Differences in the soils across the basin primarily reflect variations in content of clays, sands, and gravel. Hard, clayey loam is most common. Choke Canyon soils are generally alkaline and highly calcareous.

Elevational differences are modest, but definitely apparent at Choke Canyon. The highest point in the vicinity is the top of Skillet Mountain near the west end of the reservoir. The elevation there is 372 feet above mean sea level (msl). Directly below Skillet Mountain, the channel of the Frio River is at an elevation of 210 feet above msl. The elevation contrast of about 160 feet between these two features constitutes the most drastic topographic relief anywhere in the reservoir. Downstream near the dam, the uplands rise to maximums of between 250 and 300 feet above msl, with the river channel running from 120-170 feet below. Throughout most of the valley, the Frio River flows in a well-entrenched channel with a width of 150 feet or less. The river has a gradient of about two to three feet per mile (*ibid.*:B-1).

In the project area, the Frio's valley is broadest across the eastern half of the reservoir. Valley width varies from four to five miles. At the east end, the dam is footed on bedrock of the Catahoula Formation, a Miocene deposit consisting of tuff, tuffaceous sand, and sandstone interbedded with tuff, clay, and silt. Outcrops of Catahoula tuff form fairly prominent margins to the valley. Tuffaceous sedimentary rock from the outcrops was used extensively by prehistoric people for hearth construction on sites at this end of the valley. Another interesting component of the Catahoula Formation is pumice. Pieces of pumice have been found on prehistoric sites in the area, but there is no evidence that the material was used by prehistoric people.

The Oligocene Frio Formation trends across the midsection of the Choke Canyon basin. This deposit consists of dark gray-green clays interbedded with shales and sand. Gypsum, occurring in a distinctive form called "satin spar," is found as seams in the Frio Formation. After being eroded out and stream rolled, satin spar gypsum cobbles assume a distinctive oblong shape. These gypsum cobbles have been found on prehistoric sites at Choke Canyon and were apparently used by the site occupants. Not as resistant to the effects of erosion as formations flanking the east and west, the Frio Formation supports gradually sloping valley margins with fewer abrupt transitions from valley to upland.

Westward from Calliham, a small community located eight miles upstream from the dam, systems of the Eocene Jackson Group crop out. Consisting of interbedded clays, ash, and sands, the group contains a unit of resistant sandstone which forms bluffs at the western end of the reservoir basin. In this half of the valley, the steepest margins, including Skillet Mountain, are along the southern side. The northern side of the valley at the western end rises more gradually away from the river. The valley narrows appreciably in passing through the Jackson Group. There is a corresponding reduction in the width of the floodplain. In some places along the southern valley margin, there is little or no floodplain zone between river and uplands.

Sandstone of the Jackson Group was heavily utilized by the area's prehistoric inhabitants. In prehistoric sites across the western half of the basin, sandstone was used almost exclusively in construction of hearths. Sandstones were also used to make grinding slabs, manos, and a variety of abraders.

Major upland tributaries to the Frio River in the project area include San Miguel Creek, Opossum Creek, and Willow Hollow on the north side and Salt Creek on the south side. Upland drainage systems are not as extensive on the south side of the Frio Valley as on the north, because of the narrow divide between the Nueces and Frio systems. Runoff waters are shared between the two. The larger tributaries such as San Miguel Creek and Opossum Creek have deeply entrenched channels and well-developed terrace systems in their lower reaches.

Landform features in the Frio floodplain include the channel of the river, relict channels (sloughs), remnants of ancient terrace systems, and tributary drainages of varying magnitudes. The river channel is moderately sinuous. It swings into a big reverse S-curve northwest of Calliham. The early historic community of Yarbrough Bend sprang up along this stretch of the river in the 1850s (Everett 1981; Bandy 1981). As noted in Appendix II, the straight courses and bends in the river channel reflect local bedrock fractures and lineations. At normal rates of flow, the river has both deep pools and shallows. Gravel and, less frequently, bedrock are exposed along the shallow stretches. Several oxbow lakes on the floodplain evidence minor changes in the channel's course. Other more obscure drainage traces suggest even older and more dramatic shifts in the channel's path through the valley. A number of sharp bends in the modern channel would eventually produce new oxbow cutoffs were the river not to be dammed. A few of the prominent sloughs contain water on a more-or-less permanent basis. Others are filled only when the river rises to flood stage or when there is locally heavy rainfall.

Remnants of older, higher terraces are apparent on the floodplain at Choke Canyon, especially in the wider section of the valley at the eastern end. Such features are of particular archaeological interest because they are old, relatively stable surfaces where the likelihood of encountering early prehistoric cultural remains is greater than on younger, more dynamic surfaces. These old terraces are discontinuous and have not been carefully mapped across the entire reservoir basin.

Major and minor drainages channelling runoff water from the uplands are responsible for much of the erosion on the floodplain and for severe erosion along the valley walls. Where the slough channels tend to be broad and U-shaped in cross section, the drainage channels are narrow and V-shaped. Gullies are much more common along the sides of drainages than they are along the sloughs, probably because the natural levees lining the sloughs effectively block runoff. In some instances, older relict channels have been pirated by upland drainage and are now serving as major arteries of floodplain runoff.

One of the foremost distinctions of the Rio Grande Plain is its vegetation. Referred to as "brush country" (Inglis 1964:1), common elements of the south Texas floral community include mesquite, acacias (blackbrush, guajillo, huisache, and catclaw), cenizo, prickly pear, and whitebrush. At Choke Canyon, 28,900 acres are covered in brush and forest; about 6500 acres are in cultivation; and 3200 acres are in native pasture (U.S. Department of the Interior 1975:A-11). Acacias, especially blackbrush and guajillo, are the prevailing upland and valley margin vegetation around Choke Canyon. Along the channels of the Frio River and San Miguel and Opossum Creeks grows a narrow band of large trees including live oak, willow, elm, sugarberry, hackberry, ash, and pecan. Arbors of mustang grapevines form dense canopies in treetops along certain stretches of the river. On the floodplain between the river channel and valley margins, mesquite, whitebrush, huisache, prickly pear, spiny hackberry, and Texas persimmon are common. Although they may grow almost anywhere on the floodplain, all of these species tend to be locally denser and more luxuriant along the drainages and sloughs. All the cultivated land lies in the floodplain, with most of the acreage located at the eastern end of the basin where the plain is wider. Pastures occur both on the floodplain and in the uplands. See Appendix IV for a discussion of brush clearing methods employed in south Texas.

A number of the modern-day trees and plants at Choke Canyon would likely have been economically important to the area's prehistoric inhabitants. As discussed in Appendix III, the present distribution of vegetation in and around Choke Canyon does not accurately reflect floral patterns known for the area in early historic times. Upland areas were formerly covered in grass with trees and brush growing only in localized or scattered communities if at all (Inglis 1964:44, 50). River valleys and channels of major upland drainages were apparently wooded, but it is not clear how dense and widespread this growth was. Early explorers observed the presence of oaks, other large trees, mesquite, and thorny brush in the floodplains and along drainages in southern Texas. As reported in Appendix III, archaeological data have confirmed the presence of certain brush community species at Choke Canyon as early as 1300 B.C.

The available data do not yet permit a full reconstruction of plant communities existing at any given time in Choke Canyon's prehistory. However, based on the limited evidence available at present, one may speculate that many of the tree and plant species now found at Choke Canyon were in the area as much as 3000 years ago and perhaps longer. A much more critical unknown from the standpoint of prehistoric subsistence pursuits is the density in which some of the more important trees and plants may have occurred in the region. Ethnohistoric data (Campbell and Campbell 1981) demonstrate the extreme importance of prickly pear fruit to many early historic Indian groups in south Texas. Mesquite beans, acorns, hackberries, pecans, the beans of guajillo and other acacias, mustang grapes, spiny hackberry fruit, persimmons, and many kinds of grass seed are modern plant products found in substantial quantities at Choke Canyon which, assuming that they were available in sufficient amounts, would have been important considerations in planning seasonal hunting and gathering strategies. The Spanish dagger and narrow-leaved yucca are two other plants now found at Choke Canyon that may have been important to prehistoric people as sources of fiber for manufacture into a variety of woven goods.

Choke Canyon is located in the Tamaulipan Biotic Province as defined by Blair (1950). White-tailed deer are the most common large game animal now in the area. Antelope were common on the uplands in early historic times prior to brush encroachment (Inglis 1964:89). The archaeological record indicates that bison ranged into the territory during the Late Prehistoric period. Other animals commonly seen include javelina, coyote, bobcat, raccoon, opossum, skunk, jackrabbit, cottontail rabbit, badger, squirrels, rats, and mice. Birds often seen include wild turkey, hawk, quail, dove, duck, vulture, crane, and owl. Snakes, especially the Western Diamondback rattlesnake, are numerous in the area, as well as lizards and turtles (both land and water). The river, creeks, and sloughs contain a number of species such as alligator, gar, carp, drum, catfish, numerous small fish, bullfrog, and mussel. The land snail *Rabdotus* is common in the brush country and was heavily exploited by prehistoric people as a protein source. Lists of faunal remains recovered from archaeological deposits at Choke Canyon are provided in Appendices V and IX.

ARCHAEOLOGICAL BACKGROUND

THE 1930s AND 1940s

Early publications on the archaeology of south Texas were confined to studies of artifact distribution, with the exception of a brief review in the early survey of Texas archaeology conducted by E. B. Sayles (1935). In one of the first summaries of Texas archaeology, Pearce (1932) did not specifically note the south Texas area, although he did discuss the distinctive characteristics of adjacent regions such as the "kitchen middens" of central Texas and the "shell mounds" of the coastal region (*ibid.*:46). Pearce did, however, discuss the importance of distinctive environments in the development of prehistoric lifeways, a consideration of which has been much a part of the study of south Texas archaeology in recent years (see pages 12-23 of this section).

In Sayles' 1935 survey, he defined the Coahuiltecan Branch, Gulf Region, noting numerous "extensive campsites of large hearths along small streams" inland from Brownsville. The sites were characterized by numerous large, roughly chipped nodules and blades, triangular and leaf-shaped projectile points, and flake and core scrapers. Manos, metates, and pottery were not noted (Sayles 1935:102-103).

Several articles in the 1936-1940 period documented the presence throughout the state of relatively unknown artifact forms in the hope of arousing interest in and further study of them. South Texas counties are occasionally mentioned in these studies. Patterson (1936:19-20) tabulated the distribution of "corner-tang knives," noting specimens occurring in McMullen, LaSalle, Maverick, Frio, Dimmit, and Atascosa Counties. Patterson (*ibid.*:27) believed that the corner-tang knife as an artifact form was developed and first used in central Texas, spreading out from there. Poteet (1938:260-261) carried out a distributional study of beveled knives, but none were recorded in the immediate area. It was noted that their southernmost limit at the time was Calhoun County of the Texas Gulf Coast and that beveled knives appeared to be distributed throughout "the bison country." Wright (1940:41) recorded a graver in nearby San Patricio County in his study of flint graver occurrence in Texas. None were noted in the immediate study area. Jackson (1940:103) recorded a sandstone tube found along with projectile points in a burial in Atascosa County and a "unique pottery tube" from an "eroded village site" in nearby San Patricio County (*ibid.*:128). He noted that distribution of tubular pipes and other tubes in Texas was most abundant "in south Texas along the coast" (Jackson 1940:100).

THE 1950s

In 1950, The University of Texas (Austin) carried out archaeological survey and test excavations along the Rio Grande in Starr County, south of the Choke Canyon area, preparatory to construction of the Falcón Dam and Reservoir (Hartle and Stephenson 1951). A total of 55 archaeological sites was located during the initial phase of investigation. In 1951, three of these sites were in danger of destruction and were therefore immediately excavated. Two were historic Spanish Colonial house remains. The third site was a deeply buried aboriginal site situated along a major arroyo ca. 30 yards from its confluence with the Rio Grande (*ibid.*:14). The site was described as primarily a "workshop area," with hearths found sporadically within the deposits. Large quantities of snail shells were found throughout the excavation, but bone material was rare. Artifacts included triangular projectile points and bifaces, scrapers of various forms, and cores (Hartle and Stephenson 1951:14-22). A charcoal specimen from the site produced a radiocarbon date of 2700 B.C.

In a 1951 article in the Dallas Archeological Society *Record*, Sollberger (1951) described and illustrated artifacts from three sites in Atascosa County. One site was located near the junction of White Brush Creek and the Atascosa River, with the other two sites within 1.5 miles of the first. Numerous arrow and dart points were collected, with the illustrations indicating some of the more frequently occurring Archaic and Late Prehistoric forms. Two corner-tang knives, a drill, a scraper, and a bone awl were also recovered.

In 1954, Suhm, Krieger, and Jelks published a general summary of Texas archaeology as it was known at that time. The current study area falls with the northern portion of the "Southwest Texas" section as they defined it (Suhm, Krieger, and Jelks 1954:135). The chronological framework utilized in their summary was divided into four stages: Paleo-American (ca. 9000-4000 B.C.), Archaic (4000-3000 B.C. to A.D. 1000), Neo-American (0 to A.D. 1000 to historic contact), and Historic (Suhm, Krieger, and Jelks 1954:15-21).

As used by Suhm, Krieger, and Jelks (1954:16-17), the Paleo-American Stage referred to those peoples who arrived via northeastern Siberia in the late Pleistocene, living as nomadic big game hunters until the gradual disappearance of the late Pleistocene fauna encouraged the shift to greater emphasis on plant foods. The Archaic Stage "bridges the time between Paleo-American hunting people . . . and the settled, agricultural pottery-making Indians" (Suhm, Krieger, and Jelks 1954:18), with hunting, gathering, and fishing all pursued. The Neo-American Stage relates to cultures possessing pottery; small, light arrow points; agriculture; and more permanent settlements (Suhm, Krieger, and Jelks 1954:20). All remains associated with objects of European or modern American origin are referred to as within the Historic Stage (*ibid.*:20-21).

The four stages of Suhm, Krieger, and Jelks' (1954) chronological framework as related to south Texas are as follows:

Paleo-American. No sites of this stage were noted. However, a few isolated artifacts were recovered from areas south of the current study area, in the Falcón Reservoir and Dam area (Suhm, Krieger, and Jelks 1954:136).

Archaic. Two foci, Falcón and Mier, were recognized, based on work in the Falcón Reservoir area. Components of the Falcón Focus were identified largely from Falcón Reservoir sites, but also included items from private collections from at least eight counties, including LaSalle and Dimmit Counties. Archaeological evidence was found which indicated open campsites of varying size, and subsistence based largely on game, reptiles, insects, prickly pear fruit, and land snails. Artifacts included primarily *Tortugas, Abasolo*, and *Refugio* dart points; large, crude fist axes; triangular and leaf-shaped "knives"; and heavy side and end scrapers. The age of the Falcón Focus was estimated at 5000 B.C. to A.D. 500 or 1000 (*ibid.*:138-141). Many of the same traits continued into the Mier Focus, but distinctly smaller dart points (*Matamoros* and *Catán*), arrow points (*Fresno, Perdiz*, and *Starr*), and a few stone pestles were present. The Mier Focus was seen as transitional between the Falcón Focus and the Historic horizon (Suhm, Krieger, and Jelks 1954:141-142).

Neo-American. The Neo-American stage was not recognized in southwest Texas since neither agriculture nor pottery were believed to exist prior to Spanish contact (*ibid.*:142).

Historic. After Spanish contact, some of the local Indian groups were described as resisting missionization for over 200 years. Although some missionization occurred in the mid-1700s, after 1800 the native population became rapidly extinct (Suhm, Krieger, and Jelks 1954:142).

In a 1954 paper prompted by the presence of small numbers of Paleo-Indian artifacts at archaeological sites which also contained Archaic or even later artifacts, Orchard and Campbell (1954) described such associated artifacts from the Olmos Basin site in Bexar County. The authors reviewed the 1940 findings of Sellards, who had carried out extensive excavations at a Bee County site, not far east of the Choke Canyon area, and where a few Paleo-Indian projectile points and other lithic artifacts were found in apparent association with bones of extinct Pleistocene fauna. Loosely associated were Archaic dart points and *Clear Fork* tools in a context which could indicate contemporaneity (*ibid.*:454-455). The possible surface association of a *Plainview* point with Archaic artifacts from the Falcón Reservoir was also noted. The authors expressed their desire of generating additional information about the association of Paleo-Indian and Archaic projectile points, indicating that such artifact associations could be explained "in terms of successive occupations of the same site by different cultural groups, . . . the occasional collection of earlier points by Archaic peoples either for re-use or out of sheer curiosity, . . . or in terms of contemporaneity or overlap in time . . ." (Orchard and Campbell 1954:464).

Following up on Orchard and Campbell's (*ibid.*) paper, Enlow (Enlow and Campbell 1955) searched for similar Paleo-Indian points in various archaeological collections of the Witte Memorial Museum. Of 27 Paleo-Indian points selected, eight were from southern Texas, south of San Antonio. Only one, a *Plainview* point of tan flint, was from Live Oak County in this specific study area (*ibid.*:36).

THE 1960s

During the 1960s, amateur and professional archaeologists added to knowledge of the area largely by studies of private collections. Reports of such studies were prepared by Hester (1968a-c, 1969a); Hester, White, and White (1969); Hester and Hill (1969); and House and Walper (1969). Results of early excavations were described in Nunley and Hester (1966) and Wakefield (1968). From 1968 to 1974, members of the Coastal Bend Archeological Society (CBAS) conducted preliminary archaeological surveys at Choke Canyon. This CBAS effort resulted in the location and recording of approximately 40 sites.

In 1964-1965, archaeological investigations were carried out in Dimmit County (Nunley and Hester 1966). Twenty-six sites were recorded as a result of the survey. Nine of these were solely Archaic, two were solely Neo-American, and all but one of the remainder evidenced occupation in both periods. The other site revealed no time diagnostic artifacts (*ibid.*:237).

Common artifact forms included *Tortugas, Desmuke, Catán-Abasolo, Ensor*, and *Matamoros* dart points, *Perdiz* and *Scallorn* arrow points, knives, scrapers, and other lithics. Excavations of a burial at site 41 DM 28 revealed the upper portion of a badly disarticulated skeleton, lying on its back and oriented east-west, with a thin, crude dart point probably associated (Nunley and Hester 1966:244).

Specimens from artifact collections observed by the authors "indicate that the sand on the upper terraces of Carrizo Creek was a camping spot" of Paleo-Indian peoples (*ibid.*:250). With regard to Archaic occupations, the location of Dimmit County on the apparent boundary between the Edwards Plateau Aspect, characterized by stemmed dart points, and the Falcón-Mier complex, characterized by stemless projectile points, was noted (Nunley and Hester 1966:251). Whether groups responsible for the different morphological types occupied the area simultaneously or individually was not known, but there was definitely a combination of stemmed and stemless varieties at many of the sites (*ibid.*:251-252).

In 1967, a preliminary archaeological reconnaissance of the Choke Canyon area was performed by Walter H. Wakefield (Wakefield 1968) of the Texas Archeological Salvage Project (now the Texas Archeological Survey [TAS]). Eighteen open sites (41 LK 1-7, 41 MC 11-21) situated on Frio River terraces were recorded during the survey. Artifacts recovered included Archaic dart points, scrapers, cores, flakes, knives, gouges, manos, and a metate. From both sites 41 LK 4 and 41 MC 12, a single sherd of bone- and sand-tempered Historic pottery and metal artifacts were recovered. As a result of the survey, testing or excavations was recommended for 11 of the 18 sites (*ibid.*).

The occurrence of pottery and associated Late Prehistoric and Historic period artifacts in south Texas was noted in a brief paper by Hester (1968b). *Leon Plain* was found at all sites but one, from which *Goliad Plain* was collected.

Hester (*ibid.*:11) suggested that the art of pottery making may have been acquired from Toyah Focus peoples of central Texas, as well as Rockport Focus peoples in the instance of the *Goliad Plain* specimen.

Additional documentation of pottery from southern Texas was presented in a paper by Hester and Hill (1969), in which pottery of the *El Paso Brown* type (Mogollon) was noted in southwestern Dimmit County. The intrusive ceramics provided evidence of contact with the present-day New Mexico area, either through direct trade or trade with intermediary groups (*ibid.*:12).

The presence of Paleo-Indian artifacts in several south Texas counties was documented in two papers by Hester (1968a, 1968c). Paleo-Indian artifacts from eight surface sites along San Miguel Creek in Frio, Atascosa, and McMullen Counties were described by Hester (1968a). The sites had predominantly Archaic artifact assemblages, but 23 Paleo-Indian projectile points were also present in the collections (*ibid.*:147, 151). The specimens fell within the range of artifacts previously defined as *Angostura, Plainview, Plainview golondrina, Meserve*, and *Milnesand* (Hester 1968a:151-157). Although *Tortugas*, other dart points, and a few arrow points were present at these sites, other artifacts such as gouge-scrapers, choppers, and knives made up the larger part of the assemblages (*ibid.*:158).

Folsom points from various private artifact collections in southwestern Texas were reported by Hester (1968c). Five specimens from Dimmit County and one from near the Maverick-Dimmit Counties boundary were described. All of the specimens were collected from the surface of sites containing primarily Archaic components.

Hester (1969b) described materials from the Lotta Tunnell collection from a small site (41 MC 3) situated on a south terrace of the Frio River and two "localities," all located in McMullen County. Locality 41 MC 00-1 was "a series of poorly defined aboriginal camping areas extending for several miles from just southeast of 41 MC 3 to below Tilden . . . along a high southern terrace of the Frio River . . ." in midwestern McMullen County (*ibid.*:2). Locality 41 MC 00-2 included "a number of small campsites, and one rather large site of about 30 acres . . . ," all in northeastern McMullen County. At one site, a sizable midden accumulation of mussel shells was present (Hester 1969a: 26). Most of the artifactual materials from the site and localities were attributable to the Archaic period. An *Angostura* dart point was collected from locality 41 MC 00-1. No Late Prehistoric artifacts were collected. Common nonprojectile point tools included triangular gouge-scrapers, *Nueces* scrapers, and lunate scrapers, with most showing "varying degrees of wear resulting from use in cutting and scraping activities." Hester (*ibid.*:29) also noted that "at least one site in the 41 MC 00-2 locality indicated the collection of freshwater mussels as part of the prehistoric food-gathering activities."

Also in 1969, Hester, White, and White (1969) documented a large surface collection from site 41 LS 3, as well as collections from six nearby LaSalle County sites (41 LS 1 and 41 LS 4-8). They also carried out an areal distribution study of various southwest Texas projectile point types. Site 41 LS 3 covered about 40 acres, with cultural debris exposed though erosion and cultivation. Archaic-style dart points occurred most frequently in the large collection, dominated by the *Tortugas, Desmuke, Matamoros*, and *Catán* dart point types. Tabulating the dart point count for all seven sites, the above types plus *Ensor, Fairland*, and *Frio* were dominant. Arrow points were found at four of the seven sites, with *Scallorn* predominant, followed by *Perdiz* and *Fresno* (*ibid.*:134-160). Although no pottery was reported from these sites, it was noted by Hester (1968b:9) at the Storey Ranch site (41 LS 2).

With regard to areal distribution, the northern part (northern LaSalle, Dimmit, and McMullen Counties) and the southern part (southern Dimmit, Webb, and Starr Counties) of southwest Texas were compared (Hester, White, and White 1969:161). In the northern part, *Desmuke, Ensor, Frio, Langtry, Matamoros*, and *Tortugas* were the major dart point types. *Matamoros, Desmuke*, and *Tortugas* remained dominant in the south, but *Abasolo* and *Catán* also appeared, and the stemmed or side-notched points were rarely evidenced. Rather distinct localizations of certain forms were seen, such as the *Carrizo* type (*ibid.*). *Desmuke* similarly appeared to have an area of main concentration (Hester, White, and White 1969:161).

A large collection of surface artifacts from Live Oak, McMullen, and LaSalle Counties was described in an unpublished paper by House and Walper (1969). Of more than 300 lithic artifacts, 219 were identifiable dart point types, 33 were arrow points (all from LaSalle County), and the remainder were cores, scrapers, awls, and miscellaneous items. *Tortugas, Catán, Desmuke, Matamoros*, and *Refugio* were identified as predominant dart points. *Scallorn* comprised more than half of the arrow points.

Most of the sites noted by House and Walper (*ibid.*) lie immediately within the Choke Canyon study area. One site, lying in both McMullen and Live Oak Counties, is "associated with high level terrace gravels that contain abundant chert cobbles" for lithic production (House and Walper 1969:4). A major part of the collection was from five Live Oak County sites. The greatest number and variety of artifacts were from the Herring site, located between the confluence of the Atascosa and Frio Rivers. At least 20 types of projectile points were noted, as well as shell core tools, pieces of metates, a small pestle, scrapers, awls, burins, drills, and potsherds, probably of the *Goliad Plain* variety (*ibid.*:6). Unusual artifacts included a conch shell columella gouge, a boatstone, and two metal points from the Historic period. About a mile north of the river confluence, a skeleton was found in an erosional bank. The skeleton, probably that of an older adult, was in a flexed position, and a few projectile points were found in the vicinity (House and Walper 1969:7-8).

1970 TO PRESENT

During the 1970s, knowledge of south Texas archaeology grew rapidly. Increasing survey and excavation were carried out in the area, and interpretive works and syntheses on various aspects and periods of prehistoric life were written. The majority of the archaeological work of this period was carried out in Zavala and Dimmit Counties, west of Choke Canyon, and is thus emphasized here.

In 1970, site survey and excavation were first undertaken at the Chaparrosa Ranch in Zavala County (Hester and Hill 1970; Hester 1978a). Research was oriented toward two major goals: "(1) the recording and sampling of sites in varied topographical and ecological locales with a view toward preliminary reconstruction of prehistoric subsistence-settlement systems; (2) the location and test excavation of buried archaeological deposits with sufficient depth to warrant future large-scale excavations" (Hester and Hill 1970:4). Fifty-eight new sites were documented during the 1970 season, with a number of sites sampled through controlled surface collection and four sites test excavated. The excavations revealed over one meter of buried deposits, containing abundant lithic debris, faunal remains, mussel and snail shell, burned rock, and charcoal. Limited analyses of site data indicated that "village sites (or base camps) were located on the floodplains of major stream valleys and were usually situated on natural levees adjacent to and paralleling the stream course. Subsidiary sites (chipping stations, hunting and foraging camps, short-term occupation sites) were on gravel terraces and in the uplands" (*ibid.*).

In connection with archaeological studies carried out in the early 1970s (Hester 1976a, 1978a), the environmental setting as it existed in aboriginal times was also considered. In a paper prepared for a 1971 Texas Academy of Science meeting, Hester (1976a) discussed the environmental shifts which have occurred in south Texas in recent times. Based on reports of 17th century Spanish explorers, the vegetational patterns at the time of Spanish arrival consisted of open, level prairies, with occasional groves and thickets of large mesquites and other trees. In the riparian environments of the Nueces River streambed, dense forests were noted (Hester 1978a:3). In the last 300 to 400 years, the spread of thorn brush, particularly mesquite, had altered the prehistoric savannah conditions. By the latter part of the 1800s, such species dominated the vegetation. Several factors were probably responsible for the brush spread. The introduction of cattle ranching and subsequent overgrazing was probably a factor aiding the spread of mesquite from the prehistoric riparian zones to the uplands. The cessation of aboriginal burning of the prairies, as well as short-term climatic fluctuations, may also have contributed to the thorn brush spread (Hester 1976a:3; 1978a:3; cf. Inglis 1964; Bogusch 1952). Records of early Spanish and Anglo inhabitants also make it evident that surface water, in the form of numerous perennial streams and springs, was much more abundant in prehistoric times. Lowered water tables resulting from deep-well irrigation and watershed destruction have dried up many creeks and springs since the early 20th century (Hester 1976a:3). Hester (*ibid.*) also considered faunal changes since prehistoric times. Although bison, antelope, and bear were present in early postcontact and prehistoric periods, the fauna were otherwise believed to be quite similar to those of the present.

The main topic of the above-noted paper incorporating a discussion of environmental patterns was a summary of the prehistoric lifeways on the Rio Grande Plain and lower Texas coast (Hester 1976a). Only meager evidence, consisting largely of scattered projectile point finds, was available for the Paleo-Indian period; thus, Paleo-Indian lifeways were not delineated. The Archaic was described as a "morass" in terms of knowledge of the period, but was "probably characterized by the use of similar tool forms for many thousands of years" (*ibid.*:4). More well defined was the Late Prehistoric, beginning with the introduction of the bow and arrow and ceramics around A.D. 1200. *Perdiz*, *Scallorn*, *Fresno*, and other arrow point styles, as well as plain bone-tempered pottery, occurred throughout the south Texas area. Small "dart points" also seemed to be associated with the Late Prehistoric artifact assemblage. Well-made flake end scrapers, perforators made on flakes, and laterally retouched blades were also part of the lithic tool kit (Hester 1976a:4-5). The initial Historic contacts occurred with Cabeza de Vaca's trek through the region in the 1520s and 1530s. Eventually the native populations were either eradicated or assimilated by the newcomers. Occasional metal arrow points and trade beads have been found on south Texas sites (*ibid.*:5).

A study of the cultural adaptations made by the prehistoric peoples, as evidenced by prehistoric settlement and subsistence patterns, was also presented (Hester 1976a:5-9). The "savannah adaptation" and the "maritime adaptation" of the interior savannah and the lower Texas coast, respectively, were described. The savannah adaptation was based on research in northwestern Zavala County. Preferred camping spots were on the floodplains, with chipping stations and small, short-term campsites located on "high gravel terraces rimming the stream valleys" (*ibid.*:6). Upland sites were generally small, very temporary campsites. The subsistence pattern of these prehistoric groups was largely seasonal in nature, with small groups occupying preferred campsites for a few weeks while partially exploiting the food resources available in that area. Pecan harvests in the fall and prickly pear fruit and mesquite bean harvests in the spring and summer were the more important seasonal harvests drawing together groups from many areas of the savannah.

Aboriginal subsistence, as determined by faunal remains, was probably dominated by white-tailed deer, jackrabbit, cottontail rabbit, land turtle, turkey, freshwater mussels, and land snails. However, ethnohistoric accounts indicate the paramount importance of plant food gathering (Hester 1976a:7).

The aboriginal tool kit included stemmed and unstemmed projectile points, triangular unifaces and bifaces known as *Clear Fork* gouges, large thin bifaces, and scrapers. Although no evidence of such artifacts has been preserved, baskets, nets, traps, and wooden tools were surely also of great importance (*ibid.*: 7-8).

The maritime adaptation of the lower Texas coast evidenced "living sites confined largely to the bay edge and located atop clay dunes," which are elevated, well drained, and have freshwater ponds adjacent on the inland side (Hester 1976a:8). Subsistence remains included white-tailed deer, land turtle, and possibly opossum, but most abundant were the remains of fish, shellfish, and crustaceans. Inland plant resources were probably also exploited. Cemetery sites from two complexes were described, as well as an extensive trade network from one complex. Tools were most commonly of shell, with projectile points of both shell and stone (*ibid.*:8-9).

In a 1971 paper, Hill and Hester (1971) identified two distinct components at the Honeymoon site in Zavala County. In the Archaic area, a variety of lithic debris was associated with a relatively intact hearth constructed largely of sandstone. This area appeared to be a short-term chipping station or a temporary camping site. The Late Prehistoric area appeared to be a short-term hunting camp. Four *Scallorn*-like arrow points and two small "dart points" were recovered from this area, indicating that short, thick dart points were coeval with early arrow points in the region (*ibid.*).

Also in 1971, Hester and Hill (1971) studied aboriginal bone-tempered pottery from 28 sites in the Rio Grande Plain, describing seven categories of aboriginal pottery, most of which could be included in the *Leon Plain* type defined by

Suhm, Krieger, and Jelks (1954). The origin of the ceramic tradition was believed to be an introduction via Late Prehistoric peoples from central Texas, either through trade or through interaction during seasonal food harvesting (*ibid.*:195-197, 198-200).

In 1970 and 1971, Hester corresponded with Mrs. Bob Hindes of Charlotte, Texas. Mrs. Hindes had collected artifacts from at least 25 sites in the area of Green Branch Creek at her ranch in McMullen County. A total of over 5000 artifacts had been collected from the sites, including pottery sherds, scrapers, and dart and arrow points (notes on file, CAR-UTSA).

Hester and Hill (1972) reported on two Zavala County occupation sites, one primarily Late Prehistoric and one with Archaic materials only. At the first site (the Holdsworth site, 41 ZV 14), an abundance of Late Prehistoric materials were recovered, including *Perdiz* and *Scallorn* arrow points, flake tools, one bone-tempered ceramic sherd, and manufacturing debris. The Late Prehistoric materials were overlying an ill-defined Archaic component. Also found due to erosion was a *Plainview golondrina* specimen; other such artifacts, all basal fragments, had been found downstream, at 41 ZV 7 (*ibid.*:57). Remains from the second site (the Stewart site) were meager, including corner- and side-notched projectile points, scrapers, and bifaces, all attributable to the Archaic period (Hester and Hill 1973:57-58).

Both sites were occupation sites, containing an array of hunting, processing, and fabricating tools and tool manufacturing debris. Three microenvironments were noted at both sites--channel, floodplain, and upland--offering a wider range of subsistence resources to the sites' inhabitants (*ibid.*:35, 36, 50). Gilbow's (1972) analysis of Holdsworth faunal remains indicated that the major meat source was probably white-tailed deer, and that the marrow was also consumed. Small mammals were also present in the faunal assemblage.

Information about site 41 MC 1 was submitted in 1973 by J. L. Mitchell. The site was located on a rise just south of San Miguel Creek and west of a small tributary. The artifactual materials were recorded as primarily Archaic, with a *Plainview golondrina* and a *Scallorn* projectile point providing minor evidence of the Paleo-Indian and Late Prehistoric periods, respectively. Mitchell also recorded two sites each in LaSalle and Atascosa Counties in 1973. Scrapers, corner-notched points, and a *Carrizo* point were collected from 41 LS 11. A *Fresno* point, a corner-tanged drill, and a metate were recovered from 41 LS 12, which was believed to be an occupation site. In Atascosa County, site 41 AT 7 was recorded on the south side of San Miguel Creek. A surface collection revealed primarily *Tortugas* points, but *Scallorn, Perdiz, Desmuke, Abasolo, Ensor*, and one *Shumla* point were also collected. Downstream about a quarter of a mile from 41 AT 7, site 41 AT 18 was recorded. A *Plainview* basal fragment and a variety of Archaic and Late Prehistoric points were collected from this site. (All of the above site information was from the files of Thomas R. Hester and is also on file at the Texas Archeological Research Laboratory, Austin.)

Hill and Hester (1973) briefly described archaeological investigations which had been in progress for the previous two years at the Tortuga Flat site (41 ZV 155) in Zavala County. (This was another of the important sites in syntheses of south Texas archaeology by Hester [1975a, 1975b, 1976a, 1976b] and by Hester and Hill [1975].) The site was located on the eastern floodplain of Tortugas Creek, a major Nueces River tributary. Several distinct surface artifact features were mapped in the eastern part of the site, consisting of clusters of bone-tempered plainware, arrow points, scrapers, a bipointed biface, manos, and a milling stone fragment. A buried accumulation of faunal remains and other debris was also excavated near the creek edge, and was believed to be a trash dump. This accumulation, or "bone pile," contained faunal remains from antelope, white-tailed deer, jackrabbit, cottontail rabbit, coyote, gray fox, and small rodents, as well as fish, turtles, and snakes. Although bison was not present in the bone pile feature, it was recovered in small amounts from other excavated units. Antelope, however, was the dominant large mammal species at the site (Hester and Hill 1973:2).

In 1974, field work resumed at Chaparrosa Ranch. Approximately 40 new sites were recorded by the UTSA archaeological field course participants under the direction of Thomas R. Hester (1978c). Included among the recorded sites were many "buried occupation sites along the stream channels . . ., flint workshops on gravel ridges paralleling the streams, occupation sites . . . on high elevations overlooking the streams, and small upland sites" (*ibid.*:34). Radiocarbon analysis of charcoal samples from the Chaparrosa Ranch sites indicated that the earliest occupations occurred around A.D. 500, continuing intermittently to ca. A.D. 1450 or later (Hester 1978b:37-38). The latest occupations were characterized by "the co-occurrence of a variety of projectile point forms, especially specimens resembling the *Perdiz* and *Scallorn* types; triangular and subtriangular arrow points; small, thick 'dart points' [cf. Hill and Hester 1971], some of the tentative *Zavala* points; and in a nearby test pit . . . a *Tortugas* dart point" (Hester 1978c:34).

One of the first sites in south Texas to be extensively excavated was the Mariposa site, 41 ZV 83. The site was excavated by Hester during the 1974 UTSA field school, and Montgomery (1978) subsequently carried out a detailed analysis of the site. The site is a Late Prehistoric (and possibly Archaic) occupation site located on a floodplain of Turkey Creek in northwestern Zavala County. Three radiocarbon samples were obtained, resulting in corrected dates of A.D. 620, A.D. 1430, and A.D. 1650 (Hester and Hill 1975:19). However, little of the excavated material was believed to date prior to A.D. 1430. In an effort to identify intrasite patterns, maps indicating provenience of artifacts, debitage, features, and faunal remains were prepared (Montgomery 1978:111-127). The analysis of the maps revealed discrete "activity areas" associated with subsistence activities. Burned rock and faunal remains co-occurred in several areas, at various levels, as did artifacts and faunal remains (*ibid.*: 113, 122, 126). "Separate subsistence activity areas (hearths) and lithic activity areas (flakes and artifacts)" were indicated in levels one and two (Montgomery 1978:122). Lithic analysis indicated that tools were manufactured either by core-reduction or flake production and modification. Comparing his analysis to the Collins-Hester model (see page 20), it was apparent that Phase II activities could occur at occupation sites such as Mariposa (*ibid.*:142).

Montgomery (1978:137-139) compared the results of the Mariposa site investigations to a number of other south Texas Late Prehistoric sites. When compared to other such sites, Mariposa was unique in the small quantity of excavated faunal remains; the nonoccurrence of drills, perforators, and ceramics; and the low number of hammerstones. On the other hand, manos, grinding slabs, and scratched and grooved sandstone were more common at Mariposa than at other area sites. The high frequency of ground sandstone slabs may have been indicative of extensive reliance upon processing of vegetal materials. The presence of *Scallorn* and *Perdiz* arrow points; ovate and triangular bifaces; features (hearths with associated materials); and specialized lithic activity areas was common to most area sites, including Mariposa (*ibid.*:137-142).

In 1974, an archaeological survey was carried out in Atascosa and McMullen Counties by the Texas A&M University Anthropology Research Laboratory (Shafer and Baxter 1975). As a result of the survey, 85 prehistoric archaeological sites were recorded. The sites were located along all drainages in the survey area, as well as on upland slopes and ridges between stream drainages. The sites were classified into three groups on the basis of their artifactual content: Multiple Function, Limited Function, and Resource Procurement (*ibid.*:70-71). Multiple Function sites yielded artifactual evidence indicating that a wide range of activities occurred at those locations. Limited Function sites produced evidence of only a few activities and may have been short-term or seasonal campsites. Resource Procurement sites yielded artifacts indicating use as resource procurement localities. Of the 85 sites recorded, 44 were classified as Multiple Function, 15 as Limited Function, 16 as Resource Procurement, and 10 as unknown (Shafer and Baxter 1975:71-72, 78-80). In an attempt to test Hester's (1976a; see page 19 of this report) settlement pattern model for Zavala County, the sites were also grouped into locational areas according to their location in upland, upland margin, or valley areas. If the model were applicable to these sites, it would be expected that Multiple Function sites should cluster in the valley areas along the creeks. However, it was found that Multiple Function sites extended beyond the valley into the upland margins and uplands. Shafer and Baxter (1975:75) proposed that, since water was available during wetter periods in the uplands, and assuming that water was a determining factor in site location, the prehistoric inhabitants could settle anywhere that water was available. Therefore, the Multiple Function sites need not be restricted to the valley areas, although such areas over time would see the most intensive utilization.

An important source of additional archaeological knowledge in recent years has been the quarterly publication known as *La Tierra*, published by the Southern Texas Archaeological Association (STAA). In one of STAA's early volumes, a paper about a McMullen County site was included (Hester, Bass, and Kelly 1974). The site was located a short distance south of the confluence of Elm Creek and the Nueces River and was discovered as a result of private construction activities. The authors examined a disturbed burial located 105-120 cm below the surface and associated with bits of mussel shell, animal bones, pieces of baked clay, charcoal, scattered flint flakes, and a worked flint pebble. Also noted was a large stone-filled pit with scattered land snails, mussel shell fragments, animal bone fragments, and bits of charcoal. The depth of the deposits was at least 1.5 m, a fact of considerable significance as an indicator of buried sites which might be found in the future by archaeologists excavating in the Nueces River area (*ibid.*:23).

Another publication which was initiated in 1974 was the *Journal of South Texas*, published by the South Texas Historical Association. In the first volume, Hester (1974) presented a guide to more than 200 published sources of information about south Texas archaeology. Of the 214 sources listed, approximately 40% were dated 1970 to 1974, an indication of how rapidly knowledge of south Texas archaeology was accelerating in the early 1970s.

Also in the first volume of the *Journal of South Texas* was a paper by Mitchell (1974) reporting several metal projectile points in south Texas. Two of the specimens, previously reported by Hester (1970), were from sites in Zavala and Dimmit Counties. Both were made from iron. Mitchell's (1974:47-48) other three specimens were from Bexar and Uvalde Counties. All of the specimens were probably of Indian manufacture, although tribal affiliations were tentative.

At site 41 ZV 152, an Archaic/Late Prehistoric site in northwestern Zavala County, Hester *et al.* (1975) have described a female burial with associated bone beads. The burial was believed to date to the Late Prehistoric.

In 1975, results of much of the archaeological work carried out in the preceding years were synthesized in the form of papers and symposia presentations dealing with various aspects or periods of prehistoric life (Hester 1975a, 1975b, 1976b; Hester and Hill 1975). Two of the papers dealt with aspects of the Late Prehistoric and Protohistoric period. Hester and Hill (1975) recognized distinct Late Prehistoric manifestations in the interior of south Texas and adjacent northeastern Mexico, as well as areas of intra-regional variation within the south Texas area. Dozens of Late Prehistoric occupation sites were recognized, generally having concentrated midden deposits of 10 to 30 cm in depth. Site deposits yielded large amounts of lithic debris, land snails, mussel shells, scattered hearthstones, baked clay lumps, charcoal, and animal bones (*ibid.*:7; Hester 1975a:112). The settlements were concentrated in riparian microenvironments on the banks of large creeks and were often horizontally separate from Archaic sites (Hester and Hill 1975:7; Hester 1975a: 114).

Short-term hunting and gathering camps were located largely in the uplands. Seasonal availability of plant foods may have been the primary determining factor in selection of site locations (Hester and Hill 1975:20). The Late Prehistoric tool kit included the bow and flint-tipped arrow (*Perdiz* arrow points predominant, followed by *Scallorn, Edwards, Fresno*-like, and miniature dart points), quartzite hammerstones, bone pressure-flaking tools, grooved stones for arrow shaft straightening, end and side scrapers, beveled knives, and bifacial drills and perforators. Bone-tempered ware, usually in the form of bowls or jars for storage and cooking and usually undecorated, was also evident (Hester 1975a:115; Hester and Hill 1975:22). Small mammals were probably the major meat resource, although fish, birds, and reptiles, especially turtle, were also common; and large mammals, such as bison, antelope, and deer, would have provided large amounts of meat when available. Plant foods, although poorly preserved, would also have been important (Hester 1975a:116-117). Examination of ethnohistoric data suggested that groups of ca. 30 persons might have occupied a specific campsite (Hester and Hill 1975:21), although Campbell (1975) believed that number could approach 100 persons.

Papers presented at a symposium entitled "The Texas Archaic" in 1975 and subsequently published by the CAR-UTSA included a review of the Archaic of southern Texas by Hester (1976b). Hester (*ibid.*:84) summarized the evidence for the various divisions of the Archaic, beginning with the Pre-Archaic, for which there was "evidence from high stream terraces flanking Turkey Creek [Zavala County] . . . . Other surface sites yield a mixture of central [Texas] and Trans-Pecos diagnostic point styles indicative of Early and Middle Archaic populations." *Shumla*-like dart points from 41 ZV 10 were the only excavated remains indicative of Middle Archaic occupation. The Late Archaic at such sites was evidenced by smaller notched forms, such as *Ensor* and *Frio*, and radiocarbon dates of A.D. 550 (41 ZV 83), A.D. 415, and A.D. 770 (41 ZV 11) could be linked to this period. At the end of the Archaic and continuing into the Late Prehistoric, a small stemmed form was apparent. This form, termed *Zavala*, probably functioned as an arrow point (Hester 1976b:84).

With regard to other areas of inquiry involving south Texas Archaic sites, Hester (*ibid.*:85) discussed the results of settlement studies:

> . . . settlement studies have demonstrated that there is a good deal of heterogeneity in distribution of sites . . . [T]hey appear to reflect localized adaptational patterns . . . [which] may often be recognized from one stream drainage to another . . . . Paleo Indian and Pre-Archaic sites are found on high terraces rimming the stream valley; later sites, particularly Late Archaic and Late Prehistoric, are found near the present channels . . . often positioned in ecotone situations. . . .

With reference to functional differences, large campsites were often apparent as "occupation zones" paralleling a stream course, with satellite hunting and foraging sites found on the floodplain margins and in upland areas. Lithic workshops were generally confined to "outcrops of Uvalde gravels present on high terraces and divides." Intrasite patterning was apparent in excavated sites such as 41 ZV 10, which contained "hearth areas, chipping loci, and pits for cooking and debris disposal" (Hester 1976b:85).

Early lithic studies were concerned largely with typology, but Hester (*ibid.*:86) felt that such constructs for the "amalgam of unstemmed forms that characterize the southern portion of the region" were of little use. The area of lithic manufacturing processes had shown the greatest progress to date (Hester 1976b:86).

Because of poor faunal preservation in Archaic sites, limited faunal samples were available for subsistence studies. Analysis of excavated materials at 41 ZV 10, however, revealed a number of species, including snakes, rabbits, raccoon, deer, and small mammals. Also present were land snails and mussel shell fragments (*ibid.*).

Hester (1976b:86-87) also identified a number of areas for future study: chronology; analysis of settlement, subsistence, and technological subsystems; paleoenvironmental data; and a solid ethnographic model.

In a 1975 paper, Hester (1975b; see also Hester 1978d) utilized a portion of a linear systems model developed by Collins (1971) to examine the fabrications processes of the chipped stone industries on the Rio Grande Plain of southern Texas. Three phases were used in the study: (1) procurement of raw materials; (2) initial chipping and shaping; and (3) shaping, trimming, and completion of lithic artifacts. Since occupation sites were generally confined to the floodplain and siliceous raw materials unavailable on these alluvial floodplains, the flintknappers would leave the occupation sites and use as workshops locations on the flanking high, gravel-covered terraces. At the workshop sites, the flintknappers would apparently "test" many cobbles in the search for high quality materials. From the selected materials, they would either rough out cores for use as blanks in tool manufacture or would manufacture preforms intended for further reduction and shaping. The cores and preforms were transported back to the floodplain occupation sites for further work, which involved the shaping, trimming, and completion of lithic artifacts (Hester 1978d:25, 28).

Two major flintknapping technologies were recognized by Hester (1975b) in his analysis of workshop debris. The first was a flake industry, in which both prepared and unprepared cores were worked to obtain suitable flakes for fashioning into various tools. The flakes were used with minimal additional trimming as light-duty cutting and scraping tools. Others were made into projectile points, knives, gravers, perforators, and scrapers. The flake industry appeared to extend back to Archaic times, but was most prominent in the Late Prehistoric, beginning after ca. A.D. 1250. Arrow points, end scrapers, and other tools were made on bladelike flakes (Hester 1975b:215, 217).

The second major industry was a core-tool or cobble industry, in which selected cobbles were bifacially reduced to produce implements such as projectile points, knives, chopping tools, and large scrapers. A third industry, based on a core-blade technology, may also be present, probably at sites dating primarily from the Late Prehistoric (*ibid.*:217-218).

Inferences about site function and intrasite behavior were made based on lithic analysis. The high incidence of decortication flakes and core fragments at terrace sites indicated their use as workshops, while interior, thinning, and tool rejuvenation flakes and maintenance and exploitative tools at floodplain sites inferred use as occupation areas. Additionally, chipping loci and an area possibly used for shaping wooden tools were identified (Hester 1975b:219-220).

An intensive survey of the Choke Canyon Reservoir area during 1974 and 1976 by the Texas Historical Commission revealed a total of 161 prehistoric sites (Lynn, Fox, and O'Malley 1977). Artifact morphology and physiographic setting of the sites was the basis for chronological interpretations (*ibid.*:219). Three lanceolate thin bifaces (*Plainview, Angostura*) indicated the presence of humans during the relatively moist Paleo-Indian period. From the close of the Pleistocene, Early Archaic adaptations to moderately xeric conditions continued for 5000 to 6000 years with little change. Little influence of artifacts from surrounding areas was evident until ca. A.D. 300-700, when an influx of new lithic assemblages from central Texas, the Cuero area of the Guadalupe River, and parts of southern Texas was seen. There was widespread use of the bow and arrow and ceramics after A.D. 1300, such artifacts having affiliations with both the western Nueces/Frio area and central Texas (*Perdiz* and *Scallorn*-like arrow points) and with southern Texas and northern Mexico (diminutive dart point forms; see Hester 1975c:8-9). Almost all sites reflected evidence of hearth building, mussel exploitation, and all phases of lithic tool manufacturing.

Contract archaeological work carried out by the CAR-UTSA has contributed considerably to archaeological knowledge, particularly in the San Antonio area and to the south. In 1975, the CAR carried out archaeological investigations in northern Jim Wells County at site 41 JW 8 (Hester and Bass 1974; Hester 1977a). Midden deposits and cultural features excavated at the site revealed a single component Late Prehistoric site datable to ca. A.D. 1300. The artifact assemblage was dominated by *Perdiz* arrow points, tiny end scrapers, and bone-tempered ceramics. The extensive faunal assemblage was notable for the occurrence of bison. Hester (*ibid.*:34-36) believed that the site was occupied during winter to early summer (based on bison presence) and that it was primarily a bison-hunting camp. The site may have reflected a marginal Plains lifeway as a response to the spread of bison into southern Texas around A.D. 1200-1300 (cf. Dillehay 1974:Fig. 6). A probable bison processing and/or bone disposal area in the southern part of the site supported the assumption that the site was of a hunting-camp nature.

In a 1976 issue of *La Tierra*, Mokry (1976) reported two Paleo-Indian projectile points surface collected from an area of McMullen County about seven miles west of Tilden. The artifacts were found on a floodplain of Leoncita Creek, where the author had previously noted primarily Archaic materials. The specimens were basal fragments of *Plainview* and *Golondrina* projectile points.

A few miles east of the Choke Canyon Reservoir area, the CAR-UTSA carried out excavations at 41 LK 106 in 1978 (Creel *et al.* 1979). Three chronologically distinct occupations were evident at the site, which was located on the uplands along Sulphur Creek. The upper site component was radiocarbon dated at ca. A.D. 1230, while the lower component was tentatively cross-dated through the *Bulverde* dart point to a general age of 2650-1650 B.C. The third component was cross-dated through its artifact assemblage to the Late Prehistoric period. The assemblages from the three recognized components were "remarkably similar, both qualitatively and quantitatively" (*ibid.*:28). They included hearths or burned sandstone scatters, occasional bifaces in varying stages of reduction, large amounts of chipping debris, occasional utilized flakes, and snail and mussel shells. Projectile points and other faunal remains were much less common. The lack of artifact diversity as compared to other southern Texas occupation sites was striking, suggesting a narrower range of activities had occurred at the site. Evidence indicated a short-term, special-purpose campsite, with small prehistoric groups camping in the areas of highest elevation within the site, consuming small quantities of aquatic foods, and procuring lithic raw materials from the creek bed and bluff, from which they were transported to the blufftop campsites for reduction and biface manufacture. The indications were that such activities encompassed a large temporal span and, as evidenced by a variety of diagnostic projectile points, several distinct aboriginal groups (Creel *et al.* 1979:29).

Survey and testing of an area approximately 11 km east of Three Rivers in early 1978 resulted in the recording of a large occupation site (41 LK 117) encompassing an alluvial terrace of Sulphur Creek and an upland area above the terrace (Smith 1978). Diagnostic projectile points representing Early, Middle, and Late Archaic periods were recorded. Also present were plainware pottery sherds; arrow points had also been found at the site by private collectors.

A number of short articles published in the STAA's quarterly journal are relevant to this study area and are briefly mentioned. From LaSalle County, Mitchell (1976) reported artifacts from an Archaic site, 41 LS 15. Hester (1979) described a sandstone pestle, probably used with a wooden mortar, from an open occupation site in Dimmit County. Also from Dimmit County were reported four obsidian artifacts. Three of the four artifacts were determined through trace element analysis to be from central Mexico, with their presence in south Texas probably representing trade relations through the Brownsville Complex. The fourth artifact was traced to an obsidian source in northeastern New Mexico, representing probable trade with the Jornada Mogollon (Hester *et al.* 1980).

Additional Paleo-Indian artifacts from the McMullen County area documented by Hester (1968a; see page 11 of this volume) have been recorded by McReynolds, McReynolds, and McReynolds (1980). Twenty additional Paleo-Indian dart points and eight *Clear Fork* tools were described in these two papers. Also recorded from the same site was a "Waco sinker" (McReynolds 1981).

From Atascosa County, McReynolds (1981) has recorded a ground stone artifact probably used as a hammerstone.

Analysis of a surface collection from sites in western McMullen County was carried out by Hemion (1979a, 1979b). Late Prehistoric arrow points of the *Scallorn*, *Perdiz*, *Edwards*, *Bonham*, *Livermore*, and *Toyah* varieties were recorded (Hemion 1979a). The analysis extended the distribution of the *Edwards* type southwest of its prior known range. Also reported from the collection were five notched or grooved stones described as line sinkers or "Waco" sinkers. Function of these artifacts is uncertain but may be postulated to be for use as bola stones or net or line sinkers (Hemion 1979b).

Based on recommendations made as a result of an earlier survey (Shafer and Baxter 1975; see page 17) in 1978 and 1979, the Texas A&M Anthropology Research Laboratory carried out archaeological investigations at seven sites in Atascosa County (Usrey 1980). Site investigations included "mapping and intensive surface collection utilizing a systematic, defined-units sampling scheme" (*ibid.*:iv; see also pp. 38-45). Site 41 AT 54 appeared to be a seasonal occupation site from late "Early Lithic" (Paleo-Indian) through Late Prehistoric times. Sites 41 AT 25 and 41 AT 36 were characterized as multifunctional sites with occasional occupation from the Middle Archaic to the Late Prehistoric. The remaining four sites were also believed to be multifunctional, but few temporally diagnostic artifacts were available to indicate occupational periods (Usrey 1980:127).

In 1979, the Texas Archeological Survey excavated three sites which were to be affected by construction of a levee as part of the Three Rivers Flood Protection

Project (Pliska 1980). Sites 41 LK 116, located on a floodplain, and sites 41 LK 114 and 41 LK 228, situated on high terrace knolls, had all been previously subjected to disturbance by plowing and bioturbation. Few diagnostic artifacts were recovered during the excavations. Dart points recovered from 41 LK 116 were indicative of the Late Prehistoric period (*ibid.*:47-48). Based on artifact assemblage and site location, it was inferred "that 41 LK 116 was utilized primarily as a mussel collecting station" (Pliska 1980:49). Site 41 LK 114, situated close to a lithic resource, was notable for the numerous cores and primary flakes recovered. The lack of specialized attributes precluded functional interpretation of 41 LK 228 (*ibid.*).

Dusek (1980) recorded two basal *Plainview* fragments from site 41 MC 10 within the proposed Choke Canyon Reservoir area. The author also knew of three other early points from the area. The site's advantageous location upon a ridge overlooking the Frio River valley, its close proximity to water, and the easy availability of natural chert in the area probably accounted for its occupation by Paleo-Indian groups.

Lithic resource procurement sites, limited function sites (lithic workshops, hunting lookouts), and multiple function sites were recognized among the 12 prehistoric sites recorded by Robinson (1980) in a southern McMullen County survey. A range of technical and domestic functions was apparently conducted at several upland multiple function sites (cooking, food processing, campsites, tool manufacturing areas, lookout stations, resource procurement sites), probably providing logistical support for surrounding limited function sites (*ibid.*:64-65).

SUMMARY OF CULTURAL CHRONOLOGY

The Paleo-Indian period in south Texas is represented largely by surface artifact finds from areas eroded by sheetwash and gullying. The time frame for this period is probably about 9000-6000 B.C. (Hester 1980a:134). A number of Late Paleo-Indian points, including *Plainview*, *Golondrina*, and *Angostura*, have been reported from eroded sites in an area along San Miguel Creek in Atascosa and McMullen Counties (Hester 1968a). *Folsom* points from private artifact collections have been documented from Dimmit County (Hester 1968c). In a previous survey of Choke Canyon Reservoir, the presence of human populations during the Paleo-Indian period was indicated by three lanceolate thin bifaces (Lynn, Fox, and O'Malley 1977). Other artifactual evidence of the Paleo-Indian period in south Texas includes that for the Falcón Reservoir (Suhm, Krieger, and Jelks 1954:136), McMullen County (Mokry 1976; McReynolds 1981; Dusek 1980), and Live Oak County (Enlow and Campbell 1955). The current status of the Paleo-Indian period has been summarized in Hester (1977b).

The Pre-Archaic period (ca. 6000-3500 B.C.) is not well known in south Texas and, according to Hester (1977b:Fig. 6; 1980a:Fig. 6.7), only Chaparrosa Ranch within the study area is known as a major Pre-Archaic locality. This period represents the transition between Paleo-Indian and developed Archaic lifeways and is characterized by distinctive artifact styles.

The Archaic period had a long-lasting time span in south Texas prehistory, lasting from about 3500 B.C. until European contact. Specialized hunting technologies were developed, and the gathering of wild plant foods was carefully scheduled. The environmental setting may have existed with more grassy plains than today and with heavy tree growth along the major creeks and rivers, many of which flowed year round (Hester 1980a:150). There are numerous Archaic sites throughout south Texas.

Some of the earliest evidence of Archaic sites in south Texas came from the Falcón Reservoir, where archaeological evidence indicated open campsites of varying size (Suhm, Krieger, and Jelks 1954:138-141). Nunley and Hester (1966:244) studied Archaic sites in Dimmit County, including a burial with a loosely associated dart point. Eighteen principally Archaic sites were recorded in the Choke Canyon Reservoir area by Wakefield (1968), and Hester (1969a) described a series of aboriginal Archaic campsites in McMullen County. A large artifact collection from LaSalle County, containing primarily Archaic-style dart points, was documented by Hester, White, and White (1969), and an areal distribution of point styles within the county was plotted. House and Walper (1969) described a large artifact collection with primarily Archaic dart points from Live Oak, McMullen, and LaSalle Counties. Hill and Hester (1971) identified a short-term chipping station or temporary camping site of Archaic age in Zavala County. In a 1976 paper, Hester (1976b) summarized the current state of knowledge about the southern Texas Archaic.

One of the most familiar south Texas Archaic projectile points is the triangular *Tortugas*. Other dart point styles in use during the Archaic include unstemmed, round-based points known as *Abasolo* and *Catán*; a smaller triangular point called *Matamoros*; stemmed points such as *Ensor, Frio, Shumla, Pedernales*, and *Langtry*; the heart-shaped *Carrizo*; and the lozenge-shaped *Desmuke* (Hester 1980a:152). A wide variety of tool forms are also found at Archaic sites. The triangular *Clear Fork* tool is the most common tool type (*ibid.*). Other chipped stone tools include end and side scrapers, triangular and leaf-shaped "knives," triangular gouge-scrapers, *Nueces* scrapers, lunate scrapers, and choppers. Manos and metates used for the processing of plant foods and seeds are also present.

Archaeological and ethnohistoric evidence from sites at the Falcón Reservoir indicated that Archaic subsistence was based largely on game, reptiles, insects, prickly pear fruit, and land snails (Suhm, Krieger, and Jelks 1954:138-141). Collection of freshwater mussels was noted as part of the food gathering activities at a McMullen County site (Hester 1969a:29). Excavated materials from site 41 ZV 10 in Zavala County revealed a number of species, including snake, rabbit, raccoon, deer, small mammals, land snail, and mussel shell fragments (Hester 1976b:86). In general, faunal preservation at south Texas Archaic sites has been poor.

With regard to various divisions within the Archaic, Hester (*ibid.*:84) has noted evidence of the Pre-Archaic from high stream terraces flanking Turkey Creek at Chaparrosa Ranch. Indications of Early and Middle Archaic populations come from surface sites which yield a mixture of central Texas and Trans-Pecos diagnostic projectile points. The only excavated evidence of Middle Archaic occupation outside the Choke Canyon area are *Shumla*-like dart points from

41 ZV 10 and *Pedernales* points from 41 ZV 263 (Gibson 1981). Smaller notched forms such as *Ensor* and *Frio* provide evidence of the Late Archaic, and radiocarbon dates of A.D. 550 (41 ZV 83), A.D. 415, and A.D. 770 (41 ZV 11) can be linked to this period. At the end of the Archaic and continuing into the Late Prehistoric, a stubby stemmed projectile point form, termed *Zavala*, is apparent (Hester 1976b:84).

South Texas Archaic sites demonstrate a great deal of heterogeneity in terms of site distribution, with localized adaptational patterns often recognizable from one stream drainage to another. "Paleo-Indian and Pre-Archaic sites are found on high terraces rimming the stream valley; later sites, particularly Late Archaic and Late Prehistoric, are found near the present channels . . . often positioned in ecotone situations . . . ." (*ibid.*:85).

Large Archaic campsites were often apparent as occupation zones paralleling the stream courses, with satellite hunting and foraging sites found on the floodplain margins and in upland areas. Outcrops of Uvalde gravels present on high terraces and divides were the sites of lithic workshops.

The Late Prehistoric period in south Texas is probably the best known archaeologically. The hunters and gatherers of south Texas were still following much the same lifeways as during the Archaic, with the primary change being the introduction of the bow and arrow. This change occurred sometime between A.D. 1000 and A.D. 1300 or 1400.

Among the papers previously discussed which have documented Late Prehistoric sites are Montgomery (1978), Hester (1976a), Hester and Hill (1973, 1975), and Hester (1977a).

A number of Late Prehistoric sites have been intensively studied in recent years. In Zavala County, Hill and Hester (1971) documented a short-term Late Prehistoric hunting camp, indicating from their investigations that short, thick dart points and early arrow point styles were coeval in the region. Also in Zavala County, Hester and Hill (1973) recovered abundant Late Prehistoric materials from an occupation site. At the Tortuga Flat site in Zavala County, surface artifact clusters were mapped, and a buried "bone pile" provided important faunal data (Hill and Hester 1973). Montgomery (1978) carried out detailed studies of the Mariposa site, identifying intrasite patterns, and performing lithic analysis studies. A single component Late Prehistoric site in Jim Wells County, excavated by the CAR (Hester and Bass 1974; Hester 1977a), was believed to be primarily a bison hunting camp.

Common south Texas arrow point types include *Perdiz, Scallorn, Fresno*, and *Zavala*. Small "dart points" are also often associated with the artifact assemblage. Well-made flake end scrapers, perforators made on flakes, laterally retouched blades, beveled knives, bifacial drills, and triangular bifaces and unifaces known as *Clear Fork* gouges are also part of the lithic tool kit (Hester 1976a:4-5). Plain bone-tempered pottery (*Leon Plain*) also appears in the Late Prehistoric period (Hester 1980a:157).

Late Prehistoric sites in south Texas are generally occupation sites with concentrated midden deposits 10-50 cm thick. Lithic debris, land snails, mussel shells, scattered hearthstones, baked clay lumps, charcoal, and faunal remains often occur in the deposits (*ibid.*:157). In plan, the sites tend to be either oval or linear, paralleling stream courses. The settlements are generally "concentrated on or near the present channels of large creeks or rivers and on abandoned channels or sloughs," with Archaic deposits at times underlying the Late Prehistoric middens (Hester 1980a:157). Chipping stations and small short-term campsites are located on high gravel terraces rimming the stream valleys (Hester 1976a).

Subsistence patterns were largely seasonal in nature, with small groups occupying preferred campsites for a few weeks while partially exploiting that area's available food resources. Important seasonal harvests included pecan harvests in the fall and prickly pear and mesquite bean harvests in the spring. Such seasonal harvests would have drawn together groups from many areas.

Faunal remains from Late Prehistoric sites indicate that aboriginal subsistence was probably dominated by white-tailed deer, jackrabbit, cottontail rabbit, land turtle, turkey, freshwater mussels, and land snails (Hester 1976a). At the Tortuga Flat site, pronghorn was the dominant large mammal species (Hester and Hill 1973). According to Hester (1980a:158), "at least forty-one individual species have been identified" as meat resources, indicating that few potential resources were ignored. Mammals such as bison, pronghorn, and white-tailed deer would have been important meat sources due to their size, but frequency of occurrence would indicate that small mammals such as jackrabbit, cottontail rabbit, pack rat, and cotton rat were also of importance (*ibid.*:158-159).

Hackberry seeds and charred acorn fragments are the only direct evidence of plant food. However, ethnohistoric records indicate that plant food gathering was probably of paramount importance to prehistoric peoples of south Texas.

RESEARCH GOALS

The archaeological investigation at Choke Canyon has been the largest, most intensive research effort yet conducted in the area of Texas generally south of a line from Del Rio to San Antonio to Victoria. The Choke Canyon basin, consisting of about 38,000 acres of land, is the greatest contiguous area of this south Texas region to be thoroughly inspected for prehistoric and historic archaeological remains. The approximately 400 sites recorded at Choke Canyon during the course of surveys by the TAS, CBAS, THC, CRI, and CAR constitute a very substantial percentage of all the sites now known over thousands of square miles of land falling between the Rio Grande and the Gulf of Mexico. As such, Choke Canyon offers a unique potential for furthering our understanding of past lifeways. At the same time, however, the relatively small amount of information generated as a result of previous archaeological research in south Texas does not provide the framework of basic substantive data available in better known regions such as the Trans-Pecos and central Texas.

Out of the analysis of materials and information collected during the initial survey of Choke Canyon came recognition of the need to establish a sound cultural/chronological sequence as a critical first step in further study of the area's prehistory (Lynn, Fox, and O'Malley 1977:172, 226). Direct application of well-established projectile point chronologies from central Texas and the

Trans-Pecos has been confounded by the absence of many distinctive time diagnostic forms from south Texas assemblages as well as the suspicion that certain of the shared artifact forms are not actually coeval from one area to the other. It was recommended that the Phase I program at Choke Canyon "seek to establish a sound cultural/chronological framework in terms of artifact assemblages . . . using seriation in conjunction with stratigraphic sequences and radiocarbon dating" (*ibid.*:226).

Along with the chronological framework, reconstruction of past environments was suggested as a second major prerequisite to an effective study of aboriginal lifeways at Choke Canyon. Except for observations recorded by early historic travelers as they followed various routes across south Texas (Inglis 1964), there is at present little data of use in attempting to characterize the region's environment during much of its prehistory. The general conditions of late prehistoric environment in south Texas may be safely inferred from data summarized by Inglis (*ibid.*), but the study offers little specific information relating directly to Choke Canyon.

An in-depth summary of paleoenvironmental background data for the western half of Texas is provided by Lynn, Fox, and O'Malley (1977:30-40). As with the cultural chronology, the best paleoenvironmental data comes from a region marginal to Choke Canyon, the Trans-Pecos country of west central Texas. Adjacent, but different in many ways, we do not know if the paleoenvironmental trends recognized in the Trans-Pecos are directly applicable to the Choke Canyon area of south Texas. As a remedy to this situation, it was recommended that Phase I investigations be directed at "reconstruction of the prehistoric environment, using geologic, soil, pollen, and faunal analyses" (*ibid.*:226).

The impression gained by THC researchers as a result of their experience during the initial survey of the reservoir was that the prehistoric inhabitants of Choke Canyon were operating within "generalized resource areas" (Lynn, Fox, and O'Malley 1977:172, 226). The perceived effect of these generalized resource areas on the settlement pattern was the creation of sites having a linear configuration resulting from repeated small band encampments within a specific area, but not necessarily at exactly the same spot on each occasion. Thus, with the passage of time, cultural residues deposited during successive periods of encampment might be separated both horizontally and/or vertically through slight shifts in camp location within the site (that is, the "generalized resource area") and through natural processes of sediment and debris accumulation (soil development, alluvial and colluvial deposition, and accumulation of human refuse).

To insure recovery of data useful in building a cultural chronology, reconstructing the paleoenvironment, and defining prehistoric subsistence pursuits, a program of "vertically controlled recovery of data from extensive horizontal excavation at numerous sites" was recommended for Phase I investigations at Choke Canyon's prehistoric sites (*ibid.*:226). At sites not amenable to subsurface exploration, surface artifact collections were suggested. Besides yielding data applicable to the general problems outlined above, the excavations and surface collections would permit elucidation of local prehistoric settlement patterns, "locally distinctive lithic technological processes and tool forms," and patterns of tool utilization.

It was around the THC recommendations that the CAR approach to the Phase I archaeological investigations at Choke Canyon was formulated. The technical procedures applied in the field and the subsequent laboratory analysis of collected data were intended, insofar as possible, to provide solutions to the problems recognized by the THC researchers and to generally elaborate on the current understanding of south Texas prehistory. In the main descriptive text and appendices of this report, data collected with a view toward accomplishing the research goals outlined above are presented.

TECHNICAL PROCEDURES

The methods used to investigate prehistoric sites during the Phase I research at Choke Canyon included site survey, excavation, mapping of site limits and surface features, and collection of surficially exposed artifacts. The data reported in this volume were generated through excavations and surface collections.

Excavations at many of the sites consisted of scattered 1-m^2 test pits intended to permit an assessment or evaluation of a site's potential for later extensive excavations. This level of effort is referred to as "limited testing." Progressively greater amounts of effort expended at a small number of other sites were termed "intensive testing" and, finally, "extensive excavations." Investigations at three of the sites visited during Phase I--41 LK 31/32, 41 LK 67, and 41 LK 202--evolved into the "extensive excavation" phase. In the Phase I Scope of Work (and subsequent modification), 41 LK 67 was listed as an intensive testing site. Sites 41 LK 31/32 and 41 LK 302 were scheduled for minimal testing. Results of investigations at those sites are presented in Volumes 7 (Brown, Potter, Hall, and Black 1982) and 8 (Scott and Fox 1982) of the research series.

Also during Phase I, cultural remains were gathered from site surfaces using methods which resulted in either "provenienced" or "unprovenienced" collections depending upon individual conditions encountered at each site. The technical procedures for intensive testing, minimal testing, and surface collections are presented below.

INTENSIVE TESTING

Three sites--41 LK 41, 41 LK 59, and 41 MC 222--were intensively tested during the course of Phase I investigations. At all three sites, grid systems were placed to provide horizontal provenience controls. Arbitrary datums were established to provide vertical provenience controls. Site limits, based on distribution of surface artifacts, were mapped using an alidade and plane table. Controlled excavations took place in one or more blocks of 1-m^2 units with a minimum of 4 m^2 and maximum of 14 m^2 to the unit block. Surface artifacts were gathered using both provenienced and unprovenienced collection methods at the intensive testing sites. An especially large provenienced surface collection was made at 41 LK 41. At 41 LK 41 and 41 LK 59, transects of backhoe trenches were excavated at intervals down the length of each site.

Intensive testing may thus be generally distinguished from limited testing by the greater number of controlled excavation units, the formal placement of grids and datums providing horizontal and vertical provenience controls, more careful attention to definition of site boundaries and distribution of surface remains, and the excavation of backhoe trenches. These distinctions are not exclusive, however. No backhoe trenches were excavated at 41 MC 222, while four trenches were placed on 41 LK 201, a limited testing site.

Investigations at the intensive testing sites began with comprehensive ground inspection of site surfaces. Photographs were taken to document site appearance prior to archaeological investigation. Using flagging tape, the limits of surface artifact scatters were marked and later recorded on plane table maps. Surface artifacts having potential as time or function diagnostics were marked and left in place for a later provenienced collection.

Once a site was thoroughly reconnoitered, a wooden stake was arbitrarily placed at a convenient location within site limits and assigned metric coordinates of N1000 E1000 (41 LK 41 and 41 LK 59) or N100 E100 (41 MC 222). This stake became the primary horizontal datum from which baselines for a grid system emanated. North-south baselines were established by centering a survey transit over the primary datum and orienting it to magnetic north (declination from true north was 9° east in 1968). East-west lines were then set by rotating the transit 90° from magnetic north. Other lines and units were set off the baselines using both the transit and measuring tape triangulation. Grid coordinates increased to the north and east. The basic unit of excavation was a one meter square, each unit being designated by the grid coordinates at its southwest corner. Vertical controls were established by driving a steel spike into the trunk of a large tree located near the major excavation areas at each site. These vertical datum spikes were assigned arbitrary elevations of 100 m. All elevations were taken relative to the primary vertical datum spike with the aid of the survey transit and leveling rod.

Concurrent with the placement of grid baselines at 41 LK 59 and 41 LK 41, numerous backhoe trenches were excavated down the length of each site as a means of determining more precisely their horizontal and vertical extent and to isolate areas within the sites where controlled hand excavations would be most productive. Trench excavations were constantly monitored by one or more members of the field crew. In brief notes, the following information was recorded for each trench: (1) dimensions; (2) vertical changes in soil, color, texture, or consistency; and (3) character and density of subsurface cultural remains. Artifactual material seen in backdirt piles was collected and bagged for each trench.

At 41 LK 41 and 41 LK 59, controlled excavations were placed primarily on the basis of findings made in backhoe trenches and secondarily on the distribution and character of surface cultural debris observed on each site. Excavations at 41 MC 222 were located on the basis of surface observations. Prior to commencement of excavations in each 1-m^2 unit, surface elevations were taken to provide a record of localized topography before any alterations took place. Matrix was removed from units by hand excavation using shovels and trowels. At 41 LK 41 and 41 LK 59, units were excavated in arbitrary vertical increments of 10 cm. Using the transit and stadia, floors were leveled on even increments of 10 cm relative to the primary datum elevation of 100 m (such as 99.40, 99.30, etc.,). Each level was also given a consecutive number starting with Level 1 at the top and so forth on down to the bottom of the unit. Excavated matrix was dry screened through 1/4-inch mesh hardware cloth. All material (except roots, modern wood fragments, animal droppings, insects, insect parts and residues, worms, and fragments of large land snails (*Rabdotus*) screened from excavated matrix was collected. The collections from each level were placed in paper bags labeled with the following information: site number, unit coordinates, level (both the level number and its top and bottom elevations), names of excavators and screeners, and the date of excavation. In each level, a block of matrix with approximate dimensions of 10 x 10 x 10 cm was left unexcavated in the southwest corner of the unit. Termed a Constant Volume Sample (CVS), this block of earth was removed and placed in paper bags labeled as above with the additional notation of "CVS." The CVS samples were collected for later laboratory analyses of microfauna, pollen and phytoliths, for soil chemistry research, and for sediment size studies. At 41 MC 222, these same procedures were applied except that most units were excavated in arbitrary levels of 5 cm rather than 10 cm.

As a general rule, the exact provenience of artifacts and other cultural debris encountered as excavations proceeded was not recorded unless there was reason to believe that the objects were constituents of definable habitational or activity features. Elements of features, such as hearthstones, mussel shell, snail shell, animal bone, chipped stone tools, debitage, and soil discolorations, were left *in situ*. Such features were recorded on measured plan and profile sketches and were photographed using both color and black-and-white film. Matrix samples were collected from most features for purposes similar to the CVS samples described above. In most cases, features were cross-sectioned to establish presence or absence of subsurface structure.

Carbon encountered in fill and in features was collected and placed in sealed foil pouches labeled with appropriate provenience information. Large chunks of charcoal having potential for wood species identification purposes were wrapped in tissue paper and placed in plastic vials labeled with provenience data. Fragile materials recovered in excavations, such as bone and modified shell, were also wrapped in tissue and foil or placed in boxes for added protection during transport back to the laboratory.

In addition to the constant volume and feature matrix samples, column matrix samples were collected from one or more of the unit blocks at each intensive testing site upon conclusion of excavations. Columns were located on unit walls having profiles more-or-less representative of the excavation area in general. Obviously disturbed deposits were avoided. Prior to removal of the samples, the profiles were sketched and photographed. Exact column locations and vertical collection increments were recorded on the measured profile drawings. Twin samples, one for pollen analysis and one for soil chemistry analysis, were taken from the columns. Each sample was taken from a block 10 cm thick, 20 cm wide, and 10 cm deep in the profile face. The vertical 10-cm increments corresponded to the vertical levels excavated from units in each area. Samples were placed in plastic-lined paper bags labeled with appropriate provenience information.

Written records included a daily journal, general site notes, level records, feature records, and a photographic journal. The daily journal was kept by the field director. In it were recorded a summary of each day's activities and a general discussion of findings. At each site investigated, the assistant field director wrote a general description of the site, including such things as landform setting, vegetation, character of the cultural remains, site condition, and research activities carried out. The most copious written records were the level forms or notes filled out upon conclusion of each level of excavation. On these forms the basic observations and findings made in each level were detailed. When features were isolated in the level, the level record was augmented by feature descriptions and measured plan drawings. In the photographic journal, the subject, exposure number, photographer, and date were recorded for each photograph taken during the course of Phase I investigations.

Upon conclusion of excavations at 41 LK 41 and 41 LK 59, all units and trenches were mechanically backfilled.

MINIMAL TESTING

Beyond producing data applicable to the research goals outlined above, the Phase I minimal testing program at Choke Canyon was intended (1) to gather information permitting selection of sites suitable for future (Phase II) extensive excavations and (2) to preserve samples of cultural material and related data from the sites in the event that they were not selected for additional investigations prior to inundation.

The results of minimal testing efforts at 34 prehistoric sites are reported. At each of these sites, from one to seven 1-m^2 test pits were excavated. Before excavations commenced, minimal testing sites were thoroughly reconnoitered to establish site limits, flag artifacts to be collected, and select locations for test pits. Test pit location was based on the distribution and density of surface cultural debris and on findings made in shovel tests. Shovel tests were done with the sole purpose of very quickly determining the depth and character of cultural deposits on the site. They were usually dug without regard for vertical control, and matrix was not screened. Whenever possible, test pits were placed in apparently uneroded and otherwise undisturbed areas on the sites. Such locations were often immediately adjacent to gullies or deflated areas where substantial amounts of cultural debris were evident on the surface.

Most of the test pits were oriented to magnetic north with a Brunton compass. The 1-m^2 test units were staked using measuring tape triangulation. Vertical measurements were taken relative to the ground surface at the southwest corner of the unit with the aid of a level line and measuring tape. In all other respects, the technical procedures applied to minimal testing sites were the same as those described above for intensive testing sites. All test pits were backfilled.

SURFACE COLLECTIONS

Surface collections of varying intensities were performed at almost all of the prehistoric sites investigated during the course of Phase I field work. There were 63 sites where a surface collection was the only investigative procedure carried out. Among these, collections at 17 sites were "provenienced," that is, the exact location of each item collected was recorded. Unprovenienced collections were made at the remaining 46 sites.

Surface collection sites were first thoroughly inspected by the field crew. The crew would divide up, each person or group being responsible for inspection of different areas within the site. Degree of coverage was variable depending on surface visibility, density of brush cover, extent and severity of erosion and deflation, and time available for the investigation. Record was made of general site characteristics such as landform setting, vegetation, surface condition, and nature and extent of cultural materials seen on the site. As the site was walked over, artifacts believed to have potential as time or function diagnostics were flagged to permit quick relocation. Locations of features such as hearths, mussel or snail shell concentrations, fire-fractured rock concentrations, and chipping stations were also marked.

As initial inspections in different areas of a site were completed, the crew reconvened and discussed their findings. The field director then decided which type of collection, either provenienced or unprovenienced, would be made at the site. As can be seen from the figures presented above, the decision reached at over two-thirds of the sites was to make unprovenienced collections.

On provenienced surface collection sites, locations of individual artifacts were recorded on maps produced with a plane table, alidade, and leveling rod. After the provenience of an artifact was recorded on the map, the object was placed in a paper bag labeled with the site number, and the abbreviation "PTM" (for Plane Table Mapped) followed by a consecutive unique number. This same unique number was recorded on the plane table map. The location and extent of surface features were also recorded on the site maps. Notes were taken describing the character of such features and associated materials. In cases where it appeared that cultural debris scattered around a feature might yield significant information, collection units of appropriate size were laid out and their limits recorded on the site plan. Collection units were distinguished by letter designations such as "Area A," "Area B," and so on. Materials gathered from within the collection units were placed in paper bags labeled with the site number and area designation.

MAPPING

During the Phase I archaeological investigations at Choke Canyon, extensive topographic mapping was unnecessary since the USBR provided excellent map coverage for the entire reservoir. Maps with a contour interval of two feet were available for all of Choke Canyon. A second set of maps, covering only an area of roughly 5000 acres in the dam and borrow areas, was drawn with a 50-cm contour interval. On both sets of maps, presentation of modern cultural features such as roads, houses, fencelines, and utility lines was extremely detailed and accurate. On all plane table and alidade maps produced during Phase I investigations, site limits, archaeological grids, test pit locations, provenienced artifacts, and surface collection units were "tied-in" to distinctive modern cultural features (fence and road intersections, specific utility poles, houses, wells, etc.) appearing on the USBR maps. By this means, the relationship between sites and local topography was recorded. Though the modern features used in this mapping process will, for the most part, be removed before the reservoir fills, it will still be possible to relocate any point of archaeological interest preserved on these maps using Modified Texas State Plane Coordinates, the grid system superimposed on the USBR maps. In addition, site markers consisting of steel rods (one inch in diameter, 12 inches in length) set in concrete were placed on many of the sites and their locations recorded on the site maps. Many of the markers will be replaced with some type of permanent monument prior to inundation.

LABORATORY PROCESSING

Materials collected in the field were brought back to the CAR laboratory at The University of Texas at San Antonio on a weekly basis. Each bag of material was assigned a catalogue lot number which was initially written on the outside of the bag. Each site had a separate sequence of consecutive lot numbers, the first number assigned for the site being "Lot 1" and so on. On sites where excavations took place, the aggregate of material from each level of each unit of excavation was assigned a lot number. Whenever possible, material collections from levels were assigned lot numbers in the same sequence as they were removed from the unit. Surface-collected materials were assigned individual lot numbers. For provenienced surface artifacts, the lot number was followed in parentheses by the artifact's Plane Table Map (PTM) number.

Materials that would not be harmed by immersion were washed in tap water and then air dried. Particularly fragile items were dry cleaned by hand. Ceramic sherds were gently washed, but not brushed. Carbon sample packets were opened and the contents allowed to dry thoroughly before being resealed.

After being washed and dried, materials in each lot were sorted into analytical classes. These classes are listed on a sample Material Analysis Form presented as Figure 103 in Appendix VI. Two record forms were then filled out for each lot of material. On a lot catalogue form, a very general listing of materials represented by each lot number was made. On a second record--the Material Analysis Form mentioned above--precise counts, weights, and measurements were recorded for materials in the various analytical classes. This form was structured to accommodate transfer of data from form to computer.

After their counts and weights were recorded, tuff, sandstone, fire-fractured rock, and pebbles from general level collections were then discarded. Larger objects (primarily lithic artifacts) to undergo later special studies were labeled in ink with site, catalogue, and (if appropriate) PTM numbers. Labels were then coated with clear varnish. Many of the large ceramic sherds were also marked in this way, a procedure that hindered later analysis of the sherds. Classes composed of numerous smaller specimens, such as chert debitage, mussel shell, snail shell, and bone were enclosed in plastic bags labeled with site and lot number.

A great number of CVS's were collected and transported from the field to the lab. The samples were found to be too numerous for effective analysis and much too bulky for permanent storage. Samples from at least one unit of every excavated site, usually the deepest and/or most productive, were sorted out and set aside. The remaining CVS's were discarded. Portions of the samples retained for study were water washed through nested fine screens, and other portions were submitted for soil chemistry analysis. Small portions of each CVS retained after the initial discard of samples are stored in the permanent collection. All feature matrix samples were saved. Results of fine screening and soil chemistry analysis are presented elsewhere in this report.

After completion of special studies whose procedures are described in later sections of this report, much of the Phase I collection was segregated by material class (such as debitage, faunal remains, land snail, mussel shell, chert cores, etc.) and stored in pasteboard boxes. The boxes are labeled with "Choke Canyon Phase I," the type of material contained, and the numbers of the sites from which the enclosed materials were collected. Artifacts most likely to be in demand for future comparative purposes are stored in drawered cases for easy access.

All notes, plan maps, drawings, photographs, and material collections generated during Phase I archaeological investigations at Choke Canyon will be permanently housed in the facilities of the Center for Archaeological Research, The University of Texas at San Antonio. Also housed at The University of Texas at San Antonio are the notes, photographs, and material collections resulting from the archaeological survey of Choke Canyon conducted by the Texas Historical Commission (Lynn, Fox, and O'Malley 1977). A small amount of material collected at Choke Canyon during early studies carried out by the Texas Archaeological Salvage Project (Wakefield 1968) and the Coastal Bend Archeological Society is housed at the Texas Archeological Research Laboratory, Balcones Research Center, The University of Texas at Austin.

THE PHASE I SITE INVESTIGATIONS

Information collected at 116 sites during the course of Phase I investigations at Choke Canyon is presented. In reaching this total, 41 LK 31 and 41 LK 32 (found to be a single site) are counted as two sites and 41 LK 48/41 MC 30 (one site crossing the Live Oak-McMullen County line) is counted as two sites. The extensive excavation sites--41 LK 31/32, 41 LK 67, and 41 LK 202--receive only brief mention in this discussion.

For descriptive purposes, the sites have been arbitrarily divided into 16 groups based for the most part on their geographic proximity to one another. The site groups are dealt with in an order that proceeds generally from east to west, starting in the Choke Canyon Dam area and then extending up the Frio River valley to the western end of the reservoir basin. For each group, individual site discussions are prefaced by a listing of sites comprising the group, the investigative procedures applied at each, and a general description of the area containing the group. Locations of sites included in this discussion, as well as other known prehistoric and historic sites at Choke Canyon, are shown in Figure 1 (folded insert).

The artifacts and other material remains recovered from the sites and the results of special studies performed on certain categories of material (such as carbon, faunal remains, ceramics, and lithics) are given only brief mention in this section. Detailed information on material recovery and results of special studies is provided in later sections. For some of the artifacts mentioned below--most often chipped stone specimens--group, form, and specimen numbers are sometimes provided. These numbers relate the artifacts to the organizational scheme used in the descriptive sections further on in the report. Also mentioned are data tables and special studies presented in Appendices III, V, and VII. In particular, the Material Analysis Records in Appendix IX are frequently referenced or summarized in this section.

SITE GROUP 1

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
41 LK 31/32	41 LK 59	41 LK 91	41 LK 64	41 LK 198
41 LK 202	41 LK 41	41 LK 34	41 LK 197	
		41 LK 201		

Site Group 1 consists of ten prehistoric sites located immediately west of the dam on the south side of the Frio River. The area containing the sites measures about 2.0 km north-south and 3.3 km east-west. The bedrock deposit in the site group area is the Catahoula Formation. The major landform features in the area include the river, a relatively flat expanse of floodplain, an abandoned river channel (slough), two upland drainages, and a segment of valley margin grading into the uplands.

Much of the land surface in the area is open and was in active use as pasture or cropland at the time site investigations took place. Along the river channel, comprising the northern boundary of this study area, was a narrow band of riparian forest. Scattered thickets of mesquite trees, some very large, and other lowland brush species occurred back away from the river. Branching from the active river channel just northwest of 41 LK 201, a pronounced slough channel swings southward through the heart of the area and then rejoins the Frio River downstream in the vicinity of 41 LK 90 and 41 LK 91. This slough channel was heavily wooded down its entire length with mesquite, elm, retama, and oak as well as an understory of other woody brush species. Trending north to the river from the valley margin east of 41 LK 64, an upland drainage named Charley York Hollow feeds into the slough channel as it passes between 41 LK 90 and 41 LK 91. The area containing Charley York Hollow, the northeastern end of the slough, and sites 41 LK 64, 41 LK 90, and 41 LK 91, was heavily infested with mesquite, cactus, and low brush. Site 41 LK 64 rests on a portion of the valley margin marking the sloping transition from floodplain to upland. Tuffaceous sedimentary rocks of the Catahoula Formation are exposed in the 41 LK 64 area. Extensive deposits of lag gravel occur as a surface pavement over much of this portion of the valley side. The area is covered with a dense growth of mesquite, cactus, blackbrush, guajillo, and other brush species.

41 LK 59

Site 41 LK 59 is situated on a low natural levee along the south (right) bank of the slough channel. The site is on the floodplain roughly equidistant (ca. 1 km) between the Frio River and the valley margin. It lies in an open field that was actively farmed until a short time before Phase I archaeological investigations began. Short grasses and weeds formed a moderate to heavy ground cover as the investigation began. Along the edges of the slough grew a thick stand of large huisache trees and smaller retamas. Small mesquites and cactus were present, but not common (Fig. 2,a).

The investigation at 41 LK 59 took place in July 1977 and was carried out over a period of 15 work days by a field crew of ten persons (Table 1). Initial reconnaissance of the site revealed four surface concentrations of prehistoric debris occurring in a 50-m-wide band paralleling the slough channel for a distance of about 600 m east-west. The site defined by the CAR crew (ca. 50 x 600 m) was much smaller than as it was recorded by the THC survey crew (ca. 250 x 900 m). In addition, the eastern end of the site was set approximately 300 m farther east than was first recorded. Careful surface inspections and extensive backhoe trenching in areas south and west of the site limits as defined by CAR (but still within the THC boundary) yielded no evidence warranting boundary expansion (Fig. 3).

Following the topography of the natural levee containing the site, the surface of 41 LK 59 rose gradually from east to west. There was a gradual slope down to the slough channel on the north side and into a gentle swale on the south side. Starting at the east end of the site, the first two concentrations of cultural debris were designated Area A. On the west, the next two surface concentrations were designated Area B and Area C. Preliminary observations indicated that Area A was evidenced mainly by fire-fractured rock and tuffaceous sedimentary rock. Area B contained more debitage than Area A and less burned rock. Area C had more mussel and snail shell showing on the surface than did the other two areas.

The primary horizontal datum, designated N1000 E1000, was placed south of Area A. An east-west baseline was laid out extending to E1125 at the east end of Area A and to E550 near the west end of Area C. A vertical datum spike was driven into the trunk of a huisache tree north of Area C and assigned an arbitrary elevation of 100 m. An absolute elevation of 51.987 m above mean sea level (msl) was later calculated for this datum by USBR surveyors.

Excavations commenced with the placement of three 1-m^2 test units, two in Area A and one in Area B. Coordinates for these three units were N1032 E1116, located in the small surface concentration at the east end of Area A; N1010 E949 near the west end of Area A; and N1010 E857 in Area B.

TABLE 1. SITES BY GROUP AND PERSON HOURS EXPENDED IN FIELD INVESTIGATION

SITE NO.	SITE GROUP	PERSON HOURS
41 LK 59	1	998
41 LK 41	1	1187
41 LK 64	1	122
41 LK 91	1	72
41 LK 34	1	70
41 LK 201	1	246
41 LK 197	1	54
41 LK 198	1	2
41 LK 31/32*	1	1783
41 LK 202*	1	94
41 LK 67*	2	1700
41 LK 8	2	112
41 LK 13	2	82
41 LK 69	2	105
41 LK 9	2	68
41 LK 10	2	30
41 LK 97	2	2
41 LK 207	3	58
41 LK 203	3	5
41 LK 204	3	65
41 LK 205	3	25
41 LK 206	3	25
41 LK 14	4	115
41 LK 15	4	182
41 LK 17	4	135
41 LK 77	4	33
41 LK 18	4	18
41 LK 75	4	25
41 LK 65	4	5
41 LK 20	4	10
41 LK 27	4	54
41 LK 85	5	20
41 LK 94	5	124
41 LK 92	5	4
41 LK 93	5	2
41 LK 87	6	66
41 LK 88	6	80
41 LK 51	6	207
41 LK 53	6	199
41 LK 52	6	20
41 LK 86	6	8
41 LK 50	6	1

SITE NO.	SITE GROUP	PERSON HOURS
41 LK 74	7	158
41 LK 73	7	124
41 LK 48 (MC 30)	7	150
41 LK 49	7	8
41 MC 48	7	1
41 MC 50	7	8
41 MC 189	8	8
41 MC 10	8	12
41 MC 13	8	142
41 MC 31	8	84
41 MC 8	8	12
41 MC 9	8	60
41 MC 14	8	6
41 MC 33	8	10
41 MC 11	8	35
41 MC 223	8	6
41 MC 39	9	150
41 MC 41	9	40
41 MC 177	9	120
41 MC 40	9	16
41 MC 45	9	16
41 MC 44	9	16
41 MC 43	9	6
41 MC 42	9	6
41 MC 36	9	16
41 MC 24	10	71
41 MC 22	10	12
41 MC 176	10	26
41 MC 29	10	137
41 MC 25	10	30
41 MC 26	10	30
41 MC 28	10	10
41 MC 174	10	20
41 MC 55	11	198
41 MC 54	11	2
41 MC 224	11	2
41 MC 56	11	44
41 MC 57	11	50
41 MC 58	11	1
41 MC 59	11	1
41 MC 65	12	76

SITE NO.	SITE GROUP	PERSON HOURS
41 MC 64	12	69
41 MC 68	12	25
41 MC 67	12	18
41 MC 53	13	8
41 MC 52	13	8
41 MC 184	13	0
41 MC 92	14	0
41 MC 93	14	0
41 MC 91	14	0
41 MC 90	14	0
41 MC 94	15	82
41 MC 95	15	16
41 MC 84	15	90
41 MC 69	15	9
41 MC 86	15	54
41 MC 171	15	8
41 MC 18	16	8
41 MC 19	16	224
41 MC 15	16	309
41 MC 17	16	62
41 MC 72	16	4
41 MC 74	16	32
41 MC 78	16	32
41 MC 75	16	152
41 MC 79	16	12
41 MC 222	16	310
41 MC 80	16	2
41 MC 219	16	2
41 MC 220	16	4
41 MC 83	16	2
41 MC 88	16	3

*Hours expended during Phase I only. Does not include extensive excavation time. See Volumes 7 and 8 (Brown, Potter, Hall, and Black 1982; Scott and Fox 1982) of the research series for additional information.

Figure 2. *Photographs of 41 LK 59.*

a. View north from State Highway 72 to 41 LK 59. The site lies along the treeline on the horizon.

b. View south of excavations in progress at Area C of 41 LK 59.

c. Feature 1 found in Area C excavations at 41 LK 59. Stones are composed of Catahoula tuffaceous sedimentary rock. Note mussel shells.

d. Cross section of Feature 1 in Area C at 41 LK 59.

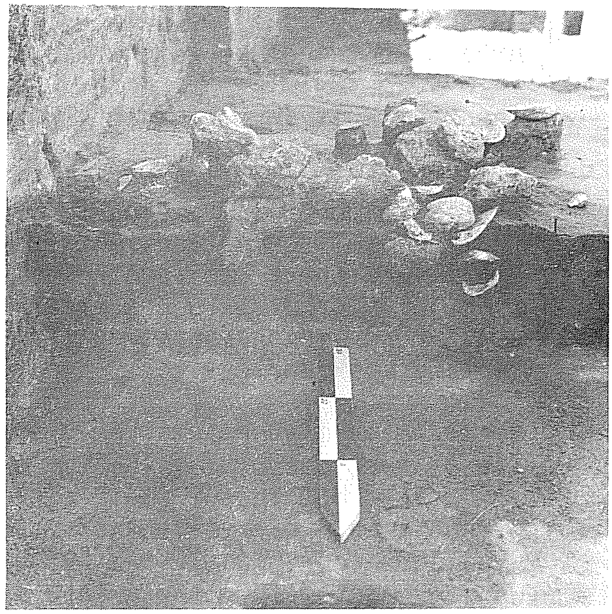
e. Typical soil profile along north wall of Area C excavation at 41 LK 59.

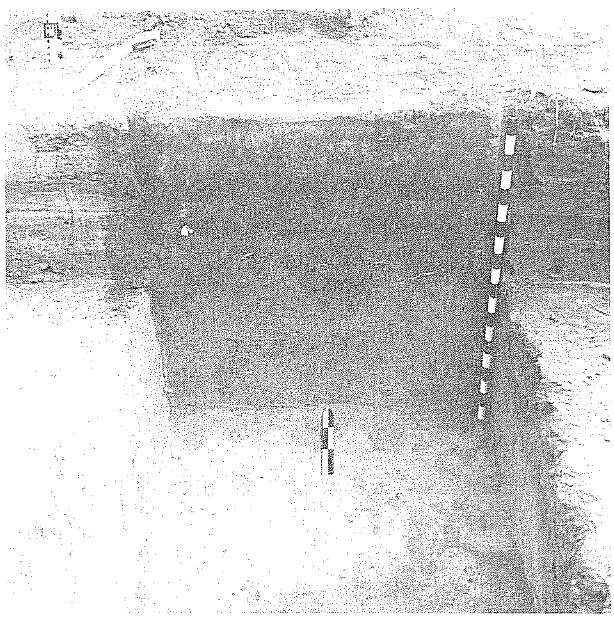
f. Feature 2 found in Area B excavations at 41 LK 59.


a


b


c


d


e


f

Concurrent with excavation of the three test units, a series of backhoe trenches was excavated in transects set perpendicular to the long (east-west) axis of the site. Three transects totaling 13 trenches were excavated in and around Area A. The same number of trenches was placed in and around Area B. One transect of five trenches ran through Area C. Fourteen other trenches were dug to the west between Area C and the Schwartz-Naylor property line. In general, these trenches revealed a very close correspondence in the distribution of surface and subsurface remains. Substantial subsurface deposits of cultural material occurred only within the area delimited by surface debris scatters.

In both test units and backhoe trenches, Area A yielded only scant amounts of tuffaceous sedimentary rock, fire-fractured rock, mussel shell, land snail shell, and debitage. Contained in a matrix of dense, very compact gray or gray-brown silty clay, cultural materials were recovered only in the top 30 cm of deposit in Area A. Backhoe trenches placed in Area A, averaging about 1.5 m in depth, revealed very little subsurface cultural debris, none of which occurred more than 30 cm below surface. These findings indicated that further effort in Area A would not be worthwhile.

The test unit and trenches in Areas B and C revealed somewhat more productive subsurface cultural deposits. At a higher elevation on the levee than Area A, Areas B and C contained cultural debris to a depth of 50 cm below surface in a matrix of moderately compact, gray to gray-brown sandy clay. Debris recovered included tuffaceous sedimentary rock, fire-fractured rock, mussel shell, *Rabdotus* shell, and chert debitage. The quantities of materials recovered were substantially greater in the Area B test unit than in Area A. Trench 29 in Area C cut through a concentration of mussel shells with associated tuffaceous sedimentary rock and debitage.

Based primarily on a markedly greater amount of surface materials in the immediate area, a block of 15 1-m^2 excavation units (3 m north-south, 5 m east-west) was staked out in the south central part of Area B. Coordinates at the corners of the Area B excavation were N981 E823 (southwest), N981 E828 (southeast), N984 E828 (northeast), and N984 E823 (northwest). Forty-six 10-cm levels were excavated from the Area B units, each unit being taken down three and occasionally four levels (ca. 30 to 40 cm below ground surface).

As the Area B units were being excavated, no cultural stratigraphy was recognized either by differential rates of material recovery vertically through the deposit or by visually perceptible layering of the deposit in unit wall profiles. In the laboratory, quantification and analysis of material recovery from Area B produced no clear-cut distinctions in rates of vertical recovery. Combined unit and level recovery, by selected material classes, for the Area B excavations was as follows:

Tuff Rock Weight* (grams)	5651
Fire-Fractured Rock Weight** (grams)	747
Mussel Shell Umbo Count	126
Mussel Shell Weight*** (grams)	270
Rabdotus Shell Count****	386
Bone Weight (grams)	0
Primary Flake Count	21

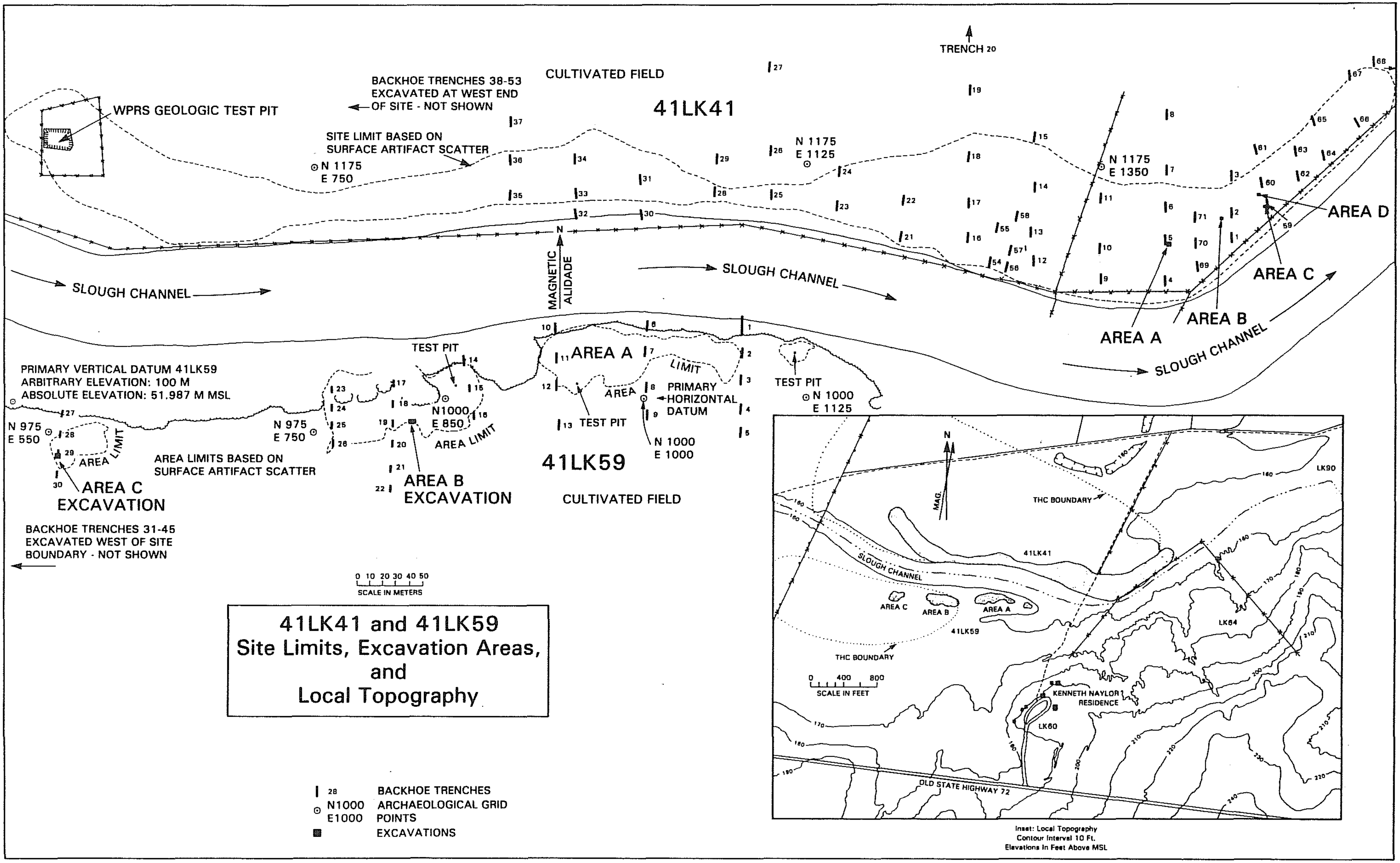

41LK41 and 41LK59
Site Limits, Excavation Areas,
and
Local Topography
41LK41
41LK59
CULTIVATED FIELD
BACKHOE TRENCHES 38-53
EXCAVATED AT WEST END
OF SITE - NOT SHOWN
WPRS GEOLOGIC TEST PIT
SITE LIMIT BASED ON
SURFACE ARTIFACT SCATTER
N 1175
E 750
N 1175
E 1125
N 1175
E 1350
TRENCH 20
AREA D
AREA C
AREA B
AREA A
SLOUGH CHANNEL
MAGNETIC
ALIDADE
N
PRIMARY VERTICAL DATUM 41LK59
ARBITRARY ELEVATION: 100 M
ABSOLUTE ELEVATION: 51.987 M MSL
N 975
E 550
N 975
E 750
TEST PIT
N1000
E 850
AREA LIMIT
AREA A
LIMIT
AREA
PRIMARY
HORIZONTAL
DATUM
TEST PIT
N 1000
E 1125
N 1000
E 1000
AREA LIMIT
AREA LIMITS BASED ON
SURFACE ARTIFACT SCATTER
AREA C
EXCAVATION
AREA B
EXCAVATION
CULTIVATED FIELD
BACKHOE TRENCHES 31-45
EXCAVATED WEST OF SITE
BOUNDARY - NOT SHOWN
0 10 20 30 40 50
SCALE IN METERS
28 BACKHOE TRENCHES
N1000
E1000 ARCHAEOLOGICAL GRID POINTS
EXCAVATIONS
THC BOUNDARY
41LK41
SLOUGH CHANNEL
AREA C
AREA B
AREA A
41LK59
THC BOUNDARY
LK90
LK64
MAG.
0 400 800
SCALE IN FEET
KENNETH NAYLOR
RESIDENCE
LK60
OLD STATE HIGHWAY 72
Inset: Local Topography
Contour Interval 10 Ft.
Elevations In Feet Above MSL

FIGURE 3

Secondary Flake Count	167
Tertiary Flake Count	357
Chip Count	586

The following notes apply to all material recovery listings presented in this section.
*This category contains the various types of tuffaceous sedimentary rocks (sandstone, siltstone, mudstone) derived from the Catahoula Formation. "Tuffaceous sedimentary rock(s)" and "tuff rock(s)" are terms used interchangeably in the text.
**Throughout this volume, the category of "Fire-Fractured Rock" represents a combination of apparently nonartifactual chert, quartzite, and petrified wood broken as a result of being burned.
***"Mussel Shell Weight" represents a combination of umbos and nonumbo shell fragments.
****Count of whole shells only.

Counts and weights of materials in each class are provided on a unit and level basis in the Material Analysis Records, Appendix IX.

One feature was defined during the course of excavations in Area B. Feature 2 consisted of a loose cluster of about 25 pieces of tuff rock occurring in a single layer midway through Level 2 (98.80 to 98.70 elevation) in units N982 E825 and N983 E825. The feature was not very well integrated, the rocks being strewn over an arcuate area measuring 35 cm on an east-west axis and 95 cm southeast to northwest (Fig. 2,f). The rocks were fist size and smaller (3 to 15 cm) and weighed a total of 2964 g. The rocks showed signs of thermal alteration (reddish gray color and fracturing), but no carbon was found in the feature. There was no apparent patterning of debris around this feature. All materials were distributed more-or-less uniformly across the excavation, including the two units containing Feature 2.

Artifacts recovered in the Area B excavations included six chert cores, a thick biface fragment, four thin biface fragments, one trimmed flake, one small sandstone grinding slab fragment, and one subrectangular piece of mussel shell shaped by intentional cutting. Five of the six chert cores found in Area B were classified as core nuclei (Group 6), that is, cores reduced down to such a small size that further flake removals would have been impractical. This is an unusually large number of such cores to come from a relatively small excavation area. One of the thin biface fragments was a small dart point lacking its stem (Group 1, Form 6, Spec. 6) recovered from Level 1 of Unit N982 E823.

In Area C, 15 contiguous 1-m^2 units were staked adjacent to Backhoe Trench 29 where a substantial deposit of mussel shell was observed in the trench walls. The Area C unit block measured 5 m along its west side and 4 m along the south side. The north and east walls were 2 m in length. Corners of the unit block were placed at N954 E555 (southwest), N954 E559 (southeast), N956 E559, N957 E558, and N959 E557 (stair-stepped northeast corners), and N959 E555 (northwest). Eighty 10-cm levels were excavated in the Area C units. Nine units went down six levels. Five units went down five levels. Only one level was removed from Unit N956 E557 (Fig. 2,b).

Deposits containing cultural debris went 20-30 cm deeper in Area C than they did in Area B. The greatest amounts of material were recovered from Levels 2-5 in most of the units. As in Area B, no cultural stratigraphy could be discerned in the Area C excavations. Combined unit and level recovery for selected classes of material in Area C was as follows:

Tuff Rock Weight (grams)	5466
Fire-Fractured Rock Weight (grams)	784
Mussel Shell Umbo Count	4729
Mussel Shell Weight (grams)	15,777
Rabdotus Shell Count	1116
Bone Weight (grams)	2
Primary Flake Count	12
Secondary Flake Count	152
Tertiary Flake Count	136
Chip Count	173

Counts and weights for materials in each class are provided on a unit and level basis in the Material Analysis Records, Appendix IX.

A tight subcircular cluster of approximately 20 tuff rocks and about 16 mussel shell valves was found on a surface midway through Level 4 (98.90 to 98.80 elevation) of Units N955 E556 and N956 E556. Designated Feature 1, this single layer concentration of rock and shell had a diameter of 44-45 cm (Fig. 2,c). Rocks in the feature averaged 4-10 cm in diameter and weighed 2400 g. They were dark gray in color and not fractured. Mussel shell was concentrated in the western half of the feature. The feature was cross-sectioned along an east-west line. No underlying structure such as a basin or additional rocks was recognized in the feature cross section (Fig. 2,d). A small amount of carbon--a quantity insufficient for radiocarbon assay--was collected from amidst the rock and shell of the feature as it was removed.

Analysis of material distributions in Area C produced no truly distinct patterning of materials across the unit block. Substantial quantities of material from most categories occurred in most of the levels excavated. Some general trends were indicated, however. Vertically, more material was collected from Levels 4 and 5 than in levels above and below. The greatest concentrations of rock and mussel shell umbos occurred in a row of three units running north from Feature 1 (N956 E556, N957 E556, and N958 E556). These units paralleled the western edge of Trench 29 where much mussel shell was observed in profile. The data suggest that there is patterning to the distribution of materials in Area C, but the excavations were simply not extensive enough to permit a meaningful projection of prehistoric activities over this area of the site.

The north wall profile of Unit N958 E556 in Area C provided significant information concerning the condition of cultural materials vertically through the Area C deposit. The profile measured one meter from ground surface to unit floor (Fig. 2,e). Two distinct soil zones were recognized in the profile based on a color contrast. The upper zone, containing all of the cultural debris, extended from the ground surface to a depth of 50 or 60 cm. It consisted of a uniformly dark grayish brown sandy clay. The lower zone went from 60 cm to the bottom of the profile. It was also a sandy clay, but light brown in color. The profile of the upper soil zone contained a large amount of mussel shell with lesser amounts of debitage and rock. Based on size of mussel shell fragments, the upper soil zone in Area C was divided into three subunits. In a layer from ground surface down 15 or 20 cm, mussel shell fragments were 1 cm or less in length. From 20-40 cm below ground surface, shell fragments were 2-5 cm in length. Between 40-50 cm below surface, whole shells and shell fragments greater than 5 cm in length were common. The variation in shell size down through this profile in Area C was attributed to the effects of cultivating equipment used during the years that the site surface was farmed.

Artifacts recovered in the Area C excavations included seven chert cores (one Group 1, three Group 3, one Group 5, one Group 6, and one Group 10), one thin biface fragment (Group 10), and one distally beveled biface (Group 9, Spec. 7). Most of the cores were found in Levels 4 and 5 of units around and north of Feature 1. The thin biface fragment came from Level 1 of N958 E556. Level 2 of N955 E557 yielded the distally beveled biface. Eleven pieces of mussel shell showing modifications, possibly intentional, were found in Area C. Of these, seven were perforated with small holes, three were notched, and one was shaped by cutting.

Three pieces of bone were recovered from Area C. These were (1) one turtle carapace fragment from Level 5 of N954 E556, (2) one freshwater drum otolith from Level 1 of N954 E558, and (3) the scapula of a Mexican ground squirrel (?) from Level 4 of N957 E556. These three bones were the only vertebrate faunal remains found in the 41 LK 59 deposits. It is assumed that much more bone once existed in the site, but soil conditions have not been conducive to preservation. The drum otolith and turtle carapace fragment, both quite durable, are assumed to be prehistoric aboriginal food residues. The fragile squirrel scapula is probably a modern introduction.

A very interesting object found in Level 6 of Unit N954 E557 in Area C was a well-rounded, extremely shiny pebble. It is speculated that this pebble was a gastrolith, perhaps of an alligator or large fish. Assuming that the pebble really is a gastrolith, there is no way of knowing how it may have arrived at 41 LK 59.

The chipped stone tool fragments, chert cores, and debitage recovered from 41 LK 59 represent a full lithic reduction sequence beginning with cortex-covered river cobbles and ending with flake tools and bifaces. Debitage was present in the following percentages (approximate):

Primary Flakes	2%
Secondary Flakes	20%
Tertiary Flakes	30%
Chips	44%
Chunks	4%

The total debitage count was 1685 specimens. Breakdowns of this total are provided in Appendix IX. In addition to the 13 cores from Areas B and C, there were also eight core fragments (Group 9) found in the excavations. The chert cobble source closest to 41 LK 59 is a short distance to the southeast in the vicinity of 41 LK 64 (Figs. 1, 3).

Although very few potentially time-diagnostic artifacts were recovered and no carbon samples large enough for radiocarbon assay collected, it is suggested that the prehistoric remains evidencing 41 LK 59 as a site were deposited during the Late Archaic. This suggestion is based on the relatively shallow depth of the site and the occurrence of a small stemmed dart point (with stem missing) along with a small distally beveled biface ("gouge") fragment.

Initial differences recognized among the three areas based on the character of surface remains were confirmed by trenching and controlled excavations. Backhoe trenching revealed that the surface distribution of material accurately reflected subsurface distribution of cultural debris. Area B, with more debitage on its surface than the two other areas, yielded much more evidence of flintknapping (cores, bifaces and biface fragments, and debitage) than did Area C. Much mussel shell was seen on the surface of Area C. Subsurface excavations in Area C yielded over 4700 mussel shell umbos and a total mussel shell weight of almost 16 kg.

The significance of the three distinct areas defined on the site is conjectural. Superficially, the differences in subsurface material recovery from Area B to Area C--especially with respect to debitage and mussel shell--would seem to indicate that certain activities were more-or-less specific to each area. Considering the size of the excavation blocks relative to the overall limits of each area, however, sampling bias is a distinct possibility. What is more, it is not possible to establish the exact temporal relationship of the areas to one another. They may have resulted from a single encampment in the area or they may represent three distinct episodes of activity. The number and duration of prehistoric encampments on the site could not be deduced from available data.

The discovery of two features in the 41 LK 59 excavations, one of them quite well integrated, indicates that modern farming practices have not had as disastrous an effect on the subsurface prehistoric remains as might have been predicted. It does appear, however, that there has been considerable vertical displacement of smaller objects through the deposit. This vertical movement is probably due in some part to bioturbation, but recent (post-1900) cultivation of the land is undoubtedly responsible for much churning of the remains. The condition of shells observed in the profile of Unit N958 E556 is particularly instructive with respect to the effects of soil tillage on the archaeological remains. Even though the remains are now scattered throughout 30-50 cm of deposit at 41 LK 59, it is likely that all remains were once contained in a subsurface zone not more than 20 cm thick. A fair approximation of the elevation of the "living surface" at the time of prehistoric cultural activity on the site is provided by the features found in Areas B and C. Feature 2 in Area B rested 19-24 cm below surface. Feature 1 in Area C occurred 36-42 cm below surface. The distinctions in thickness of cultural deposits and depth of features from Area B and Area C are attributed to differential rates of natural deposition and later deflation on the natural levee containing the site.

The mussel shell, *Rabdotus* land snail shell, and bones of turtle and freshwater drum are assumed to be the residues of foods consumed by Late Archaic people during their stay at the site. As noted in Appendix V, an overwhelming number of the identified mussel shells were of two species (*Lampsilis* sp. and *Cyrtonaias tampicoensis*), both relatively small shellfish inhabiting shallow water. The presence of 90 specimens of the mussel species *Carunculina parva* in the 41 LK 59 collection reinforces the belief that shallow water mussel beds were being harvested. Also, because *Carunculina parva* is such a small shellfish (ca. 25 mm in length), it might be inferred that aboriginal collecting techniques were indiscriminate with respect to the size of shellfish gathered. Some kind of scoop or dredge may have been used for collecting the mussels. Roasting of mussels preparatory to consumption might be inferred from the concentration of mussel shells found in Feature 1 of Area C. Considering the number of mussel shells found throughout the Area C excavations, the occurrence of shell in the feature might simply be coincidental to its actual function. The mussels, turtle, and drum may have come out of the slough along the north edge of the site, assuming that it was a more substantial body of water or perhaps even a flowing channel at the time the site was occupied. Indirect evidence of plant food processing at 41 LK 59 was provided by a small grinding slab fragment made of sandstone. The limited array of food residues recovered at 41 LK 59, most likely not representing the full compliment of foodstuffs actually consumed at the site, suggests reliance on nearby floodplain resource areas. A season of occupation other than winter is implied, but not conclusively demonstrated by the presence of *Rabdotus* land snail, drum, and turtle in the 41 LK 59 faunal assemblage.

41 LK 41

On the opposite side of the slough channel from 41 LK 59, 41 LK 41 is an open prehistoric campsite with a length of over 1100 m east-west and width varying from 20-100 m. Much like 41 LK 59, this site is located in a grass- and weed-covered field actively cultivated until a short time before Phase I work began (Fig. 4,a,b). Almost twice as long as 41 LK 59, 41 LK 41 extends slightly farther west than 41 LK 59 and over 400 m farther to the east. The intensive testing operation at 41 LK 41 took place in December 1977. A crew of ten persons spent 15 days investigating the site (Table 1).

A preliminary inspection of the site surface by the crew revealed that prehistoric cultural debris was scattered continuously over the entire site. Again, the site limits defined by the CAR crew (20-100 m north-south by 1100 m east-west) were not nearly as extensive as those set by the THC survey crew (ca. 300-500 m north-south and 1300 m east-west). No surface evidence could be found warranting placement of the site's northern boundary farther than 100 m north of the slough channel. The western end of 41 LK 41 as defined by the THC surveyors extended about 200 m west of the CAR limit. There was essential agreement on the site's southern boundary--the north bank of the slough--and its eastern end. Limits of the site as defined by the CAR on the basis of surface debris were later justified by findings made in numerous backhoe trenches excavated on the site (Fig. 3).

The surface of 41 LK 41 is relatively flat except along the immediate edge of the slough where the site surface drops very gradually down to the edge of the channel. From east to west up the 1100 m length of the site, the surface rises less than 2 m in elevation. Near the east end of 41 LK 41, the slough channel meets the valley margin and bends to assume a more northeasterly course on its way to the river.

In surface reconnaissance of 41 LK 41 prior to excavations, its eastern quarter was found to be much different than the remainder of the site in terms of density and character of surface debris. At the eastern end, a Late Prehistoric component was immediately recognized on the basis of arrow points and sherds of aboriginal ceramics seen in the area. Other material, such as mussel shell, snail shell, debitage, tuff rock, chert cores, chipped stone tools and tool fragments, and some fragments of animal bone, was also observed on the surface in this area of the site. To the west, over the remaining three-quarters of 41 LK 41's surface, there was much less cultural debris exposed on the surface. Tuff rock, chert cores, and debitage were widely scattered, and nowhere did debris concentrate as heavily as it did at the eastern end.

Because of the proximity of the two sites, the decision was made to extend the previously established grid at 41 LK 59 north across the slough channel to 41 LK 41. Using the survey transit, a north-south line was laid from N1000 E1000 (the primary datum at 41 LK 59) to N1175 E1000, a point located in the central area of 41 LK 41 (Fig. 3). Thus, one archaeological grid system covers both sites. Placing stakes at 100-m intervals, the N1175 grid line was extended to the east and west ends of 41 LK 41. From this east-west baseline, further gridding was done with the survey transit and measuring tape triangulation.

Vertical control was established by driving a steel spike into the trunk of a large tree located adjacent to excavation areas at the eastern end of the site. This datum, arbitrarily assigned an elevation of 100 m, was independent of the vertical datum at 41 LK 59. Unfortunately, an absolute elevation was not calculated for the 41 LK 41 vertical datum. The tree into which the datum spike was driven was removed as the borrow area for the dam was cleared of vegetation.

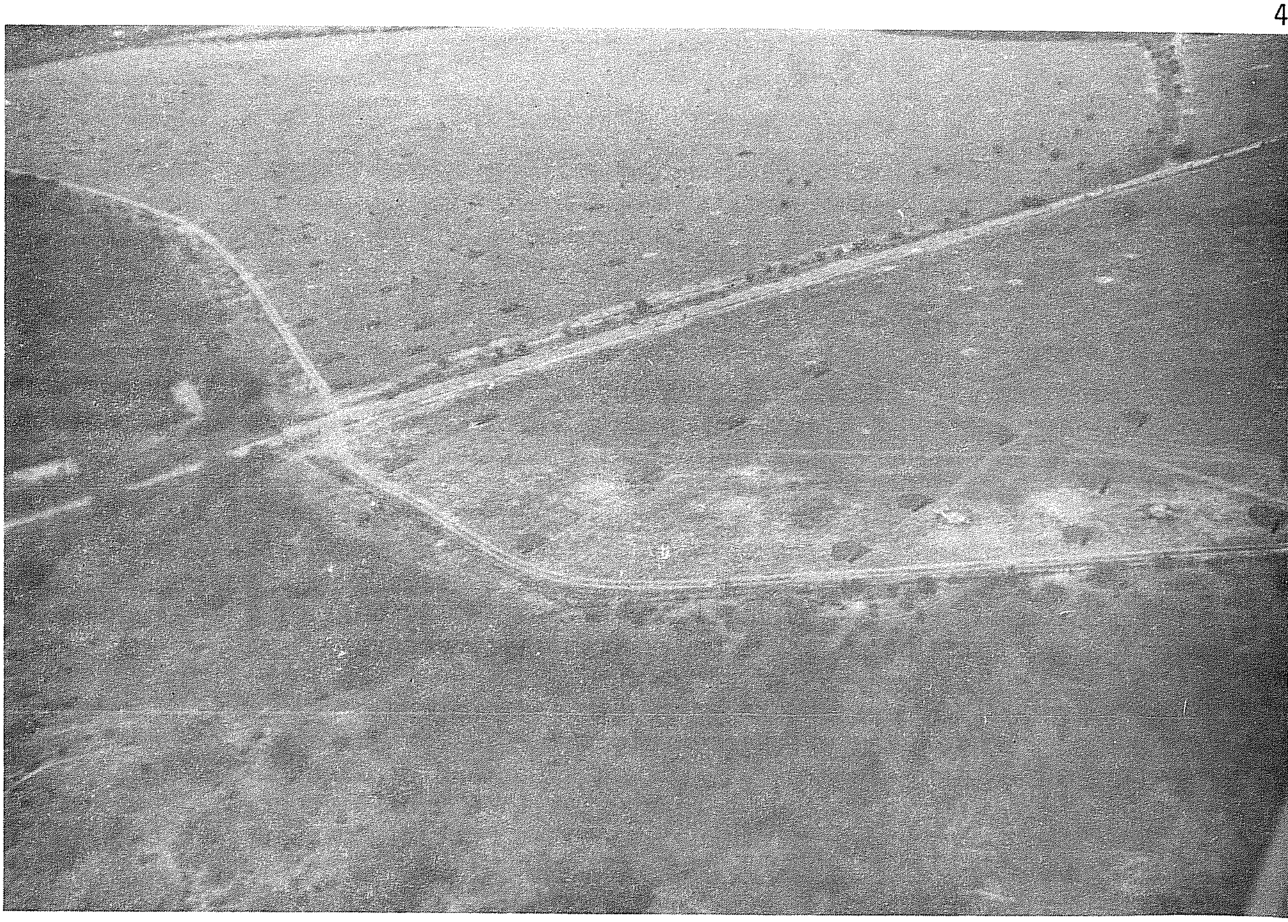
Seventy-one short backhoe trenches were excavated at 41 LK 41. Initially, north-south transects of from two to five trenches were placed at 50-m intervals down the length of the site from east (Trench 1) to west (Trench 53). Trenches were dug both inside and outside of the site boundary as defined by distribution of surface debris (Fig. 3). Trenches 54-71 were excavated in a series of less structured transects (that is, without strict regard for orientation relative to the baselines) at the eastern end of the site. The trenches averaged from four to six meters in length, were 80 cm wide, and varied in depth from 1.3-2.2 m.

The extensive trenching operation at 41 LK 41 revealed that the distributions of surface and subsurface cultural debris approximated one another across the site. Furthermore, the densities of material on the surface were found to be a reasonable measure of material density in the subsurface. The eastern quarter of the site, where the greatest densities of surface debris were observed, was

Figure 4. *Photographs of 41 LK 41.*

Upper photograph is an aerial view of the eastern end of 41 LK 41. The slough channel runs along the brushline beside field road. Site extends along slough up to the upper left corner of the photograph. Note transects of backhoe trenches running length of site. The major concentration of surface artifacts was found in the light-colored area above the brushline and east (to the right) of the road intersection.

Lower photograph is the view east from the west end of 41 LK 41. Photograph taken from backdirt pile by USBR geologic test pit.



found to offer the best prospects for controlled subsurface excavations. In particular, Trenches 5 and 59 cut through substantial concentrations of tuff rock and mussel shell, respectively. The trenches in the western three-quarters of 41 LK 41 produced no information indicating that controlled excavations would be worthwhile.

In conjunction with the grid laying and trenching activities, an extensive provenienced surface collection was made at 41 LK 41. On maps produced with a plane table and alidade, the individual locations of over 300 objects were recorded. About 200 of the surface-collected artifacts came from the eastern quarter of the site. At this eastern end, chert cores and potsherds were the most common artifacts in the collection. Lesser numbers of thick bifaces, thin bifaces, and grinding slab fragments were also found. To the west, chert cores were common in the collection with smaller numbers of thick bifaces, thin bifaces, and grinding slab fragments also being recovered.

Four excavation areas were staked at the eastern end of 41 LK 41. Area A, consisting of 12 units, was placed along the eastern side of Trench 5. The six units of Area C were located at the southwest end of Trench 59. Areas B and D were positioned at locations where greater-than-average concentrations of potsherds and arrow points were noted as the provenienced surface collection was carried out.

The excavation of Backhoe Trench 5 revealed a concentration of tuff rocks, mussel shell, and carbon occurring 50-70 cm below ground surface. In the trench backdirt were additional tuff rocks, animal bone, carbon, mussel shell, and *Rabdotus* shell. The matrix containing the cultural debris was a very compact, brown clayey silt. Area A was staked beside Trench 5 to permit exposure of surviving portions of the underlying tuff rock concentration. The Area A excavation block eventually reached the dimensions of 4 m north-south and 3 m east-west. Coordinates at the corners of the pit were N1114 E1400 (southwest), N1114 E1403 (southeast), N1118 E1403 (northeast), and N1118 E1400 (northwest). Sixty-seven 10-cm levels were excavated from the 12 1-m^2 units in Area A. Most of the units went down five levels.

On the basis of aboriginal ceramic sherds found primarily in the upper two levels of units in Area A, the material recovery was divided into two components for purposes of comparison and analysis. The upper component, consisting of materials recovered from Levels 1 and 2, is suggested to be Late Prehistoric. Materials recovered from Level 3 and below in Area A constitute what is assumed to be a Late Archaic component. This assumption is based on the stratigraphic relationship of the lower component to the upper (Late Prehistoric) component and on the occurrence, at similar depth, of Late Archaic remains at 41 LK 59 a short distance southwest. No obviously diagnostic artifacts of the Late Archaic were found at 41 LK 41. Combined unit and level recovery, by selected material classes, for the two components in Area A was as follows:

	Late Archaic	Late Prehistoric
Tuff Rock Weight (grams)	2198	3063
Fire-Fractured Rock Weight (grams)	39	227
Mussel Shell Umbo Count	135	154

Mussel Shell Weight (grams)	511	924
Rabdotus Shell Count	1547	547
Bone Weight (grams)	125	100
Primary Flake Count	4	3
Secondary Flake Count	18	46
Tertiary Flake Count	30	77
Chip Count	81	232

Counts and weights for materials in each class are provided on a unit and level basis in the Material Analysis Records, Table 33, Appendix IX.

Feature 1, a portion of which was first seen in the east wall of Trench 5, was exposed in Units N1115 E1400, N1115 E1401, N1115 E1402, and N1116 E1401. Most of the feature was in Unit N1115 E1401. It consisted of a single layer of approximately 12 rocks ranging from 5-17 cm in length. Together, the rocks weighed 2952 g. With the exception of one piece of sandstone, all were tuff. The rocks were grouped into a loose cluster measuring 140 cm northwest-southeast and 90 cm northeast-southwest. The outline of the cluster was very irregular, perhaps best described as arcuate. Rocks rested on surfaces ranging in elevation from 99.09-99.18 (40-50 cm below ground surface). A very small amount of carbon mottling was noted beneath some of the rocks as they were removed. This feature was very similar in general appearance to Feature 2 at 41 LK 59 (Fig. 2,f). It is not illustrated.

Artifacts recovered in the Area A excavations included seven chert cores, one thick biface, one thin biface, two grinding slab fragments, some pieces of yellow ocher, and 22 sherds of prehistoric pottery. The cores--representing Groups 1, 3, 6, and 8--came mostly from the upper three levels. The thin biface, a *Scallorn* arrow point (Group 1, Form 5, Spec. 2), was found in Level 1 of N1116 E1400. Medium and small sandstone grinding slab fragments were collected from Level 2 of N1117 E1401 and Level 5 of N1114 E1400. The yellow ocher was found in three small pieces weighing a total of 2.3 g. These pieces came from Level 1 of N1117 E1400. One or more prehistoric potsherds were recovered from the upper levels of all units in Area A. Seven sherds came out of Level 1 in N1115 E1400. Except for a single sherd occurring in Level 3 of Units N1116 E1401 and N1117 E1402, all sherds were found in Levels 1 and 2.

Bones representing a number of animal species were recovered in the Area A excavations. The species identified, broken down into Late Archaic (Level 3 and below) and Late Prehistoric (Levels 1 and 2), were as follows:

Species	Late Archaic	Late Prehistoric
ground squirrel	X	X
rabbit	X	X
snake	X	X
white-tailed deer	X	X
wood rat	X	X
mouse	X	
pond slider	X	X
pocket gopher	X	X
pronghorn antelope (?)	X	X
rock squirrel	X	X
Canis--unidentified	X	
mottled duck or mallard		X

More detailed information on the faunal remains is provided in Table 35, Appendix IX.

The Area B excavation, consisting of a 2-m^2 block of four 1-m^2 units, was staked out to sample subsurface remains in a portion of 41 LK 41 where controlled surface collecting showed a heavy concentration of potsherds and arrow points. Coordinates at the corners of Area B were N1135 E1441 (southwest), N1135 E1443 (southeast), N1137 E1443 (northeast), and N1137 E1441 (northwest). As the excavation was intended to sample the Late Prehistoric component in the area, only two levels were excavated in each unit. Eight 10-cm levels were excavated. Matrix in Area B was a gray-brown clayey silt, soft and loose in the first level and very compact in the second level. Counts and weights for selected materials recovered in Area B are as follows:

Tuff Rock Weight (grams)	399
Fire-Fractured Rock Weight (grams)	80
Mussel Shell Umbo Count	16
Mussel Shell Weight (grams)	138
Rabdotus Shell Count	51
Bone Weight (grams)	5
Primary Flake Count	0
Secondary Flake Count	14
Tertiary Flake Count	25
Chip Count	41

Thirty-one prehistoric potsherds were recovered from Area B. A chipped stone drill or perforator (Thin Biface Group 8, Spec. 1) was also found.

The six 1-m^2 units comprising Area C were staked along the western edge of Backhoe Trench 59 where a substantial subsurface concentration of mussel shell was noted as the trench was excavated. Area C had dimensions of 2 m north-south and 3 m east-west. Coordinates at the pit corners were N1144 E1474 (southwest), N1144 E1477 (southeast), N1146 E1477 (northeast), and N1146 E1474 (northwest). Thirty 10-cm levels were excavated from six 1-m^2 units. Each unit went down five levels.

The Area C material recovery was divided into two components based on the presence of potsherds and an arrow point in the upper levels of the deposit. As in Area A, Levels 1 and 2 are taken to represent a Late Prehistoric component. Levels 3-5 contain materials assumed to have been deposited during Late Archaic occupations. Combined unit and level recovery for the two components identified in Area C was as follows:

	Late Archaic	Late Prehistoric
Tuff Rock Weight (grams)	985	511
Fire-Fractured Rock Weight (grams)	302	136
Mussel Shell Umbo Count	389	335
Mussel Shell Weight (grams)	1644	1250
Rabdotus Shell Count	240	142
Bone Weight (grams)	216	130
Primary Flake Count	1	6
Secondary Flake Count	11	33
Tertiary Flake Count	14	18
Chip Count	40	114

Artifacts recovered in the Area C excavations included one chert core (Group 3, Level 4, N1145 E1474), one *Perdiz* arrow point (Level 1, N1144 E1476), and six potsherds (Level 1, N1144 E1474, and Level 1, N1145 E1475).

The concentration of mussel shell observed in the wall of Trench 59 was uncovered in Units N1144 E1476 and N1145 E1476. The shells concentrated in the eastern half of the units were most prevalent in Level 2, thinning out in Level 3. The concentration contained approximately 445 mussel shell umbos, well over half of all the umbos found in Area C.

Animal species represented by bones recovered from Area C included white-tailed deer and/or pronghorn antelope, bison, wood rat, rabbit, and turtle. More detailed information on these faunal remains is provided in Table 35, Appendix IX.

As with Area B, Area D was placed where many potsherds and arrow points were found on the site surface. This 2-m^2 excavation had corner coordinates as follows: N1153 E1469 (southwest), N1153 E1471 (southeast), N1155 E1471 (northeast), and N1155 E1469 (northwest). Only one 10-cm level was excavated in each of the four 1-m^2 units of Area D. Recovery for selected material classes was as follows:

Tuff Rock Weight (grams)	401
Fire-Fractured Rock Weight (grams)	6
Mussel Shell Umbo Count	59
Mussel Shell Weight (grams)	170
Rabdotus Shell Count	19
Bone Weight (grams)	4
Primary Flake Count	0
Secondary Flake Count	14
Tertiary Flake Count	11
Chip Count	89

Artifacts recovered from the Area D excavation included two chert cores (Groups 3 and 6), two thick bifaces (both Group 7, Form 1), one *Perdiz* arrow point (Thin Biface Group 1, Form 4, Spec. 2), and five potsherds. The vertebrate species represented by bones found in Area D could not be identified.

The provenienced surface collection at 41 LK 41 yielded 160 cores, 20 thick bifaces, 36 thin bifaces, one distally beveled biface, four trimmed flakes, one hammerstone, 16 pieces of modified sandstone, and 65 sherds of aboriginal pottery. Recognized Late Prehistoric diagnostics--aboriginal ceramics and arrow points--all occurred over an area 50 x 250 m at the eastern end of the site. Of 160 surface-collected cores, 99 came from the eastern one-fourth of the site. A comparison of cores from the eastern end to cores found over the remainder of the site revealed only one notable difference in core group distribution. Flat, circular to elliptical, unifacially cortex-covered cores (Group 7) occurred only at the eastern end and might be the result of Late Prehistoric lithic reduction technology. Thick bifaces were distributed evenly across the site with the exception of the circular to subcircular specimens (Group 4). Out of six such specimens, five came from the eastern end. Among thin bifaces, other than arrow points, there seemed to be a more-or-less even distribution across the site. There were two stemmed dart points (Group 1, Form 1, Spec. 10, and Group 1, Form 3, Spec. 27). One was found at the eastern end, the other to the west. The single distally beveled biface ("gouge," Group 7, Form 3) was found in the western portion of the site. All four trimmed flakes collected at 41 LK 41 (Group 1, Group 3, Form 5, and Group 4, Forms 2 and 6) came from the eastern quarter. Sixteen pieces of modified sandstone (grinding slab fragments and manos) were surface collected--11 from the eastern end and five from the remainder of the site. Maps showing the locations of individual artifacts collected at 41 LK 41 are on file at the CAR-UTSA.

Surface collections and subsurface excavations at 41 LK 41 yielded evidence of both Archaic and Late Prehistoric activities on the site. Remains attributed to Archaic occupations were scattered down the entire 1100-m length of the site. The number and duration of encampments resulting in the Archaic component(s) at 41 LK 41 are unknown. As previously mentioned, the earlier remains on the site are assumed to be Late Archaic, but this determination is based solely on a stratigraphic similarity to 41 LK 59 across the slough. The potential Archaic time diagnostics--two stemmed dart points and one distally beveled biface--are not distinctive enough to permit an exact time period assignment. A Late Prehistoric component was defined at the eastern end of 41 LK 41 by the occurrence of prehistoric ceramics and arrow points. These remains covered an area approximately 50 x 250 m. Although the area over which Late Prehistoric activities took place is clearly defined, there is presently no way of knowing the number or duration of encampments represented by these later remains.

Remains of apparent food items consumed by the prehistoric inhabitants of 41 LK 41 include numerous mussel shell fragments and bones of 13 vertebrate animal species. As at 41 LK 59, the mussel species *Lampsilis* and *Cyrtonaias tampicoensis* were by far the most common. The presence of specimens of the small mussel *Carunculina parva* again suggests harvest of shallow-water mussel beds and an indiscriminate collection technique (see Appendix V and 41 LK 59 discussion above). The species *Amblema plicata* occurs at 41 LK 41, but does not show up commonly at other excavated prehistoric sites at Choke Canyon. Mussel shells were recovered from both Archaic and Late Prehistoric contexts. *Rabdotus* shells were found in substantial numbers at 41 LK 41. These shells were slightly more prevalent in Archaic rather than Late Prehistoric levels, but this difference may simply be the result of a sampling bias since more levels of Archaic deposit were excavated.

Vertebrate remains were found in both Archaic and Late Prehistoric deposits. All may be prehistoric human food remains, but some, such as the rats, mice, gophers, and snakes, could be natural introductions to the 41 LK 41 matrix. The vertebrate and invertebrate remains suggest a primary emphasis on hunting and gathering in floodplain microenvironments. However, the remains of pronghorn antelope (identifications questionable) and bison may indicate that the uplands were being hunted also. Sandstone manos and fragments of grinding slabs offer indirect evidence that both the Archaic and Late Prehistoric inhabitants of 41 LK 41 were processing plant products for food.

The amount of chipped stone material, especially chert cores, found at 41 LK 41 indicates that stone tool production was an important activity on the site.

The eastern end of 41 LK 41 is only a short distance from extensive lag gravel deposits at 41 LK 64 (see Figs. 1, 3 and discussion below). Over 100 chert cores were collected over the eastern quarter of 41 LK 41. An additional 61 cores were picked up across the western three-quarters. The closest and likeliest source of these cores is the gravel-covered ridge at 41 LK 64. A total of 711 pieces of debitage was recovered in the four excavation areas. Chert flakes, chips, and chunks were present in the following percentages (approximate):

Primary Flakes	2%
Secondary Flakes	16%
Tertiary Flakes	21%
Chips	58%
Chunks	3%

Exact breakdowns of the debitage collection are provided in Appendix IX. In all types of debitage, the Late Prehistoric deposit (Levels 1 and 2) yielded substantially greater numbers of specimens than did the Archaic levels (Levels 3 and below). Flintknapping activities appear to have been more intensive during the Late Prehistoric than during the Archaic.

Prehistoric ceramic sherds totaling 126 specimens (65 surface and 61 subsurface) were collected at 41 LK 41. Most were body sherds of small bowls and pots. One pot handle was found. The sherd collection was divided into six major groups and 17 subgroups (see Ceramic Analysis section). With only two exceptions, all sherds were recovered from the surface and upper two levels of deposit at 41 LK 41.

41 LK 64

Located on the valley margin a short distance southeast of 41 LK 41 and 41 LK 59, this open prehistoric site is situated partly on a gently sloping terrace bench above (southeast of) the slough channel and partly on a short peninsular ridge or spur projecting northwestward into the Frio valley. The spur was formed by headward erosion of Charley York Hollow, a short upland drainage running along the east side of 41 LK 64. The site measures approximately 600 m north-south and 900 m east-west. From the northwest end of the site above the slough channel to the southeast end on the ridge top, the site rises 12 m in elevation. The shortest distance to the Frio River is 900 m.

The northwestern two-thirds of the site, an area measuring roughly 300 x 900 m, rests on a badly eroded sloping bench consisting of very old alluvial terrace deposits. Large gullies cut into the terrace from the slough drainage. In between the gullies, the effects of severe sheetwash erosion are apparent. Large mesquites, whitebrush, prickly pear, yucca, guayacan, agarita, tasajillo, and grasses grow in this area of the site (Fig. 16,c). Because of erosion, distribution of trees and plants is patchy.

The southeastern part of the site, a triangular area 400 m to a side, encompasses the flanks and top of the ridge. On the surface are exposures of Catahoula Formation tuff and an extensive pavement of lag gravels. Covering this area is typical upland vegetation including guajillo, blackbrush, and smaller mesquites.

Initial inspection of the 41 LK 64 surface by the CAR crew revealed that a considerable amount of cultural material was exposed. Everywhere amidst the gravel pavement on the ridge top and flanks was evidence of quarry activity in the form of tested cobbles, chert cores, very large primary cortex flakes, thick bifaces, and debitage. In sharp contrast, cultural remains on the bench slope north and west of the ridge consisted of apparent tuff rock hearths surrounded by scatters of chipped stone tools and mussel shell.

The exposed hearths and greatest concentration of surface artifacts were found at the southwestern end of 41 LK 64 (Fig. 5). It was in this area that a provenienced surface collection was performed. The locations of 27 tuff rock hearths and three mussel shell concentrations were recorded. The locations of 83 individual artifacts were plotted as each was collected.

Shown in Figure 5, the tuff rock concentrations are labeled A thru X and AA. Also labeled are the three major mussel shell concentrations observed in the feature area. The hearth features consisted of 15-25 rocks (Fig. 16,e). Most of the rocks had diameters in the 5-10 cm range, but some were as big as 15-25 cm in diameter. Diameters of individual rock clusters commonly ranged from one to two meters. In three cases (Features A, I, and N), rock scatter diameters of three to five meters were noted. It appeared that the feature diameters were proportional to the severity of erosion at each location. Where the least amount of erosion was apparent, cluster diameters were about one meter. Features with larger diameters occurred in the more severely eroded portions of the feature area.

Three concentrations of mussel shell were found in the area of the tuff rock concentrations. Diameters of these concentrations were in the same range as the rock clusters, one to five meters. Again, feature diameter seemed to correspond to severity of erosion at each location. Two of the shell concentrations were located immediately alongside rock clusters (G and R) in the main feature area. A third shell concentration, having a diameter of about 5 m, was located 18 m northwest of rock cluster S.

Exclusive of rock clusters Y and Z, the tuff rock and mussel features recorded at 41 LK 64 were distributed over an area of 70 x 100 m. Features Y and Z were separated from the nearest edge of the main feature area by 70 and 45 m, respectively.

Roughly three-quarters of the artifacts surface collected at 41 LK 64 came from the area in and immediately around the tuff rock and mussel shell features. The remaining materials were picked up a short distance southwest of the feature area (up to 130 m west of rock cluster Z). Among the artifacts collected were six chert cores, 20 thick bifaces, 32 thin bifaces, six distally beveled bifaces, five unifaces, three trimmed flakes, one hammerstone, 11 sandstone grinding slab fragments, three sandstone manos, and one grooved piece of sandstone. The sandstone artifacts and distally beveled bifaces occurred most frequently in the main feature area. The other artifact groups--especially the thick bifaces and thin bifaces--were scattered more evenly over the entire collecting area.

41LK64 Site Extent, Local Topography, and Surface Feature Distribution

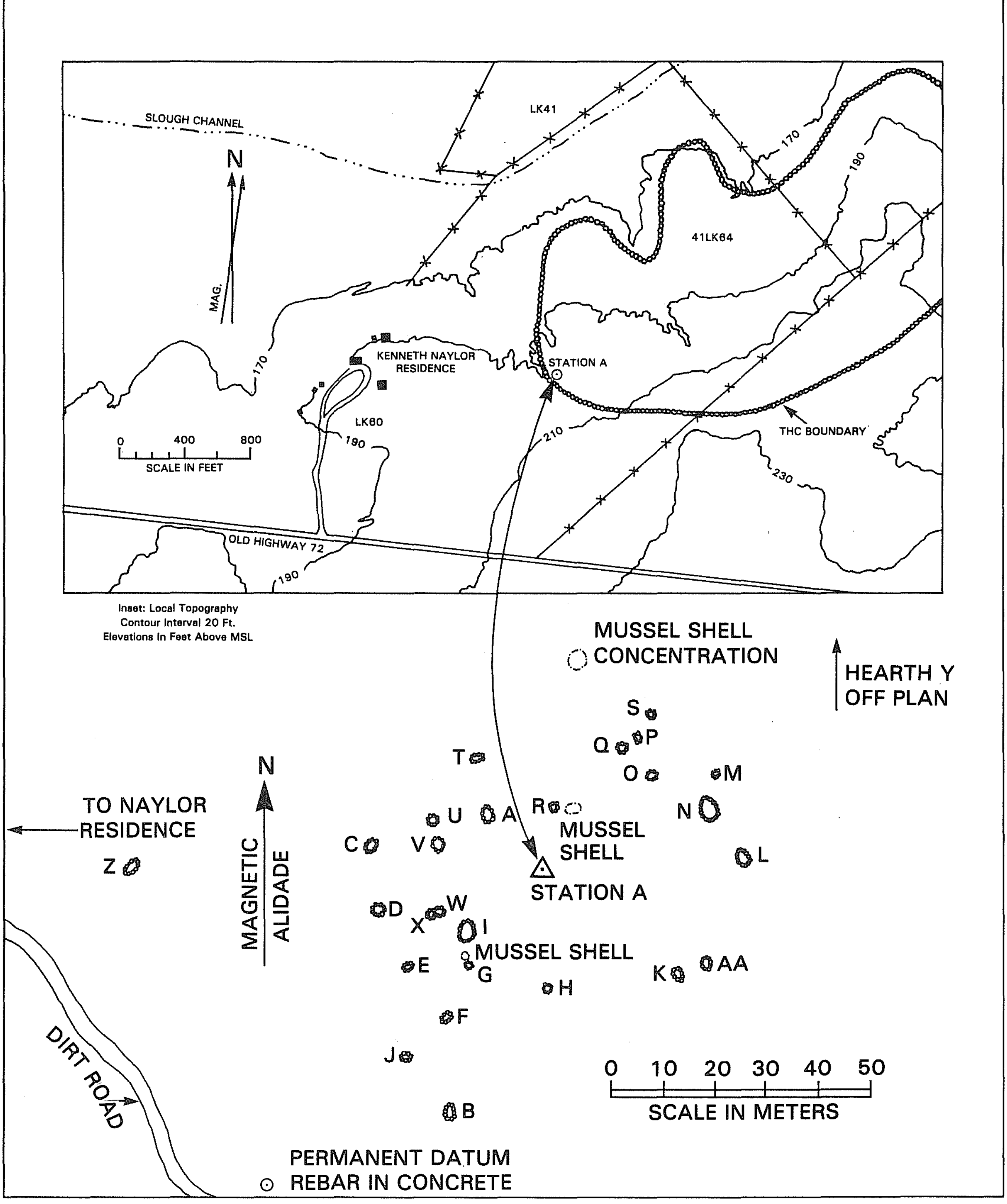


FIGURE 5

Dating of the cultural activity resulting in the remains at 41 LK 64 is tenuous. Two stemmed thin bifaces, both found near the western end of the collection area away from the main feature group, have potential as time diagnostics. One specimen, an *Ensor* dart point (Group 1, Form 3, Spec. 3), suggests activity during the Late Archaic. A second stemmed point (Group 1, Form 1, Spec. 13) does not readily fit any previously recognized types and may be either Middle Archaic or Late Archaic in age. The many unstemmed thin bifaces found on the site are not yet recognized as being diagnostic of a particular time period, except to say that they are probably Archaic. Of four of the distally beveled bifaces ("gouges") found in the main feature area, three (Group 2, Forms 1 and 2) are tentatively suggested to be of Middle and/or Late Archaic vintage, and one (Group 3, Form 2) is likely of Late Archaic age (see discussion following descriptions of Distally Beveled Bifaces and Unifaces below). No Late Prehistoric diagnostics were recognized on the site. THC analysts, however, list the site as containing a Late Prehistoric component (Lynn, Fox, and O'Malley 1977: 44). Thus, the artifacts do not clearly define a time period during which 41 LK 64 was occupied, but activity during the Middle Archaic, Late Archaic, and Late Prehistoric periods is indicated. Maps showing locations of provenienced artifacts are on file at the CAR-UTSA.

Judging from the amount of quarry debris and number of bifaces (both thick and thin) found at 41 LK 64, chipped stone tool manufacture was one of the major activities on the site. Many of the bifaces are assumed to be preforms or manufacturing failures discarded for various reasons before being finished. Seven of the thick bifaces were fragmentary as were 25 of the thin bifaces. It is significant to note that so few chert cores (only six) were collected in the main feature area. Much of the initial breaking up of cores and rough shaping apparently occurred on the gravelly ridge above the feature area. Quarry blanks were then brought down into the habitation area for thinning and finishing.

A considerable amount of energy was expended in construction of the 27 tuff rock hearths recorded at 41 LK 64. Mussel shell concentrations near these rock clusters suggest that one function of the hearths may have been to prepare mussels for consumption. The concentration of sandstone grinding implements in and around the main feature area indicates that floral products, perhaps seeds or beans, were also being processed for consumption. Neither the mussels nor the plant foods indirectly suggested by grinding implements can definitely be said to account for the effort obviously expended in construction of the tuff rock clusters. For whatever purpose they may have served, the rock clusters were apparently quite important to the site's prehistoric inhabitants.

Cultural remains aside, 41 LK 64 is important in a more general sense as the most likely source of tuff rock and chert found at adjacent sites down on the floodplain. The site also serves as a very good example of the diversity of landform settings, microenvironments, and material sources that can occur over relatively small areas at Choke Canyon. Based in the main feature area on the bench at 41 LK 64, prehistoric people were in an ideal location to exploit nearby resources such as upland gravel deposits and plant foods (acacia beans, yuccas, grass seeds); tuff rock exposures along the valley margin; and the rich fauna, both aquatic and terrestrial, down on the floodplain. The proximity of these varied resources to one another emphasizes the need for caution as inferences are made concerning local patterns of prehistoric settlement.

41 LK 91

An open prehistoric site, 41 LK 91 is situated on an old floodplain terrace bounded on the west and north by the right bank of Charley York Hollow. The hollow meets the Frio River approximately 200 m north of the site's northeastern end. The site surface slopes gradually from south to north. Site dimensions as recorded by the THC survey crew were on the order of 400 m northwest to southeast and 700 m northeast to southwest. Nearby sites include 41 LK 90 on the other side of Charley York Hollow and 41 LK 64 to the southwest. Investigations at 41 LK 90 were conducted by the crew from the ARL, Texas A&M University (Weed and Shafer 1981).

Brush was quite thick over much of the 41 LK 91 surface. Grazing cattle had cropped the ground bare in some areas so that there were open patches amidst the brush thickets. Mesquite, whitebrush, lotebush, and spiny hackberry were the most common trees and plants seen. Other species observed include Spanish dagger, prickly pear, Mexican persimmon, agarita, tasajillo, acacias and guayacan. Ash, hackberry, and elm trees grew just north of the site in the channels of the hollow and the river.

Preliminary surface reconnaissance by the CAR crew revealed that the heaviest concentration of cultural debris occurred over an area 150 x 300 m at the northeast end of the site. This particular area is closest to the active floodplain and channel of the Frio River. Over the vast remainder of the site, surface cultural debris was very widely scattered or not observed at all.

Locations of two 1-m^2 test pits were selected on the basis of findings made in five shovel tests dug in the area of maximum debris exposure at the site's northeast end. Test Pit 1 was staked out in the central area of the site. Test Pit 2 was located 90 m northeast of Test Pit 1 near the edge of the terrace. A map showing test pit locations at 41 LK 91 is on file at the CAR-UTSA.

In Test Pit 1, four 10-cm levels were excavated into a deposit described as a light grayish brown sandy silt. Cultural debris came mostly from the upper two levels. Level 3 yielded much less material and Level 4 hardly anything at all. With depth, the soil color lightened, the matrix became blockier, and the number of calcium carbonate concretions increased. From the floor of Level 4, the test pit was shovelled out to a depth of 60 cm below surface. No additional cultural material was found. A caliche zone was encountered at 50 cm and continued to the bottom of the unit.

Five levels were excavated in Test Pit 2. Again, the matrix was found to be a light grayish brown sandy silt. Debris recovery was heaviest in Levels 1 and 2. A decrease in debris recovery was noted in Levels 3 and 4, but they contained more material than corresponding levels in Test Pit 1. Level 5 yielded very little debris. A shovel test from the floor of Level 5 to a depth 65 cm below surface yielded only pea-sized carbonate concretions.

Combined level recovery of selected materials from the 41 LK 91 test pits was as follows:

	Test Pit 1	Test Pit 2
Tuff Rock Weight (grams)	1412	2993
Fire-Fractured RockWeight (grams)	379	2241
Mussel Shell Umbo Count	149	85
Mussel Shell Weight (grams)	248	108
Rabdotus Shell Count	45	84
Bone Weight (grams)	0	0
Primary Flake Count	3	4
Secondary Flake Count	60	62
Tertiary Flake Count	99	82
Chip Count	167	156

Artifacts recovered in test pit excavations at 41 LK 91 included two chert cores (Group 1), one each from Level 2 of each unit. A small stemmed dart point (Group 1, Form 3, Spec. 18) was found in Level 1 of Test Pit 1. This point is tentatively typed as a *Darl*. Surface-collected artifacts (13 of which were provenienced) included one chert core, six thick bifaces, seven thin bifaces, three distally beveled bifaces, and two unifaces. One of the thin bifaces (Group 1, Form 7) was an arrow point fragment. On the basis of the *Darl* point, the arrow point fragment, and one of the distally beveled bifaces (Group 3, Form 2), the remains at 41 LK 91 are attributed to Late Archaic and, to a lesser extent, Late Prehistoric activities.

Mussel shell and *Rabdotus* shell are the only probable food remains recognized in the 41 LK 91 collection. No bone was found on the site. Perhaps significantly, no manos or grinding slab fragments were found either. This seems unusual in that such artifacts were fairly common at adjacent sites (41 LK 41 and 41 LK 64).

In Test Pit 2, unusually large amounts of tuff rock and fire-fractured rock (chert, quartzite, and petrified wood) were recovered.

Debitage recovered from the 41 LK 91 test pits breaks down into the following percentages by type:

Primary Flakes	1%
Secondary Flakes	19%
Tertiary Flakes	29%
Chips	50%
Chunks	1%

The bifaces, debitage, and fire-fractured rock recovered from the site indicate that substantial gravel deposits were available nearby, e.g., the eastern slopes of the ridge containing 41 LK 64.

41 LK 34

Located on the right (east) bank of a tight bend in the Frio River channel, 41 LK 34 is an open prehistoric site measuring roughly 100 m north-south and 400 m northeast to southwest. The site is on the first terrace above the river. The cleared field containing 41 LK 34 was in cultivation until a short time before the archaeological investigation began. On the river side of the site grow mesquites, oaks, and an understory of riparian brush.

Although cultural debris was not very dense on the surface of 41 LK 34, there did seem to be a slightly heavier concentration of material occurring in a narrow band along the terrace edge at the northeast end. Three very unproductive test pits were excavated in this area of the site. In all units, a very hard, gray clayey silt was encountered. Test Pits 1 and 3 went down four and two levels, respectively. In Test Pit 2, planks of sawn lumber were exposed in Level 2, and the unit was abandoned. The site had obviously been badly disturbed by farming and may also have been damaged by petroleum exploration. Refer to Appendix IX for a listing of the small amount of material recovered.

Artifacts found at 41 LK 34 included three chert cores and one triangular thin biface (Group 3, Form 1). The test pits yielded one secondary flake, two tertiary flakes, eleven chips, and two chunks. This limited array of material does not permit speculation on period of occupation at the site. Mussel shells and *Rabdotus* shells, both recovered in small quantities, were the only probable food residues recognized.

41 LK 31/32

A kilometer upstream (west) from 41 LK 34 and 1.4 km north of the slough running between 41 LK 41 and 41 LK 59 lie two sites originally recorded by members of the Coastal Bend Archeological Society and revisited by CRI personnel, Texas Tech University, during 1977 archaeological survey activities at Choke Canyon. Situated on a low terrace running east-west across the open end of a northward trending U-shaped bend in the Frio River, these two sites fell within the area of floodplain where fill material (sand, clay, and gravel) for Choke Canyon Dam would be excavated. Testing for the availability of these materials in the subsurface, the USBR excavated 20-m^2 pits at a number of locations throughout the borrow area. Two of these pits were placed within the site limits of 41 LK 31 and 41 LK 32.

In 1977, CRI surveyors examined the walls of the geologic test pits at 41 LK 31 and 41 LK 32. Their inspection revealed zones of cultural debris occurring at depths greater than 2 m below the modern ground surface (Thoms, Montgomery, and Portnoy 1981:138-141). At the time, these were the most deeply buried cultural deposits known in the Choke Canyon area. Based strictly on their stratigraphic position, it was speculated that the cultural materials in the deep horizons at 41 LK 31 and 41 LK 32 might represent Paleo-Indian or Early Archaic activities.

A modification of the CAR's Phase I contract permitted testing and evaluation of a number of sites found by CRI surveyors in the Choke Canyon borrow area. In order that dam construction could proceed on schedule, sites in the borrow had to be assessed as quickly as possible. Sites 41 LK 31 and 41 LK 32 were intensively tested during a 20-day period in February and March 1978. Based on test findings, both of these sites were recommended for extensive excavation prior to their destruction as borrow excavations proceeded.

Under terms of a separate contract issued to the CAR by the USBR, extensive excavations were conducted at 41 LK 31 and 41 LK 32 during July and August 1978. A full account of findings made during the course of those excavations (as well as results of work at a nearby historic site, 41 LK 202) is provided in Volume 8 of this research series (Scott and Fox 1982). A summary of findings at 41 LK 31/32 pertinent to later discussions and comparisons in this report is provided here.

Numerous backhoe trenches excavated across the area containing 41 LK 31 and 41 LK 32 revealed that the two sites, defined on the basis of separate surface scatters, were connected in the subsurface. Thereafter, the two sites were referred to as a single entity designated 41 LK 31/32. Prehistoric cultural material occurred from the surface down to the deepest horizon. The materials were stratified into layers of varying thickness and clarity by intervening sterile zones down through the deposit.

A number of habitation features were exposed and recorded during the course of excavations at 41 LK 31/32. Carbon in amounts adequate for radiocarbon assay were recovered from three of the features. Assays of these samples yielded two absolute dates ranging from 3380 B.C. to 3350 B.C. on the early horizon in the site and a date of 2360 B.C. to 2340 B.C. for a living surface which occurred 1.1 m above the early horizon, a location roughly midway through the deposit (all dates MASCA corrected). This data is summarized in Table 36 of Appendix IX and thoroughly discussed by Scott (Scott and Fox 1982:33-34). These dates indicate that 41 LK 31/32 contained Early Archaic and Middle Archaic components in its lower reaches. Although no time-diagnostic artifacts were recovered and no radiocarbon dating possible, prehistoric debris occurring in the upper 60-80 cm of deposit at 41 LK 31/32 is attributed to activity during the Late Archaic. Thus, a full Archaic sequence is represented at the site.

All of the features recorded at 41 LK 31/32 occurred in Early Archaic and Middle Archaic contexts. The principal components of most of the features were mussel shell, *Rabdotus* shell, tuff rock, fire-fractured rock, debitage, and carbon. They combined to form hearth areas around which food was prepared and consumed and chipped stone tools made and/or maintained. In the Middle Archaic component, three unusual features were found. Occurring within a meter of one another were two circular, densely packed concentrations of fire-fractured rock, each having a diameter of about one meter. Consisting predominantly of river cobbles (chert, quartzite, and petrified wood), these two features were essentially single-layer constructs. Beneath the rocks were thin, very slightly basined lenses of carbon. Another interesting feature found in the Middle Archaic horizon consisted of a very tightly clustered pile of chert including cores, core fragments, and debitage. Many of the chert pieces fit back together. Nearby was a concentration of mussel shell, perhaps the remains of a meal consumed by a flintknapper as he worked with the chert.

The integrity of all the features found at 41 LK 31/32 suggests that they were quickly buried after being deposited by the site's early inhabitants. It may be very significant that more than a meter of deposits containing the Early and Middle Archaic remains in the site accumulated during a period of approximately 1000 years. It took another 4300 years for a roughly equal amount of sediment to be deposited on the site, a period during which Late Archaic and modern activities took place. The apparent inequity in rates of deposition at 41 LK 31/32 may simply indicate that, as the elevation of the site surface gradually rose through time, it was flooded less frequently and sedimentation was not as rapid. It is also possible that the comparatively thick deposit which accumulated during the first 1000 years of human activity (that is, between 3380 B.C. and 2340 B.C.) may have been the result of either more frequent or more severe floods coming down the Frio River.

Eight artifacts recovered from the Early and Middle Archaic components of 41 LK 31/32 have good potential as time diagnostics. Stemmed thin bifaces included a possible *Nolan* dart point (Group 1, Form 1, Spec. 9) and a dart point having a triangular blade outline, straight blade edges, pronounced shoulders, and a stem expanding slightly to an irregular base (Group 1, Form 3, Spec. 26). Among four distinctive unstemmed thin bifaces were three thin, broad, finely worked proximal fragments having concave bases (Group 3, Form 2, Specs. 4-6). These three pieces were found grouped together over a small area in the Early Archaic component. A fourth specimen (Group 4, Form 1, Spec. 6) was triangular with a rounded base. Two specimens classified as distally beveled bifaces and unifaces ("gouges") were found in Middle Archaic context. One was a distally beveled uniface (Group 3, Form 2, Spec. 6) and the other a biface (Group 3, Form 2, Spec. 6). Except for the two distally beveled specimens shown in Figure 79 of this report, these specimens are all illustrated in Volume 8 (Scott and Fox 1982).

Excavation of prehistoric components at 41 LK 31/32 yielded information particularly important in several respects. The presence of *in situ* Early and Middle Archaic components in the subsurface of the lower Frio River valley was established. Discovery of the early remains in the site brought the realization that, given the appropriate landform setting (i.e., terrace deposits along major drainage channels), cultural debris could occur at depths exceeding 2 m below the modern ground surface. A series of features resulting from Early and Middle Archaic habitational activities was recorded and provides a useful base of comparative data. An assemblage of artifacts potentially diagnostic of a 1000-year period in the Archaic was obtained.

41 LK 202

Approximately 250 m upstream from the western end of 41 LK 31/32, the CRI survey crew recorded the ruins of a middle to late 19th-century homestead. The site was evidenced by shaped sandstone building blocks and tuff rock found both as *in situ* foundations on a high bank immediately above the river channel and as a talus strewn down the river bank into the channel. Excavations at 41 LK 202 resulted in definition of wall foundations, at least one chimney foundation, and recovery of a sample of historic artifacts. Results of investigations at this site, as well as at a related historic component located on 41 LK 31/32, are presented in Volume 8 (*ibid.*).

41 LK 201

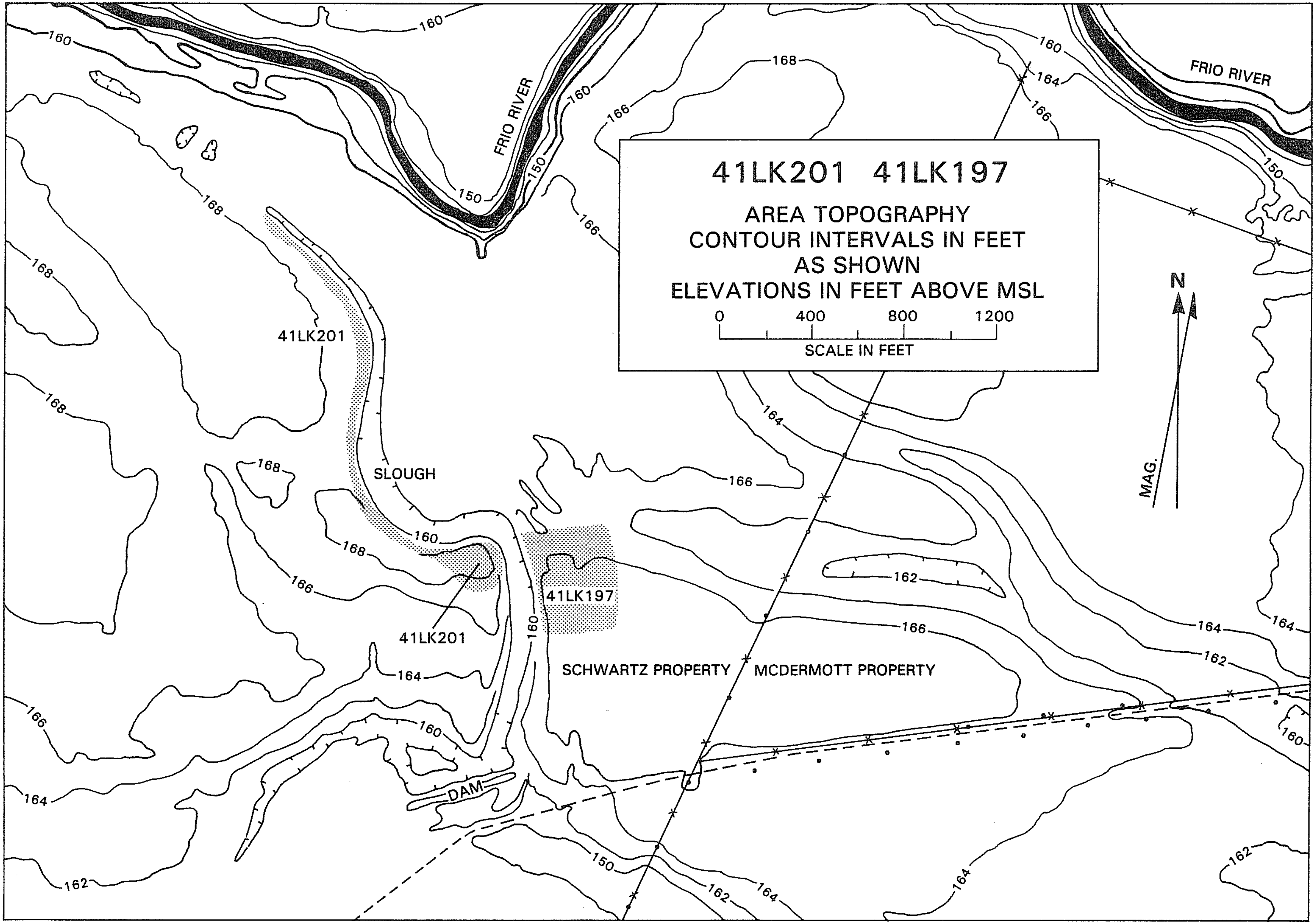
Site 41 LK 201 is located along the west (right) bank of the slough running through the area containing Site Group 1. The site was evidenced primarily by prehistoric debris, but there was also a small scatter of historic material found at the southeastern end. The site parallels the upstream end of the slough channel for a distance of about 800 m (Fig. 6). Through this area, cultural remains occur in a 50-m-wide band running along a natural levee beside the slough channel. At the site's southeastern end, the slough channel curves abruptly southward. In this area, the site width increases to 80 m or more. Except for a narrow strip of trees and brush fringing the slough channel, the entire area west and south of the site is taken up by a cleared field. The field carried a crop of maize at the time the site was under investigation. Along the slough bank grow some very large mesquite trees, elms, hackberrys, whitebrush, Mexican persimmon, spiny hackberry, guajillo, other low brush, and grasses (Figs. 8,d-f).

The general trend of the slough in the area of 41 LK 201 is from northwest to southeast. Over much of the site, there is a relatively gradual slope from the field down into the slough. Approaching the site's southeastern end and the abrupt dogleg in the channel, the slope becomes quite steep, and the greatest elevation differences (approximately 3.5 m) between the levee surface and channel bottom occur (Fig. 7). As will be discussed below, prehistoric settlement seems to have been most intense on and around this high spot on the levee.

The slough contained a substantial body of water at the time the site was investigated. Water entered the slough both as rainfall drainage and as floodwater overflow from the river. In months subsequent to the site investigation, the water gradually evaporated and finally disappeared completely (Fig. 8,d). Left in the slough bed were the shells of literally millions of aquatic snails. The snail shells bleached white and looked like a layer of snow. Numerous bivalve shells, some quite large, showed that mussels had been living in the slough. Dessicated bodies of gar fish marked the location where the last water stood. In the slough bank just below the site's southeastern end was the den of a very large alligator. The animal apparently occupied the den until just before the slough dried up. The many turtles inhabiting the slough waters were able to crawl away as the water level dropped.

The CRI crew recorded 41 LK 201 during the 1977 survey at Choke Canyon (Thoms, Montgomery, and Portnoy 1981:173). Situated along the western margin of the borrow area, there was a possibility that the site would be partially or wholly destroyed as dam construction commenced. In consequence, the site was included among those to be evaluated by the CAR crew under terms of the modification to the Phase I contract. Surface collections and minimal testing were done at the site early in 1978.

The CAR investigation of 41 LK 201 began with a thorough reconnaissance of the site surface during which shovel tests were excavated at periodic intervals down its length. Beginning at the northwestern end near the slough's juncture with the river channel (Fig. 6), surface remains were found to be light and widely scattered. Shovel tests revealed little cultural material in the subsurface and a matrix of very compact clayey loam. Occasional chert cores,


41LK201 41LK197
AREA TOPOGRAPHY
CONTOUR INTERVALS IN FEET
AS SHOWN
ELEVATIONS IN FEET ABOVE MSL
0 400 800 1200
SCALE IN FEET
N
MAG.
FRIO RIVER
FRIO RIVER
41LK201
SLOUGH
41LK201
41LK197
SCHWARTZ PROPERTY
MCDERMOTT PROPERTY
DAM
150
160
162
164
166
168

debitage, mussel shell, and *Rabdotus* shells were the materials most often observed. These general characteristics were common over much of the site. As the site began to broaden into its lobate southeastern end, amounts of surface debris increased. Shovel tests excavated in this area went down over a meter into a very soft, friable loam varying in color from brown to light grayish brown. Much cultural debris showed up in the backdirt from the shovel tests. Most notably, animal bone seemed to be very well preserved in the subsurface. Cultural material eroding out of the steep slough bank indicated that the deposit might contain material at depths exceeding 1.5 m.

Three 1-m^2 test pits were staked at the southeastern end of 41 LK 201 (Fig. 9). All three units were located in the fringe of brush by the slough to avoid damaging the maize crop then growing in the adjacent field. Four backhoe trenches in two transects were excavated between the test pits. The limits of prehistoric and historic surface debris scatters were recorded, and a provenienced collection of surface artifacts was made.

The three 1-m^2 test pits at 41 LK 201 were excavated to depths ranging between 1.8-2.1 m below surface. Based on variations in amounts of material recovered down through the deposit, the debris collection was divided into assemblages representing four or, in the case of Test Pit 2, five horizons. Materials recovered from the 10-cm levels excavated in the test pits were combined into horizon assemblages according to the following level groupings:

	Horizon Level				
Test Pit No.	1st	2nd	3rd	4th	5th
1	1-4	5-11	12-15	16-18	
2	1-5	6- 9	10-13	14-18	19-21
3	1-5	6-10	11-15	16-20	

As findings made in each of the test pits are discussed, summaries of material recovery will be presented on a horizon total basis.

Test Pit 1 was excavated to a depth of 1.9 m below ground surface. Nineteen 10-cm levels were removed from the unit. Matrix from the unit was described as light brown, loosely compacted loam. It was very easy to excavate and screen. At Level 8 (70-80 cm below surface), the matrix assumed a grayish brown color, and clay content was noted to increase slightly. In Level 15, the matrix color changed to grayish tan. The deposit became gradually more compact with depth, but was always easy to work. Recovery for selected classes of material from Test Pit 1 was as follows:

	Horizon			
	1st	2nd	3rd	4th
Tuff Rock Weight (grams)	203	1589	842	0
Fire-Fractured Rock Weight (grams)	186	637	312	0
Mussel Shell Umbo Count	64	95	4	1
Mussel Shell Weight (grams)	200	355	28	0
Rabdotus Shell Count	50	231	189	11

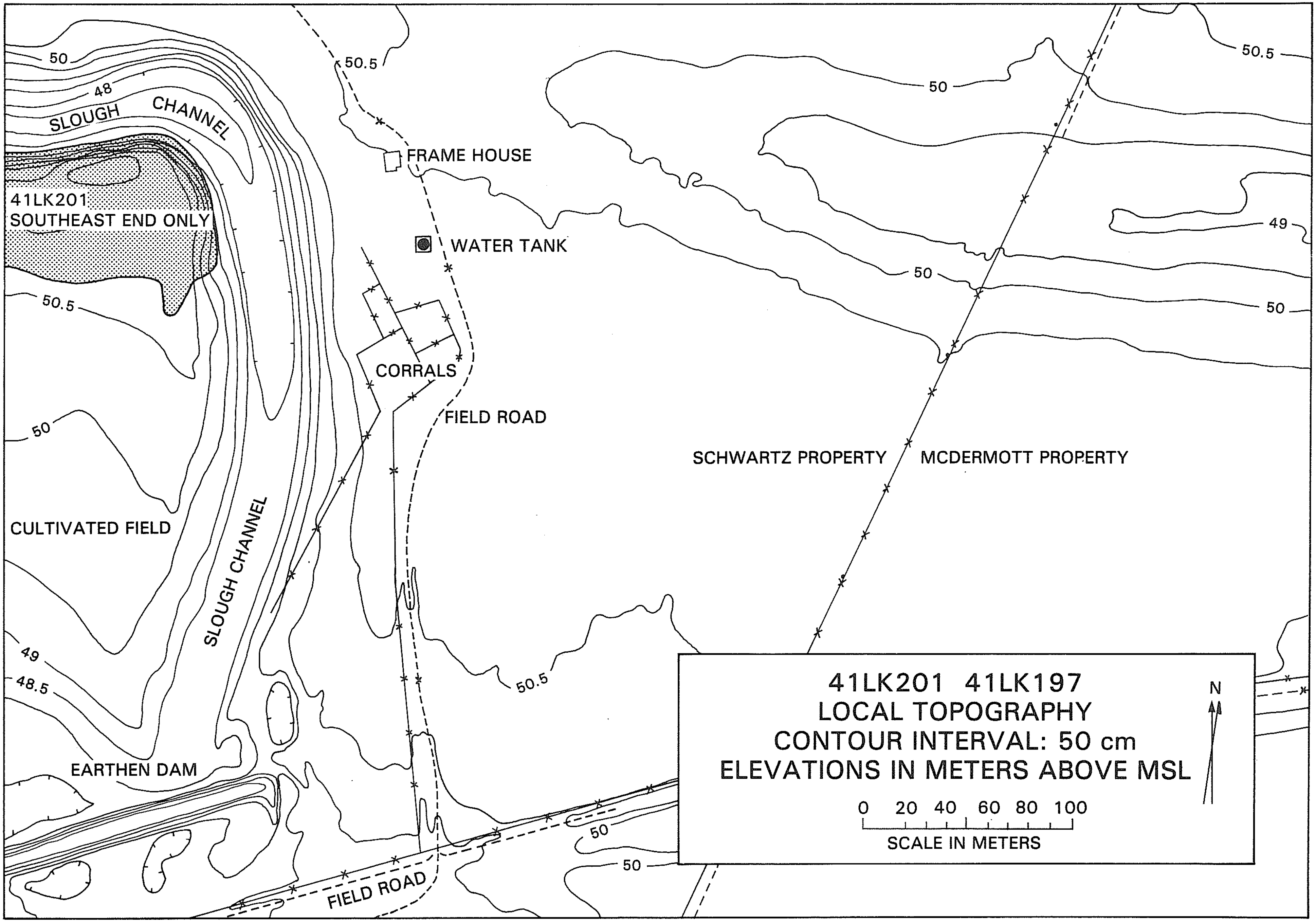

50
50.5
48
SLOUGH CHANNEL
FRAME HOUSE
41LK201
SOUTHEAST END ONLY
WATER TANK
50.5
50
50
49
50
50.5
CORRALS
FIELD ROAD
50
SCHWARTZ PROPERTY
MCDERMOTT PROPERTY
CULTIVATED FIELD
SLOUGH CHANNEL
49
48.5
50.5
EARTHEN DAM
50
50
FIELD ROAD
41LK201 41LK197
LOCAL TOPOGRAPHY
CONTOUR INTERVAL: 50 cm
ELEVATIONS IN METERS ABOVE MSL
N
0 20 40 60 80 100
SCALE IN METERS

FIGURE 7

Figure 8. *Photographs of 41 LK 197 and 41 LK 201.*

a. Looking northwest at the hired hands' quarters, Schwartz-Mahoney Ranch, 41 LK 197.

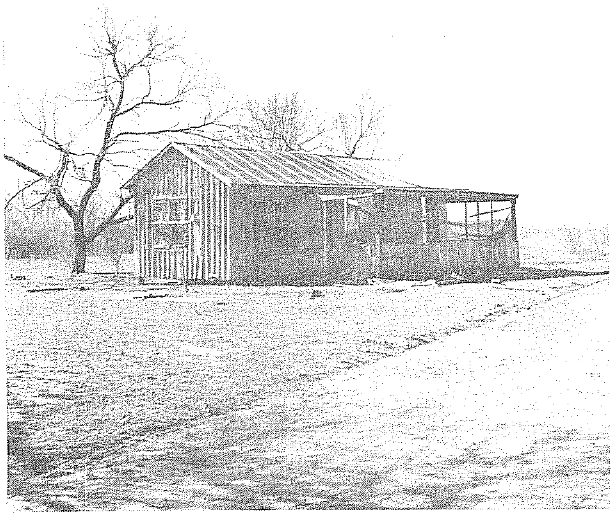
b. View north across site of main residence to hired hands' house at 41 LK 197. Main ranch house was destroyed by a hurricane.

c. Detail of a mesquite log fence in the corral complex at 41 LK 197.

d. View northeast along slough between 41 LK 197 and 41 LK 201. Area to right of photo has been cleared of brush for dam borrow pits. Site 41 LK 201 is located in the trees and brush on the other side of the channel. The slough channel is unaltered and, until a short time before this photo was taken, contained water. Larger trees are mesquites and occasional live oaks. No foliage on trees due to winter weather.

e. View west to southeast end of 41 LK 201 from 41 LK 197. Slough channel is in foreground. Note the rise of the natural levee containing the site. No foliage on trees due to winter weather.

f. View west from southeast end of 41 LK 201. Note cultivated field to left. Most of vegetation is whitebrush, spiny hackberry (granjeno), and mesquite. Slough channel is to the right.



a

b

c

d

Bone Weight (grams)	3	14	1	0
Primary Flake Count	0	3	1	0
Secondary Flake Count	12	21	4	1
Tertiary Flake Count	23	26	30	0
Chip Count	20	59	21	4

A small cluster of tuff rock, designated Feature 1, was exposed in Level 11 of Test Pit 1. The feature consisted of one layer of nine rocks arranged into a cluster having a diameter of about 40 cm (Fig. 10). The rocks were fist size and smaller. Eight were tuff, and one was fire-fractured chert. Total rock weight was 2028 g. One large chert primary flake was found along with the rocks. A carbon sample was collected from among the rocks, but the sample later proved too small for radiocarbon assay or species identification.

Artifacts recovered from Test Pit 1 included three cores, two thick bifaces, four thin bifaces, one fragment of a distally beveled biface, two trimmed flakes, and one sandstone grinding slab fragment. One core (Group 3), one thick biface (Group 5), three thin bifaces (Group 2, Form 1, Spec. 23; Group 4, Form 1, Spec. 9; and Group 1, Form 4), one distally beveled biface fragment (Group 9, Spec. 14), and two trimmed flakes (Group 3, Form 4, Spec. 3, and Group 3, Form 5, Spec. 4) were all recovered from Levels 10 and 11. The thin bifaces are unstemmed and triangular. Two have convex bases, and one has a straight base.

Among the bones collected from Test Pit 1 were elements of rabbit (Levels 3, 9, and 14) and turtle (Level 13).

Test Pit 2 at 41 LK 201 was excavated to a depth of 2.1 m below ground surface. Twenty-one 10-cm levels were removed from the unit. From the floor of Level 21, half of the unit was dug down to a depth of 2.4 m below surface. By Level 19, material recovery had decreased greatly from levels above. Very little cultural debris was recovered from Level 19 down to the bottom of the unit. Matrix characteristics in Test Pit 2 were much the same as those described for Test Pit 1 above. Recovery for selected classes of material from Test Pit 2 was as follows:

	Horizon				
	1st	2nd	3rd	4th	5th
Tuff Rock Weight (grams)	122	5	544	2083	15
Fire-Fractured Rock Weight (grams)	124	101	287	983	18
Mussel Shell Umbo Count	61	4	12	70	0
Mussel Shell Weight (grams)	467	26	33	249	0
Rabdotus Shell Count	238	29	47	622	87
Bone Weight (grams)	403	1.2	1.2	3.4	0.4
Primary Flake Count	4	2	0	1	0
Secondary Flake Count	83	7	10	22	4
Tertiary Flake Count	147	7	11	55	2
Chip Count	226	10	7	80	4

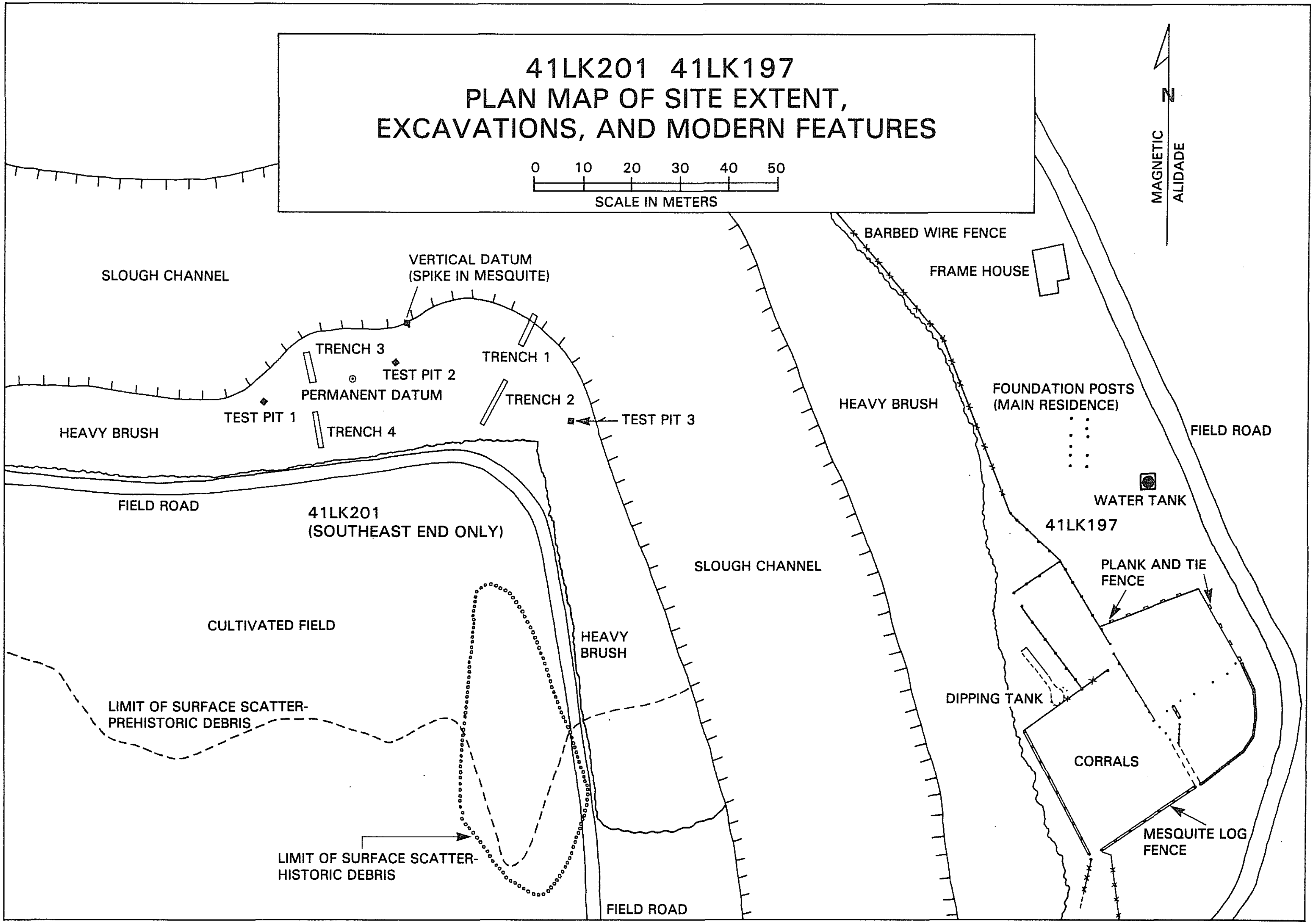

41LK201 41LK197
PLAN MAP OF SITE EXTENT,
EXCAVATIONS, AND MODERN FEATURES
0 10 20 30 40 50
SCALE IN METERS
N
MAGNETIC
ALIDADE
SLOUGH CHANNEL
VERTICAL DATUM
(SPIKE IN MESQUITE)
TRENCH 3
TEST PIT 2
TRENCH 1
PERMANENT DATUM
TRENCH 2
TEST PIT 1
TEST PIT 3
HEAVY BRUSH
TRENCH 4
FIELD ROAD
41LK201
(SOUTHEAST END ONLY)
CULTIVATED FIELD
HEAVY
BRUSH
LIMIT OF SURFACE SCATTER-
PREHISTORIC DEBRIS
LIMIT OF SURFACE SCATTER-
HISTORIC DEBRIS
FIELD ROAD
SLOUGH CHANNEL
HEAVY BRUSH
BARBED WIRE FENCE
FRAME HOUSE
FOUNDATION POSTS
(MAIN RESIDENCE)
FIELD ROAD
WATER TANK
41LK197
PLANK AND TIE
FENCE
DIPPING TANK
CORRALS
MESQUITE LOG
FENCE

FIGURE 9

Two features were defined in Test Pit 2. Feature 3 was exposed in Level 14 (130-140 cm below surface). It consisted of a layer of tuff rock, fire-fractured rock, mussel shell, *Rabdotus* shell, and carbon flecking that covered all but the western corner of the unit (Fig. 11). There were roughly equal numbers of tuff rocks (about 28) and fire-fractured rocks (about 29) in the feature. Many smaller spalls of fire-fractured rock were also recovered from the feature area. The tuff rock weighed 882 g, and the fire-fractured rock weighed 1155 g. At least 25 mussel shell umbos and numerous nonumbo shell fragments were observed amidst the rocks. Although a carbon sample was recovered from the feature, the amount was inadequate for radiocarbon assay.

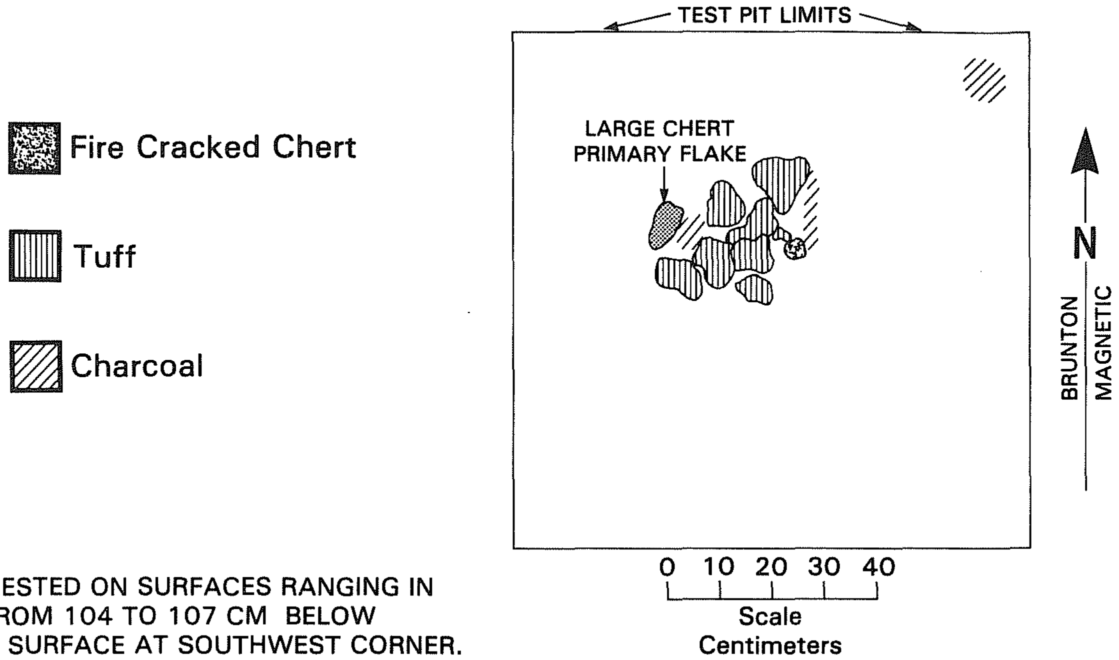
In Level 16 of Test Pit 2, a second cluster of tuff rock was isolated. Designated Feature 4, this linear rock concentration measured 60 cm southwest-northeast and was about 30 cm wide. The 15 rocks composing the feature were all tuff. The rocks ranged from 5-15 cm in diameter. *Rabdotus* snail shells were very common in and around the feature. Some mussel shell was present. Carbon was observed as flecks throughout the feature area. This feature may have been a continuation of Feature 3 which occurred only 10 cm above in Level 14. Feature 4, however, contained no fire-fractured rock and only a small amount of mussel shell. It was thus not completely in character with Feature 3. Feature 4 is not illustrated.

Artifacts recovered in Test Pit 2 included one chert core, two thick bifaces, five thin bifaces, two trimmed flakes, three sandstone grinding slab fragments, and six sherds of aboriginal pottery. Among the thin bifaces were one *Perdiz* arrow point (Group 1, Form 4, Spec. 13) and two chert pieces onto which sharp, slender points had been worked (Group 8, Specs. 3 and 4). These three specimens came from Levels 1 and 2. Distinctive trimmed flakes were recovered from Level 2 (Group 3, Form 3, Spec. 2) and Level 11 (Group 3, Form 1, Spec. 5). Sandstone grinding slab fragments were found in Levels 1, 4, and 5. Pottery sherds were found in Levels 1-3.

Test Pit 2 yielded a rich inventory of vertebrate faunal remains. The following species were represented:

	Horizon				
	1st	2nd	3rd	4th	5th
Softshell Turtle	X				
Pond Slider	X				
Turtle	X				
White-tailed Deer	X				
Bison	X				
Rabbit	X		X		
Jackrabbit	X				
Fish	X				
Gar	X				
Freshwater Drum	X				
Wild Turkey	X				
Snake	X				

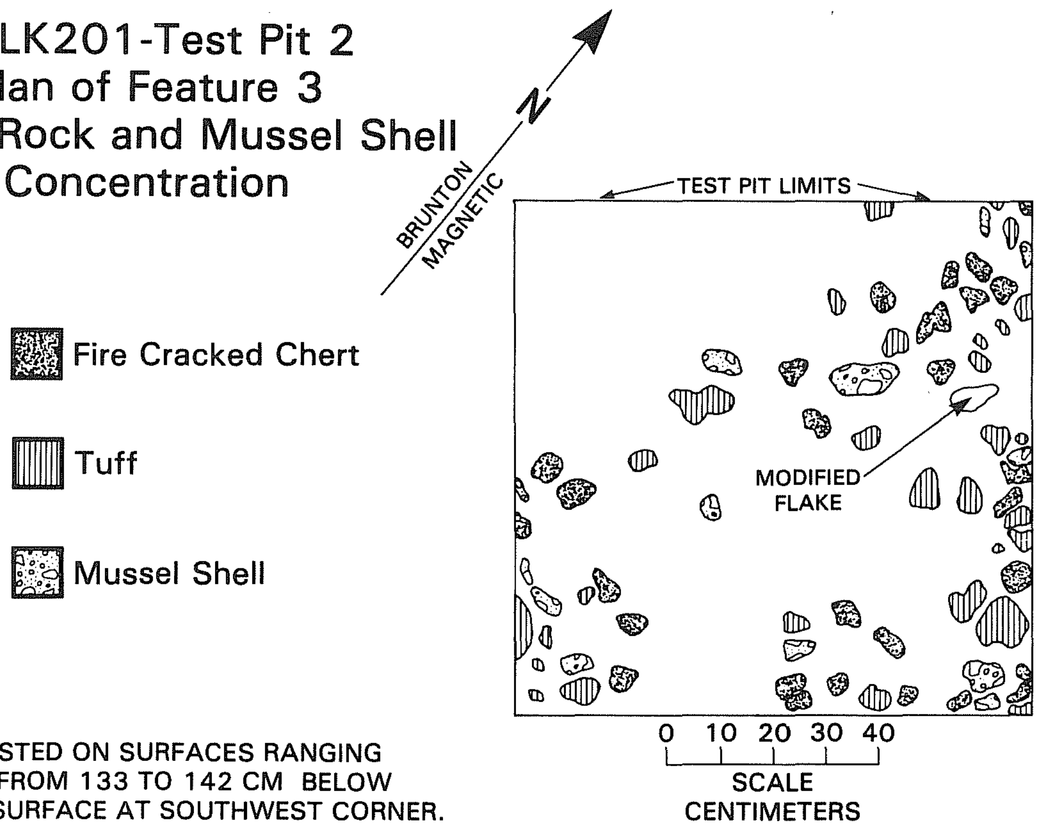
41LK201-Test Pit 1
Plan of Feature 1
Burned Rock Concentration



ROCKS RESTED ON SURFACES RANGING IN DEPTH FROM 104 TO 107 CM BELOW GROUND SURFACE AT SOUTHWEST CORNER.

FIGURE 10

41LK201-Test Pit 2
Plan of Feature 3
Burned Rock and Mussel Shell Concentration



ROCKS RESTED ON SURFACES RANGING IN DEPTH FROM 133 TO 142 CM BELOW GROUND SURFACE AT SOUTHWEST CORNER.

FIGURE 11

A carbon sample recovered in Level 20 of Test Pit 2 was too small for radiocarbon assay, but a wood species identification was possible. Mesquite (*Prosopis glandulosa* Torr.) was recognized in this sample.

Test Pit 3 was excavated to a depth of 2 m below ground surface. Matrix in this unit started out as a loose, brown loam. In Level 3 it lightened to a grayish brown. At Level 8, the deposit became slightly more compact, but still loose and very workable. In Level 9, the matrix darkened again to a brown color. At Level 16, the complex feature described below was encountered. Recovery for selected classes of material from Test Pit 3 was as follows:

	Horizon			
	1st	2nd	3rd	4th
Tuff Rock Weight (grams)	4	169	912	1327
Fire-Fractured Rock Weight (grams)	36	186	253	462
Mussel Shell Umbo Count	19	15	49	10
Mussel Shell Weight (grams)	113	51	152	46
Rabdotus Shell Count	182	48	78	28
Bone Weight (grams)	63	86	9	163
Primary Flake Count	2	1	3	2
Secondary Flake Count	7	17	33	3
Tertiary Flake Count	11	12	41	4
Chip Count	13	22	39	4

A very unusual and complex feature was first recognized in Level 16 of Test Pit 3. Designated Feature 2, it was first evidenced at about 1.55 m below ground surface by two huge pieces of carbonized wood, one large piece of bone, five pieces of sandstone, and two pieces of fire-fractured rock (Fig. 12). Matrix around the feature constituents was ashy. Numerous land snails were found in and around the feature. Following recording, Feature 2 elements isolated in Level 16 were removed.

As excavation continued in Test Pit 3, Feature 2 was found to extend well into Level 17. At this level, the feature expanded to cover much of the unit floor (Fig. 12). The feature became well defined in a subcircular area measuring 70 cm north-south and 80 cm east-west. This area was generally indicated by burned earth, bits and chunks of fired clay, and ash. Within this feature were additional large pieces of carbonized wood, some animal bone, and a few pieces of sandstone. Many small bones, land snail shells, hackberry seeds, and some mussel shell fragments were found in and around the feature at this level. The sticks of carbonized wood exposed in this level were noted to dip, but not in any consistent direction.

Feature 2 was cross-sectioned along a north-south line 35 cm out from the west wall of the test pit. The western portion of the feature was left pedestaled as Levels 18-20 were excavated in the remainder of the unit. In Level 18, the area covered by the feature decreased (Fig. 13). Two discrete areas were evident, one marked by gray, ashy matrix and the other by much carbon flecking and mottled, burned earth. At the floor of Level 19, the feature was recognized as a single small area of gray, ashy matrix extending into the feature pedestal (Fig. 13).

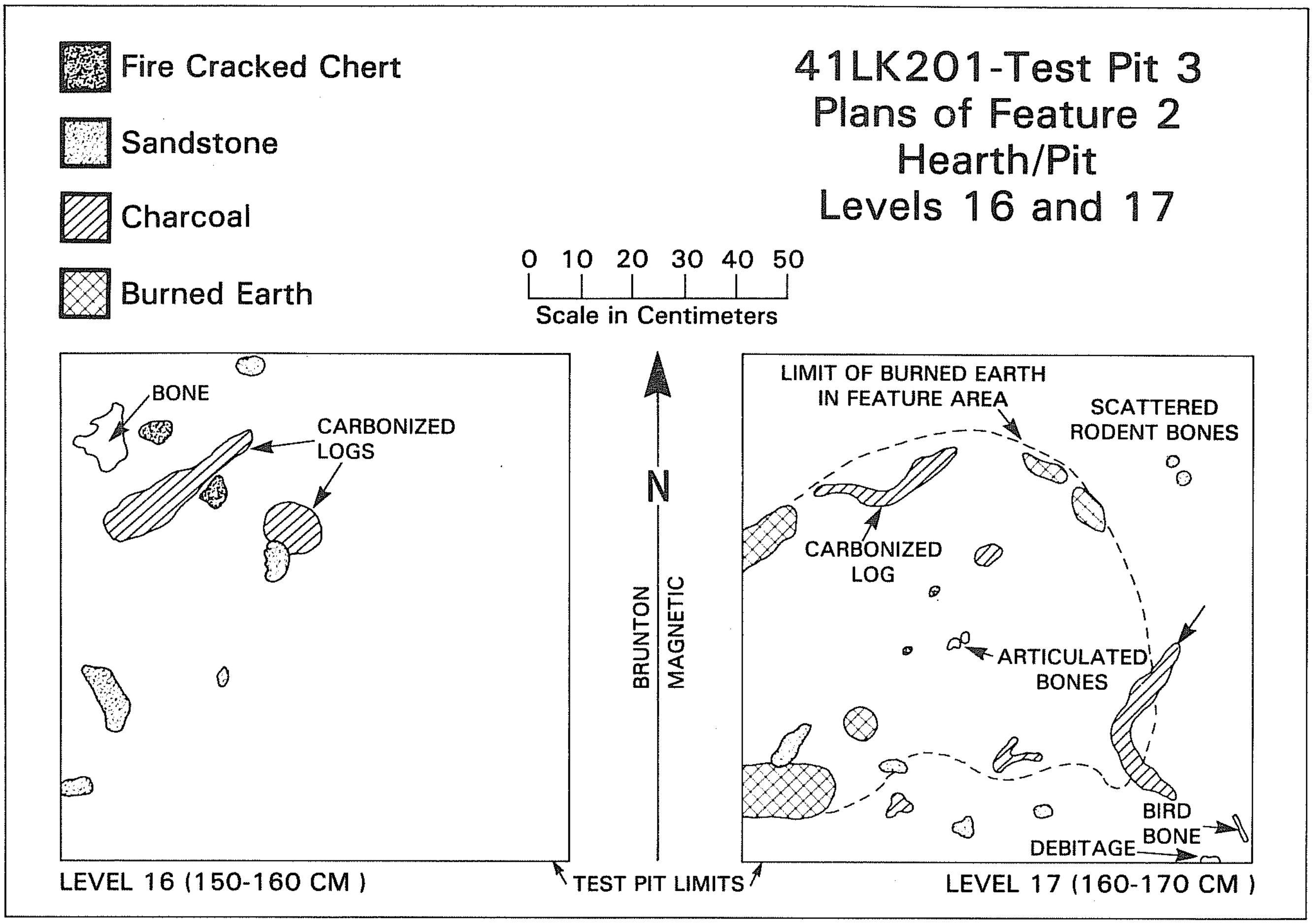


FIGURE 12

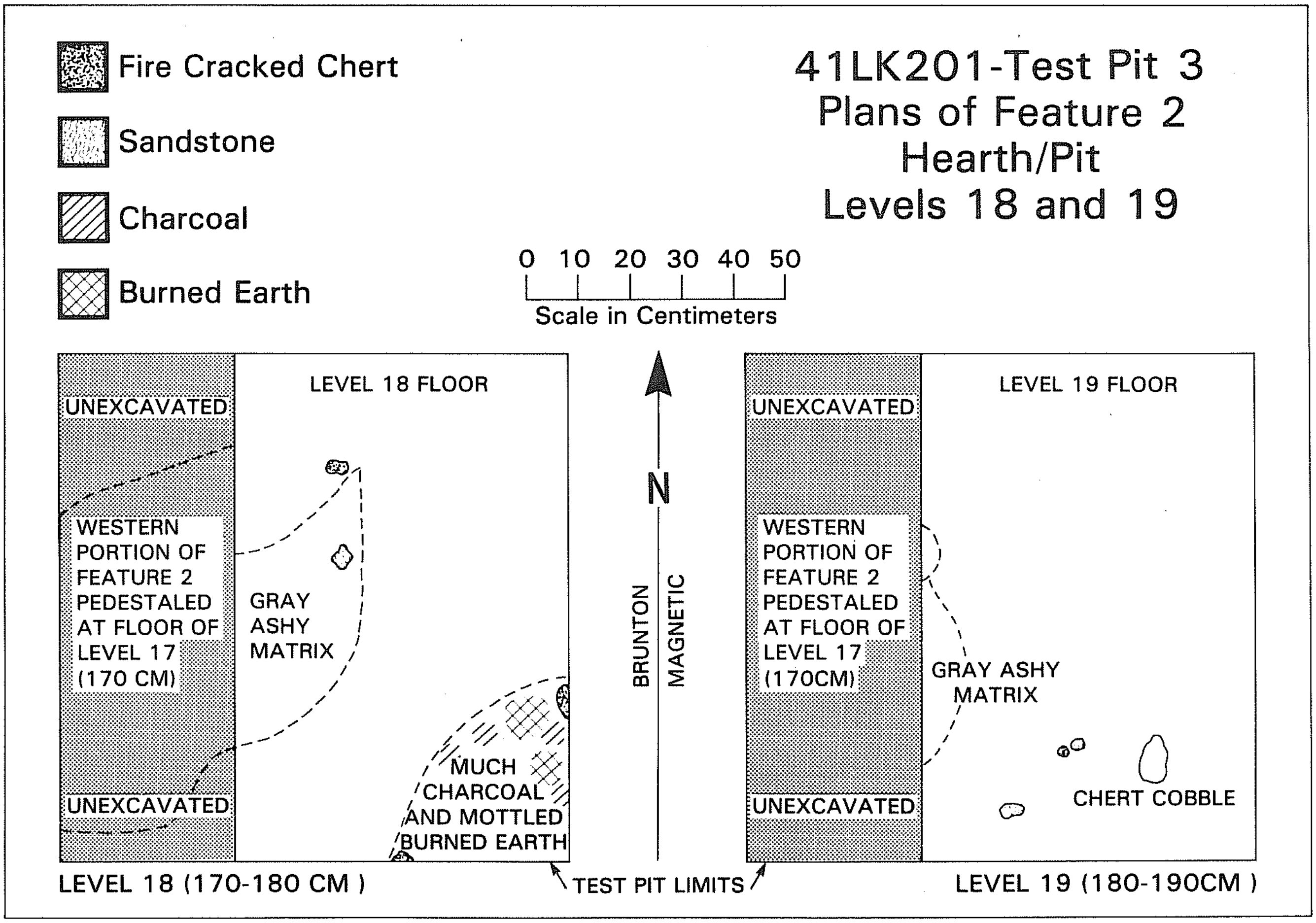


FIGURE 13

With excavation of Level 20 in Test Pit 3, the bottom of Feature 2 was found at 1.93 m below surface. A profile drawing of the east face of the Feature 2 pedestal is shown in Figure 14.

The portion of Feature 2 preserved in the pedestal was excavated by removing matrix and materials from the pit they apparently filled. As this fill was removed, additional baked earth and massive pieces of carbonized wood were found. The pit or trough remaining after the fill was removed was very irregular in shape. The pit was 65 cm wide (north-south) along the east face of the feature pedestal. It expanded to a north-south dimension of one meter or more as it met the west wall of the test pit (Fig. 14). Numerous samples of feature matrix were collected as Feature 2 was excavated.

Artifacts recovered from Test Pit 3 included four cores, two thin bifaces, one distally beveled uniface, and one sandstone grinding slab fragment. The two thin bifaces were unstemmed, leaf-shaped specimens (Group 5, Specs. 13 and 42) recovered from Levels 9 and 7, respectively. The distally beveled uniface ("gouge," Group 3, Form 2, Spec. 8) came from Level 9. The grinding slab fragment (Group 1, Form 3, Spec. 59) was found in Level 1.

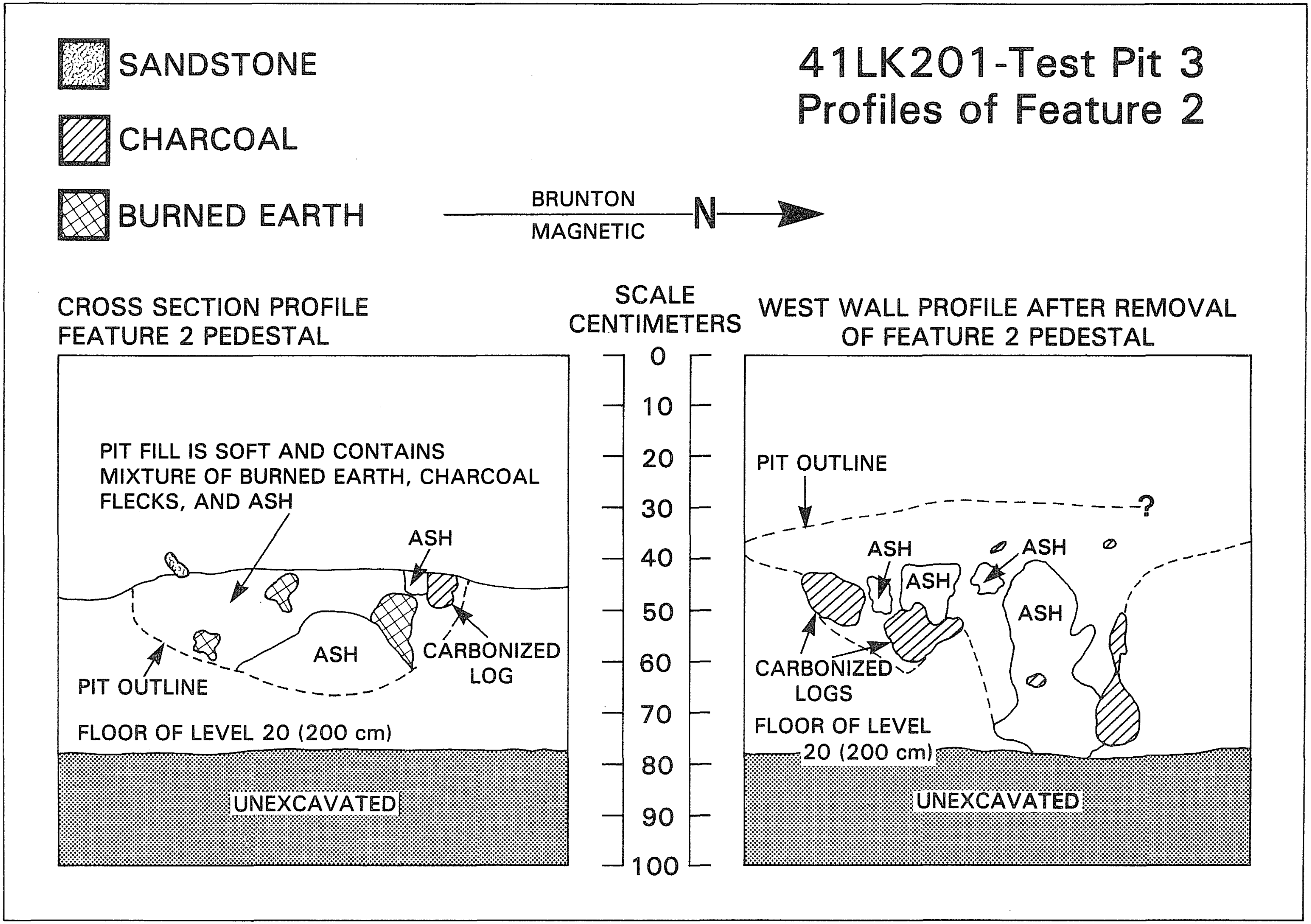
The great amount of carbon recovered from Feature 2 in Test Pit 3 yielded both a radiocarbon assay and wood species identification. The sample submitted for radiocarbon assay (TX-3022) produced a date of 3090 ± 80 or 1300 B.C. (MASCA correction). All identifiable carbon in the feature was oak (*Quercus* sp.). See Appendices III and IX for more information concerning these samples.

The following species were represented among the vertebrate faunal remains collected in Test Pit 3:

	Horizon			
	1st	2nd	3rd	4th
White-tailed Deer	x	x	x	x
Rabbit	x	x	x	x
Jackrabbit		x		x
Snake		x		x
Wood Rat			x	x

See Appendix IX, Table 35, for more complete information on the vertebrate faunal recovery.

One item of special interest recovered from the Feature 2 area of Level 17 in Test Pit 3 was a fired mud dauber's nest. This nest may provide indirect evidence that a structure once existed on the site. This speculation is based on the belief that mud daubers only build their nests in protected areas such as are not naturally afforded in the immediate site area. Based on modern observations, they will take advantage of protected areas created by man, such as under the eaves of houses and beneath highway bridges. Thus, one inference that might be drawn from the Test Pit 3 specimen is that the prehistoric inhabitants of 41 LK 201 built structures that provided the kind of protection needed by the mud daubers for nest building. This is admittedly a weak bit of evidence, and the existence of prehistoric housing cannot be confidently inferred based solely on this finding.


41LK201-Test Pit 3
Profiles of Feature 2
SANDSTONE
CHARCOAL
BURNED EARTH
BRUNTON
MAGNETIC
N
CROSS SECTION PROFILE
FEATURE 2 PEDESTAL
SCALE
CENTIMETERS
0
10
20
30
40
50
60
70
80
90
100
WEST WALL PROFILE AFTER REMOVAL
OF FEATURE 2 PEDESTAL
PIT FILL IS SOFT AND CONTAINS
MIXTURE OF BURNED EARTH, CHARCOAL
FLECKS, AND ASH
ASH
ASH
CARBONIZED
LOG
PIT OUTLINE
FLOOR OF LEVEL 20 (200 cm)
UNEXCAVATED
PIT OUTLINE
?
ASH
ASH
ASH
ASH
CARBONIZED
LOGS
FLOOR OF LEVEL
20 (200 cm)
UNEXCAVATED

Four backhoe trenches were excavated at 41 LK 201. The trenches were placed in two transects between the test pits (Fig. 9). Simplified wall-profile sketches are shown for three of the trenches in Figure 15. In Trench 1, mussel shell, tuff rocks, chert, and carbon were contained in three relatively distinct horizons, the deepest of which was the most clearly defined. In Trench 2, the cultural debris was concentrated at two different levels down through the deposit. At the southern end of Trench 2, the outline of a modern, filled pit was recognized. This pit was manifested on the site surface as a shallow depression ringed by a low mound of backdirt. The date of excavation and function of the pit were not determined. In the lower layer of debris seen in the wall of Trench 2 was a lens of gray clay loam containing small amounts of shell, rock, carbon, and debitage. One thin, stemmed biface (Group 1, Form 3, Spec. 34, *Ensor* or *Fairland* ?) was found in the lower debris layer. In the wall of Trench 3, at least three distinct debris layers were evident. In the two deepest layers, gray clay lenses similar to the one in Trench 2 were evident. In all four of the trenches, cultural debris was confined to the layer 1.5-1.8 m below ground surface.

A provenienced surface collection at the southeast end of 41 LK 201 (generally over the area shown in Fig. 9) yielded the following artifacts and materials: 29 cores, one thick biface, nine thin bifaces, two distally beveled bifaces or unifaces, seven trimmed flakes, five pieces of modified sandstone, four hammerstones (two probable, two possible), one unusual grooved and faceted rock (Modified Quartzite and Igneous Rocks--Spec. 2), one piece of satin spar gypsum, 51 sherds of aboriginal pottery, 12 large bone fragments, and 25 historic artifacts including ceramics, glass, and metal. The most common cores collected on the site were classified into Group 3 (11 specimens) and Group 9 (8 specimens). Lesser numbers of cores belonging to the other groups, except for Group 8, were also found. One Group 3 biface was collected. Among the thin bifaces were a *Fairland* point (Group 1, Form 3, Spec. 44), three arrow point fragments (Group 1, Form 7), and one beveled knife (Group 4, Form 2, Spec. 4). There were also four unstemmed thin bifaces with straight or convex bases. The two surface-collected distally beveled specimens represent Group 3, Form 3 and Group 7, Form 3. A variety of trimmed flake forms (Groups 3 and 4) were collected. Modified sandstone surface finds included a mano (Group 2, Form 1) and four grinding slab fragments.

Analysis of data recovered during the testing operation at 41 LK 201 indicates that the southeastern end of the site was occupied during the Late Archaic, Late Prehistoric, and Historic times. Radiocarbon assay of a carbon sample from Feature 2 yielded a corrected date of 1300 B.C. Tentatively, this dates the earliest human activity on the site. However, materials found at slightly greater depths in the other test pits might be somewhat older.

The Late Prehistoric component at 41 LK 201 seems to be contained within the upper four or five levels (40-50 cm below surface) of deposit on the site. Material remains representing the Late Prehistoric are grouped into the 1st Horizon debris assemblages in all three of the test pits. The Late Archaic remains occurred down through a deposit ranging in thickness from 1.3-1.6 m (from 0.5-2.1 m below surface). On the basis of variable rates of material recovery, the obvious layering of materials in the trench wall profiles, and the superpositioning of apparent Late Archaic habitational features, it is quite evident

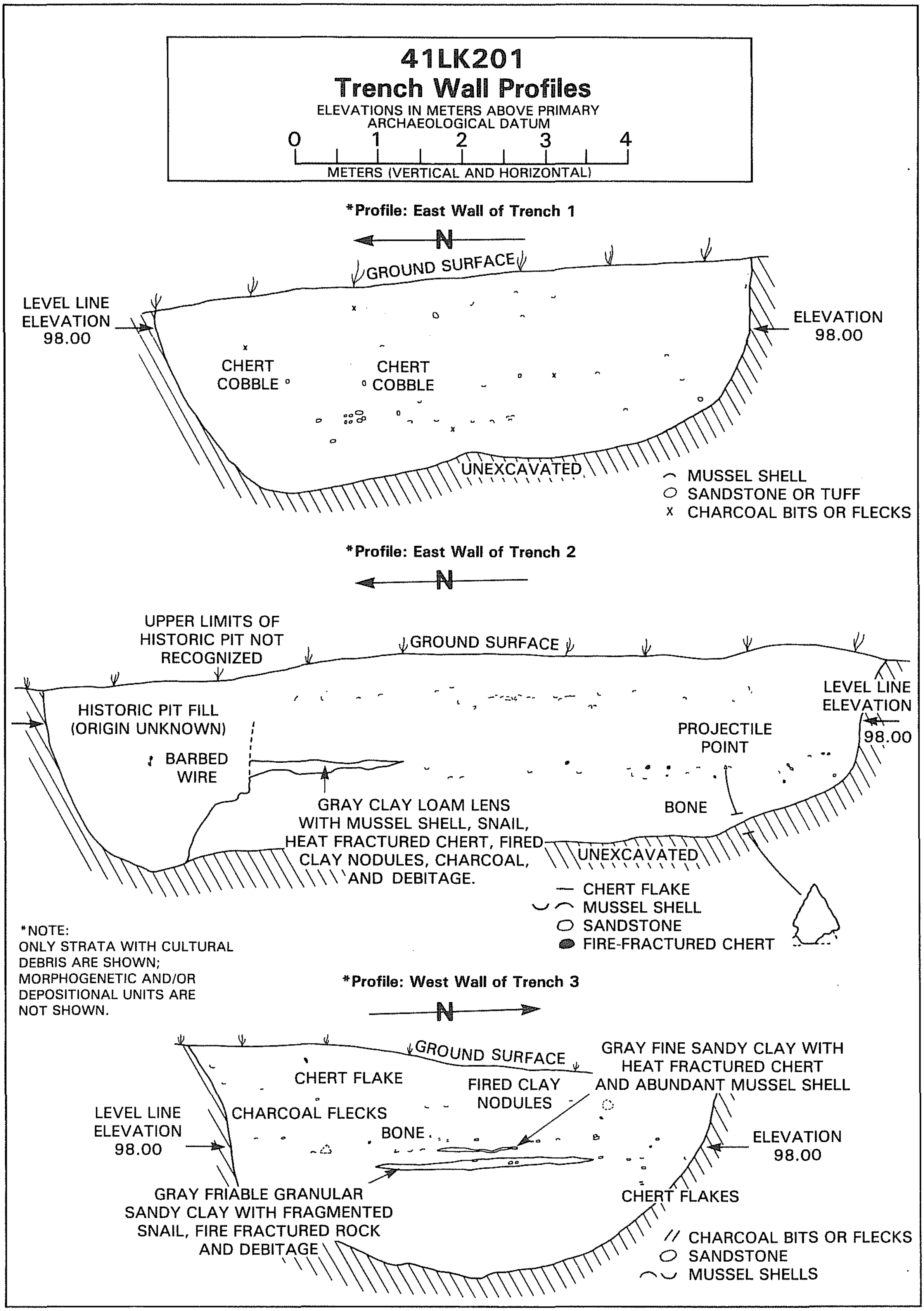

41LK201
Trench Wall Profiles
ELEVATIONS IN METERS ABOVE PRIMARY ARCHAEOLOGICAL DATUM
0 1 2 3 4
METERS (VERTICAL AND HORIZONTAL)
*Profile: East Wall of Trench 1
N
GROUND SURFACE
LEVEL LINE ELEVATION 98.00
ELEVATION 98.00
CHERT COBBLE
CHERT COBBLE
UNEXCAVATED
MUSSEL SHELL
SANDSTONE OR TUFF
X CHARCOAL BITS OR FLECKS
*Profile: East Wall of Trench 2
N
UPPER LIMITS OF HISTORIC PIT NOT RECOGNIZED
GROUND SURFACE
HISTORIC PIT FILL (ORIGIN UNKNOWN)
BARBED WIRE
LEVEL LINE ELEVATION 98.00
PROJECTILE POINT
GRAY CLAY LOAM LENS WITH MUSSEL SHELL, SNAIL, HEAT FRACTURED CHERT, FIRED CLAY NODULES, CHARCOAL, AND DEBITAGE.
BONE
UNEXCAVATED
CHERT FLAKE
MUSSEL SHELL
SANDSTONE
FIRE-FRACTURED CHERT
*NOTE: ONLY STRATA WITH CULTURAL DEBRIS ARE SHOWN; MORPHOGENETIC AND/OR DEPOSITIONAL UNITS ARE NOT SHOWN.
*Profile: West Wall of Trench 3
N
GROUND SURFACE
GRAY FINE SANDY CLAY WITH HEAT FRACTURED CHERT AND ABUNDANT MUSSEL SHELL
CHERT FLAKE
FIRED CLAY NODULES
CHARCOAL FLECKS
LEVEL LINE ELEVATION 98.00
BONE
ELEVATION 98.00
GRAY FRIABLE GRANULAR SANDY CLAY WITH FRAGMENTED SNAIL, FIRE FRACTURED ROCK AND DEBITAGE
CHERT FLAKES
// CHARCOAL BITS OR FLECKS
SANDSTONE
MUSSEL SHELLS

FIGURE 15

that the site was occupied on successive occasions during the Late Archaic. The gradual aggradation of the site surface concurrent with Late Archaic activities provided a certain amount of stratigraphic separation between debris accumulations representing each discrete period of site use. In Test Pit 1, materials grouped into the 2nd and 3rd Horizons are suggested to represent two distinct Late Archaic components. In Test Pit 2, the same is true for Horizons 3 and 4. Late Archaic materials found in Test Pit 3 were divided into Horizons 2, 3, and 4 where three distinct components were recognized. The horizons not mentioned--the fourth in Test Pit 1 and Horizons 2 and 5 in Test Pit 2--are suggested to be relatively sterile layers containing materials derived from horizons above and/or below. It must be emphasized that these horizon groupings have been somewhat arbitrarily defined and are certainly subject to alternate interpretation. The important point is that Late Archaic debris and features were found in at least three stratigraphically distinct layers down through the deposit at 41 LK 201.

All of the thin bifaces recovered from Late Archaic context in the test pits at 41 LK 201 were unstemmed and triangular or leaf shaped. They fit the type descriptions for *Tortugas* and *Refugio* points. One stemmed thin biface, typed as either an *Ensor* or *Fairland* point, was found among Late Archaic materials in a trench wall. Two distally beveled bifaces were also found in Late Archaic context. For later comparative purposes, it is important to note that these particular forms were recovered from Late Archaic deposits tentatively dating no earlier than 1300 B.C.

Distinctive artifacts recovered from the Late Prehistoric horizon at 41 LK 201 included one *Perdiz* arrow point, two chert drills or perforators (Thin Biface, Group 8, Specs. 3 and 4), and a number of potsherds. Surface-collected artifacts probably related to Late Prehistoric activities on the site include fragments of a ceramic pipe bowl, several large bladelike trimmed flakes, and a beveled chert knife (Thin Biface, Group 4, Form 2, Spec. 4).

The three habitational features isolated in the test pits at 41 LK 201 were all in Late Archaic context. Features 1 and 3, both composed of tuff rock and fire-fractured rock, were not especially remarkable. Feature 2, however, was extremely unusual. Consisting of a pit in which an intense fire was built, this feature may have been some type of specialized cooking facility. The feature was surrounded by mussel shell, *Rabdotus* shell, and the bones of deer, rabbit, snake, and rat. No other features as complex or well-integrated as Feature 2 were found during the Phase I investigations at Choke Canyon.

A substantial collection of faunal material resulted from the testing operation at 41 LK 201. Mussel shells and *Rabdotus* shells were common in both Late Archaic and Late Prehistoric components. Bones of a wide variety of vertebrate species were recovered from the Late Prehistoric component, especially in Test Pit 2. Turtle, deer, bison, rabbit, fish, gar, turkey, and snake were all found in the Late Prehistoric levels. Some bone was recovered from Late Archaic deposits, especially in the vicinity of Feature 2 in Test Pit 3. Rabbit, deer, snake, rat, and turtle were represented. Bone was much less common in the Late Archaic deposits than in the Late Prehistoric, and not as many species were represented. Of ten pieces of modified sandstone found on the site (one mano and nine grinding slab fragments), five were found in the test pits, and five were surface collected. All subsurface specimens came from Late Prehistoric deposits (Levels 1-5).

Oak (*Quercus* sp.) and mesquite (*Prosopis glandulosa* Torr.) were identified in carbon samples recovered from the deeper reaches of the 41 LK 201 deposit. The oak carbon came out of Feature 2 which is dated at 1300 B.C. The mesquite carbon came out of Level 20 in Test Pit 2. Stratigraphically deeper than Feature 2, the Level 20 sample is assumed to be as old or older than the dated oak sample. Thus, this specimen provides evidence for the earliest known occurrence of mesquite in south Texas. The recognition of both oak and mesquite in Late Archaic context at 41 LK 201 permits the suggestion that both species were growing on or near the site concurrent with the earliest period of human activity at the location.

The array of chipped stone materials recovered at 41 LK 201 suggests that a full range of flintknapping activities were being carried out by the prehistoric inhabitants. Along with the cores, thick bifaces, and finished chipped stone tools mentioned above, there were 1125 pieces of debitage recovered. This collection broke down into debitage types in the following percentages:

Primary Flakes	1.5%
Secondary Flakes	20 %
Tertiary Flakes	33 %
Chips	45 %
Chunks	0.5%

Almost all of the historic artifacts collected at 41 LK 201 came from the site surface within the limits of the "Historic Debris Scatter" shown in Figure 9. Observed over this same area, but not collected, were a small number of medium to large pieces of gray sandstone identical to those used in construction of foundations and chimneys at 41 LK 31/32 (historic component) and at 41 LK 202. The artifacts suggest that the site was occupied sometime between 1860 and 1880. The presence of sandstone building materials indicates that a structure probably once existed on the site. Any structural integrity there may have been to this historic component has apparently been eliminated by brush clearing and farming. A listing of artifacts recovered from this component is provided in the Historic Artifacts section. The background history of the land containing this and several other historic sites is provided in Volume 2 of the research series (Everett 1981:34-35).

41 LK 197

On the left bank of the slough channel directly across from the southeast end of 41 LK 201 was the headquarters of the Mark Mahoney Ranch (Figs. 6 and 7). The site was recorded by the CRI crew and assigned the permanent designation 41 LK 197. Efforts on the site were directed primarily at mapping and photographing extant historic features. Several shovel tests were also excavated in the area.

The major features recorded at 41 LK 197 included a small frame house, the foundation posts of what was the main residence, and a corral complex (Figs. 8,a-c; 9). These features together comprise what has been described as a 20th-century Anglo ranch headquarters (*ibid.*:34-35).

The foundation posts shown in Figure 9 mark the location of the main ranch residence which was destroyed by a hurricane in 1967. The small four-room frame house located at the north end of the complex was originally a ranch hands' quarters and more recently served as a camphouse for hunters and a residence for farm workers. The corrals consisted of three kinds of fencing. On the southeast and southwest sides was a fence of mesquite logs. One section of this fence is shown in Figure 8,c. The north and northeast sides were plank and tie fences. These consisted of railroad-tie uprights with planks of 2 x 12-inch lumber serving as crosspieces. The remaining portions of the corral were typical barbed wire fences. The dipping tank located on the west side of the corral was cement lined.

Several shovel tests were excavated in the area between the structures and the slough bank at 41 LK 197. In these shovel tests, the presence of subsurface prehistoric remains was established. Tests in the heavily wooded strip between the barbed wire fence and the slough channel (Fig. 9) revealed a deposit very similar to that described for the southeast end of 41 LK 201 located directly across the slough. Prehistoric remains were not seen on the surface in the area of the historic structures, but did show up on the surface along the slough bank northwest of the frame house. The prehistoric element of 41 LK 197 was not further tested.

41 LK 198

This small, open prehistoric site was also recorded by the CRI crew during the 1977 survey. The site is located on the south (right) bank of the slough roughly 300 m south of 41 LK 201 (southeast end) and approximately 500 m northwest and west of 41 LK 59 and 41 LK 41 (Fig. 1). The site measures about 50 m north-south and 220 m east-west. It is bisected by a dirt road that now serves as the access to the Mahoney Ranch from State Highway 72. This track was once a portion of the old Tilden-Three Rivers Highway. Where the road crosses the slough channel just north of 41 LK 198 are the remains of an old bridge that spanned the slough channel. The bridge was once a very substantial structure. It had concrete abutments on either side of the channel. There were steel beams running between the abutments. The beams were overlain by heavy wooden planks.

Much of the surface of 41 LK 198 was cleared of brush and was sparsely covered with grass and weeds. Some mesquite, cactus, spiny hackberry, and whitebrush occurred as fairly dense thickets in the central and eastern parts of the site. The northern margin of the site was moderately eroded where the site surface broke down a gentle slope into the shallow channel of the slough. The site was manifested as a light-density surface scatter of fire-fractured rock, debitage, cores, mussel shell fragments, and *Rabdotus* shells.

Activities at 41 LK 198 included excavation of two shovel tests and an unprovenienced surface collection. In the shovel tests, very little debris was found. Artifacts collected from the site surface were one core (Group 3), two thick bifaces (Groups 1 and 8), and one thin biface fragment (Group 10). These materials permit no estimate of the period during which the site was occupied.

SITE GROUP 2

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
41 LK 67	-	41 LK 8 41 LK 9 41 LK 13	41 LK 69 41 LK 207	41 LK 10 41 LK 97

Site Group 2 encompasses eight prehistoric sites located on the north side of the Frio River along and just east of the Choke Canyon Dam alignment. Six sites cluster within an area of 4 km^2 near the river and dam centerline. Two sites--41 LK 97 and 41 LK 207--are located 3-4 km northwest of the main cluster. They occur in a setting quite different from the other six sites, but being equally isolated from all adjacent site groups, they are included in Site Group 2 as a convenience. Site Group 2 thus covers an area measuring approximately 6 km north-south and 4 km east-west.

In the area of Site Group 2, the Frio River valley constricts to form the "choke" across which the dam will be constructed. The width of the floodplain decreases greatly in comparison to locations further west. South of 41 LK 8 and 41 LK 67, the river bends north and collides with the northern edge of the valley. There is essentially no floodplain on the northern side of the river along this stretch. Short, deep arroyos cut into the valley margin and expose the Catahoula Formation in steep bluff faces. The river then bends south towards the opposite side of the valley leaving a somewhat wider area of floodplain containing sites 41 LK 9 and 41 LK 10. Sites 41 LK 67 and 41 LK 69 are draped over a ridge of upland and valley margin slope created by the Frio River valley to the south and the valley of Live Oak Hollow which trends from northwest to southeast just north of the sites. Near the river and just off the edge of the valley, 41 LK 8 is situated on an isolated terrace remnant forming an unusual rise out on the floodplain. Immediately southwest of 41 LK 8 lies 41 LK 13. This small floodplain site is separated from 41 LK 8 by a channel that apparently carries water only as overflow from the Frio River and/or as drainage from the uplands. Gravel is distributed extensively throughout the area. It is especially common over the entire surface of 41 LK 69, at the west end of 41 LK 8, in a narrow band paralleling the river between 41 LK 8 and 41 LK 67, and over much of the 41 LK 10 surface.

The vegetational communities change quite dramatically over short distances in the vicinity of the Group 2 sites. Where the river channel meets the valley margin, there is an abrupt, seldom seen contact of upland flora with a riparian gallery forest. The narrow bands of floodplain in the area are choked with thickets of mesquite and whitebrush. The valley margin and upland are covered with blackbrush, guajillo, and short grasses.

41 LK 67

Scheduled for intensive testing during Phase I investigations, 41 LK 67 was located astride the centerline of the dam as it rose from the Frio floodplain to abut the northern side of the valley. A test pit excavated at 41 LK 67 by the THC survey crew revealed shallow, but promising subsurface cultural deposits in the site (Lynn, Fox, and O'Malley 1977:149-150). In earlier investigations, members of the CBAS had found a soapstone elbow pipe and a fragmentary ceramic figurine on the surface of 41 LK 67 (Brown *et al.* 1982:Appendix III).

Initial excavations conducted at 41 LK 67 by the CAR-UTSA crew late in 1977 demonstrated the presence of significant prehistoric remains in the site. Based on these findings, further excavations were recommended. Final excavations were done by the CAR crew in 1978. Shortly thereafter, the site was completely destroyed as the foundation trench for the dam was excavated. A comprehensive report of the findings made at 41 LK 67 is provided in Volume 7 Brown *et al.* 1982) of this research series. The site is discussed briefly below since certain findings will be useful for comparative purposes later in this report.

Site 41 LK 67 occurred in a valley margin-upland setting. The river, however, lay only a short distance downhill from (south of) the site. Categorization of a site as "upland" would normally imply that the site was farther away from a permanent water source than 41 LK 67 actually was. The site surface sloped gently north-south and was covered with thick patches of blackbrush and guajillo with grassy areas in between (Fig. 16,a). Along the southwestern margin of the site were steep bluffs cut into the Catahoula Formation (Fig. 20,a,b). Gravels paved the surface of terrace remnants forming a bench in the heavily eroded zone between the site surface and the river channel.

As defined by the THC survey crew, 41 LK 67 measured roughly 700 m north-south and 400 m east-west. Within these limits, further reconnaissance by the CAR crew resulted in definition of an area at the southeastern end of the site where the density of cultural debris exposed on the surface was greater than elsewhere on the site. This area was subcircular with a diameter of approximately 250 m. All excavations were conducted in this southeastern portion of the site.

Excavations at 41 LK 67 were concentrated in three unit blocks. Area A eventually reached dimensions of 10 x 12 m. Area B measured 2 x 4 m. Area C was a unit block of 8 x 8 m. Work in these excavations yielded evidence of Late Archaic and Late Prehistoric activities on the site. Remains of both components were contained in a deposit that seldom exceeded a depth of 40 cm below surface. Late Prehistoric debris was confined to the upper 10 cm (Levels 1 and 2) while Late Archaic materials seemed to concentrate on a plane approximately 40 cm below the modern surface. Matrix in all excavations was a tan to light brown sandy clay loam.

Characteristic of the Late Archaic component at 41 LK 67 were dense clusters of tuff rock that apparently served as hearths. Although exposures of tuff are located nearby, the many kilograms of rock hauled into the site area nevertheless represent a considerable expenditure of energy on the part of Late Archaic inhabitants. Scattered around the tuff rock clusters were considerable amounts of mussel shells, *Rabdotus* shells, and debitage. Radiocarbon assay of carbon samples recovered from Late Archaic contexts in Areas A and C yielded corrected dates ranging from 1590 B.C. to 660 B.C. One sample of carbon from Area A, dated at 780 B.C., was identified as *Acacia* sp. (see Appendices III and IX).

Artifacts from the Late Archaic component at 41 LK 67 having potential as time diagnostics include two stemmed thin bifaces (one unclassified dart point, Group 1, Form 1, Spec. 14, and one *Fairland* dart point, Group 1, Form 3, Spec. 13), one unstemmed thin biface with a concave base (Group 3, Form 1, Spec. 3--possibly a *Tortugas* point), and four distally beveled bifaces (Group 2, Form 2, Specs. 6 and 7; Group 4, Spec. 12; and Group 9, Spec. 8).

Most of the excavated Late Prehistoric material came from Area C at 41 LK 67. No habitational features were recognized in the Late Prehistoric component. Time-diagnostic artifacts representing the component include five *Perdiz* arrow points (Thin Biface Group 1, Form 4, Specs. 9-12), two *Cliffton* points (Thin Biface Group 1, Form 4, Specs. 19-20), two unusual arrow points (Group 1, Form 5, Specs. 15 and 16), and numerous sherds of aboriginal ceramics (see Ceramic Analysis section).

The shallow depth of the deposit containing cultural debris at 41 LK 67 permitted excavation of much larger horizontal areas than was, or likely will be, possible at most of the other prehistoric sites investigated at Choke Canyon. As a consequence, the data recovered will provide a rare opportunity to study patterns of debris distribution across relatively large areas. Inferences concerning organization of activities over parts of a Late Archaic camp should be possible. The clear stratigraphic separation between debris collections representing Late Archaic and Late Prehistoric activities in Area C will permit comparison of lithic technology and subsistence habits in two distinct cultural periods. The Late Archaic chipped stone tool assemblage and corresponding radiocarbon dates together provide a body of time-diagnostic information that will be useful in identifying similar components elsewhere in the region. The recognition of a species of the *Acacia* family in a carbon sample dated at 780 B.C. is generally important in demonstrating that a major component of the modern brush community was present in prehistoric times. More specifically, the occurrence of *Acacia* in prehistoric context at 41 LK 67 permits the suggestion that brush was growing in the immediate site area during Late Archaic times.

41 LK 8

Recorded by members of the CBAS in 1970, 41 LK 8 is an open prehistoric site situated on a terrace remnant forming a distinct oblong hill out on the Frio floodplain (Figs. 16,f; 17). Until shortly before the site was tested, the Nichols family had their home on the crest of the hill. The foundations of

Figure 16. *Photographs of Sites at the Eastern End of the Reservior, Including 41 LK 67, 41 LK 204, 41 LK 64, 41 LK 206, and 41 LK 8.*

a. View of uplands looking southeast across 41 LK 67. Note blackbrush, prickly pear, and Spanish daggers in bloom. Landowners claimed that dead tree trunks in the area represent mesquite trees killed during a severe drought in the 1950s. The north end of the dam now covers the area shown in the foreground of this photo.

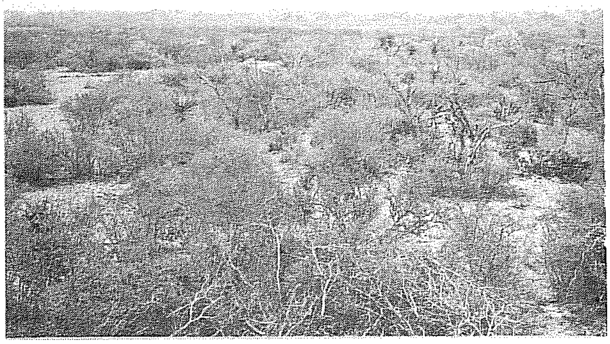
b. View east of uplands in area of 41 LK 204 at the east end of the reservoir. Nueces River valley is visible along the horizon. This area is along the divide between the Nueces and Frio valleys.

c. View north across a portion of valley margin site 41 LK 64. This area contained the exposed tuff rock clusters, an example of which is shown below. Note the severe erosion typical of many areas along the valley margins. Mesquites, prickly pear, and yucca are all present.

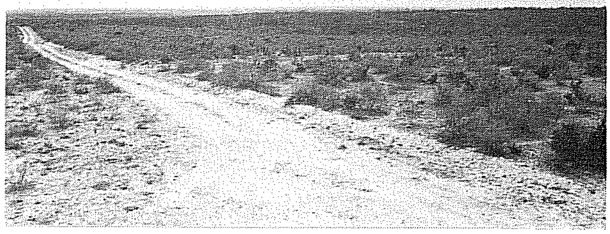
d. Typical surface exposure of a fire-fractured rock concentration at 41 LK 206, a valley margin/upland site.

e. A concentration of tuff rocks, probably a hearth remnant, typical of many observed at 41 LK 64. See Figure 5 for distribution of surface features.

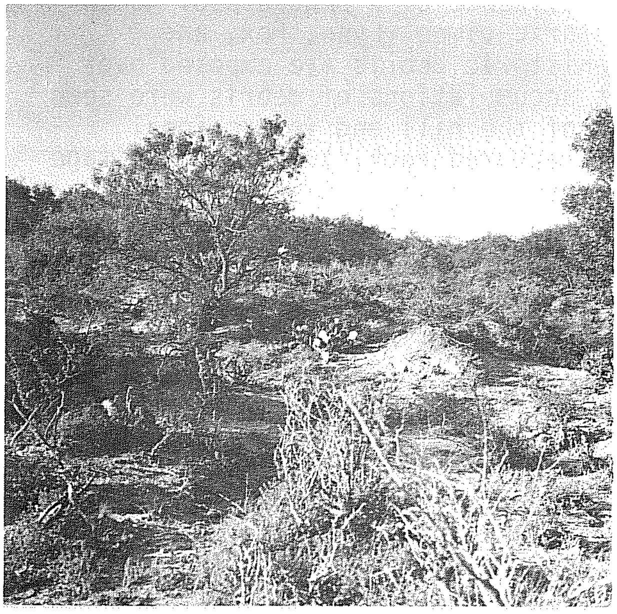
f. View west to 41 LK 8 (cleared area) from western edge of 41 LK 67. Blackbrush and mesquite are predominant vegetation.



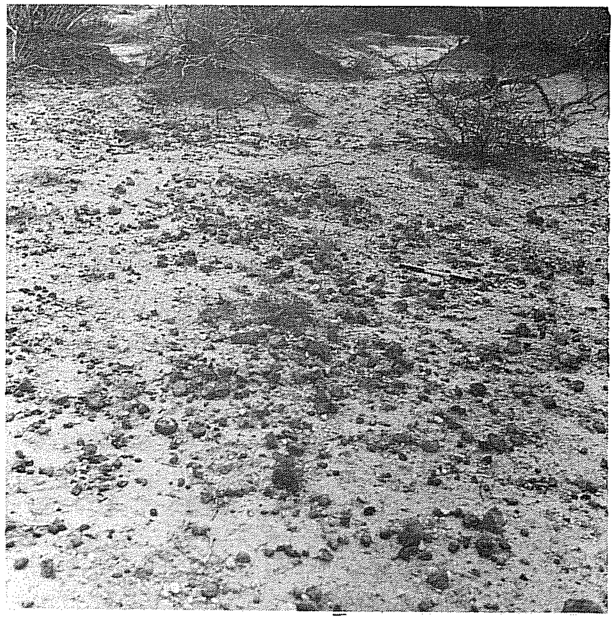
a



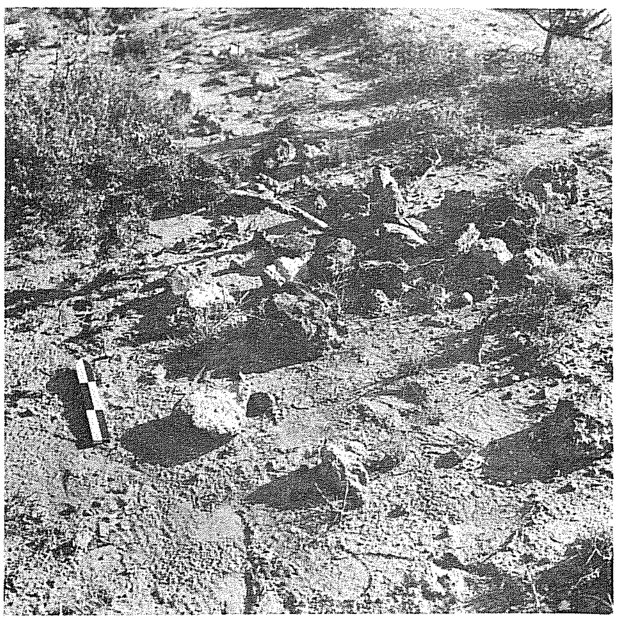
b



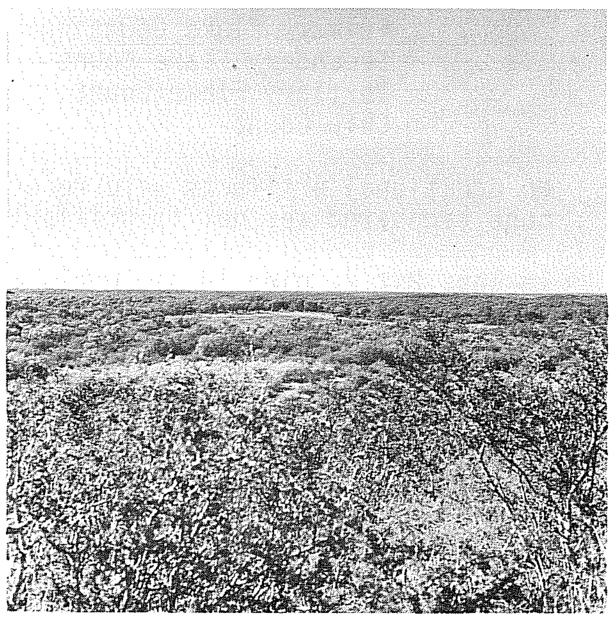
c



d



e



f

the main residence and outbuildings, corrals, and cross fences were still visible over the site as it was investigated. The long axis of the hill is roughly 300 m oriented west-northwest to east-southeast. The hill measures between 150-200 m wide (north-south). The modern channel of the Frio River lies 150 m from the southeastern margin of the site. Downhill from the western and southern margins of the site runs a drainage that now carries upland runoff, but which may once have been an active stream or river channel (Fig. 17). Gravels are common at the western end of the hill and along a bench running between the southern foot of the hill and the drainage channel. Much of the site surface is relatively clear, having only scattered large mesquite trees and short grass growing on it. The southern and western slopes of the hill are thickly covered with brush including such species as whitebrush, persimmon, prickly pear, spiny hackberry, lotebrush, and guayacan.

The THC crew reported that 41 LK 8 contained evidence of a sequence of human activity spanning Pre-Archaic to Late Prehistoric times (Lynn, Fox, and O'Malley 1977:44). Varying densities of prehistoric debris are exposed over most of the site (see Fig. 17). The densest accumulations of debris were seen in roadcuts and other disturbed areas on top of the hill and in erosional gullies on the hill's southern slope. Fire-fractured rock, tuff, and debitage were the most commonly seen surface indications.

Four 1-m^2 test pits were excavated along the crest of the hill containing 41 LK 8 (Fig. 18). Test Pit 1 was excavated to 70 cm below surface. Between ground surface and the floor of Level 4, matrix in the pit was light brown sandy loam. In Level 5, the matrix became paler and more compact. Rates of recovery in Test Pit 1 were fairly constant down throughout the deposit, so no attempt was made to divide the unit material collection into horizons. Recovery for selected classes of material was as follows:

Tuff Rock Weight (grams)	1530
Fire-Fractured Rock Weight (grams)	1019
Mussel Shell Umbo Count	36
Mussel Shell Weight (grams)	148
Rabdotus Shell Count	59
Bone Weight (grams)	0.1
Primary Flake Count	8
Secondary Flake Count	50
Tertiary Flake Count	86
Chip Count	100

No additional artifacts were recovered from Test Pit 1. The single piece of bone recovered was not identifiable as to species.

In Test Pit 2, nine 10-cm levels were excavated. Matrix from the pit was gray sandy loam down into Level 4. From Level 4 down, increasing amounts of yellowish silty clay nodules caused the soil color to lighten from gray to yellowish brown. By Level 9, the matrix had become light tan in color. Variable amounts of material recovery down through the deposit in Test Pit 2 suggested that distinct horizons of material were present. The material recovery was grouped by level into three horizon assemblages. The Upper Horizon consisted of Level 1. Levels 2-7 were grouped into the Middle Horizon; Levels 8 and 9 were

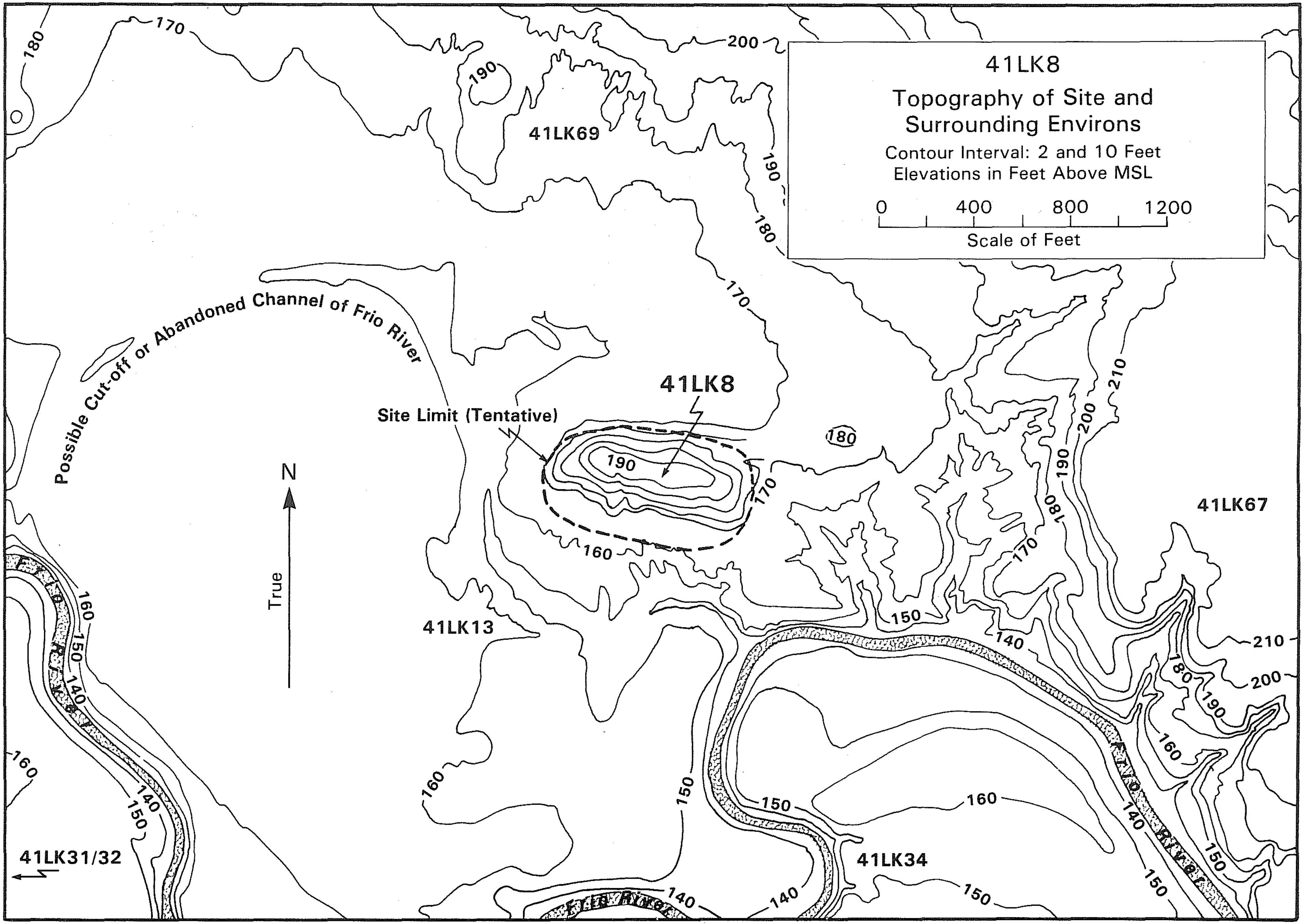

41LK8
Topography of Site and Surrounding Environs
Contour Interval: 2 and 10 Feet
Elevations in Feet Above MSL
0
400
800
1200
Scale of Feet
41LK8
Site Limit (Tentative)
Possible Cut-off or Abandoned Channel of Frio River
N
True
41LK69
41LK13
41LK67
41LK34
41LK31/32
Frio River
Frio River
Frio River
180
170
190
200
190
180
170
190
180
160
170
210
200
190
180
170
150
140
210
200
180
190
160
150
140
150
160
150
140
140
150
160
150
140
150
160
150
140
160

FIGURE 17

grouped into the Lower Horizon. Recovery of selected classes of material for these horizons was as follows:

	Horizons		
	Upper	Middle	Lower
Tuff Rock Weight (grams)	11	1781	176
Fire-Fractured Rock Weight (grams)	35	1304	175
Mussel Shell Umbo Count	12	120	5
Mussel Shell Weight (grams)	21	383	60
Rabdotus Shell Count	3	73	17
Bone Weight (grams)	0.1	0	0
Primary Flake Count	0	8	0
Secondary Flake Count	13	76	11
Tertiary Flake Count	12	147	13
Chip Count	6	116	11

Four chert cores, two thick bifaces, and two thin biface fragments were recovered from Test Pit 2. The cores came from Levels 5-9, the bifaces from Levels 1-3. The small amount of bone recovered from the Upper Horizon was not identifiable as to species.

Test Pit 3, placed on the highest part of the hill, was the deepest unit excavated at 41 LK 8; it went down 1.3 m below surface. The matrix in the pit was light to medium brown sandy loam and easy to excavate and screen. At Level 11, it became more compact, but still worked well. The material recovery was divided into three horizons. An Upper Horizon represents Levels 1 and 2; a Middle Horizon, Levels 3-9; a Lower Horizon, Levels 10-13. Horizon recovery for selected classes of material was as follows:

	Horizons		
	Upper	Middle	Lower
Tuff Rock Weight (grams)	156	1995	835
Fire-Fractured Rock Weight (grams)	357	2473	681
Mussel Shell Umbo Count	7	37	4
Mussel Shell Weight (grams)	0.1	78	27
Rabdotus Shell Count	9	120	87
Bone Weight (grams)	0.1	0.1	0
Primary Flake Count	5	10	4
Secondary Flake Count	18	122	40
Tertiary Flake Count	80	171	56
Chip Count	17	149	80

Three chert cores, two thick bifaces, and two thin bifaces were recovered from Test Pit 3. All of these materials came from the Middle Horizon. One thin biface (Group 4, Form 2, Spec. 1) is a relatively large tool with a semi-circular base and slightly beveled blade edges. Recovered from Level 9, it has potential as a diagnostic form. One otolith of a freshwater drum was identified in the Level 9 collection.

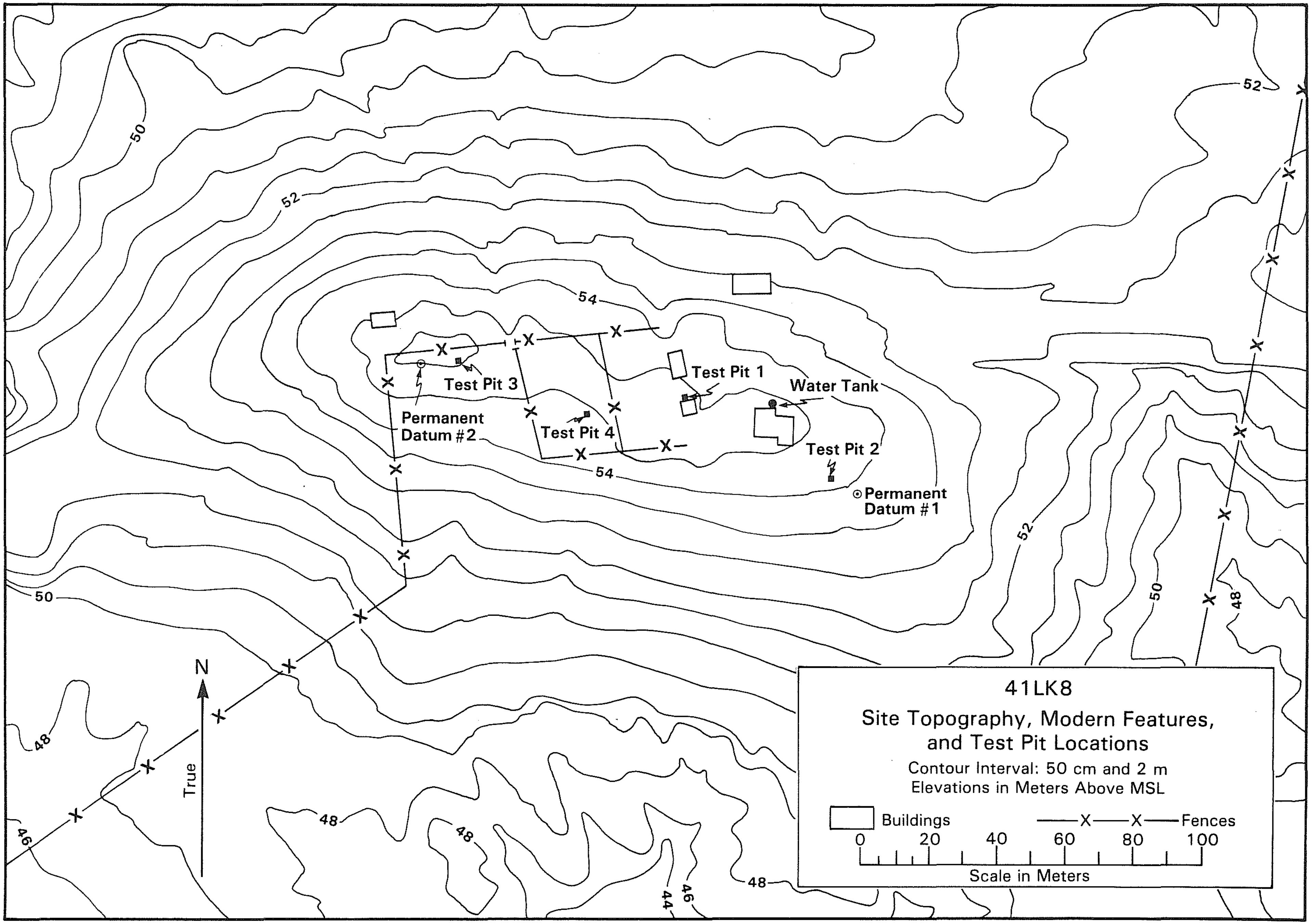

52
50
52
54
54
50
52
50
48
48
46
48
48
44
46
48
X
Test Pit 1
Water Tank
Test Pit 3
Permanent
Datum #2
Test Pit 4
Test Pit 2
Permanent
Datum #1
N
True
41LK8
Site Topography, Modern Features,
and Test Pit Locations
Contour Interval: 50 cm and 2 m
Elevations in Meters Above MSL
Buildings
Fences
0 20 40 60 80 100
Scale in Meters

FIGURE 18

Six levels were excavated in Test Pit 4, located within one of the corrals west of the Nichols's residence. Recovery for selected classes of material from this pit was as follows:

Tuff Rock Weight (grams)	2509
Fire-Fractured Rock Weight (grams)	1285
Mussel Shell Umbo Count	40
Mussel Shell Weight (grams)	67
Rabdotus Shell Count	85
Bone Weight (grams)	0
Primary Flake Count	8
Secondary Flake Count	107
Tertiary Flake Count	176
Chip Count	142

Three cores and one thin biface were also collected in Test Pit 4. Found on the site surface near Test Pit 4 was a well-smoothed marine shell columella segment (Spec. 1, Fig. 88) that may be a bead blank.

A small number of artifacts were collected from the surface of 41 LK 8 by the CAR crew. Noteworthy among these were two distally beveled bifaces (Group 2, Form 2 and Group 8, Form 5).

Although the site had previously yielded artifacts suggesting a long span of prehistoric activity (Lynn, Fox, and O'Malley 1977:237-242), the CAR testing effort at 41 LK 8 did not yield a particularly impressive set of results. No habitational features were isolated, no recognizable time-diagnostic artifacts were recovered, preservation of prehistoric organic remains (bone and carbon, in particular) was poor, and although horizons were defined in two test pits, there was no clear-cut visible stratigraphy in the excavated deposits. The results are particularly disappointing because the terrace remnant containing the site is an unusually high topographic feature for a floodplain setting and is likely one of the older surfaces present in the Choke Canyon floodplain.

41 LK 13

Immediately southwest of 41 LK 8 on the southwest (right) bank of the abandoned channel is the small prehistoric site designated 41 LK 13 (Fig. 17). The site is in an open floodplain context, and its surface is at an elevation considerably lower than the highest areas of the adjacent hill containing 41 LK 8. The site is small, running northwest-southeast along the channel bank for a distance of about 75 m. Surface debris was observed no farther than 25 m away from the channel bank. Mussel shell fragments were the most common materials observed on the site. A small amount of debitage and some *Rabdotus* shells were also evident. The site surface is heavily covered with brush except at a field road and power line that leads up to the Nichols's house on the hill. Mesquite, whitebrush, allthorn, cactus, weeds, and grasses form a dense thicket over most of the site. Moderate to heavy erosion has occurred along the slope from the site surface down into the channel.

Activities at 41 LK 13 included excavation of seven shovel tests and one 1-m^2 test pit. Each of the shovel tests, scattered throughout the site, went to a depth of about 60 cm. In all of these holes, cultural debris was restricted to the upper 20 cm of deposit and consisted primarily of mussel shell fragments. Matrix in the site was a hard, badly cracked, gray silty clay loam. In the test pit located in the east central part of the site, only two 10-cm levels were excavated. Recovery for selected classes of material from the test pit was as follows:

Tuff Rock Weight (grams)	20
Fire-Fractured Rock Weight (grams)	406
Mussel Shell Umbo Count	141
Mussel Shell Weight (grams)	617
Rabdotus Shell Count	11
Debitage Count	9

Only one artifact, a thin biface fragment (Group 10) was recovered from the test pit. Two cores, one distally beveled biface (Group 3, Form 3), and one sandstone grinding slab fragment (Group 1, Form 2) were collected from the surface. The form of the distally beveled biface specimen suggests Late Archaic activities. The site is distinguished only by the great number of mussel shells on the surface and in the subsurface.

41 LK 9

Prehistoric site 41 LK 9 is located southeast of 41 LK 67 and 41 LK 8 on a second terrace near the north (left) bank of the Frio River. As recorded by the THC survey crew, 41 LK 9 measures 400 m northeast-southwest and 150 m north-south. The site is covered with dense brush over its northern half and with riparian vegetation (e.g., elm and hackberry trees) along the margin nearest the river. THC analysts advanced no estimate as to the period(s) of prehistoric activity at the site.

In a reconnaissance carried out by the CAR crew, prehistoric remains were seen only in a small area measuring about 20 x 50 m beside a north-south field cutting down to the river bank. Even with the improved surface visibility afforded by several gullies and bladed *senderos*, no additional surface materials were observed outward from this small area.

Eroding from the west side of the field road running through 41 LK 9 was a concentration of tuff rocks believed to be a hearth feature. Twenty to 40 cm of overburden was removed from above the rocks. A mussel shell lens containing 15-20 shells was encountered 5-8 cm above the rock concentration. Once exposed, the rock cluster was found to consist of about 25 tuff stones ranging from 5-10 cm in diameter. The stones covered an area measuring 65-75 cm in diameter. Total rock weight was 2177 g. Scattered small pieces of tuff, fire-fractured rock, and mussel shell fragments were found in the matrix around the rocks. No other materials or artifacts were found at 41 LK 9.

41 LK 10

Side by side with 41 LK 9 is the open prehistoric site 41 LK 10. This floodplain site is situated on a gravelly terrace remnant forming a low hill beside the north (left) bank of the Frio River. The oblong hill has a long axis extending 500 m northwest-southeast. This landform feature is similar to the hill at 41 LK 8. The gravel pavement is especially widespread at the west end of the site, but occurs in patches almost everywhere. Dense thickets of thorny brush including mesquite, blackbrush, allthorn, acacia, prickly pear, and whitebrush are common over much of the surface. The old Nichols-Herring house (41 LK 66) is located within the boundary of 41 LK 10 at its far east end.

According to THC analysts, 41 LK 10 contained material evidencing Pre-Archaic to Late Archaic activities (Lynn, Fox, and O'Malley 1977:44). In 1977, the CAR crew conducted an unprovenienced surface collection on the site. Eight cores, eight thin bifaces, three distally beveled bifaces, and 12 thick bifaces were collected. Time-diagnostic specimens include one *Pedernales* dart point (Thin Biface Group 1, Form 1, Spec. 2) and two distally beveled bifaces (Group 3, Forms 1 and 2). These forms tentatively indicate the activities of Middle and Late Archaic peoples on the site. The prevalence of cores and thick bifaces, as well as the high incidence of primary and secondary flakes noted in conjunction with gravel exposures, suggests that the 41 LK 10 area was an attractive source of raw materials for chipped stone tool manufacture.

In 1978, excavation of a foundation trench for the Choke Canyon Dam destroyed much of 41 LK 10. USBR engineeers contacted CAR personnel about cultural debris exposed in the foundation trench wall where it passed through the site. In a return visit, CAR workers examined the western wall of the foundation trench and saw a stratum containing cultural debris buried over two meters below the modern ground surface. In general, the 41 LK 10 profile was very similar to those at 41 LK 31/32. Based only on this apparent similarity, it is speculated that the deeply buried cultural horizon found at 41 LK 10 is an Early Archaic manifestation. Relevant portions of the trench wall were photographed and sketched, but no further effort was expended at the site.

41 LK 69

On a section of the valley margin directly north of 41 LK 8 is a heavily eroded gravel-paved area containing prehistoric site 41 LK 69. The site surface slopes from north to south and is characterized by deep gullies and severe sheetwash which has left a surface of yellowish gray calcareous soil from old terrace deposits (Figs. 19 and 20,c). At higher elevations in the northern portion of the site, ledges of Catahoula Formation tuff rock were observed (Fig. 20,b). Eroded areas of the site support no vegetation. Upland vegetation grows where thin soils are present along the divide between gullies. Blackbrush is very common. Also present are guayacan, prickly pear, agarita, mountain laurel, allthorn, yucca, guajillo, and small mesquites. As defined by the THC surveyors, 41 LK 69 covers an area 600 m east-west and 300 m north-south. They found evidence of Pre-Archaic and Archaic activities at the site (*ibid.*: 44).

A surface collection was done at 41 LK 69 by the CAR crew. Preliminary inspection of the site surface resulted in the location of six hearths, a very extensive concentration of fire-fractured rock, and numerous artifacts. Clustering of artifactual materials around the features suggested that a provenienced surface collection would be informative.

A total of 887 lithic specimens was collected at 41 LK 69. Of this total, 715 specimens were debitage. The remaining 172 specimens included 95 cores, 34 thick bifaces, 19 thin bifaces, 15 distally beveled tools, five trimmed flakes, and four pieces of modified sandstone. For all but 10 of the 77 specimens other than cores and debitage (accounting for 810 artifacts), individual artifact locations were plotted on a plane table map as each was collected. All other specimens were gathered from collection units of varying sizes staked at four locations on the site. These were designated Areas A-D. Except for fire-fractured rock, all prehistoric cultural debris located within these areas was collected. Two of the collection units were intentionally placed to surround hearth features; one was placed within the large fire-fractured rock concentration. The locations of all collection units and prehistoric features were also recorded on the plant table map.

Collection Area A (Fig. 19) was a 5-m^2 unit situated within a massive concentration of fire-fractured rock. The concentration, as manifested on the surface, measured about 18 m north-northwest to south-southeast and approximately 10 m east-west (Fig. 20,d). The spalls of rock formed a very dense cover over the ground and were densest in the central area of the feature where a low mound of solid rock spalls was formed. In and around this feature, much chert debitage and a number of chipped stone tools were collected. There were no mussel or *Rabdotus* shells noted in the immediate vicinity. About 18 m west of Area A was a circular chert cobble concentration, probably a hearth, with a diameter of 2 m. Materials collected in the Area A unit included 26 cores and 465 pieces of debitage. There were 12 primary flakes, 138 secondary flakes, 124 tertiary flakes, and 191 chips. Five thick bifaces, 10 thin bifaces, four distally beveled tools, two trimmed flakes, and one sandstone grinding slab fragment were collected within a 15-m radius of Area A (all provenienced). Among the thin bifaces were four unstemmed specimens with triangular outlines and straight bases (Group 2, Forms 1 and 2); one unstemmed, triangular specimen with a concave base (Group 3, Form 1); one unstemmed, leaf-shaped specimen (Group 5), and one stemmed piece (Group 1, Form 2, Spec. 6) of the *Langtry* type. Among the distally beveled tools were specimens representing Group 4, Group 6 (*Guadalupe* tool), and Group 8, Form 4. The *Langtry* and *Guadalupe* specimens were found beside the small hearth west of the Area A unit.

Collection Area B (Fig. 19) was also a 5-m^2 unit. It was located in the north central area of 41 LK 69. A total of 34 cores and 118 pieces of debitage was collected in Area B. There were 16 primary flakes, 73 secondary flakes, 12 tertiary flakes, and 17 chips. Another chert cobble hearth was located 40 m northeast of Area B. Two thick biface specimens were found in the area.

Collection Area C measured 10-m^2 and was staked to surround two chert cobble hearths located at the intersection of the two *senderos* crossing the site

(Fig. 19). One of the two Area C features is shown in Figure 20,e. It consisted of at least 20 large cobbles arranged in a subcircular pattern with a diameter of approximately 1.5 m. This feature is typical of five similar rock concentrations found at the site. The second cobble concentration in Area C was located 5 m east-southeast of the first. Thirty-six cobbles and 104 pieces of debitage were collected in Area C. There were 13 primary flakes, 48 secondary flakes, 27 tertiary flakes, and 16 chips. A small number of mussel shell fragments was noted in the area, and one large umbo was collected. A grooved piece of sandstone (Modified Sandstone Group 3) was also found.

Collection Area D was staked around a cobble concentration and measured 5 x 10 m. One core, 21 secondary flakes, two tertiary flakes, and five chips were collected from this area. Two mussel shell umbos were also found.

About 40 of the provenienced artifacts collected at 41 LK 69 came from a zone running east-west through the heavily eroded central portion of the site. This zone covered an area roughly 80 m north-south, bounded on the south by Area B. It extended up to 100 m east-west from Area B. The hearth (Fig. 19) northwest of Area B marks the western end of the zone. This particular feature was somewhat different from the others; it was composed of fire-fractured cobble spalls rather than unburned cobbles (Fig. 20,f). Fourteen thick bifaces and seven distally beveled tools were collected in this area. Many cores and much debitage also occurred in this area, but were not collected. The distally beveled tools (Group 2, Forms 1 and 2; Group 7, Forms 1 and 2; and Group 8, Form 2) are particularly distinctive forms and may be time-diagnostic artifacts.

The great number of cores, pieces of debitage, thick bifaces, and finished chipped stone tools found at 41 LK 69 clearly demonstrates that during prehistoric times the site functioned as a chert quarry and stone tool production locality. No Late Prehistoric remains were found; the site appears to have been inhabited only during the Archaic. Furthermore, implements such as the *Langtry* dart point, various unstemmed triangular bifaces, a *Guadalupe* tool, and other distally beveled tool forms strongly suggest that most of the activity occurred during Early and/or Middle Archaic times. The features recognized at the site and the occurrence of mussel shell and grinding slab fragments indicate that Archaic activities were not limited to flintknapping, but also included food preparation and consumption. The large concentration of fire-fractured rock in and around Area A was unusual and suggests a specialized activity, perhaps related to lithic technology or food preparation.

41 LK 97

Site 41 LK 97 is located in the valley of Willow Hollow, a major upland drainage system feeding down from the northwest into the Frio River valley. The site is on the east (left) bank of the drainage near its headward end, a distance 3.1 km northwest of Willow Hollow's confluence with the Frio River. As recorded by the THC survey crew, 41 LK 97 is subcircular with a diameter of 200 m. The site rests on a terrace in the floodplain of the hollow. The site surface slopes gently east-west. A short feeder channel cuts down from the upland to Willow Hollow along the site's northern edge. Upland areas lie only

41LK69
Death Valley
Site Extent, Surface Collection Areas and Surface Features

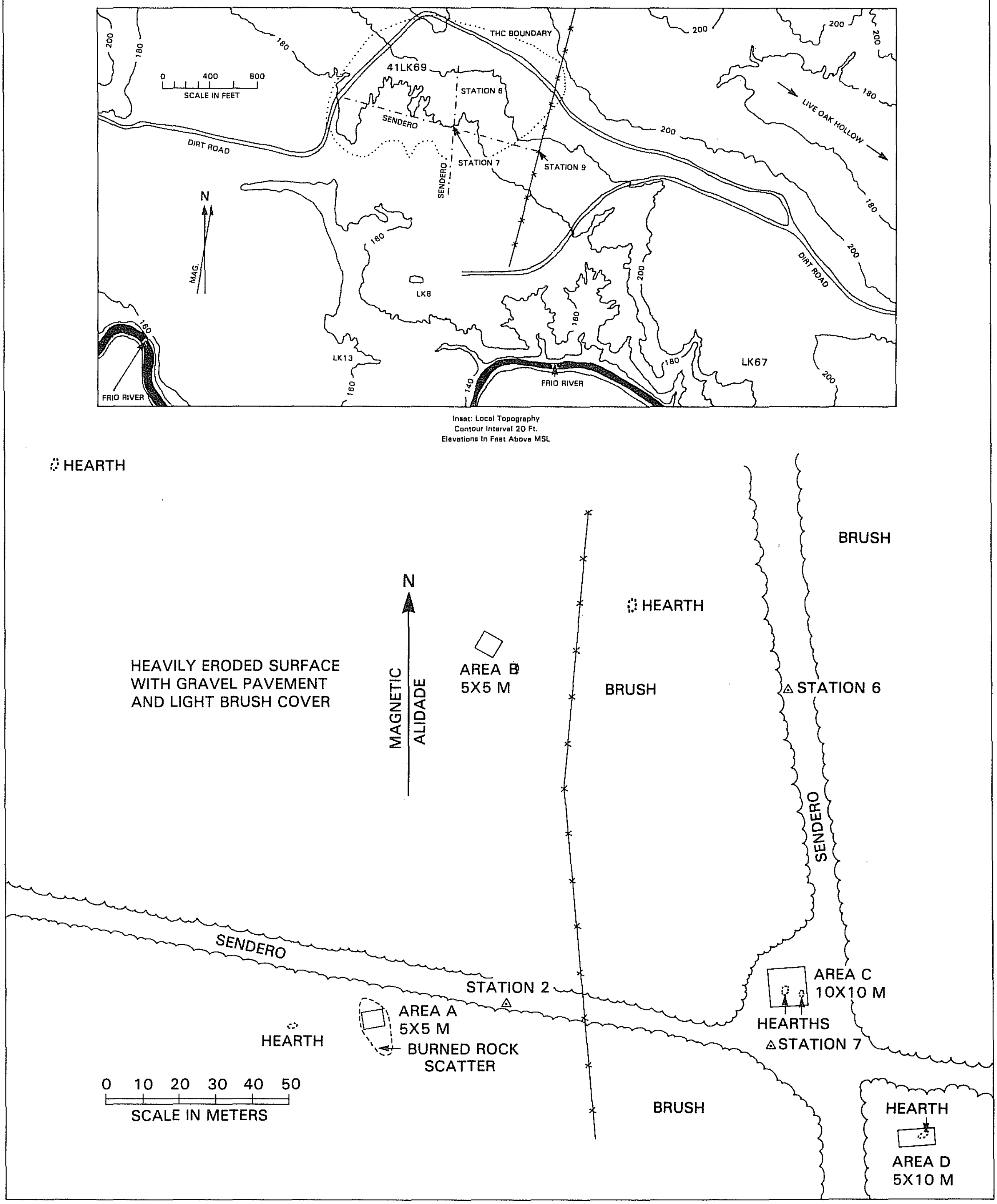


FIGURE 19

Figure 20. *Photographs Taken in the Vicinity of 41 LK 67 and 41 LK 69.*

a. View north of bluffs formed in the Catahoula Formation, vicinity of 41 LK 67. Predominant vegetation is blackbrush.

b. An outcrop of the Catahoula Formation underlain by clays of the Frio Formation in the vicinity of 41 LK 67.

c. View north across main area of valley margin site 41 LK 69. Note severe erosion and lag gravels forming a veneer or pavement on the surface. Such gravel deposits are found at many locations around the margins of the Choke Canyon basin.

d. Area A, a concentration of fire-fractured rock at 41 LK 69. See Figure 19 for area location.

e. A cobble concentration in Area C at 41 LK 69. See Figure 19 for feature location.

f. A fire-fractured rock feature in the northwest part of 41 LK 69. Note severe erosion.

a

b

c

d

e

f

a short distance to the east and north. The floor of the small valley containing 41 LK 97 had been cleared of brush and planted in grass. Immediately north and east of the site were segments of valley margin covered with gravel pavement and dense thickets of blackbrush.

A surface scatter of fire-fractured rock, debitage, mussel shell, and *Rabdotus* shell evidenced prehistoric activity at 41 LK 97. Shovel tests excavated in the site indicated only small amounts of material occurring in the subsurface. No test pits were excavated. An unprovenienced surface collection yielded only one thick biface (Group 6, Form 2) and one thin biface (Group 5). These limited remains permit no estimate of the time the site was occupied.

41 LK 207

Situated on an upland hill over one kilometer north-northeast of the headward end of Willow Hollow (Fig. 1), prehistoric site 41 LK 207 is farther from the future lake than any other site investigated during Phase I. Most of the site rests on privately owned land (the Raschke Ranch, as recorded by USBR archaeologist Stephen Ireland during survey of an access road leading to the reservoir basin). The site is generally evidenced by widely scattered fire-fractured rocks, cores, and debitage. It measures 450 m east-west and 150 m north-south. These dimensions are approximate; it was difficult to determine precisely where the site boundaries should be set due to the light, widespread occurrence of gravels over much of the ground surface in the area. The gravels apparently served as a source of prehistoric lithic materials; many of the cobbles had been tested, and secondary flakes were common. The site surface and surrounding area were covered with large mesquites, prickly pear, and other brush forming dense thickets over much of the site. Clearings for the east-west access road and three north-south roads provided the only clear views of the site surface.

The investigation at 41 LK 207 consisted of a provenienced surface artifact collection: two cores, 25 thick bifaces, seven thin bifaces, three distally beveled tools, and two trimmed flakes. Most of these specimens were found along a 150-m length of the cleared east-west access road *sendero*. Surface visibility was poor due to the density of brush and heavy layer of leaf trash on the site; few artifacts were found. One extensive feature, however, was recognized in the brush near the west end of the collection area about 60 m south of the east-west clearing. It consisted of a locally heavier concentration of fire-fractured rock covering an area 20 m from east-northeast to west-southwest and 8 m north-south. In size and outline, this feature was very similar to the large fire-fractured rock feature found at 41 LK 69. There was not as much rock visible in the 41 LK 207 feature, but it was considerably obscured by leaf trash; the 41 LK 69 feature was exposed and eroded. Long axis orientation of the 41 LK 207 feature was close to east-west, whereas the feature at 41 LK 69 was more northerly.

The artifact assemblage at 41 LK 207 permits no definite determination of the time period of prehistoric activity at the site; no Late Prehistoric materials are recognized in the collection. Three of the thin bifaces are unstemmed triangular points with straight bases (Group 2, Forms 1 and 2). The three distally beveled tools (Group 7, Forms 1 and 4 and Group 8, Form 1) are not particularly distinctive. The thin bifaces and distally beveled specimens suggest an Archaic affiliation. More generally, the artifact assemblage and feature from 41 LK 207 yield findings similar to those made at 41 LK 69. Material remains suggest that similar activities were performed at both sites.

SITE GROUP 3

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	--	41 LK 204 41 LK 205	41 LK 203 41 LK 206

Site Group 3 consists of four upland prehistoric sites situated on valley margin hills which will soon form the southern bank of the Choke Canyon Lake. The sites lie 2.0-6.5 km southwest of the dam (Fig. 1). They were recorded by USBR archaeologist Stephen Ireland as he surveyed the new route of State Highway 72; its relocation was necessitated by creation of the lake.

The sites in Group 3 rest on the slopes and crests of hills which have developed through erosion of ancient terrace deposits. Gravels are extensively distributed across the area, occurring in varying densities as a pavement on the ground surface. Bedrock in the vicinity is the Catahoula Formation. Exposures of tuff rock and pumice (constituents of the Catahoula) crop out at various locations throughout the area. The crests of the hills upon which the sites occur are on the divide between the Nueces and Frio valleys. Drainages from the southern slopes runs down to the Nueces River. The northern slopes feed into the Frio River. Vegetation at these sites is of the upland variety (Fig. 16,b). Principal components of the plant community are guajillo, blackbrush, and ceniza. Mesquite, prickly pear, mountain laurel, and other acacias are also seen.

Erosion has been so severe that cultural debris is essentially restricted to the surface, often resting on bedrock exposures of Catahoula Formation tuffaceous sedimentary rock. No test pits or shovel tests were excavated in any of the four sites. Activities were limited to surface collections.

Definition of boundaries for the sites in Group 3 was difficult. There is an almost continuous scatter of tested cobbles, cobble fragments, and primary and secondary flakes along the row of hills containing sites 41 LK 203 to 41 LK 206; the widespread lag gravels distributed over much of the area apparently served as a source of raw material for chipped stone tool manufacture. The areas defined as sites are quite arbitrary. With allowances for variations in the density of prehistoric cultural debris on the surface, almost the entire area of hill crests and valleys from 41 LK 203 to 41 LK 206 could be considered a single site. In general, the artifact collections at each site were restricted to the area where cultural remains were densest.

41 LK 203

The easternmost of the sites in Group 3, 41 LK 203, is situated on the northern slope and crest of a hill approximately 2.5 km southwest of the dam's southern abutment (Fig. 1). The site measures about 400 m northeast-southwest and 300 m north-south.

The CAR crew conducted an unprovenienced surface collection at 41 LK 203; only six cores and one distally beveled tool (Group 2, Form 1) were collected. No cultural features were observed. The distally beveled tool suggests activity during the Early or Middle Archaic.

41 LK 204

Reconnaissance of 41 LK 204 by the CAR crew proved this site to be the most productive of all in Site Group 3. Situated on the northern slope and crest of a long valley margin hill, 41 LK 204 measures approximately 600 m northeast-southwest and 200 m northwest-southeast (Fig. 1).

A surface collection was made at 41 LK 204; 49 artifacts were gathered. Locations of 37 of these specimens were recorded on a plane table map. The collection contained five cores, 22 thick bifaces, nine thin bifaces, nine distally beveled tools, two unifaces, and two trimmed flakes. One tuff rock hearth feature was also recognized. This feature and most of the artifacts were found over a 20,000-m^2 area within the site boundaries where cultural materials were more heavily concentrated.

Heavy aboriginal use of the gravel deposits on and around 41 LK 204 if evidenced by the large number of chipped stone tools collected (especially thick bifaces) and by considerable debitage observed on the site. The discovery of a *Scottsbluff* dart point (Thin Biface Group 1, Form 1, Spec. 1) suggests that the activities at 41 LK 204 may date to late Paleo-Indian times. This impression is reinforced by the presence of several distally beveled tools of the *Clear Fork* variety (one Group 1 specimen and three specimens of Group 2, Form 1). Although tools of this type are not yet precisely dated, they are believed to be diagnostic of the Early Archaic at least and may even be coeval with the *Scottsbluff* type. The small tuff rock concentration (about 1.5 m in diameter) found in the collection area is probably a hearth and suggests that activities on the site were not limited to chipped stone tool production, but may have included preparation and consumption of food.

41 LK 205

A short distance west of 41 LK 204, 41 LK 205 is situated on an eastward sloping hillside (Fig. 1). The site measures 500 m east-west with the east end down in the erosional gap between two hills and the west end on the crest of the hill. The site measures 200 m north-south.

A provenienced artifact collection was made in one small area, about 2800 m^2. Eleven artifacts were collected: four thick bifaces, four thin bifaces, two distally beveled tools, and one uniface. An *Ensor* dart point (Thin Biface Group 1, Form 3, Spec. 5) and a small distally beveled tool (Group 3, Form 3) indicate that cultural activities at 41 LK 205, at least in this one small area, took place during the Late Archaic. Most of the remaining area of the site is marked by widely scattered quarry debris such as tested cobbles, cobble fragments, and debitage.

41 LK 206

Site 41 LK 206 is the most westerly of the sites in Group 3 (Fig. 1). It covers the crest of a low hill with an east-west length of 500 m and a north-south width of 200 m. The limits of the site are fairly well defined by a light scatter of cultural debris. There were not substantial concentrations of surface artifacts anywhere on the site. An unprovenienced collection of surface artifacts on 41 LK 206 yielded 31 artifacts: three cores, 16 thick bifaces, four thin bifaces, seven distally beveled tools, and one uniface. This assemblage is generally similar to those from 41 LK 203 and 41 LK 204 and also appears to represent the Archaic. Two of the distally beveled tools (Group 4) may date to the Late Archaic period. One feature, a circular concentration of fire-fractured rock having a diameter of about one meter, was found near the western end of the site.

SITE GROUP 4

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 LK 14	41 LK 18	41 LK 20
		41 LK 15	41 LK 27	41 LK 65
		41 LK 17	41 LK 75	
		41 LK 77		

Site Group 4 contains nine sites located in the floodplain on the south side of the Frio River between 4-7 km west of Choke Canyon Dam (Fig. 1). The major landform features in the area are the Frio River, an elongate V-shaped oxbow lake, ancient terrace systems forming benches at two levels above the modern river channel, and an east-west channel system which feeds into the Frio River just east of 41 LK 20. Much of the southern portion of the site group area is pasture and cropland. A dense riparian forest grows along the Frio channel on the northern side of the area. Oak, elm, hackberry, and willow are common by the river. Away from the river, where the land has not been cleared for agriculture, there are thickets containing mesquite, whitebrush, prickly pear, spiny hackberry, yucca, and other brushy species. The Frio Formation underlies sites in Group 4, but it is buried by alluvium filling the valley and does not overtly influence surface deposits. Gravel bars along the stretch of the Frio River adjacent to the Group 4 sites are the closest source of chert cobbles.

41 LK 14

An open prehistoric site, 41 LK 14 occurs on a Pleistocene terrace remnant forming a distinct rise out on the floodplain. Downhill and 200 m north of 41 LK 14 is the modern channel of the Frio River. An extensive deposit of gravel occurs as a shallowly submerged bar in the river bend north of the site. The central and western two-thirds of the site are located in a cultivated field that carried a stand of crops at the time the site was being investigated (Fig. 21,a). On the site's northern slope and over much of its eastern end grow mesquites, whitebrush, spiny hackberry, narrow-leaved yucca, elm, and prickly pear. A strip of brush also grows in the otherwise cleared central part of the site. At the north end of the brush strip is a large (5 m in diameter) circular water cistern that once supplied water to cattle. At the foot of the terrace below the site begins the dense riparian forest that grows on the relatively flat surface of the Frio's first terrace. According to THC analysts, 41 LK 14 contained materials representative of cultural activites spanning Paleo-Indian to Late Prehistoric times (Lynn, Fox, and O'Malley 1977:44). Based on the distribution of surface prehistoric remains, dimensions of the site were set at 200 m north-south and 180 m east-west. Activities during the Phase I investigation at 41 LK 14 included excavation of four 1-m^2 test pits and provenienced collection of a large number of surface artifacts.

Test Pit 1 was excavated to 80 cm below ground surface. The unit was located in the uncleared eastern portion of 41 LK 14 (Fig. 22). Matrix removed from the pit was a gray sandy clay loam. In Level 6, the matrix color lightened, and there was a notable increase in calcium carbonate down to the bottom of the unit. No cultural features were recognized in the unit. Based on differential rates of debris recovery throughout the deposit, the collection from Test Pit 1 is divided into two horizons. The Upper Horizon consists of materials found in Levels 1-4. The Lower Horizon contains materials from Levels 5-8. Recovery rates for selected classes of material from each horizon were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	432	348
Fire-Fractured Rock Weight (grams)	1671	1603
Mussel Shell Umbo Count	121	27
Mussel Shell Weight (grams)	407	97
Rabdotus Shell Count	127	61
Bone Weight (grams)	0	0
Primary Flake Count	10	3
Secondary Flake Count	55	11
Tertiary Flake Count	55	27
Chip Count	172	65

Levels 1 and 2 (Upper Horizon) and Levels 5-7 (Lower Horizon) yielded the most material. Levels 3, 4, and 8 contained notably less debris. One core (Group 3, Level 2) and one thick biface (Group 1, Level 5) were recovered from Test Pit 1.

Test Pit 2 was excavated in the north central part of 41 LK 14 (Fig. 22). Seven 10-cm levels were excavated into a dark brown, fine sandy loam extending 40 cm below surface. In Level 5 (40-50 cm below surface), the color of the matrix became a lighter brown. In Level 7, amounts of calcium carbonate increased drastically, and the matrix color turned a yellowish tan. As in Test Pit 1, the material recovery from Test Pit 2 was divided into two horizons. The Upper Horizon consists of Levels 1-4 and the Lower Horizon Levels 5-7. Rates of recovery for selected classes of material from each horizon were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	489	24
Fire-Fractured Rock Weight (grams)	3957	287
Mussel Shell Umbo Count	220	13
Mussel Shell Weight (grams)	537	41
Rabdotus Shell Count	107	26
Bone Weight (grams)	0.1	0
Primary Flake Count	7	0
Secondary Flake Count	98	7
Tertiary Flake Count	162	17
Chip Count	328	73

In Test Pit 2, most of the cultural debris was contained in the brown sandy loam, the material recovery from which is represented by the Upper Horizon. Two chert cores (Group 3, Level 5 and Group 5, Level 1) and a distally beveled tool (Group 7, Form 1, Spec. 1) from Level 1 were recovered in Test Pit 2. An otolith from a freshwater drum was found in Level 4.

Test Pit 3 was located near the middle of 41 LK 14 where a number of Late Prehistoric artifacts were observed on the surface (Fig. 22). The unit was excavated to 70 cm below surface. As in Test Pit 2, the matrix in this unit was a dark brown, sandy clay loam down through Level 4. In Level 5, a yellowish tan matrix containing much calcium carbonate was encountered. This matrix continued to the bottom of the pit. Materials recovered from Test Pit 3 are divided into two horizons: the Upper Horizon representing Levels 1-4 and the Lower Horizon Levels 5-7. Recovery rates for selected classes of material from each horizon were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	576	220
Fire-Fractured Rock Weight (grams)	3031	287
Mussel Shell Umbo Count	112	14
Mussel Shell Weight (grams)	197	81
Rabdotus Shell Count	77	63
Bone Weight (grams)	0.1	0
Primary Flake Count	7	3
Secondary Flake Count	63	21
Tertiary Flake Count	80	26
Chip Count	298	109

Figure 21. *Photographs Taken in the Vicinity of 41 LK 14, 41 LK 15, 41 LK 17, 41 LK 73, and 41 LK 77.*

a. View east-northeast from 41 LK 15 to 41 LK 14. Both sites are located in cultivated field. Plant stubble is called "hay grazer," a cattle feed. Frio River is beyond trees to left. Both sites are located on Pleistocene terrace remnants.

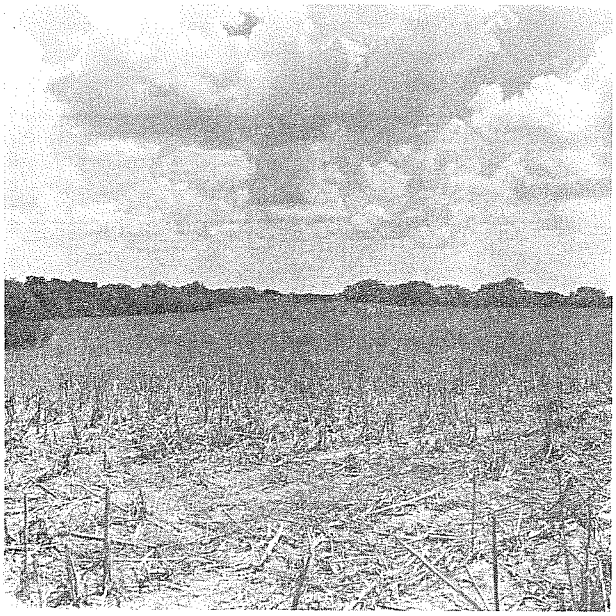
b. Main area of 41 LK 77 showing dense cover of whitebrush. Large trees are mesquites. This whitebrush thicket is typical of low-lying areas on the floodplain having dense clay soils and receiving more than normal amounts of water through runoff or flooding.

c. General view of the sandstone block walls surrounding burial crypt of 41 LK 73.

d. Detail of the sandstone slab crypt at 41 LK 73.

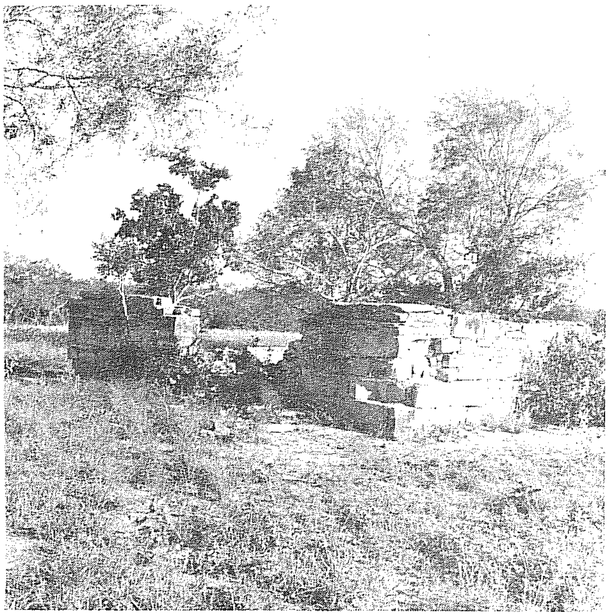
e. Construction technique and foundation details of wall around crypt at 41 LK 73.

f. Unusual soil profile revealed in Test Pit 2 at 41 LK 17. Examination of aerial photographic coverage of site showed that a filled channel was located in test pit area.



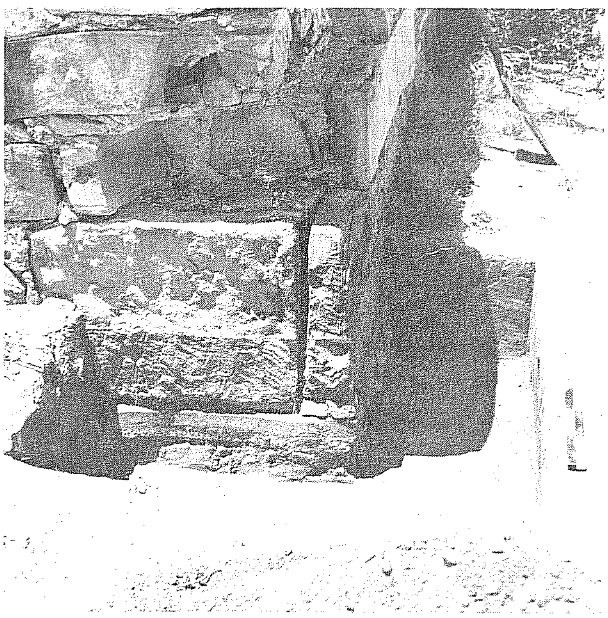
a

b

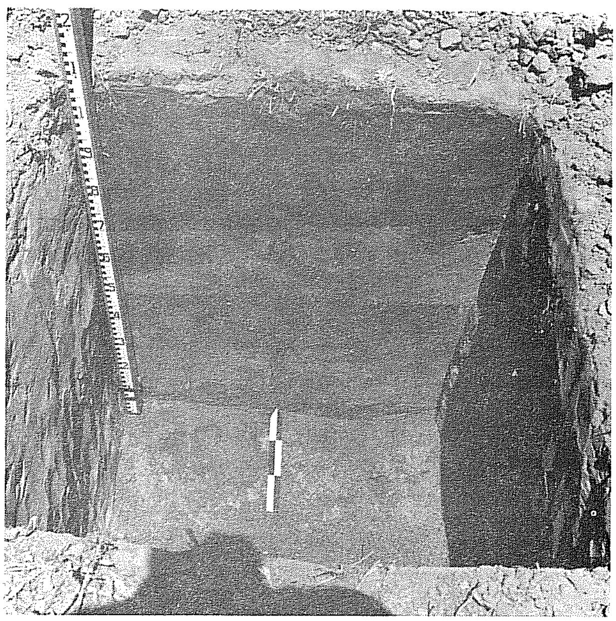


c

d



e



f

Two cores (Group 1, Levels 4 and 5), one thin biface, one sandstone mano (Group 2, Form 1, Spec. 1, Level 3) and four sherds of aboriginal pottery from Level 1 were recovered from Test Pit 3. The thin biface is an untyped arrow point (Group 1, Form 5, Spec. 11, Level 1). The single piece of bone from Test Pit 3 was not identifiable as to species.

Test Pit 4, located in the west central area of the site, was excavated to 90 cm below surface. From surface to 50 cm, matrix was a gray-brown, sandy clay loam. Beginning in Level 5, color of the matrix became light brown to tan, and amounts of calcium carbonate gradually increased toward the bottom of the pit. Debris collected from the unit was divided into two assemblages representing an Upper Horizon (Levels 1-4) and a Lower Horizon (Levels 5-9). Rates of recovery for selected classes of material from these horizons was as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	900	579
Fire-Fractured Rock Weight (grams)	3381	3037
Mussel Shell Umbo Count	232	104
Mussel Shell Weight (grams)	564	484
Rabdotus Shell Count	318	149
Bone Weight (grams)	0.1	0
Primary Flake Count	3	1
Secondary Flake Count	44	39
Tertiary Flake Count	51	42
Chip Count	65	44

Three cores, one thick biface, and three thin bifaces were also recovered from Test Pit 4. One of the thin bifaces, found in Level 5, is a *Cliffton* arrow point (Group 1, Form 4, Spec. 17). Another thin biface (Group 4, Form 1, Spec. 1), typed as a *Refugio* point, was recovered in Level 7. It is triangular with a convex base.

Surface collections at 41 LK 14 yielded 48 cores, 30 thick bifaces, 51 thin bifaces, 16 distally beveled tools, two unifaces, three trimmed flakes, one possible hammerstone, 19 pieces of modified sandstone (18 grinding slab fragments and one grooved abrader), one piece of modified mussel shell, and three sherds of aboriginal pottery. Of the total 174 surface-collected specimens, individual proveniences of 123 artifacts were recorded on plane table maps. These maps are on file at the CAR-UTSA. The thin biface assemblage includes dart points of the *Angostura* (Group 1, Form 2, Spec. 17), *Morhiss* (Group 1, Form 2, Spec. 2), and *Darl* (Group 1, Form 3, Spec. 17) types. There are also 18 unstemmed thin bifaces with triangular or leaf-shaped outlines. Among the triangular specimens, straight bases are common, but concave and convex bases also occur. The rather sizable collection of distally beveled tools from 41 LK 14 contains a variety of forms. Distally beveled tools having potential as time diagnostics include one *Clear Fork* tool (Group 1), six smaller tools belonging to Groups 3 and 4, and one *Guadalupe* tool (Group 6).

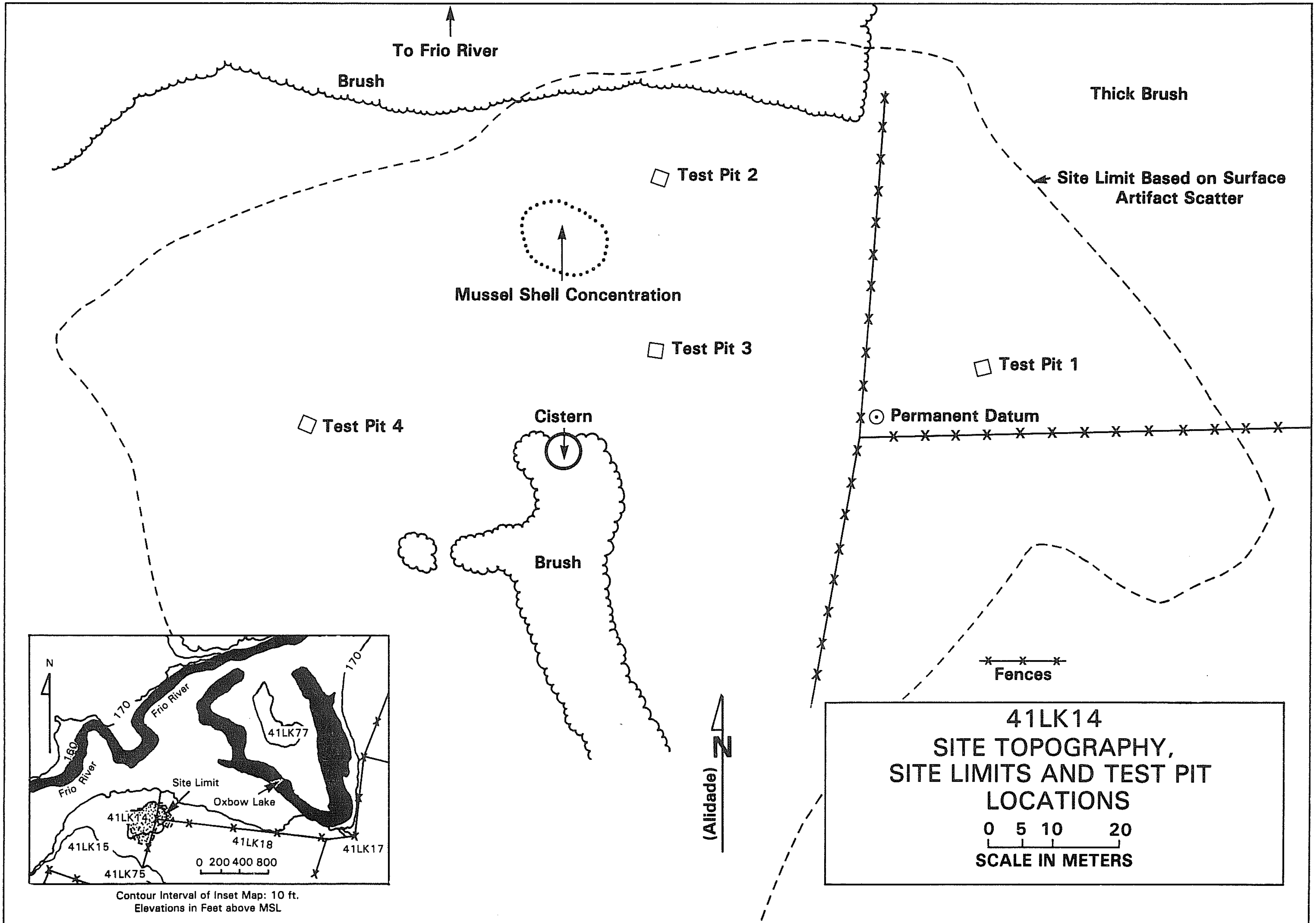

To Frio River
Brush
Thick Brush
Test Pit 2
Site Limit Based on Surface Artifact Scatter
Mussel Shell Concentration
Test Pit 3
Test Pit 1
Test Pit 4
Cistern
Permanent Datum
Brush
Fences
N
(Alidade)
41LK14
SITE TOPOGRAPHY, SITE LIMITS AND TEST PIT LOCATIONS
0 5 10 20
SCALE IN METERS
N
170
Frio River
170
160
Frio River
41LK77
Site Limit
Oxbow Lake
41LK14
41LK15
41LK18
41LK17
41LK75
0 200 400 800
Contour Interval of Inset Map: 10 ft.
Elevations in Feet above MSL

FIGURE 22

The findings made during the CAR investigation at 41 LK 14 support the THC analysts' suggestion that the site was occupied from Paleo-Indian through Late Prehistoric times. Early activity is evidenced by the *Angostura* specimen and at least two of the distally beveled tools, including *Clear Fork* and *Guadalupe* tools. The other distally beveled tools and a wide array of thin bifaces, some stemmed and many unstemmed, appear to represent the entire time span of the Archaic. Late Prehistoric activity is demonstrated by the presence of arrow points and aboriginal pottery on the site. Testing revealed a substantial deposit of prehistoric debris in the subsurface, but few recognized time-diagnostic tools were found in controlled excavations. The vast majority came from the surface, suggesting that the deposits have undergone considerable disturbance.

The wide array of cores, thick bifaces, and thin bifaces at 41 LK 14 indicate that a cobble source was present on or near the site during prehistoric times. The proximity of such a lithic resource is also suggested by the amount of fire-fractured rock recovered form the test pits. There was much more fire-fractured rock than tuff rock in all the units.

No habitational features were recognized in the test pits excavated at 41 LK 14. Very little carbon and hardly any bone were recovered. Faunal remains were limited to mussel shells, *Rabdotus* shells, and a single fresh-water drum otolith. These are assumed to be residues of foods consumed by prehistoric site residents. Plant food processing is indirectly evidenced by a substantial number of sandstone grinding implements, almost all of which were found on the surface.

In all the test pits, the deposit containing prehistoric debris was found to extend from the ground surface to a depth of 70-90 cm. Preliminary analysis of material recovery from the test pits led to the division of materials into Upper and Lower Horizons. This division was based on variations in quantities of material down through the deposit; the Upper Horizon (Levels 1-4) contained most of the debris. The remains in the Upper Horizon may represent Middle Archaic, Late Archaic, and Late Prehistoric activities; Lower Horizon materials may represent Paleo-Indian and Early Archaic activities.

41 LK 15

Separated only by a shallow draw running northwest-southeast, 41 LK 15 is located 200 m west of 41 LK 14 on an adjacent lobe of the same Pleistocene terrace system. The site is almost completely within the cultivated field which contains part of 41 LK 14 (Fig. 21,a). The central and southwestern portions of the site are immediately above the river channel. The slope down to the river is quite steep. The southwestern end of the site extends beyond the cultivated area into brushy pasture. Mesquite, whitebrush, persimmon, cactus, and grasses grow in the pasture. Along the channel slope is a riparian forest consisting of mesquite, hackberry, huisache, and elm trees.

As recorded by the THC surveyors, 41 LK 15 parallels the Frio River channel northeast-southwest for a distance of 450 m (Fig. 1). Its width was set at 150 m. Remains on the site were suggested to be the result of Archaic period activities (Lynn, Fox, and O'Malley 1977:44).

CAR activities at 41 LK 15 included excavation of five 1-m^2 test pits and provenienced surface artifact collection. These efforts were concentrated over a subcircular area with a diameter of 150 m at the northeastern end of the site where the greatest amounts of surface debris were observed (Fig. 23). Test pits ranged in depth from 30-90 cm below surface. Based on variations in amounts of material recovered throughout the deposit, the debris collection was divided into two assemblages designated as Upper and Lower Horizons. Materials recovered from the 10-cm test pit levels were combined into horizon assemblages according to the following level groupings:

Test Pit No.	Upper Horizon Levels	Lower Horizon Levels
1	1-5	6-9
2	1-4	5-9
3	1-3	---
4	1-4	5-8
5	1-4	5-7

Test Pit 1 at 41 LK 15 was excavated into a deposit characterized as gray-brown sandy loam through Level 6, at which point the color began to lighten as calcium carbonate content increased. Recovery rates for selected classes of material were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	1067	251
Fire-Fractured Rock Weight (grams)	2573	506
Mussel Shell Umbo Count	94	18
Mussel Shell Weight (grams)	361	48
Rabdotus Shell Count	194	50
Bone Weight (grams)	2.2	0
Primary Flake Count	7	0
Secondary Flake Count	66	4
Tertiary Flake Count	111	12
Chip Count	163	41

No other artifacts were found in Test Pit 1. Bones collected in the unit were identified as Mexican ground squirrel (Level 2) and a "very large" freshwater drum (otolith; Level 5).

Test Pit 2 contained a matrix very similar to the profile described for Test Pit 1. Rates of recovery for selected classes material were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	395	259
Fire-Fractured Rock Weight (grams)	968	1043
Mussel Shell Umbo Count	124	29
Mussel Shell Weight (grams)	402	99
Rabdotus Shell Count	55	52
Bone Weight (grams)	0	0
Primary Flake Count	2	3
Secondary Flake Count	22	10
Tertiary Flake Count	34	14
Chip Count	157	41

No additional artifacts were found in Test Pit 2.

Test Pit 3 was staked out on the northern slope of the site leading into the modern Frio floodplain (Fig. 23). The ground surface in this area appeared to be badly deflated. The test pit was excavated to determine how much cultural debris remained beneath the eroded surface. Calcium carbonate-rich matrix characteristic of the basal, noncultural deposit elsewhere on the site appeared in Level 2 of Test Pit 3. The unit was terminated at Level 3. Materials were recovered in the following amounts:

Tuff Rock Weight (grams)	56
Fire-Fractured Rock Weight (grams)	1205
Mussel Shell Umbo Count	23
Mussel Shell Weight (grams)	58
Rabdotus Shell Count	10
Bone Weight (grams)	0
Primary Flake Count	4
Secondary Flake Count	21
Tertiary Flake Count	27
Chip Count	97

One unstemmed thin biface (Group 2, Form 2, Spec. 7) and one grooved sandstone fragment (Group 3, Spec. 2; Fig. 86) were also found in Test Pit 3.

Test Pit 4 was located in the southwestern portion of the site area. Sherds of aboriginal pottery were observed on the ground surface, evidencing a Late Prehistoric component not found in other parts of the site. Matrix in this test pit was a light brown, sandy clay loam. Unlike the other test pits, there was no increase in calcium carbonate with depth. The matrix did not change noticeably in color or consistency from the top down to the bottom. The two horizons in the unit yielded the following amounts of material:

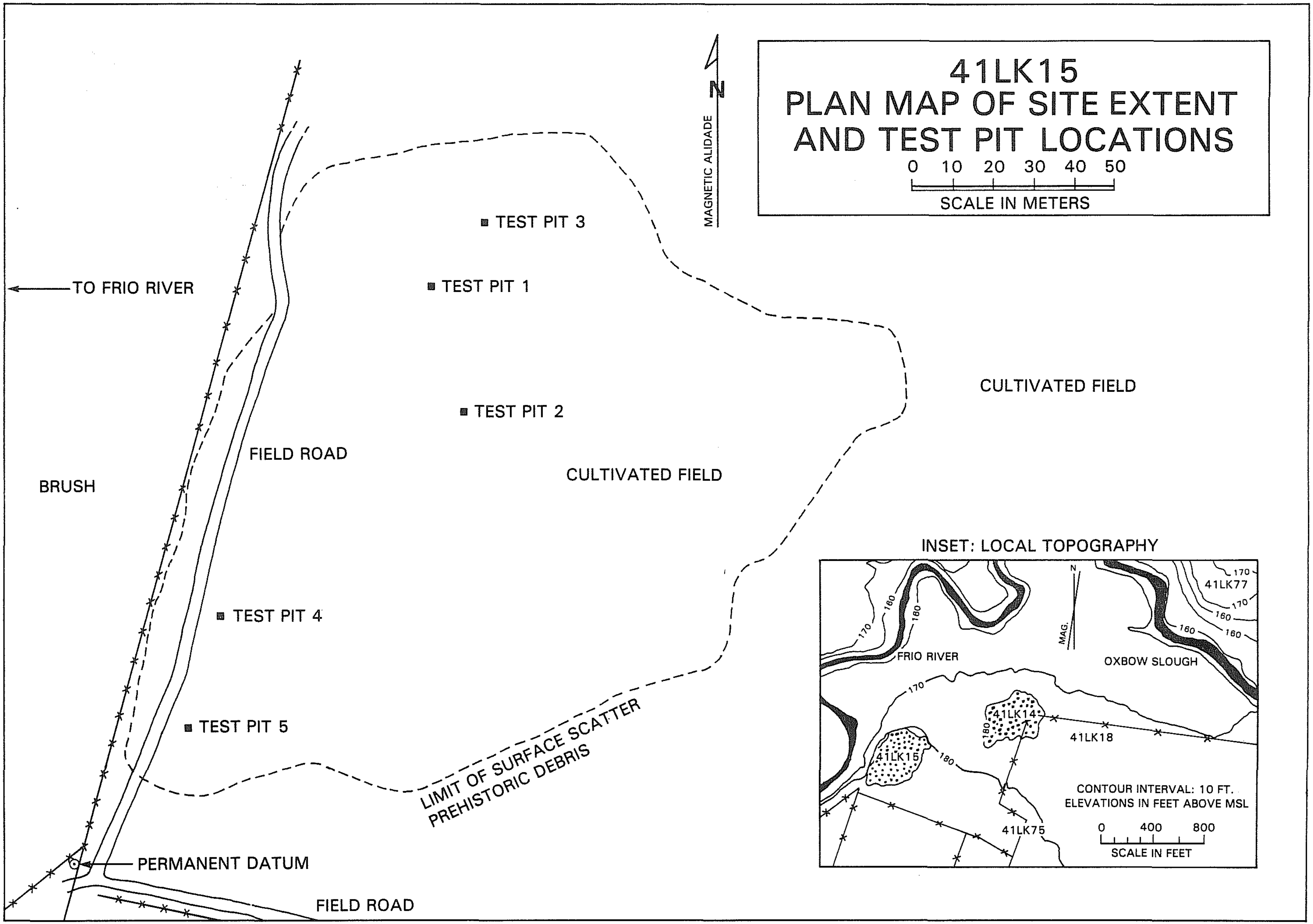

41LK15
PLAN MAP OF SITE EXTENT
AND TEST PIT LOCATIONS
0 10 20 30 40 50
SCALE IN METERS
N
MAGNETIC ALIDADE
TEST PIT 3
TEST PIT 1
TEST PIT 2
TEST PIT 4
TEST PIT 5
TO FRIO RIVER
FIELD ROAD
BRUSH
CULTIVATED FIELD
CULTIVATED FIELD
LIMIT OF SURFACE SCATTER
PREHISTORIC DEBRIS
PERMANENT DATUM
FIELD ROAD
INSET: LOCAL TOPOGRAPHY
N
MAG.
FRIO RIVER
OXBOW SLOUGH
41LK77
41LK14
41LK18
41LK15
41LK75
170
160
180
CONTOUR INTERVAL: 10 FT.
ELEVATIONS IN FEET ABOVE MSL
0 400 800
SCALE IN FEET

FIGURE 23

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	165	131
Fire-Fractured Rock Weight (grams)	226	5
Mussel Shell Umbo Count	10	8
Mussel Shell Weight (grams)	36	25
Rabdotus Shell Count	1	14
Bone Weight (grams)	0	0
Primary Flake Count	4	2
Secondary Flake Count	7	4
Tertiary Flake Count	10	3
Chip Count	42	16

Three cores, 11 sherds of aboriginal pottery (eight from Level 1 and three from Level 2), and historic artifacts including square nails and whiteware ceramics were also recovered from Test Pit 4.

Test Pit 5 was the southwesternmost unit excavated at 41 LK 15 (Fig. 23). Matrix in this pit was a very hard, compact, dark brown clayey loam. In Level 3, the soil changed to a gray brown, and sand content increased, making the matrix easier to dig. In Level 5, the matrix lightened to a yellowish tan as amounts of calcium carbonate increased. Rates of recovery for selected classes of material were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	3	0
Fire-Fractured Rock Weight (grams)	77	162
Mussel Shell Umbo Count	0	2
Mussel Shell Weight (grams)	0	1
Rabdotus Shell Count	0	0
Bone Weight (grams)	0	0
Primary Flake Count	1	1
Secondary Flake Count	6	1
Tertiary Flake Count	14	2
Chip Count	55	21

One core (Group 5), one thick biface (Group 2; Level 1), and one thin biface fragment (Group 10; Level 1) were also recovered from Test Pit 5.

Seventy-one artifacts were collected from the surface of 41 LK 15. These include 11 cores, 14 thick bifaces, 26 thin bifaces, seven distally beveled tools, one uniface, three trimmed flakes, two pieces of satin spar gypsum, and seven sherds of aboriginal pottery. Individual locations of 44 of these specimens were recorded on a plane table map (on file at the CAR-UTSA). Among the thin bifaces are three large stemmed specimens (Group 1, Form 3, Specs. 1, 23, and 24), one of which (Spec. 1) is classified as an (*Ensor* dart point. The other two specimens fit no currently recognized dart point types. Nine other thin biface specimens are unstemmed, triangular or leaf shaped, and have bases ranging from straight to concave to convex to semicircular (Groups 2-5). Among the distally beveled tools, three Group 3, Form 2 specimens and one *Guadalupe* tool (Group 6), are specimens with particularly good potential as time-diagnostic forms.

Certain of the chipped stone tools, the prehistoric pottery, and a small number of historic artifacts suggest that cultural activities at 41 LK 15 occurred over a lengthy span of time. The single *Guadalupe* tool is suggestive of a Paleo-Indian or Early Archaic component, but there is no other readily apparent evidence to indicate such early activity (such as the *Angostura* point and *Clear Fork* tool found at 41 LK 14). The thin bifaces, stemmed and unstemmed, and other distally beveled tool forms indicate that the heaviest activities on the site occurred during Middle and Late Archaic times. Aboriginal potsherds and historic debris found in the vicinity of Test Pits 4 and 5 evidence Late Prehistoric and early Historic components. Neither of these components had been previously recognized at the site. The Historic period debris is unusual in that it is not accompanied by sandstone blocks seen at many of Choke Canyon's historic sites.

As at 41 LK 14, the array of cores, chipped stone tools, and debitage at 41 LK 15 indicate heavy use of nearby gravel deposits as lithic raw materials. Again, fire-fractured rock was much more common in the deposits than was tuff rock. The remains collected at 41 LK 15 do not provide much insight into prehistoric subsistence efforts. Mussel shell and *Rabdotus* shells were found throughout the deposit. Bones of a ground squirrel and a freshwater drum were recovered from Test Pit 1. The ground squirrel remains are probably of modern origin, but the drum fish was probably a prehistoric food item. Manos and grinding slab fragments were absent, especially unusual considering the number of such specimens found nearby at 41 LK 14.

41 LK 18

Roughly 150 m east of 41 LK 14's eastern edge is a small prehistoric site designated 41 LK 18 (Fig. 1). The site is separated from 41 LK 14 by a shallow draw. It is situated on the same terrace complex as contains 41 LK 14 and 41 LK 15, but it is at a slightly lower elevation. Most of the site is within a cultivated field, and it is bisected by a dirt road. Along the site's northern edge there is a slope down to the first terrace of the Frio River. The slope is heavily covered with brush. Debris evidencing the site covers a circular area with a maximum diameter of 150 m.

A provenienced surface collection was conducted at 41 LK 18 by the CAR crew. Fourteen specimens were collected, most of them coming from eroded places along the field road. The collection consists of four cores, two thick bifaces, two thin bifaces, one distally beveled tool (Group 7, Form 1), and five pieces of modified standstone (Group 1, Forms 2 and 3, grinding slab fragments). One of the thin bifaces (Group 1, Form 4, Spec. 1) is a *Perdiz* arrow point. These materials suggest that the surface debris evidencing 41 LK 18 are the results of Archaic (undifferentiated) and Late Prehistoric activities.

41 LK 17

Site 41 LK 17 is located on a flat terrace at the southern end of an abandoned, V-shaped oxbow channel (Fig. 24). The oxbow, trending south from the present course of the Frio River, contains water on a more-or-less permanent basis. Most of the site is in a cultivated field. At the north end of the site, in a 30-m-wide strip along the bank of the oxbow, grows a thick stand of brush. Mesquite, spiny hackberry, whitebrush, huisache, retama, hackberry, and prickly pear are present. A steep, badly eroded slope leads from the site's northern edge into the oxbow channel. In the western part of the site, cattle going down to water at the lake have laid bare a large area and contributed to the erosion of portions of the site.

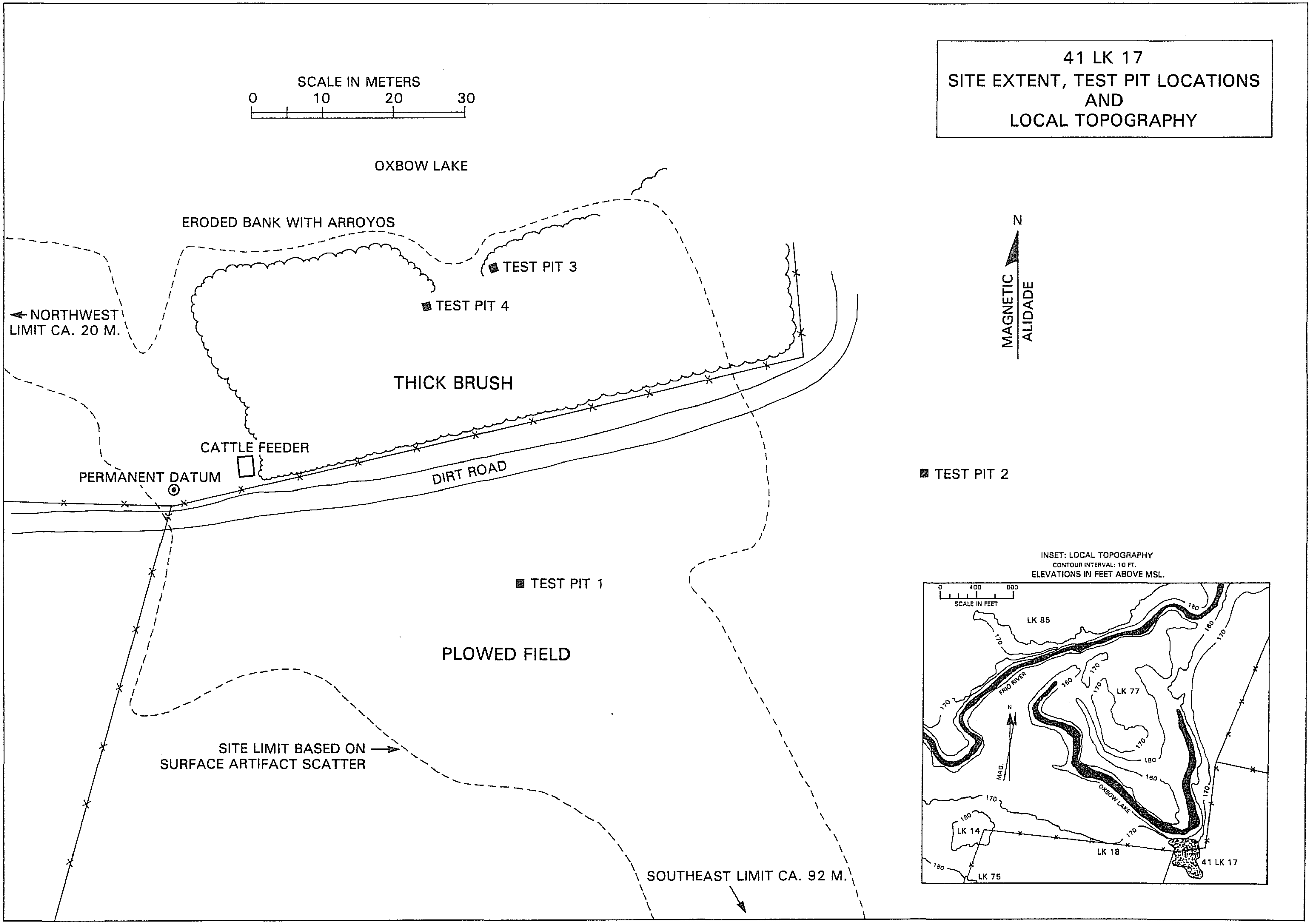
As recorded by the THC surveyors, 41 LK 17 was shown to be almost 400 m east-west and 150 m north-south. Based on the distribution of surface prehistoric debris at the time of inspection by the CAR crew, 41 LK 17 measured 200 m north-south and 100 m east-west (Fig. 24). CAR activities included the excavation of four 1-m^2 test pits and an unprovenienced collection of surface artifacts. Based on variations in rates of material recovery throughout the deposits, debris collections from the test pits were divided into Upper and Lower Horizons. Level groupings representing each horizon are as follows:

Test Pit No.	Upper Horizon Levels	Lower Horizon Levels
1	1-4	5-9
2	1-4	---
3	1-4	5-7
4	1-3	4-6

Test Pit 1 was placed outside the cultivated field near the center of 41 LK 17. Matrix was a very hard, compact, light brown, fine sandy loam. Rates of recovery for selected classes of material were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	135	943
Fire-Fractured Rock Weight (grams)	197	155
Mussel Shell Umbo Count	29	65
Mussel Shell Weight (grams)	83	171
Rabdotus Shell Count	36	52
Bone Weight (grams)	0	0
Primary Flake Count	0	1
Secondary Flake Count	6	14
Tertiary Flake Count	9	16
Chip Count	14	30

One thick biface (Group 6, Form 1, Level 6) and one thin biface fragment (Group 4, Form 4, Level 8) were also found in Test Pit 1.


41 LK 17
SITE EXTENT, TEST PIT LOCATIONS
AND
LOCAL TOPOGRAPHY
SCALE IN METERS
0 10 20 30
OXBOW LAKE
ERODED BANK WITH ARROYOS
TEST PIT 3
TEST PIT 4
NORTHWEST LIMIT CA. 20 M.
THICK BRUSH
MAGNETIC
ALIDADE
N
CATTLE FEEDER
PERMANENT DATUM
DIRT ROAD
TEST PIT 2
TEST PIT 1
PLOWED FIELD
SITE LIMIT BASED ON SURFACE ARTIFACT SCATTER
SOUTHEAST LIMIT CA. 92 M.
INSET: LOCAL TOPOGRAPHY
CONTOUR INTERVAL: 10 FT.
ELEVATIONS IN FEET ABOVE MSL.
0 400 800
SCALE IN FEET
LK 85
FRIO RIVER
LK 77
OXBOW LAKE
MAG.
LK 14
LK 18
LK 75
41 LK 17

Test Pit 2 was located east of the site boundary as defined by surface debris scatter to see if the surface evidence was a reliable indicator of subsurface debris occurrence. In the four 10-cm levels excavated in Test Pit 2, hardly any cultural debris was found. However, an ususual wall profile was exposed. The unit was excavated to a depth of 75 cm below surface. Three very distinct soil zones were recognized in the unit's wall profile (Fig. 21,f). Later examination of aerial photographic coverage of the site showed that a filled channel runs through the area of Test Pit 2. The filled channel does not seem to have any direct bearing on the prehistoric remains in the site.

Test Pits 3 and 4 were placed on either side of a small gully along the northern edge of 41 LK 17 by the oxbow lake. Inspection of the gully walls revealed substantial amounts of fire-fractured rock in a layer buried approximately 50 cm below the ground surface. In Test Pit 3, a matrix of compact, gray-brown sandy loam was encountered. In Levels 6 and 7, the matrix became lighter in color, and the clay content increased. Rates of recovery for selected classes of material were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	135	793
Fire-Fractured Rock Weight (grams)	103	1515
Mussel Shell Umbo Count	1	26
Mussel Shell Weight (grams)	3	35
Rabdotus Shell Count	21	43
Bone Weight (grams)	0	0
Primary Flake Count	0	3
Secondary Flake Count	4	19
Tertiary Flake Count	4	30
Chip Count	5	58

One core (Group 3) was found in Level 7.

Test Pit 4, situated 12 m southwest of Test Pit 3, had a similar matrix and profile. The pit yielded debris in the following amounts:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	32	77
Fire-Fractured Rock Weight (grams)	440	632
Mussel Shell Umbo Count	10	29
Mussel Shell Weight (grams)	9	32
Rabdotus Shell Count	2	32
Bone Weight (grams)	3	1
Primary Flake Count	0	0
Secondary Flake Count	1	8
Tertiary Flake Count	1	9
Chip Count	11	56

One core (Group 6, Level 2) and one distally beveled tool (Group 4, Spec. 4; Level 6) were also found in Test Pit 4. The animal bone from this pit was not identifiable as to species.

Five cores, two thin bifaces (Group 4, Form 3 and Group 9), one distally beveled tool (Group 6, *Guadalupe* tool), and one trimmed flake (Group 3, Form 1) were collected from the surface of 41 LK 67.

According to THC analysts, 41 LK 17 contained undifferentiated Archaic remains (Lynn, Fox, and O'Malley 1977:44). This estimation is supported by CAR findings at the site. The thin bifaces and distally beveled tools recovered from the site generally indicate Early and/or Middle Archaic activities. No materials readily indicative of Late Archaic or Late Prehistoric components were recognized.

At the north end of 41 LK 17 along the edge of the terrace overlooking the oxbow, there is a relatively extensive layer of fire-fractured rock 50-60 cm below ground surface. Mussel shell, *Rabdotus* shell, and some animal bone were found in association with this layer of fire-fractured rock. A rather distinctive distally beveled tool (Group 4, Spec. 4; Fig. 74) was also found in this layer.

Overall, 41 LK 17 is similar to nearby sites 41 LK 14 and 41 LK 15. Mussels, large land snails, and unidentified vertebrates were among food items apparently consumed at the site. Like 41 LK 15, no manos or grinding slabs were found. The absence of such tools is unusual considering the relative abundance of grinding slab fragments at 41 LK 14. The large amounts of fire-fractured rock on the site indicate heavy reliance on nearby cobble deposits for hearth construction and chipped stone tool manufacture. Smaller amounts of tuff were also brought in. Debris distribution at the site suggests that prehistoric activities were concentrated primarily at the north end of the site near the oxbow. It is assumed that the oxbow channel existed during the period of prehistoric activity, but it is not known whether the channel was active or abandoned at that time.

41 LK 77

Across the oxbow channel 300 m north of 41 LK 17 is an open, prehistoric site designated 41 LK 77 (Fig. 1). The site occurs on a natural levee situated between either end of the V-shaped oxbow lake. The active channel of the Frio River passes just 100 m north of 41 LK 77. The natural levee forms a distinct rise inside the oxbow. According to THC surveyors, the site is broadly U-shaped with its open end to the north. Site dimensions were set at 150 m east-west and 250 m north-south. Brush cover is extremely dense on the site (Fig. 21,b). Whitebrush is common. Also present is mesquite, spiny hackberry, prickly pear, tasajillo, allthorn, and various grasses. Close to the oxbow channel grow elm and hackberry trees.

Inspection of 41 LK 77 revealed that surface prehistoric debris was most concentrated in a 30-m-wide band spread over a north-south length of 100 m along the site's western edge. Reconnaissance of the site was severely hindered by the thick whitebrush growing almost everywhere on the surface. The area where prehistoric debris was most dense corresponds to the highest part of the levee containing the site. The western levee slope leading down into the oxbow channel is moderately to severely eroded. Cultural debris was most evident in the eroded area. Surface debris consists of fire-fractured rock, debitage, cores, mussel shells, and *Rabdotus* shells. Compared to most other prehistoric sites at Choke Canyon, the density of surface debris at 41 LK 77 was low.

The CAR crew excavated three 1-m^2 test pits along the western side of 41 LK 77. Two 10-cm levels were excavated in each unit. Rates of recovery for selected classes of material from the three test pits combined were as follows:

Tuff Rock Weight (grams)	0
Fire-Fractured Rock Weight (grams)	199
Mussel Shell Umbo Count	46
Mussel Shell Weight (grams)	100
Rabdotus Shell Count	16
Bone Weight (grams)	0
Primary Flake Count	1
Secondary Flake Count	14
Tertiary Flake Count	7
Chip Count	12

One thick biface (Group 1) was found in Level 1 of Test Pit 1. No other artifacts were collected.

As can be seen from the recovery figures provided above, there was not much cultural debris at the site. No time-diagnostic materials were found, and no estimate of the period of occupation can be advanced.

41 LK 75

Located 150 m south of 41 LK 14 and 150 m southeast of 41 LK 15, 41 LK 75 is an open, prehistoric site resting on a slope leading to a third terrace above the active Frio River channel (Fig. 1). The site lies partly in a cultivated field and partly within a large complex of corrals and pens. As recorded by the THC surveyors (Lynn, Fox, and O'Malley 1977:44), 41 LK 75 is roughly circular with an approximate diameter of 200 m. The site contained undifferentiated Archaic remains.

The CAR crew conducted a provenienced surface collection at 41 LK 75. Visibility was very good at the eastern and northern portions of the site; the field containing these portions had been plowed and cultivated not long before collection was made. Visibility in the corral complex, however, was reduced by grass and weeds. Forty-six specimens were collected from the site. Individual locations of 35 of the specimens were recorded on a plane table map (on file at the CAR-UTSA). The collection includes nine cores, 11 thick biface, 16 thin bifaces, five distally beveled tools, two trimmed flakes, two pieces of modified sandstone (grinding slab fragments), and one tool fragment made from the columella of a marine conch shell.

The prehistoric remains evidencing 41 LK 75 are suggested to represent activities during Middle and/or Late Archaic times. Among the thin bifaces found at the site were a *Langtry* dart point (Group 1, Form 2, Spec. 7) and a variety of unstemmed triangular and leaf-shaped forms with straight, concave, and convex bases (Thin Biface Groups 2-5). Of the distally beveled tools, two specimens (Group 3, Forms 1 and 3) are particularly distinctive. The marine shell artifact, one of few such specimens recovered during Phase I investigations at Choke Canyon, is made from the columella of a horse conch (*Pleuroploca gigantea*). The specimen is fragmentary and shows no obvious sign of human modification (Fig. 88). The specimen indicates that the prehistoric inhabitants of 41 LK 75 had access to materials derived from a coastal environment.

41 LK 65

This open prehistoric site is located just south of 41 LK 75 at a slightly higher elevation on an ancient river terrace above (south of) the Frio River (Fig. 1). Most of the site is in a cultivated field. A modern residence and outbuildings are located along the site's north central edge. As recorded by THC surveyors (Lynn, Fox, and O'Malley 1977:44), 41 LK 65 measures 400 m east-west and 150 m north-south. It is listed by the THC analysts as containing Pre-Archaic and Early Archaic components.

The CAR crew visited 41 LK 65 on two occasions to conduct surface collections. Both times the effort was frustrated by the paucity of surface prehistoric debris. Five artifacts were collected: two thick bifaces, two thin bifaces, and one piece of grooved sandstone. One of the thin bifaces is a stemmed arrow point (Group 1, Form 5, Spec. 13). The other is a stemmed dart point fragment. The CAR investigation produced evidence of a Late Prehistoric component, but failed to substantiate the presence of Pre-Archaic and Early Archaic components recognized by THC investigators.

41 LK 27

Farther to the west on the same high, ancient terrace containing 41 LK 65 is 41 LK 27, a large, open prehistoric site. It is situated on the south (right) bank of a channel that now drains higher areas of the floodplain to the south and west. This channel may have been at one time the main course of the Frio River. As recorded by the THC crew, the site measures almost one kilometer east-west and 100-150 m wide (Fig. 1). A modern residence and outbuildings are located at the northeastern end of the site. The drainage channel paralleling the site feeds into the Frio River at a point 150 m north of the site's eastern end. Along the northern margin of the site on the slope leading to the channel, there is a series of abandoned gravel pits. One pit at the west end is still being mined. Most of the site surface is covered with brush. Mesquite, spiny hackberry, whitebrush, prickly pear, agarita, tasajillo, and guayacan are present.

A collection of surface artifacts was made at 41 LK 27 by the CAR crew. Forty-two specimens were collected. Individual locations of 37 of these specimens were recorded on a plane table map of the site (on file at the CAR-UTSA). Materials gathered include four cores, six thick bifaces, 21 thin bifaces, six distally beveled tools, one uniface, three trimmed flakes, and one piece of modified sandstone. Two large stemmed thin bifaces (Group 1, Form 2, Spec. 14 and Group 1, Form 3, Spec. 25) and 12 unstemmed triangular or leaf-shaped thin bifaces (Groups 2-4) indicate Middle and Late Archaic components at the site. Three of the distally beveled tools (Group 2, Form 2; Group 3, Form 1; and Group 4) provide further evidence of Archaic components. One specimen, a *Scallorn* arrow point (Thin Biface Group 1, Form 5, Spec. 1), indicates Late Prehistoric activity at 41 LK 27. THC analysts found evidence of Early Archaic activity at the site (*ibid.*:44).

41 LK 20

This open, prehistoric site is located north of 41 LK 27 on the north (left) bank of the east-west trending drainage channel (Fig. 1). The site is entirely within a cultivated field. Dimensions of the site, as recorded by the THC surveyors, are 450 m east-west and 100-500 m north-south. The site is at a lower elevation than 41 LK 27, being situated on a younger terrace surface.

The initial inspection of the 41 LK 20 surface by the CAR crew revealed only a very thin scatter of fire-fractured rock, debitage, and mussel across the site. Shovel tests at various locations revealed even less cultural debris in the subsurface. The material collection from this site consists of three cores. The time period of prehistoric activity on the site could not be determined from the available remains.

SITE GROUP 5

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 LK 85 41 LK 94	--	41 LK 92 41 LK 93

Site Group 5 consists of four prehistoric sites located on the north (left) bank of the Frio River between 4.0-6.5 km west of Choke Canyon Dam. All of the sites are on the river floodplain. The major landform features in the site group area are the active river channel, a relict river channel, and an extensive drainage system known as Opossum Hollow. The main channel of Opossum Hollow may once have been the active course of the Frio River or of Opossum Creek which now meets the Frio River farther to the west. Opossum Hollow is now primarily a conduit of runoff from an extensive area to the north and northwest of its confluence with the Frio River in the vicinity of 41 LK 94. Bedrock beneath Site Group 5 is the Frio Formation, but it is deeply buried beneath alluvial deposits in the study area. Gravel deposits occur in the river bed south of the sites and as a lag pavement along the valley margin a short distance north of the sites. For the most part, Site Group 5 sites are located in cleared pastures. There are, however, thick stands of brush still growing in some areas. The channels of the Frio River and Opossum Hollow support dense riparian forests containing oak, elm, willow, and hackberry trees.

41 LK 85

Site 41 LK 85 is the largest prehistoric site known at Choke Canyon. As recorded by THC surveyors, this hook-shaped site runs 2.5 km along the north side of a relict channel north of the Frio River (Fig. 1). Its long axis runs east-west. With the exception of moderately thick stands of brush at either end of the site, 41 LK 85 is contained in a cleared pasture planted with grass. A narrow band of brush was left growing along either side of the relict channel. In reconnaissance of the site, the CAR crew found that the far west end held the best potential for investigation. Surface debris was relatively dense, and shovel tests showed that substantial amounts of debris were present in the subsurface. Over the remainder of the site, cultural debris was thinly scattered and discontinuous.

Two 1-m^2 test pits were excavated at the west end of 41 LK 85. A natural levee or terrace remnant at this end of the site formed an area of ground relatively higher in elevation than most other parts of the site. The sandy loam deposit in this area was also quite different from the clay loams characteristic of the remainder of the site. This high triangular area, 500 m to a side, seems to have been the area of the greatest amount of prehistoric activity at the site.

Test Pit 1 was staked at the west central part of 41 LK 85 along its far western edge. The unit was at the upper edge of a steep terrace slope leading to the Frio River channel 45 m to the west. It was excavated to 1.75 m below surface, but only the first 70 cm of deposit were removed in 10-cm levels and screened. Matrix from this unit was a dark gray-brown sandy loam down into Level 5. In Level 6, the matrix underwent a definite change, becoming tannish brown in color. It also seemed to contain more silt and was more compact. From Level 7 to the bottom of the unit, clay content gradually increased and became harder and more compact. No cultural debris was found below Level 6. The debris assemblage from Test Pit 1 was divided into two horizons: the Upper representing Levels 1-4 and the Lower, Levels 5-7. Rates of recovery for selected classes of material were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	807	1132
Sandstone Weight (grams)	356	525
Fire-Fractured Rock Weight (grams)	432	1447
Mussel Shell Umbo Count	50	19
Mussel Shell Weight (grams)	202	41
Rabdotus Shell Count	14	24

Bone Weight (grams)	0.1	0
Primary Flake Count	0	0
Secondary Flake Count	10	3
Tertiary Flake Count	12	3
Chip Count	32	15

No additional artifacts were recovered from Test Pit 1.

A burned rock concentration, designated Feature 1, was encountered in Level 4 (30-40 cm below surface) of Test Pit 1. The feature occurred in the northwest corner of the unit; portions extended into the walls of the pit (Fig. 25). It consisted of a dense, semicircular, single-layer concentration of rock and fired clay measuring 50 cm north-south and 30-cm east-west. Excavators projected that the entire feature (including portions extending into the wall) would have measured 50 x 70 cm. There were 44 pieces of burned rock in the feature. This total included 18 pieces of tuff rock, nine pieces of fire-fractured rock, seven pieces of sandstone, and 10 unidentified pieces (possibly fired clay). These pieces averaged 5 cm in diameter. Weights for each type of rock in this feature were 1945 g, tuff; 973 g, fire-fractured rock; and 372 g, sandstone. A small amount of debitage, two mussel shell valves, and some carbon were collected within the feature. The amount of carbon, however, was inadequate for either radiocarbon assay or species identification.

Test Pit 2, 230 m south-southeast of Test Pit 1, was at a lower elevetion on the southern flank of the high ground at the west end of 41 LK 85. The unit was excavated to 1.75 m below surface, but only the first 80 cm of deposit were removed in 10-cm levels and screened. Prehistoric debris was prevalent from surface to a depth of 60 cm. Recovery then dropped off considerably, but prehistoric debris continued sporadically thoughout the deposit to the 1.75-m floor. There was a notable increase in material from 1.2-1.4 m below surface. The matrix in Test Pit 2 was a hard, grayish brown clay loam. Because of its clay content, it was more difficult to excavate and screen than was the matrix in Test Pit 1. The debris assemblage from Test Pit 2 was divided into three horizons. The Upper Horizon contained material recovered from surface down to 50 cm. The Middle Horizon contained material recovered from the deposit between 50-80 cm below surface. The Lower Horizon contained material recovered between 80-175 cm below surface. Rates of recovery for selected classes of material from these horizons were as follows:

	Horizon		
	Upper	Middle	Lower
Tuff Rock Weight (grams)	207	72	9
Sandstone Weight (grams)	60	31	11
Fire-Fractured Rock Weight (grams)	989	348	26
Mussel Shell Umbo Count	116	38	47
Mussel Shell Weight (grams)	429	104	65
Rabdotus Shell Count	35	60	29
Bone Weight (grams)	4.1	0.1	0
Primary Flake Count	1	1	0
Secondary Flake Count	31	7	0
Tertiary Flake Count	35	13	0
Chip Count	123	23	5

41LK85-Test Pit 1
Plan of Feature 1
Burned Rock Concentration

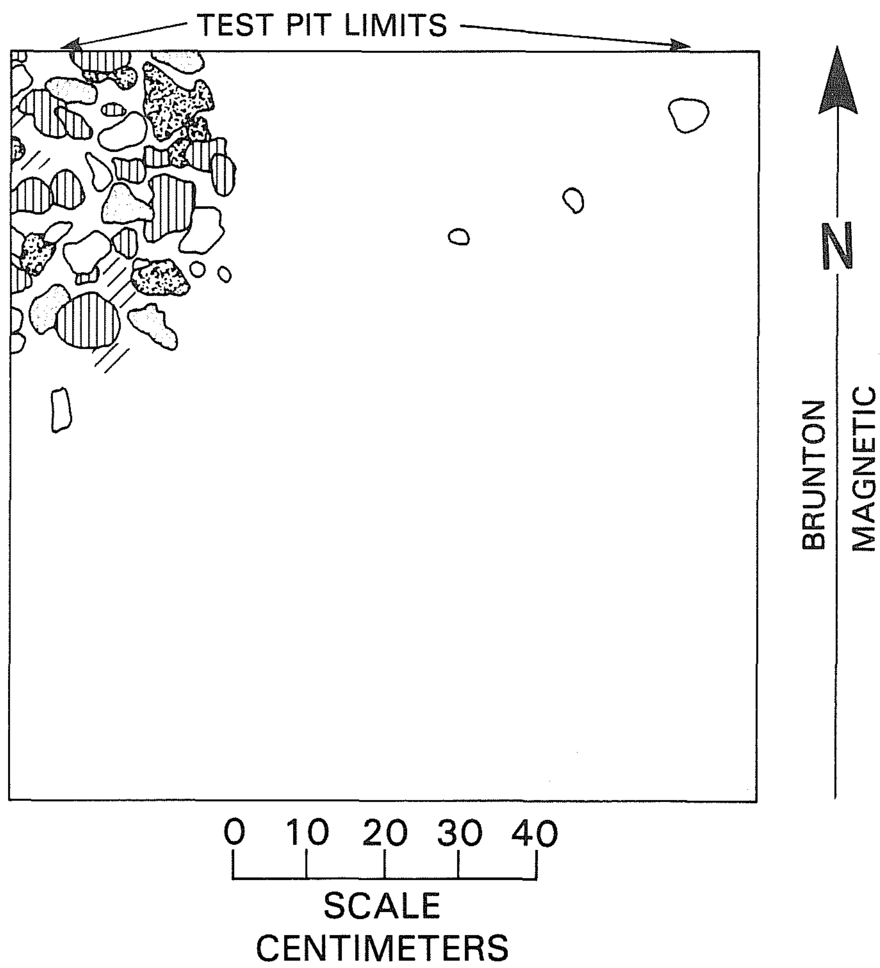
Fire Cracked Chert

Tuff

Sandstone

Unidentified Rock

Charcoal



ROCKS RESTED ON SURFACES RANGING IN DEPTH FROM 34 TO 41 CM BELOW GROUND SURFACE AT SOUTHWEST CORNER.

One additional artifact, a uniface (Group 4, Spec. 6), was found in Level 2.

One thick biface (Group 7, Form 1), three thin bifaces (Group 1, Form 1, Spec. 17; Group 4, Form 4; and Group 10), and one distally beveled tool (Group 3, Form 2) were collected from the surface of 41 LK 85. This limited array of artifacts suggests undifferentiated Archaic activity on the site. THC analysts listed components representing Archaic (undifferentiated) and Late Prehistoric activities for 41 LK 85 (Lynn, Fox, and O'Malley 1977:44).

Findings made in the subsurface at the western end of 41 LK 85 suggest that that particular area of the site was repeatedly occupied for an unknown, but probably lengthy, period of prehistory. Attention is called to the appearance of sandstone among the materials recovered from the test pits. It is in the Site Group 5 area that sandstone begins to constitute a substantial fraction of prehistoric debris assemblages. Tuff rock becomes correspondingly less common. Recognizable subsistence-related remains were limited to mussel shell, *Rabdotus* shell, and a few bone scraps (no animal species identified). Findings made during the investigation of 41 LK 85 do not significantly contribute to the understanding of prehistoric chronology or subsistence orientation.

41 LK 92

This small, open prehistoric site is located 600 m north of the Frio River and 400 m west of Opossum Hollow (Fig. 1). It is situated on a generally flat floodplain surface. A filled channel scar runs east-west along the north side of the site and creates a boggy area adjacent to the site. As recorded by THC surveyors, 41 LK 92 is oval, measuring 200 m east-west and 150 m north-south. The western half of the site lies in a pasture which is clear except for some retamas growing in the boggy channel. The eastern half of the site is brush covered.

The CAR crew performed an unprovenienced surface collection at 41 LK 92. Because of a heavy cover of grass and/or brush over most of the surface, visibility was poor. Prehistoric debris was seen primarily in the path of a field road running north-south through the site. A light scatter of fire-fractured rock and debitage was noted on the surface. Only one artifact, a thin biface fragment (Group 4, Form 4), was found. The period of prehistoric activity at 41 LK 92 cannot be determined from the available remains.

41 LK 94

Located on the east (left) bank of Opossum Hollow, prehistoric site 41 LK 94 is roughly 400 m northwest of the hollow's confluence with the Frio River (Fig. 1). The site lies on a relatively flat floodplain terrace surface overlooking the channel of the hollow. As recorded by THC surveyors, 41 LK 94 measures 300 m north-south and 100-200 m east-west. They listed the site as containing remains spanning Early Archaic to Late Prehistoric (*ibid.*:44). Most of the site lies in a recently cultivated, open field. A moderately dense cover of grass and weeds was growing in the field at the time of investigation. Along the terrace slope leading to the hollow, there was a thick growth of brush, including mesquite, prickly pear, whitebrush, and spiny hackberry. Cultural debris included fire-fractured rock, sandstone, debitage, mussel shell, and land snail shells. Activities of the CAR crew on this site consisted of an unprovenienced surface collection and excavation of two 1-m^2 test pits.

Both test pits were excavated at the southern end of 41 LK 94. Test Pit 1 was placed in the field approximately 20 m east of the terrace edge leading into the hollow. Ten 10-cm levels of matrix were excavated from the unit. The matrix was a dark gray-brown clay loam, very compact with a strong prismatic structure. Combine level recovery rates for selected classes of material were as follows:

Tuff Rock Weight (grams)	1426
Sandstone Weight (grams)	997
Fire-Fractured Rock Weight (grams)	317
Mussel Shell Umbo Count	89
Mussel Shell Weight (grams)	173
Rabdotus Shell Count	236
Bone Weight (grams)	34.8
Primary Flake Count	0
Secondary Flake Count	11
Tertiary Flake Count	10
Chip Count	21

Mexican pocket gopher, Mexican ground squirrel, jackrabbit, turtle, and white-tailed deer were identified from bones recovered from Test Pit 1. Most of this bone was found in Level 4. Two sherds of aboriginal pottery were recovered from the unit, one each from Levels 1 and 2. Much carbon occurred in the upper four levels of Test Pit 1, but the excavators believed it to be the result of recent clearing and brush burning of the site surface.

Test Pit 2 was located along the western edge of the site just above the terrace. This part of the site was brush covered. The slough channel was 40 m farther west. Six 10-cm levels were excavated in this unit. Matrix was similar to that of Test Pit 1. Rates of recovery for selected classes of material are as follows:

Tuff Rock Weight (grams)	518
Sandstone Rock Weight (grams)	134
Fire-Fractured Rock Weight (grams)	731
Mussel Shell Umbo Count	80
Mussel Shell Weight (grams)	151
Rabdotus Shell Count	299
Bone Weight (grams)	0
Primary Flake Count	0
Secondary Flake Count	25
Tertiary Flake Count	30
Chip Count	54

One thin biface fragment (Group 2, Form 2) was the only other artifact found in the unit. It was recovered from Level 2.

One core (Group 9), one distally beveled tool (Group 4), and two sandstone grinding slab fragments (Modified Sandstone Group 1, Forms 2 and 3) were collected from the surface of 41 LK 94. These materials and the two prehistoric sherds indicate Late Archaic and Late Prehistoric activities at the site. The appearance of the site and the findings made of Test Pit 1 suggest that 41 LK 94 has been subjected to severe disturbance in modern times, probably the result of brush clearing and farming.

41 LK 93

An open prehistoric site, 41 LK 93 is located immediately north of 41 LK 92 on the east (left) bank of Opossum Hollow (Fig. 1). It lies in the same cleared field with 41 LK 92. Dimensions of the site, as recorded by THC surveyors, are 400 m east-west and 150 m north-south. They listed the site as containing Archaic (undifferentiated) and Late Prehistoric remains (Lynn, Fox, and O'Malley 1977:44). A light scatter of fire-fractured rock, debitage, mussel shell, and land snail shell evidence the site.

Activities of the CAR crew at 41 LK 93 included excavation of shovel tests and an unprovenienced collection of surface artifacts. The shovel tests revealed minimal subsurface cultural debris. Based on this information, no test pits were excavated. One core (Group 4), four thick bifaces (three Group 1 and one Group 9), and one distally beveled tool (Group 2, Form 1) were found on the surface.

SITE GROUP 6

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 LK 87 41 LK 88 41 LK 51 41 LK 53	--	41 LK 52 41 LK 86 41 LK 50

The seven sites in Group 6 are located on the floodplain north of the Frio River 5-8 km west of Choke Canyon Dam. All are located along or near a well-developed channel that now carries runoff from large areas of floodplain and uplands to the north and northwest of the sites. Known as Opossum Hollow, this drainage is a relict channel of either the Frio River or Opossum Creek. It runs more-or-less west-east through the site group area. The distance north from the hollow to the valley margin varies from 0.3-1.0 km. Over this area, a number of north-south feeder channels cut down from the valley margin and meet the hollow. Along the hollow, ground relief is not pronounced, being mainly the result of natural levee and terrace development and erosion along the hollow and feeder channels. The surface slopes gently upward from the channel to the adjacent valley margin. Bedrock in the area is the Jackson Group. It is buried beneath a thick mantle of alluvium on the floodplain, but does crop out in some places along the valley margin. The valley margin north of the site group area is characterized by dense gravel pavement. Sandstone, a component of the Jackson Group, also appears on the valley margin slopes. Floral patterns are quite diverse in the area. Riparian species such as elm, oak, and hackberry grow along the channel of Opossum Hollow. On the floodplain terrace surfaces north and south of the hollow, thickets of mesquite, whitebrush, spiny hackberry, and prickly pear form moderate to dense ground cover. Along the valley margin grow dense stands of blackbrush and guajillo (Fig. 30,a).

41 LK 88

Site 41 LK 88 is an open site with an Early Archaic component (*ibid.*). The site parallels the south (right) bank of Opossum Hollow for at least 1.7 km (Fig. 1). It averages 100 m in width. The western end of the site was not confidently established. The site's eastern end is approximately 0.9 km northwest of the confluence of Opossum Hollow and the Frio River. The site surface is covered mostly with short grass. There are scattered mottes of brush across the site. Prehistoric activity was evidenced by a light surface scatter of fire-fractured rock, debitage, and mussel and snail shell. Efforts of the CAR crew on this site included excavation of two 1-m^2 test pits and an unprovenienced collection of surface artifacts.

Test Pit 1 was placed at the far western end of 41 LK 88 roughly 30 m south of the channel of the shallow feeder slough trending northeast to the Opossum Hollow channel. Three 10-cm levels were excavated from the unit. The northern half of the unit was shovelled out from the floor of Level 3 to 60 cm below surface. Matrix was a medium brown silty clay loam.

Test Pit 2 was placed in the central part of 41 LK 88 at the leading edge of the terrace slope leading into Opossum Hollow. Four 10-cm levels of deposit were excavated from this unit. The matrix was dark brown sandy clay loam.

Material recovery was light in both test pits. Rates of recovery for selected classes of material were as follows:

	Test Pit 1	Test Pit 2
Tuff Rock Weight (grams)	86	1
Sandstone Weight (grams)	37	26
Fire-Fractured Rock Weight (grams)	747	20
Mussel Shell Umbo Count	8	14
Mussel Shell Weight (grams)	19	18
Rabdotus Shell Count	19	7
Bone Weight (grams)	0	0
Primary Flake Count	1	0
Secondary Flake Count	10	2
Tertiary Flake Count	9	3
Chip Count	22	5

In both units, cultural debris was concentrated in the upper three levels of deposit (surface to 30 cm). No additional artifacts were found in either unit. A carbon sample from Test Pit 2, collected in Levels 2 and 3, yielded a radiocarbon date of A.D. 940 (TX-3607, MASCA corrected). Wood species identified in this sample were mesquite (*Prosopis glandulosa*), ash (*Fraxinus* sp.), and acacia (*Acacia* sp.). One thick biface (Group 6, Form 2) was collected from the surface of 41 LK 88.

The CAR investigation at 41 LK 88 yielded no recognizable time-diagnostic chipped stone tools. Except for debitage, no artifacts were recovered in the test pits, and there was a paucity of time- and function-diagnostic artifacts on the site surface. The carbon sample collected amidst midden debris in Test Pit 2 produced a corrected date of A.D. 940. The carbon is apparently the result of prehistoric cultural activity at the site and suggests that Late Archaic or early Late Prehistoric people inhabited the site. Perhaps more significant is the fact that mesquite, ash, and acacia were identified as the woods burned to produce the Test Pit 2 carbon sample. This evidence provides valuable insight into patterns and composition of prehistoric vegetation in the vicinity of 41 LK 88.

41 LK 87

This open, prehistoric site is located north of 41 LK 88 on the north (left) bank of Opossum Hollow (Fig. 1). As recorded by the THC survey crew, 41 LK 87 covers an area measuring 700 m northwest-southeast and 400 m north-south. The southern margin runs along the bank of Opossum Hollow. The northwestern margin banks up against the valley margin slope. The northeastern edge of the site is bounded by a runoff channel feeding north-south into the hollow. The surface of 41 LK 87 is marred in many places by severe erosion which has resulted in many gullies. Vegetation includes oak and elm trees along the channel of the hollow; whitebrush, mesquite, spiny hackberry, prickly pear, and grasses on the eroded terrace above the hollow; and blackbrush and guajillo on the valley margin slope. An extensive gravel pavement covers most of the valley margin slope. Cultural debris evidencing the site includes fire-fractured rock, a light scatter of debitage, mussel shell, and land snail shells. Pre-Archaic and Archaic (undifferentiated) components were recognized at 41 LK 87 by THC analysts (Lynn, Fox, and O'Malley 1977:44). Activities of the CAR crew at 41 LK 87 included excavation of two 1-m^2 test pits and an unprovenienced collection of surface artifacts.

Both test pits were located at the site's northwest end where erosion was not as pronounced. The units were situated in the site's midsection away from the hollow. Test Pit 1 was the northernmost of the two units and was located at the foot of the valley margin slope. Ten 10-cm levels were removed from this unit. Four distinct soil zones were recognized down through the deposit. From surface to a depth of 20 cm, the matrix was black silty clay loam. From 30-50 cm below surface, the matrix was gray-brown silty clay loam. At 50 cm, a light, friable gray-brown silty loam was revealed. This matrix graded into a very compact tan sandy loam in the 70-80 cm level. At the bottom of the unit, a significant increase in the number of pea gravels was noted.

Materials recovered from Test Pit 1 at 41 LK 87 were divided into two assemblages. Materials found in Levels 1-5 are combined into an Upper Horizon. The Lower Horizon represents materials recovered from Levels 6-10. Rates of recovery for selected classes of material for these two horizons were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	351	39
Sandstone Weight (grams)	528	106
Fire-Fractured Rock Weight (grams)	4131	444
Mussel Shell Umbo Count	122	5
Mussel Shell Weight (grams)	626	14
Rabdotus Shell Count	335	69
Bone Weight (grams)	0	0
Primary Flake Count	6	1
Secondary Flake Count	43	7
Tertiary Flake Count	42	4
Chip Count	139	13

Two cores (Group 2, Level 5 and Group 5, Level 9), one thin biface fragment (Group 9, Level 6), and one distally beveled tool (Group 8, Form 1, Level 1) were also recovered from Test Pit 1.

Test Pit 2 was placed downslope and approximately 45 m southeast of Test Pit 1. This location was more nearly in the middle of the terrace between the hollow and the foot of the valley margin slope. Seven 10-cm levels were removed from this unit. Materials recovered were divided into two assemblages: an Upper Horizon representing debris from Levels 1-4 and a Lower Horizon representing debris found in Levels 5 and 6. Rates of recovery for selected classes of material in each horizon were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	337	0
Sandstone Weight (grams)	234	137
Fire-Fractured Rock Weight (grams)	4075	118
Mussel Shell Umbo Count	52	2
Mussel Shell Weight (grams)	283	15
Rabdotus Shell Count	501	67
Bone Weight (grams)	0.1	0
Primary Flake Count	2	2
Secondary Flake Count	28	4
Tertiary Flake Count	22	3
Chip Count	61	12

Two cores (Groups 3 and 5, Level 1), one thick biface fragment (Group 6, Form 2, Level 5), and one thin biface (Group 2, Form 1, Spec. 21, Level 5) were also recovered from Test Pit 2. The bone found in the Upper Horizon was not identifiable as to species.

An unprovenienced surface collection at 41 LK 87 yielded three cores, one thick biface fragment, 11 thin bifaces, three distally beveled tools, three pieces of modified sandstone (Group 3, grinding slab fragments), and one otolith from a very large freshwater drum fish. Among the thin bifaces are three stemmed specimens: an *Ensor* dart point (Group 1, Form 3, Spec. 4), an arrow point with deeply serrated blade edges (Group 1, Form 5, Spec. 16), and an arrow point fragment (Group 1, Form 7). Unstemmed triangular and leaf-shaped thin bifaces with straight, concave, and convex bases (Groups 2-5) were also present. One of the distally beveled tools (Group 1, *Clear Fork* tool) is particularly distinctive.

Artifacts from 41 LK 87 indicate activity on the site during much of the Archaic and also during Late Prehistoric times. Evidence for a Pre-Archaic component on the site, as suggested by the THC analysts, was not recognized in data recovered by the CAR crew. Probable food residues found at this site include mussel shell, numerous *Rabdotus* shells (especially in Test Pit 2), and a very small amount of bone (freshwater drum identified). Indirect evidence of plant food processing consists of three small sandstone grinding slab fragments. Prehistoric cultural debris was most prevalent in the upper 50 cm of deposit on the site, but debris was recovered as deep as one meter below surface.

41 LK 51

41 LK 51 is an open prehistoric site which parallels the south (right) bank of Opossum Hollow for an east-west distance of nearly 2.0 km (Fig. 1). As recorded by the THC survey crew, 41 LK 51 is 100-150 m wide (north-south). The site rests on a series of low terraces and natural levees beside the channel of Opossum Hollow. The condition of the site surface varies greatly from largely undisturbed to heavily eroded. Erosion has been more severe over the eastern half of the site. The erosion occurs mainly in a narrow band along the bank of the hollow. Long, shallow gullies and large deflated areas are common in this portion of the site. The eastern end of 41 LK 51 was partially cleared of brush at some time in the recent past. However, whitebrush, prickly pear, and small mesquites have again grown up to form a low, dense brush cover. Native brush grows in dense thickets over the western half of 41 LK 51. Mesquite, whitebrush, spiny hackberry, guayacan, prickly pear, tasajillo, and various grasses are common at this end of the site. In the western central area of the site, there is a natural levee which forms a locally higher bank along the hollow for a distance of at least 200 m east-west. This area was relatively intact except for some minor gullying and deflation at its eastern end. Dense surface concentrations of fire-fractured rock, sandstone, debitage, and mussel shell were observed and shovel tests indicated substantial amounts of cultural debris in the subsurface. During the CAR investigation at 41 LK 51, three 1-m^2 test pits were excavated, and a collection of surface artifacts was made.

Test Pit 1 was placed near the eastern end of the natural levee rise in the west central area of 41 LK 51. Some deflation had occurred along the northern edge of the site immediately beside the hollow. The test pit was located on uneroded ground just above (south of) the deflated zone. Twelve 10-cm thick levels were excavated in Test Pit 1. From surface down into Level 5 (40-50 cm below surface), matrix in the unit was described as dark gray-brown silty clay loam. In Level 5, the matrix color lightened to a tannish brown and sand content was noted to increase. Matrix continued as a tannish brown sandy clay loam down to the bottom of the pit. In Level 9, veins of calcium carbonate began to show in the matrix and was observed down through the remainder of the deposit.

Cultural debris recovered from Test Pit 1 at 41 LK 51 is divided into assemblages representing three horizons. Remains collected in Levels 1-4 are combined into the Upper Horizon. Levels 5-8 combine to form a Middle Horizon, and Levels 9-12 make the Lower Horizon. Rates of recovery for selected classes of material in these horizons were:

	Horizon		
	Upper	Middle	Lower
Tuff Rock Weight (grams)	832	86	138
Sandstone Weight (grams)	437	45	55
Fire-Fractured Rock Weight (grams)	2960	264	344
Mussel Shell Umbo Count	55	6	2
Mussel Shell Weight (grams)	106	5	8
Rabdotus Shell Count	21	9	52
Bone Weight (grams)	31.3	0	0
Primary Flake Count	5	1	0
Secondary Flake Count	49	6	3
Tertiary Flake Count	84	21	13
Chip Count	228	71	24

Other artifacts recovered from Test Pit 1 include two cores (Group 1, Level 2 and Group 6, Level 4), and two thin bifaces. One of the thin bifaces is an *Ensor* dart point (Group 1, Form 3, Spec. 2) found in Level 2. The bones found in this unit (all in the Upper Horizon) were not identifiable as to species.

Test Pit 2 was placed approximately 90 m west of Test Pit 1 in undisturbed ground above a deflated area where considerable amounts of fire-fractured rock, debitage, and mussel shell were exposed. Twelve 10-cm thick levels were excavated. Matrix in the unit was described as a dark grayish brown sandy clay loam from surface to a depth of 90 cm. From 90-120 cm below surface, the matrix changed to a light grayish brown silty clay loam. The debris recovered from Test Pit 2 was divided into three horizon assemblages using the same level combinations as for Test Pit 1 (see above). Rates of recovery for selected classes of material, by horizon, were:

	Horizon		
	Upper	Middle	Lower
Tuff Rock Weight (grams)	503	50	16
Sandstone Weight (grams)	320	30	292
Fire-Fractured Rock Weight (grams)	482	72	192
Mussel Shell Umbo Count	61	2	5
Mussel Shell Weight (grams)	59	6	9
Rabdotus Shell Count	5	6	25
Bone Weight (grams)	0	0.1	0
Primary Flake Count	0	0	0

Secondary Flake Count	16	13	6
Tertiary Flake Count	29	19	11
Chip Count	92	54	13

Also recovered from Test Pit 2 were: one core (Group 6, Level 3), three thick bifaces (Group 2, Level 3 and two specimens of Group 7, Form 1 in Levels 2 and 3), and two thin bifaces (Group 4, Form 4 and Group 9, both in Level 3).

Test Pit 3 was situated 180 m west of Test Pit 2 and just east of the fenceline between the Lark and Chesnutt properties. This area was the least disturbed part of 41 LK 51. Again, twelve 10-cm thick levels of matrix were excavated from the unit. Matrix in this unit was consistently a loose, easily worked sandy loam from surface to bottom. Matrix color changed from dark grayish brown (0-40 cm) to light grayish brown (40-80 cm) to tannish brown (80-120 cm). The debris recovered from Test Pit 3 was divided into three horizon assemblages using the same level combinations as for Test Pits 1 and 2. Rates of recovery for selected classes of material, by horizon, were:

	Horizon		
	Upper	Middle	Lower
Tuff Rock Weight (grams)	620	2921	1806
Sandstone Weight (grams)	715	645	550
Fire-Fractured Rock Weight (grams)	2381	3583	2450
Mussel Shell Umbo Count	174	84	58
Mussel Shell Weight (grams)	648	222	171
Rabdotus Shell Count	214	308	281
Bone Weight (grams)	26.9	0.2	0
Primary Flake Count	6	2	3
Secondary Flake Count	48	37	39
Tertiary Flake Count	73	89	69
Chip Count	127	173	164

Other artifacts found in Test Pit 3 include four cores, three thin bifaces, two pieces of modified sandstone (grinding slab fragments), and four sherds of aboriginal pottery. The thin bifaces include a *Fairland* dart point (Group 1, Form 3, Spec. 11) from Level 5 and two unstemmed, triangular specimens (basal fragments, Group 2, Form 2 and Group 3, Form 3) from Levels 8 and 11. Sandstone grinding slab fragments (Group 1, Forms 2 and 3) were found in Levels 6 and 10. Group 1, Form 2, Spec. 16 is shown in Figure 85. Sherds of aboriginal pottery were found in Levels 2, 3, and 4. A human tooth was recovered from Level 8 (3rd upper left molar--adult). Pieces of red ocher came out of Levels 9 and 11.

A total of 137 artifacts was collected from the surface of 41 LK 51. Included in this total are 22 cores, 19 thick bifaces, 38 thin bifaces, four distally beveled tools, one uniface, one hammerstone (probable), five pieces of modified sandstone (grinding slab fragments), 47 sherds of aboriginal pottery, and the otolith of a very large freshwater drum fish. In the thin biface collection are 10 stemmed specimens including a *Pedernales* dart point (Group 1, Form 1, Spec. 4), a *Pedernales*-like dart point (Group 1, Form 1, Spec. 11), two dart points with weak shoulders and contracting stems (Group 1, Form 2, Specs. 16 and 17), two expanding stem dart points (Group 1, Form 3, Specs. 28 and 29), and three *Perdiz* arrow points (Group 1, Form 4, Specs. 5 to 7). Fifteen of the surface-collected thin bifaces are unstemmed and triangular or leaf shaped in outline with straight, concave, or convex bases (Groups 2-5). Among the distally beveled tools are three of the smaller triangular and subtriangular forms (Group 3, Form 2 and two Group 4 specimens).

THC analysts listed 41 LK 51 as containing Archaic (undifferentiated) and Late Prehistoric components (Lynn, Fox, and O'Malley 1977:44). Findings made by the CAR crew indicate the presence of Middle Archaic, Late Archaic, and Late Prehistoric components. No Early Archaic or Pre-Archaic remains were recognized. The horizons defined on the basis of material densities down through the deposit were quite clear. The Upper Horizon appears to be predominantly a Late Prehistoric manifestation, though there is some evidence to suggest that it also contains Late Archaic debris. The deeper horizons presumably represent Middle or Late Archaic components thought to be present on the site. Diagnostic materials suggesting these horizon affiliations include the aboriginal potsherds and *Ensor* dart point found in Upper Horizon context and the *Fairland* point and triangular thin bifaces (Groups 2 and 3) found in the Middle and Lower Horizons. Direct evidence of subsistence pursuits is again limited to mussel shell, *Rabdotus* shell, a small amount of animal bone, and a few grinding slab fragments. Recovery figures indicate that mussels were more heavily exploited during the later periods of site use (Upper Horizon). Conversely, *Rabdotus* shells occur in greater numbers in the Middle and Lower Horizons. The two grinding slab fragments found in the subsurface came from the Middle and Lower Horizons. Unfortunately, none of the animal bones found in the test pits could be identified as to species. Most of the bone was found in the Upper Horizon. The human tooth found in the Middle Horizon of Test Pit 3 may indicate the presence of a burial in the vicinity or may simply be a tooth lost by one of the site's prehistoric inhabitants. Fire-fractured rock was the most abundant material recovered from the test pits. Valley margin slopes located 0.8 km north of 41 LK 51 are presently the closest exposed source of rock and may be the origin of much of the lithic debris found at 41 LK 51. It is also possible that, in earlier stages of its development, the channel of Opossum Hollow contained exposed gravel bars offering a more convenient source of cobbles than the relatively distant valley margin. The three test pits combined contained nearly 13 kg of fire-fractured rock. Projecting this total for 3 m^2 outward over the total area of 41 LK 51, it is realized what a tremendous amount of effort, albeit cumulative, was expended by prehistoric people in transporting rock for use on the site.

41 LK 53

On the north (left) bank of Opossum Hollow opposite the west end of 41 LK 51 is site 41 LK 53 (Fig. 1). It contains both prehistoric and historic components. The site rests on a natural levee paralleling the hollow for an east-west distance of about 500 m. The site is about 200 m wide (north-south) as recorded by THC surveyors. The site surface is in fairly good condition, being only moderately deflated along a narrow strip beside the hollow. Brush cover on the site varies from patchy to dense. Whitebrush is very common as are mesquites, prickly pear, acacia, guayacan, and Mexican persimmon. In surface inspection of the site by the CAR crew, prehistoric debris was found to be most prevalent in an area measuring 50 m north-south and 300 m east-west beside the hollow in the central area of the site (Fig. 26). It was in this area that three 1-m^2 test pits were excavated and a surface collection was made.

The test pits excavated at 41 LK 53 ranged in depth from 70 cm-1.1 m. The material collections from these units were divided into Upper and Lower Horizon assemblages. The following excavation level combinations represent each horizon:

Test Pit No.	Upper Horizon Levels	Lower Horizon Levels
1	1-4	5-8
2	1-5	6-11
3	1-4	5-7

In Test Pit 1 (Fig. 26), eight 10-cm thick levels were excavated. Matrix in the unit was described as a very compact grayish brown clayey loam. Rates of recovery for selected classes of material from the two horizons defined in this unit were:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	24	14
Sandstone Weight (grams)	0	3
Fire-Fractured Rock Weight (grams)	846	420
Mussel Shell Umbo Count	10	38
Mussel Shell Weight (grams)	24	21
Rabdotus Shell Count	6	14
Bone Weight (grams)	0	0
Primary Flake Count	3	3
Secondary Flake Count	17	19
Tertiary Flake Count	22	53
Chip Count	136	208

One core (Group 1) was found in Level 4.

Eleven 10-cm thick levels were excavated from Test Pit 2. Matrix was described as a gray-brown clayey loam down through Level 7. In Level 8, the matrix lightened in color to a tannish brown, but continued as a very compact clayey silt. The matrix remained a tannish brown clayey loam down to the bottom of the unit. Rates of recovery for selected classes of material in the two horizons defined for Test Pit 2 were:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	769	679
Sandstone Weight (grams)	0	402

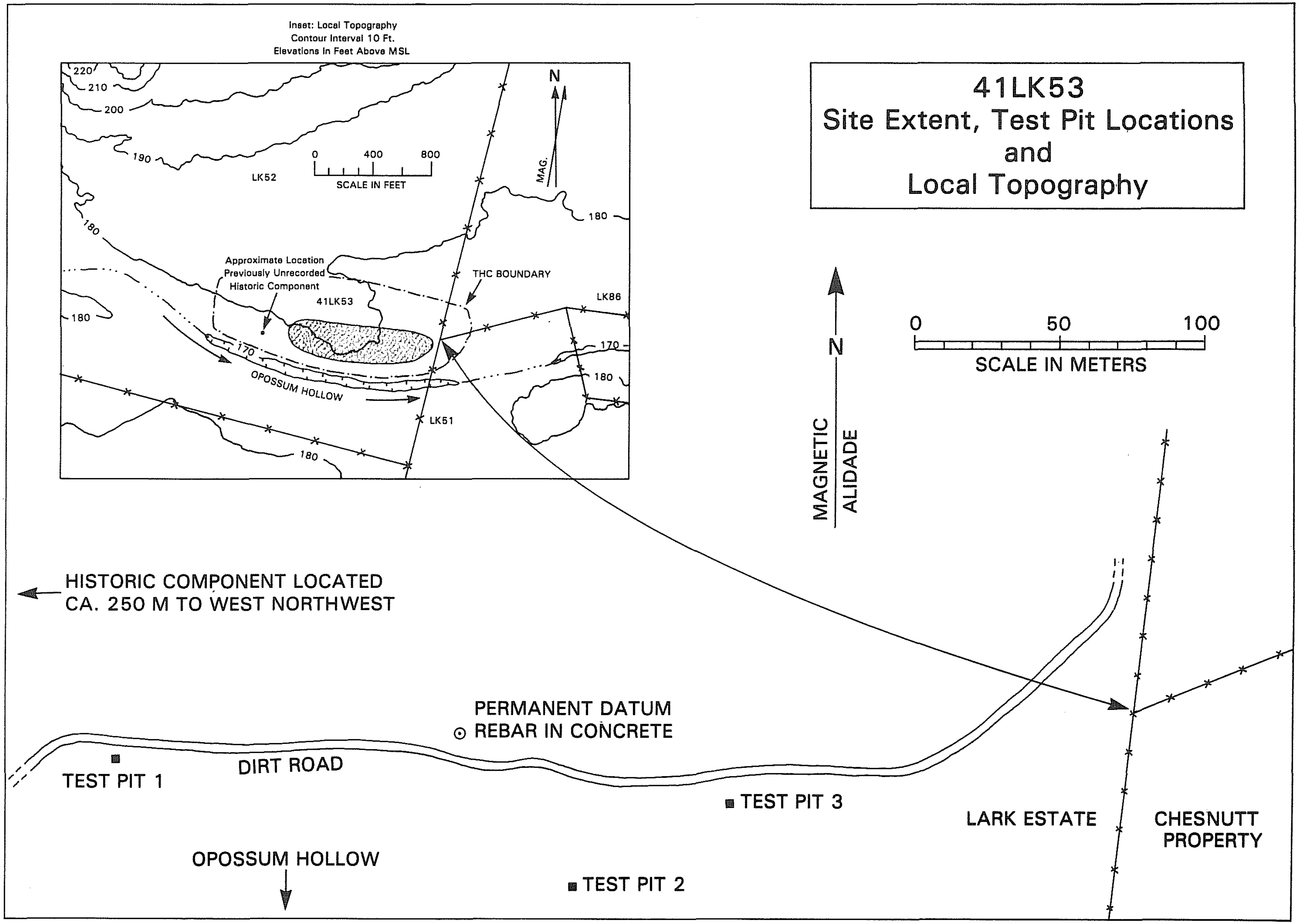

Inset: Local Topography
Contour Interval 10 Ft.
Elevations In Feet Above MSL
220
210
200
190
180
170
0
400
800
SCALE IN FEET
LK52
N
MAG.
Approximate Location
Previously Unrecorded
Historic Component
41LK53
THC BOUNDARY
LK86
OPOSSUM HOLLOW
LK51
41LK53
Site Extent, Test Pit Locations
and
Local Topography
N
MAGNETIC
ALIDADE
0
50
100
SCALE IN METERS
HISTORIC COMPONENT LOCATED
CA. 250 M TO WEST NORTHWEST
PERMANENT DATUM
REBAR IN CONCRETE
DIRT ROAD
TEST PIT 1
TEST PIT 2
TEST PIT 3
OPOSSUM HOLLOW
LARK ESTATE
CHESNUTT
PROPERTY

FIGURE 26

Fire-Fractured Rock Weight (grams)	2195	2584
Mussel Shell Umbo Count	16	25
Mussel Shell Weight (grams)	35	56
Rabdotus Shell Count	84	286
Bone Weight (grams)	4.4	0.2
Primary Flake Count	0	2
Secondary Flake Count	17	38
Tertiary Flake Count	26	94
Chip Count	59	149

Other artifacts recovered from Test Pit 2 include a core (Group 6) from Level 5 and a thick biface (Group 7, Form 4) from Level 11. Species identified from bones found in this unit include rabbit (Level 4) and fish (otolith, Level 7).

Test Pit 3 was excavated to a depth of 70 cm. The matrix in the unit was characterized as a very compact gray-brown clayey loam. The test pit yielded debris in the following amounts:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	47	4
Sandstone Weight (grams)	72	0
Fire-Fractured Rock Weight (grams)	719	63
Mussel Shell Umbo Count	7	4
Mussel Shell Weight (grams)	13	1
Rabdotus Shell Count	20	0
Bone Weight (grams)	0	5
Primary Flake Count	2	0
Secondary Flake Count	15	3
Tertiary Flake Count	8	9
Chip Count	84	51

One core (Group 6) was recovered from Level 4 of Test Pit 3. A species identification could not be made on bone found in the Lower Horizon.

The CAR crew collected the following artifacts from the surface of 41 LK 53: seven cores, four thick bifaces, 22 thin bifaces, four distally beveled tools, one trimmed flake, three pieces of modified sandstone (one grinding slab fragment and two manos), and 21 historic artifacts (ceramics, glass, and metal). The stemmed thin biface (Group 1, Form 6) is an unclassifiable dart point fragment. Thirteen of the thin bifaces are unstemmed, triangular, or leaf shaped in outline, and have straight, concave, or convex bases. Three of the distally beveled tools are relatively small and triangular in outline (Group 3, Form 1, and two Group 4 specimens). These materials indicate that Middle and/or Late Archaic activities took place on the site. Undifferentiated Archaic remains were recognized at 41 LK 53 by the THC analysts (Lynn, Fox, and O'Malley 1977: 44).

The historic artifacts found at 41 LK 53 by the CAR crew came from a previously unknown ruin at the far west end of the site (Fig. 26, inset). Two low, subcircular piles of sandstone building rocks are the major features evidencing this historic component. The limited array of artifacts found around these ruins indicate late 19th- and early 20th-century activity. Investigation of this component was limited to mapping of surface features and collection of a sample of the surface artifacts.

Located within 500 m of extensive gravel deposits on valley margin slopes to the north, 41 LK 53 contains much more fire-fractured rock than it does tuff or sandstone. Apparent subsistence-related remains found on the site include mussel shell, *Rabdotus* shell, the bones of rabbit and fish, and sandstone grinding implements suggesting plant food processing. No habitational features were recognized in the test units.

41 LK 52

The area intervening between 41 LK 53 and the lower reaches of the valley margin slope encompasses the open prehistoric site designated 41 LK 52 (Fig. 1). As recorded by THC surveyors, 41 LK 52 measures about 700 m east-west and 300 m north-south sites. 41 LK 52 and 41 LK 53 are separated by an upland drainage channel which cuts down north to south from the valley margin across the west end of 41 LK 53 and then swings east to run between the two sites before meeting Opossum Hollow. Another north-south drainage channel runs along the east side of 41 LK 52. The site rests on an older floodplain terrace surface which slopes gently from north to south. The northern edge of 41 LK 52 parallels the foot of the valley margin slope and is very gravelly. At higher elevations on the site, there are dense thickets of upland vegetation including blackbrush, guajillo, guayacan, prickly pear, agarita, yucca, and tasajillo (Fig. 30,a). On the terrace flats in the central and southern portions of the site, where there is more alluvium and less gravel, grow thick stands of mesquite, whitebrush, grasses, and prickly pear. Near the drainage channel along the site's southern margin, very large mesquite and spiny hackberry are common. The brush cover was so thick as to be a severe hindrance to investigations on the site.

In reconnaissance of 41 LK 52 by the CAR crew, results of prehistoric quarry activity were evident over much of the gravel-covered ground along the site's north side. Scattered through the gravel pavement in this area were many cores, large primary and secondary flakes, and thick bifaces. Downslope in the flatter areas of the site, inspection of mildly deflated areas revealed a litter of thinning flakes, cores, fire-fractured rock, and fragmentary chipped stone tools. Perhaps the densest surface accumulations of prehistoric cultural debris were found at the west end of 41 LK 52 where a deep gully running east-west at the foot of the valley margin slope had exposed, over an area of approximately 500 m^2, a substantial deposit of fire-fractured rock, many *Rabdotus* land snail shell, debitage, and chipped stone tools in various stages of manufacture. This debris seemed to be eroding out of the gully walls at a depth of 50-60 cm below ground surface. Quite remarkable was the absence of mussel shell in this area. Over the remainder of 41 LK 52, cultural debris was much more widely scattered over the surface.

The CAR crew conducted an unprovenienced surface collection at 41 LK 52. Recovered from the site were 12 cores, 32 thick bifaces, 48 thin bifaces, nine distally beveled tools, three unifaces, and two hammerstones (one probable, one possible). Of the 80 thick and thin biface specimens, 52 were fragmentary (13 thick bifaces, 39 thin bifaces). The three stemmed thin bifaces found on the site include a *Bell* dart point fragment (Group 1, Form 1, Spec. 7), an unclassified dart point (Group 1, Form 1, Spec. 12), and a dart point with stem missing (Group 1, Form 6). The vast majority of thin bifaces found on the site are unstemmed; triangular or leaf shaped in outline; with straight, concave, or convex bases (Groups 2-5). Particularly distinctive distally beveled tools found on the site include two *Clear Fork* specimens (Group 1); three small, triangular specimens (Group 3, Form 1); and one very unusual small, narrow tool (Group 5).

The artifacts collected at 41 LK 52 by the CAR crew suggest that remains found on the site are the result of activities during most or all of the Archaic. The *Bell* dart point and *Clear Fork* tools are indicative of site occupation by Early Archaic or perhaps even Pre-Archaic peoples. The variety of unstemmed thin bifaces and smaller distally beveled tools (Group 3, Form 1) are suggestive of Middle and/or Late Archaic activities. THC analysts listed the site as containing Pre-Archaic and Early Archaic components (*ibid.*). The CAR findings support the presence of these components, but there is the added recognition of later remains also.

The obvious signs of quarry activity in gravel-paved areas on the northern edge of 41 LK 52 and the large numbers of cores, thick bifaces, and thin bifaces found on its surface point to the extensive cobble deposits as one of the site's major attractions to prehistoric people. Signs of habitational activity on the flats below the gravelled slopes of the valley margin indicate that procurement of raw materials for chipped stone tool manufacture was not the sole purpose of visits to the site by prehistoric people. Cultural debris observed eroding from the walls of the gully at the west end of the site and in deflated areas on the flats evidence the presence of subsurface deposits in the site. Many land snail shells were seen on the site in conjunction with concentrations of fire-fractured rock. Notably absent were mussel shells and grinding implements. In considering the habitational activities which may have occurred in the area, attention should be called to the proximity of 41 LK 52 and 41 LK 53 to one another. Though two distinct sites are defined, it is really only a minor landform feature (the east-west upland drainage channel) which separates the two. People occupying camps beside Opossum Hollow at 41 LK 53 would have only a short distance to walk in reaching the gravel deposits on the north side of 41 LK 52. The entire area encompassing 41 LK 52 and 41 LK 53 would probably best be considered as one large, interrelated activity area.

41 LK 86

East of 41 LK 53 along the north (left) bank of Opossum Hollow is another long, narrow prehistoric site designated 41 LK 86 (Fig. 1). These two sites are separated only by an upland drainage which feeds down from the north into Opossum Hollow. Site 41 LK 86 is opposite the central portion of 41 LK 51 south across the hollow. As recorded by THC surveyors, 41 LK 86 measures 700 m east-west and is about 100 m wide (north-south). The site surface is badly eroded, shallow gullies and deflated areas being common over much of the area. Brush cover is moderate to dense with mesquite, prickly pear, whitebrush, and tasajillo being the major elements.

The CAR crew conducted an unprovenienced surface collection at 41 LK 86. Materials collected included one core, seven thick bifaces, and five thin bifaces. One of the thin bifaces is an *Edwards* arrow point (Group 1, Form 5, Spec 6). A Late Prehistoric component is recognized on the site based upon this single specimen.

41 LK 50

This small, open prehistoric site is located in a floodplain pasture roughly 300 m south of the west end of 41 LK 51 (Fig. 1). As recorded by THC surveyors, 41 LK 50 is oval in outline with a north-south dimension of 150 m. It is situated beside a very shallow boggy drainage channel running east-west across the floodplain. The site area is essentially flat, there being hardly any relief to the channel bank. There was a very thin scatter of prehistoric cultural debris in the site area. Small amounts of debitage were observed where cattle had churned wet ground in the bog. An unprovenienced surface collection conducted by CAR crew members at 41 LK 50 yielded very few artifacts. Three cores, one thick biface, and two thin biface fragments were found. A period of prehistoric activity on the site could not be estimated from this limited collection.

SITE GROUP 7

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 LK 74 41 LK 73 41 LK 48 (41 MC 30) 41 LK 49	--	41 MC 48 41 MC 50

In Site Group 7 are six sites located in the floodplain on either side of the Frio River between 8.0-10.0 km west of Choke Canyon Dam. The sites located on the south side of the river rest on Pleistocene (and older) terrace remnants. Sites on the north side of the river are situated both on Holocene terrace levees and on Pleistocene terrace remnants. The geologic deposits underlying this are units of the Jackson Group. These units are deeply buried in alluvium and do not crop out on any of the investigated sites. Light scatters of gravel are exposed on the slopes of the Pleistocene terraces, especially on the south side of the Frio where these older terraces are immediately above the modern channel. On the north side of the river, one of the Group 7 sites is located beside an abandoned channel scar which contains water on an intermittent basis. Cropland, pastures, and brush are all present in the site group area. A typical riparian gallery forest grows along the Frio River channel as it passes through the group. The boundary between Live Oak and McMullen Counties passes north-south through the vicinity of Site Group 7. One site is bisected by the county line and has been assigned two separate permanent designations--41 LK 48 and 41 MC 30.

41 LK 73

Historic site 41 LK 73 is located on a Pleistocene terrace hilltop overlooking the southern side of the river (Fig. 1). The historic site is within the limits of prehistoric site 41 LK 24. CAR investigations were limited to the historic site, but materials resulting from prehistoric activities in the area were recovered incidental to exploratory excavations and surface collecting on the historic component. The site is entirely within a pasture planted in grass. The area was cleared of brush in the recent past, an action that apparently had a severe impact on portions of the historic remains evidencing 41 LK 73.

Site 41 LK 73 is most obviously represented by a sandstone slab burial crypt surrounded by a low wall of sandstone building rock (Figs. 21,c-e; 27). The sandstone used in this structure is a very hard, well-cemented, medium-grained gray rock of the type common at most of the early historic sites in the area. The wall around the crypt is rectangular, measuring five meters north-south and 6.5 m east-west. The enclosure is entered through a 1-m wide opening at the center of the southern wall. The walls stand to their original finished height of 1.2 m in discontinuous segments along the south and east walls (Fig. 27). The crypt was originally constructed of five large, solid slabs of sandstone. It is oriented with its long axis east-west in the northwest corner of the enclosure. The two long slabs forming the north and south sides of the crypt measure approximately 1.8 m in length and are between 15-20 cm thick. An exploratory unit excavated on the outer side of the southern slab revealed a vertical dimension of about 90 cm to the slab, about 35 cm above ground, and 55 cm below ground. The slabs at the east and west ends measure 75 cm wide, 10-15 cm thick, and are assumed to extend about the same depth below ground as does the southern slab. The capstone or lid to the crypt is now in four pieces, only one of which remains on top of the crypt (Fig. 27). Local tradition indicates that this grave and a number of others at Choke Canyon were violated by treasure hunters who believed that gold had been secreted in the burial pits. The lid pieces were covered with modern graffiti. The interior of the sandstone crypt was not disturbed during investigation by the CAR crew.

At a distance of approximately 95 m east-southeast of the crypt and its enclosure are vestiges of what is assumed to have been the residence structure at 41 LK 73. This area was marked by a scatter of historic artifacts on the surface, several low piles of sandstone building rock, and a very large block of cement on the surface beneath a mesquite tree. The piles of sandstone had the appearance of being artificially--and recently--stacked. Nevertheless, they were assumed to be *in situ* structural ruins. Narrow trenches were excavated through the area between two of the rock piles in an attempt to find intact subsurface structural features. No such features were recognized in the trenches. Based on these subsurface findings, it was concluded that remnants of the residence structure were completely disrupted as brush was cleared from the pasture containing the site. The workers clearing the brush apparently made an effort to pile up the rocks which once formed the structure. However, the piles of rock in no way reflect the configuration of the original structure.

Historic artifacts recovered during the investigation at 41 LK 73 indicate that the site was occupied between 1880-1900, no later. Prehistoric cultural debris recovered incidental to investigation of the historic component includes

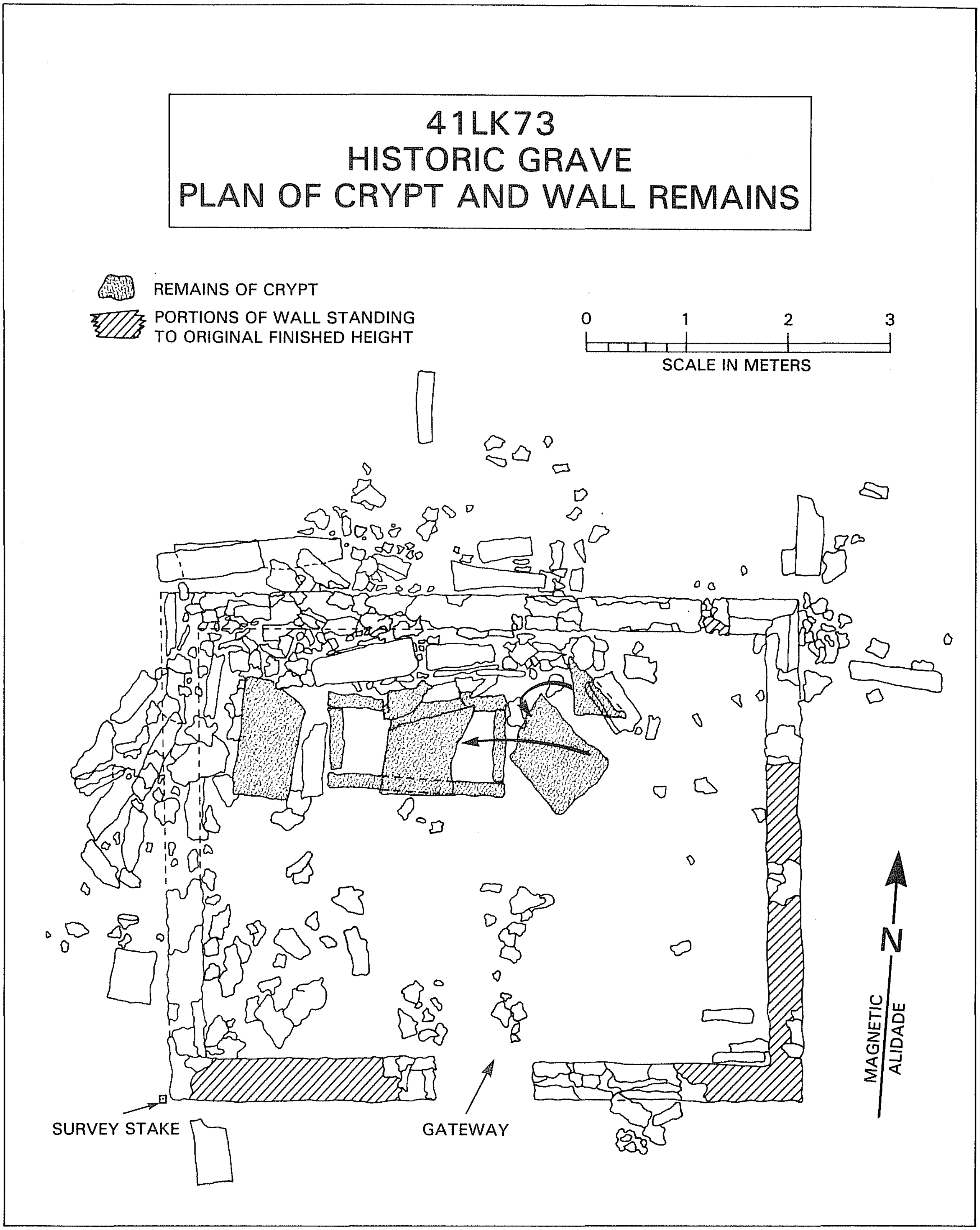

41LK73
HISTORIC GRAVE
PLAN OF CRYPT AND WALL REMAINS
REMAINS OF CRYPT
PORTIONS OF WALL STANDING
TO ORIGINAL FINISHED HEIGHT
0
1
2
3
SCALE IN METERS
SURVEY STAKE
GATEWAY
N
MAGNETIC
ALIDADE

FIGURE 27

fire-fractured rock, debitage mussel shell, and land snail shells. Among prehistoric artifacts found on the site are four cores and a *Pedernales* dart point (Thin Biface Group 1, Form 1, Spec. 5) found about 30 cm below ground surface in one of the exploratory trenches. Everett (1981:36) suggests that the remains at 41 LK 53 may represent the headquarters of the William Cavitt Ranch.

41 LK 74

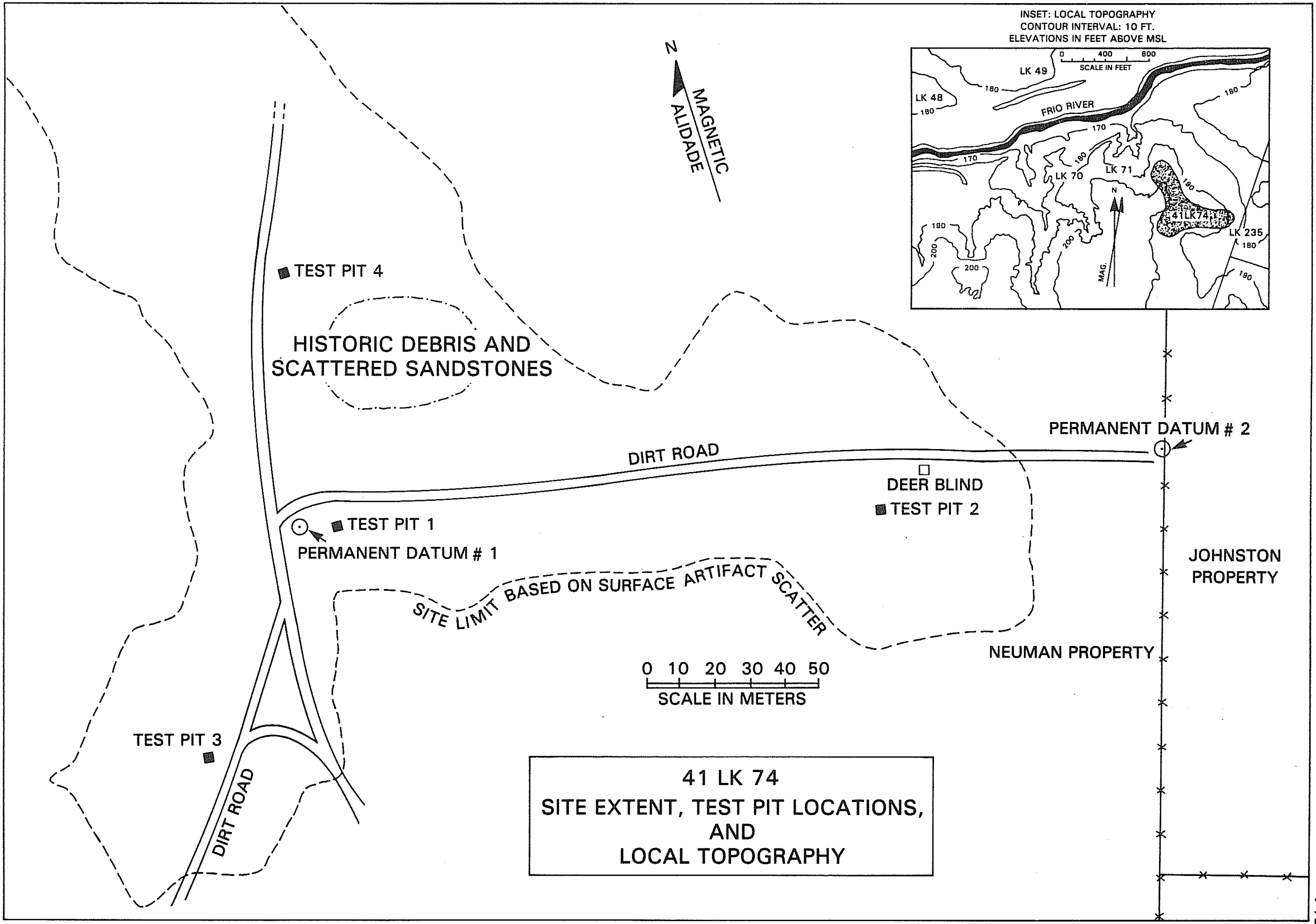
Site 41 LK 74 is located on the edge of a Pleistocene terrace remnant constituting a third terrace above the modern Frio River channel (Fig. 1). The site is on the south side of the river. Its northwest end is within 150 m of the river. As recorded by the THC surveyors, the site measures 350 m northwest-southeast and from 150-250 m east-west. As a result of CAR investigations on the site, the limits were adjusted to cover a smaller area (Fig. 28). Erosion along the slope of the terrace upon which 41 LK 74 rests has formed two lobes which project a short distance out from the general line of the terrace system. Prehistoric debris--primarily fire-fractured rock, debitage, and mussel shell--is concentrated on the crests of these terrace lobes. The site surface supports a moderate to heavy stand of brush. Mesquite, narrow-leafed yucca, Spanish dagger, persimmon, spiny hackberry, whitebrush, and guayacan are all present. THC analysts listed 41 LK 74 as containing Pre-Archaic to Terminal Archaic components (Lynn, Fox, and O'Malley 1977:44). Activities of the CAR crew included excavation of four 1-m^2 test pits and collection of surface artifacts.

Materials recovered from the four test pits at 41 LK 74 are divided into assemblages representing Upper and Lower Horizons. Debris collections were combined into horizon assemblages based on the following excavation level groupings for each test pit:

Test Pit No.	Upper Horizon Levels	Lower Horizon Levels
1	1-2	3-5
2	1-2	3-4
3	1-2	3-4
4	1-4	5-6

Test Pit 1 was placed in the west central portion of 41 LK 74 (Fig. 28). Five 10-cm thick levels were excavated down into a matrix described as a light grayish brown sandy loam. Rates of recovery for selected classes of material from the two horizons defined for Test Pit 1 were:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	8	18
Sandstone Weight (grams)	230	0
Fire-Fractured Rock Weight (grams)	1795	138
Mussel Shell Umbo Count	19	4
Mussel Shell Weight (grams)	28	4



41 LK 74
SITE EXTENT, TEST PIT LOCATIONS, AND LOCAL TOPOGRAPHY

Rabdotus Shell Count	0	0
Bone Weight (grams)	0	0
Primary Flake Count	4	0
Secondary Flake Count	49	4
Tertiary Flake Count	48	4
Chip Count	54	5

Other artifacts found in Test Pit 1 include three cores (two specimens of Group 5, Level 2 and Group 7, Level 1) and, from Level 5, a distally beveled tool (Group 7, Form 2, Spec. 7).

Test Pit 2 was located at the far east end of 41 LK 74 (Fig. 28). Four 10-cm thick levels were excavated into a matrix described as compact, light brown sandy loam. Rates of recovery for selected classes of material from the two horizons defined for this unit were:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	172	18
Sandstone Weight (grams)	116	18
Fire-Fractured Rock Weight (grams)	1279	212
Mussel Shell Umbo Count	47	13
Mussel Shell Weight (grams)	14	20
Rabdotus Shell Count	7	5
Bone Weight (grams)	0	0
Primary Flake Count	3	2
Secondary Flake Count	65	15
Tertiary Flake Count	60	26
Chip Count	137	21

Additional artifacts found in Test Pit 2 are two cores (both Group 1, Level 2).

Test Pit 3 was placed in the southwestern area of the site (Fig. 28). Four 10-cm thick levels were excavated into a matrix characterized as a reddish brown sandy clay loam. Selected classes of material were recovered in the following amounts from the two horizons defined for the unit:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	0	0
Sandstone Weight (grams)	86	113
Fire-Fractured Rock Weight (grams)	605	226
Mussel Shell Umbo Count	0	0
Mussel Shell Weight (grams)	0.5	0
Rabdotus Shell Count	0	0
Bone Weight (grams)	0	0
Primary Flake Count	1	1
Secondary Flake Count	27	12
Tertiary Flake Count	33	24
Chip Count	104	41

No other artifacts were recovered from Test Pit 3.

Test Pit 4 was staked out in the north central area of 41 LK 74 (Fig. 28). A substantial amount of prehistoric debris in the form of fire-fractured rock and debitage was observed eroding out of the ground in the road bed just west of the test pit. Also noted in the road were numerous square nails, metal fragments, and some sherds of historic ceramics. Six 10-cm thick levels of matrix were excavated from Test Pit 4. Matrix in this unit was described as a light brown sandy loam. Recovery rates for selected classes of material were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	275	22
Sandstone Weight (grams)	244	172
Fire-Fractured Rock Weight (grams)	2812	1080
Mussel Shell Umbo Count	44	10
Mussel Shell Weight (grams)	119	57
Rabdotus Shell Count	42	26
Bone Weight (grams)	97	5.5
Primary Flake Count	1	0
Secondary Flake Count	16	3
Tertiary Flake Count	30	5
Chip Count	47	2

Other artifacts found in Test Pit 4 include two thick bifaces (Group 3, Level 4 and Group 7, Form 3, Level 2), one thin biface (Group 4, Form 4, Level 4), and one distally beveled *Guadalupe* tool (Group 6, Spec. 5, Level 4). In Level 1, an expended center fire cartridge (.44 caliber pistol), 13 square nails, and a small metal strap fragment were found. Eleven more nails were recovered from Levels 2 and 3. Bone found in Test Pit 4, most of it coming out of the Upper Horizon, was identified as cow or bison.

Surface collection activities at 41 LK 74 yielded three cores, three thick bifaces, four thin bifaces, four distally beveled tools, a uniface, and a sandstone mano (Group 2, Form 1). Among the thin bifaces were two typeable stemmed dart points (Group 1, Form 1, Spec. 15 and Group 1, Form 2, Spec. 20); an unstemmed triangular specimen with a concave base (Group 3, Form 1); and an unstemmed triangular specimen with a convex base (Group 4, Form 1). Two of the more distinctive distally beveled tools found on the site are of the small, triangular variety (Group 3, Form 1 and Group 4).

In the process of inspecting the surface of 41 LK 74, an area containing historic debris and scattered sandstone building rocks was defined in the north central portion of the site (Fig. 28). This historic component is apparently the source of historic artifacts which showed up on Test Pit 4 and in the bed of the dirt road to the west. Pieces of corrugated iron and tin cans observed in the area of the sandstone rock scatter suggest that historic activity on the site took place after 1900.

Findings made by the CAR crew at 41 LK 74 generally support the chronological assessment advanced by THC analysts for the site. The *Guadalupe* tool found in

Test Pit 4 indicates activity on the site during either late Paleo-Indian or Early Archaic times. The thin bifaces, although not well-established time diagnostics, suggest the presence of Early and/or Middle Archaic components. The small, triangular distally beveled tools could be either Middle or Late Archaic diagnostics.

The deposit containing the prehistoric remains at 41 LK 74 is very shallow, averaging only about 40-50 cm in depth. This is especially significant considering the great span of prehistory during which the site was apparently inhabited. Very little in the way of assumed subsistence remains was recovered from the site. Buth mussel shell and *Rabdotus* shell were recovered in remarkably small amounts in comparison to many of the other tested sites. Bone was found only in Test Pit 4. It is identified as cow or bison and likely dates to the period of historic activity evidenced in that particular area of the site. One sandstone mano was found, but no grinding slabs or slab fragments were recognized. Fire-fractured rock was the most common type of debris recovered from the site. This rock, as well as the raw material represented by cores, debitage, and chipped stone tools recovered from the site, was likely obtained from gravel exposures on the terrace slopes northwest of the site area.

41 MC 50

Quite remote from the other sites in Group 7, 41 MC 50 is an open prehistoric site located on a very ancient terrace remnant 2.1 km south of the modern Frio River channel (Fig. 1). The terrace remnant forms a large, distinct ridge out in the river valley. The ridge measures about 1.2 km along its east-west axis and from 150-300 m north-south. The limits of 41 MC 50, as defined by the THC surveyors, correspond to the above dimensions of the terrace ridge. This ridge, separated from the valley margin by 0.6-2.0 km, is manifested as an obvious rise out on an otherwise flat land surface. The site is entirely within cultivated fields. A maize crop was growing on the site surface at the time of the CAR investigation.

Reconnaissance of 41 MC 50 by the CAR crew resulted in definition of a much smaller area for the site. Most of the prehistoric cultural debris observed on the site surface occurred at the extreme east end where the ridge reached its greatest heights. Debris was most prevalent on the crest and northern slope of the ridge over an area measuring approximately 100 m north-south and 300 m east-west.

An unprovenienced surface collection was conducted at 41 MC 50 by the CAR crew. Very little was recovered. The collection from the site consists of two thin biface fragments (Group 2, Form 2 and Group 10) and a distally beveled tool (Group 4). Fire-fractured rock, debitage, mussel shell, and *Rabdotus* shells were observed in small amounts over the collection area.

THC analysts listed the period of prehistoric activity at 41 MC 50 as "unknown" (*ibid.*). Undifferentiated Archaic activity is indicated for the site based on the limited CAR findings. The site is perhaps most significant in that it contains evidence of prehistoric habitation at a location quite remote from present sources of water.

41 LK 48 - 41 MC 30

This open prehistoric site occurs on a second terrace above the north (left) bank of the modern Frio River channel (Fig. 1). The site is bisected by the boundary between Live Oak and McMullen Counties and was therefore given two different designations by the THC surveyors. As originally defined, the site measures approximately 800 m west-southwest to east-northeast and is about 150 m wide (north-south). The southwest end of the site is within 150 m of the Frio River. The northeast end is about 300 m from the river. The eastern half of the site parallels an apparent relict channel of the Frio River which is now manifested as a low, boggy area (Fig. 29). The western end of the site is brush covered and quite severely eroded in localized areas. The eastern end trends out into a cleared pasture covered with grass. THC analysts listed 41 LK 48-41 MC 30 as containing undifferentiated Archaic remains (Lynn, Fox, and O'Malley 1977:44). CAR activities on the site included excavation of two 1-m^2 test pits and collection of surface artifacts. Both of the test units were located at the site's western end (41 MC 30) where prehistoric cultural debris seemed to be more heavily concentrated.

Test Pit 1 was placed in the central part of the site (Fig. 29). In shallow gullies and deflated areas near the unit location, substantial amounts of fire-fractured rock, debitage, and mussel shell were observed eroding from the ground. However, the test pit was staked out on an apparently undisturbed surface. Six 10-cm thick levels of matrix were removed from Test Pit 1. The matrix was described as a light brown sandy clay loam. It was very compact, making it difficult to excavate and screen. Cultural debris recovered from this unit was divided into assemblages designated as Upper and Lower Horizons. The Upper Horizon contains debris recovered from Levels 1 and 2. The Lower Horizon contains material from Levels 3-6. Rates of recovery for selected classes of debris from these two horizons were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	393	613
Fire-Fractured Rock Weight (grams)	1019	222
Mussel Shell Umbo Count	287	173
Mussel Shell Weight (grams)	690	568
Rabdotus Shell Count	16	69
Bone Weight (grams)	0	0
Primary Flake Count	2	0
Secondary Flake Count	27	13
Tertiary Flake Count	29	15
Chip Count	45	14

Two thin bifaces were found in Test Pit 1. Both occurred in Level 3. One specimen is a small, stemmed dart point (Group 1, Form 3, Spec. 35). The second specimen is a distal tip (Group 9). A sample of carbon recovered from Level 3 has been identified as mesquite (*Prosopis glandulosa* Torr.), but no corresponding radiocarbon assay was possible due to small sample size.

Test Pit 2 was placed at the far west end of 41 LK 48-41 MC 30 (Fig. 29). The unit was set along the western edge of a deep arroyo running through the site down to the river. Observed in the wall of the arroyo was a lense of mussel shell buried about 50 cm below surface. It was estimated that this lense, prior to erosion in the area, had been buried at least one meter below surface. Levels of matrix removed in 10 cm increments down to the mussel shell concentration yielded no debris other than the shell. *In situ* paired valves and the general absence of other debris suggest that this lense was some type of natural accumulation on the site.

An unprovenienced collection carried out on the surface of 41 LK 48-41 MC 30 produced two cores, two thick bifaces (Groups 1 and 2), a thin biface (Group 4, Form 4), a distally beveled tool (Group 8, Form 1), and two sandstone manos (Modified Sandstone Group 2, Forms 1 and 2).

The limited array of artifacts recovered during the CAR investigation at 41 LK 48-41 MC 30 tentatively indicate a Late Archaic component. This assessment is based primarily on the small, stemmed dart point found in Test Pit 1. The remaining specimens are not recognized time diagnostics. Remains of food items likely consumed by the site's prehistoric inhabitants are limited to mussel shell and *Rabdotus* snail shells. Two sandstone manos, both surface finds, suggest that plant foods may have been processed and consumed at this location. Discovery of carbon derived from mesquite wood suggests the presence of the species concurrent with prehistoric activity, but, unfortunately, a radiocarbon date was not obtained on the sample.

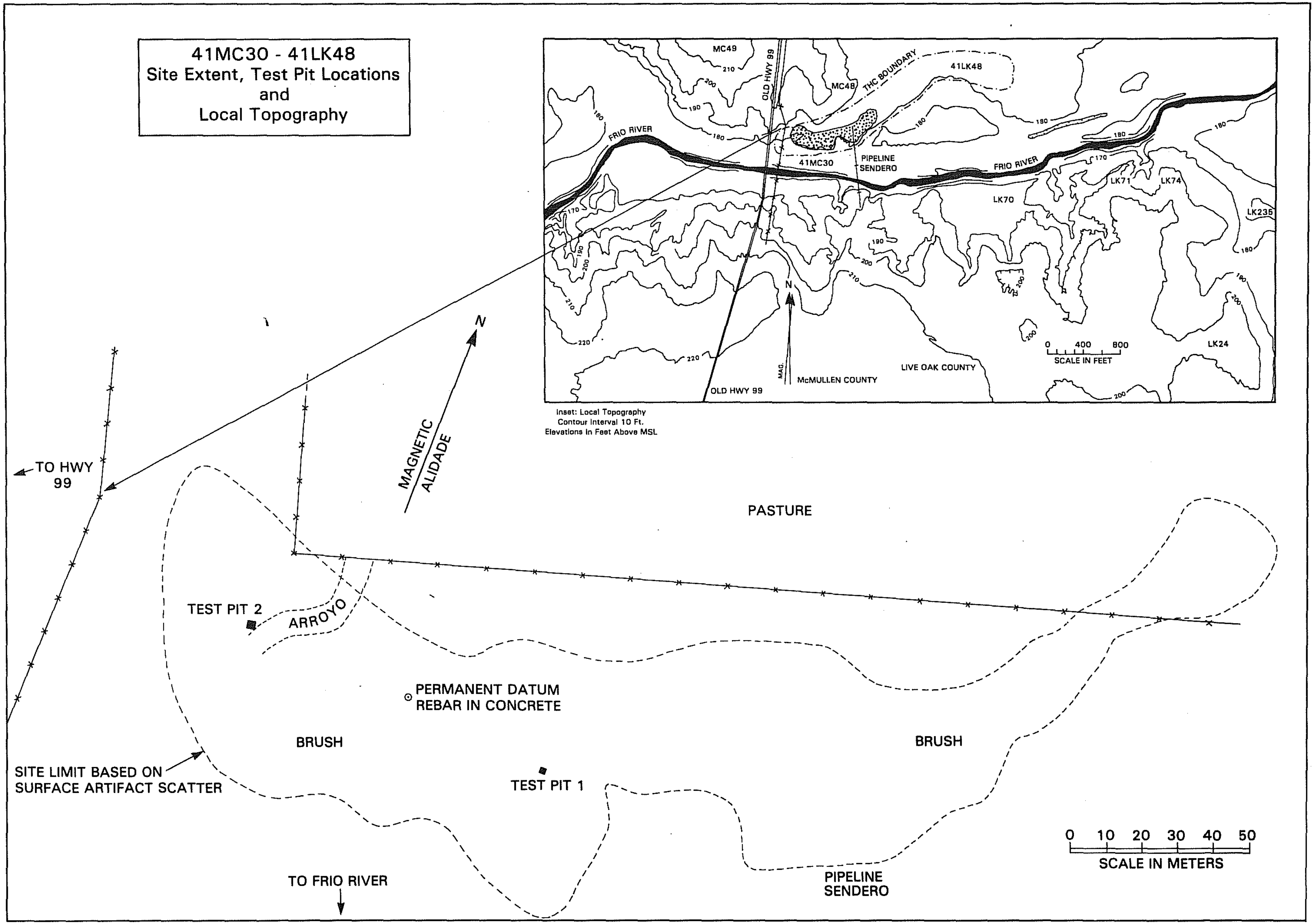
41 MC 48

Located immediately north of the western end of 41 LK 48-41 MC 30, 41 MC 48 is a prehistoric site situated on a Pleistocene terrace spur projecting southward toward the Frio River (Fig. 1). As recorded by the THC surveyors, 41 MC 48 measures 500 m north-south and approximately 100 m east-west. These dimensions approximate the size of the terrace spur. The site is completely within a cleared pasture covered with grass. THC analysts recognized Pre-Archaic and Archaic components on this site (*ibid*).

The CAR crew carried out an unprovenienced surface collection at 41 MC 48. Three cores, three thick bifaces, and one thin biface fragment were the only artifacts collected from the site. There are no recognized time diagnostic forms among these specimens.

41 LK 49

Prehistoric site 41 LK 49 is located 0.7 km east of the Live Oak-McMullen County line on the north side of the Frio River (Fig. 1). The site rests on a second terrace above the river, the same terrace as contains 41 LK 48-41 MC 30 a short distance to the west. Immediately below (south of) 41 LK 49 is a relict channel of the Frio River. The modern channel of the river is 300-400 m south of the site. Around the northern edge of the site runs a channel which drains areas at higher elevations to the north and northwest of 41 LK 48. Except for



41MC30 - 41LK48
Site Extent, Test Pit Locations
and
Local Topography
MC49
210
200
190
180
170
OLD HWY 99
MC48
THC BOUNDARY
41LK48
FRIO RIVER
41MC30
PIPELINE
SENDERO
FRIO RIVER
LK71
LK74
LK70
LK236
N
MAG.
McMULLEN COUNTY
LIVE OAK COUNTY
0 400 800
SCALE IN FEET
LK24
220
OLD HWY 99
Inset: Local Topography
Contour Interval 10 Ft.
Elevations In Feet Above MSL
N
MAGNETIC
ALIDADE
TO HWY
99
PASTURE
TEST PIT 2
ARROYO
PERMANENT DATUM
REBAR IN CONCRETE
BRUSH
BRUSH
SITE LIMIT BASED ON
SURFACE ARTIFACT SCATTER
TEST PIT 1
0 10 20 30 40 50
SCALE IN METERS
TO FRIO RIVER
PIPELINE
SENDERO

FIGURE 29

the eastern quarter of the site, which is covered with brush, 41 LK 49 is located in a cleared pasture. As recorded by the THC surveyors, the site measures 600 m east-west and is 150 m wide. The site is listed as containing undifferentiated Archaic remains (Lynn, Fox, and O'Malley 1977:44).

The CAR crew excavated one 1-m^2 test pit and conducted an unprovenienced surface collection at 41 LK 49. Although surface debris was densest at the far eastern end of the site, this was also where erosion was most severe. A location in the east central area of the site was selected for the test pit. Test Pit 1 was excavated in the pasture along the southern margin of the site overlooking the relict channel. The unit was excavated to a depth of 50 cm below surface into a matrix described as a compact, gray-brown clayey loam. Debris recovered from this test pit is divided into two assemblages, representing Upper and Lower Horizons in the deposit. The Upper Horizon contains material recovered from Levels 1 and 2. The Lower Horizon contains debris from Levels 3-5. Rates of recovery for selected classes of debris were as follows:

	Horizon	
	Upper	Lower
Tuff Rock Weight (grams)	144	271
Fire-Fractured Rock Weight (grams)	494	91
Mussel Shell Umbo Count	12	10
Mussel Shell Weight (grams)	25	15
Rabdotus Shell Count	16	57
Bone Weight (grams)	0	0
Primary Flake Count	0	2
Secondary Flake Count	6	2
Tertiary Flake Count	3	5
Chip Count	7	4

No other artifacts were found in this test pit.

The single artifact surface collected at 41 LK 49 was an unstemmed, triangular thin biface with a straight base (Group 2, Form 1).

SITE GROUP 8

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 MC 13	41 MC 11	41 MC 189
		41 MC 31		41 MC 10
		41 MC 9		41 MC 8
				41 MC 14
				41 MC 33
				41 MC 223

The ten sites in Group 8 are located on the south side of the Frio River valley between 10.0-12.5 km west of Choke Canyon Dam. Along this stretch of the valley, a very distinct change in landform setting appears as exposures of durable Jackson Group sandstone begin to crop out. Almost all of the sites in the group rest on very ancient terrace deposits or bedrock. The terrace deposits in the area have been extensively altered by erosion taking place in the channel of Salt Creek, an intermittent drainage which trends in a northeasterly direction down to the Frio River. A number of short, steep lateral channels feed into Salt Creek and contribute significantly to the locally severe erosion which has occurred in the area. The original site of Calliham is located on the eastern side of the site group area. In the vicinity of 41 MC 8 and 41 MC 9 are numerous oil wells and collection tanks constituting part of the Calliham Oil Field. Historical markers located in Calliham commemorate the founding of the town, known originally as "Guffeyola," and the drilling of the first natural gas well in south Texas at a location just west of Calliham. Much of the land surface in the Group 8 area is open pasture, cleared of brush in modern times and planted to grass. Thick stands of floodplain and upland brush communities are still present at some locations. A riparian forest grows immediately along the Frio River on the north side of the site group area.

41 MC 189

41 MC 189 is a small, open prehistoric site located in an upland context far south of the other Group 8 sites (Fig. 1). The site was recorded during an archaeological survey of the new Calliham townsite to be located on the south shore of the future lake. The survey was conducted by personnel from the USBR and the CAR. The site lies in a partially cleared pasture. In the past, the area containing 41 MC 189 was cropland and was cultivated regularly. The site is evidenced by a light surface scatter of fire-fractured rock, cores, debitage, and chipped stone tools. These remains cover a roughly oval area measuring 75 m east-west and 100 m north-south. Gravels occur naturally on the site and surrounding area. Here, the gravel is generally smaller and much less densely concentrated than is the case along valley margin slopes farther to the east.

An unprovenienced collection of surface artifacts was carried out at 41 MC 189. The assemblage gathered at the site includes seven cores, one thick biface, and two distally beveled specimens, one of which is a *Guadalupe* tool (Group 6). The *Guadalupe* tool indicates that prehistoric cultural activity may have taken place on this site in Pre-Archaic or Early Archaic times.

41 MC 10

Located on a peninsular Pleistocene terrace ridge between the channels of the Frio River and Salt Creek, prehistoric site 41 MC 10 occurs in a grass-covered pasture on a sandy hill overlooking the valleys of both drainages (Fig. 1). As recorded by THC surveyors, the site is oval shaped. It measures about 400 m northeast-southwest and 150 m north-south. A surface collection was to be conducted at the site by the CAR crew. Inspection of the site surface revealed only a very light, widely spaced scatter of fire-fractured rock and debitage. Only two chert cores were collected. The low rate of artifact recovery on the site is partly attributed to sandy soil and grass cover on the site. Subsequent to CAR activities on the site, the basal fragments of two *Plainview* points were reported as being found at 41 MC 10 (Dusek 1980:39-41). In the same article, Dusek also mentions *Folsom* and *Angostura* points recovered from sites along the same ridge as contains 41 MC 10. It is apparent that Paleo-Indian people were inhabiting sites along this particular ridge, the evidence for their presence in this general area being stronger than for almost any other location known at Choke Canyon.

41 MC 9

Northwest of 41 MC 10, 41 MC 9 is a prehistoric site located out on the end of the peninsular Pleistocene terrace ridge (Fig. 1). As recorded by the THC surveyors, the site measures 550 m northeast-southwest and 150-250 m northwest-southeast. A dirt road bisects the site down its long axis. At the far northeast end of the site is the residence of the Henry Dusek family. There is also a complex of oil storage tanks, pipelines, and pumps at this end of the site. The present channel of the Frio River is located 300 m northeast of the site. The channel of Salt Creek runs along the east side, and a relict channel of the Frio River lies at the foot of the terrace ridge on the site's northwest side. In the vicinity of the Dusek residence, some brush still grows. Gravels are common on the terrace slopes at the northeast end. An abandoned gravel quarry is also located in this area. THC analysts list 41 MC 9 as containing Archaic to Late Prehistoric components (Lynn, Fox, and O'Malley 1977:44).

Surface inspection of 41 MC 9 by the CAR crew revealed that prehistoric debris was densest at the northeast end of the site. However, this area was also badly disturbed by erosion and oil field activity. The southwestern reaches of the site were in a pasture known to have been cleared of brush in the recent past. Operating on the assumption that the effects of brush clearing on prehistoric remains were less severe than the effects of erosion and oil field construction, two 1-m^2 test pits were excavated in the south central area of the site (Fig. 36,a). The units were located at the highest elevations of the ridge west of the road bisecting the site.

Two 10-cm thick levels were excavated in each of the test pits at 41 MC 9. Matrix in the upper levels of the units was described as a very compact dark brown sandy loam. Midway through the second level in each unit, a reddish brown sandy loam was encountered. In both units, most of the prehistoric debris was recovered from the first level. Recovery declined substantially in the second level (10-20 cm below surface). Noted in the surface levels of both units were large amounts of carbon occurring both as chunks and as mottling. This carbon is attributed to recent burning of brush piles on the site surface. Rates of recovery for selected classes of material from the two units were:

	Test Pit 1	Test Pit 2
Sandstone Weight (grams)	387	136
Fire-Fractured Rock Weight (grams)	243	270
Mussel Shell Umbo Count	38	17
Mussel Shell Weight (grams)	63	48

Rabdotus Shell Count	5	11
Bone Weight (grams)	0	0
Primary Flake Count	0	0
Secondary Flake Count	12	11
Tertiary Flake Count	20	17
Chip Count	40	36

No other artifacts were recovered from these units.

The only artifacts collected from the surface of 41 MC 9 by the CAR crew were an arrow point fragment (Thin Biface Group 1, Form 7) and a large grinding slab (Modified Sandstone Group 1, Form 1). Members of the Henry Dusek family have picked up a number of artifacts from the surface of 41 MC 9 through the years. The artifact forms represented in this collection span Paleo-Indian to Late Prehistoric times (collection notes and artifact tracings provided by Curtis Dusek on file at the CAR-UTSA). The test pits excavated at this site indicate that deposits of prehistoric remains are shallow and badly disturbed by modern activities. The subsurface deposits do not appear to hold much potential for further investigation.

41 MC 8

Downhill to the northwest of 41 MC 9 is prehistoric site 41 MC 8 (Fig. 1). The site rests on a second terrace above the Frio River, which is now located 200-400 m to the west and north. Site 41 MC 8 is stretched out alongside the southeastern bank of a relict channel of the Frio River. The channel contains water during most of the year. As recorded by THC surveyors, 41 MC 8 measures 400 m northeast-southwest and is about 100 m wide. These dimensions approximate the size of the natural levee feature upon which the site occurs. The eastern and western ends of the site are in cleared, grass-covered pastures. The central area is in brush. Mesquites, whitebrush, guayacan, spiny hackberry, persimmons, and prickly pear are all present. CAR personnel made an unprovenienced surface collection at this site. Three cores and one thick biface (Group 7, Form 1) were the only specimens collected. The time period during which prehistoric cultural activity occurred on the site cannot be determined from these limited findings. THC analysts were also unable to advance a period affiliation for remains found at 41 MC 8 (Lynn, Fox, and O'Malley 1977:44).

41 MC 14

An open prehistoric site located north of Calliham, 41 MC 14 rests on the slopes of an ancient terrace trending southwestward from the Frio River (Fig. 1). The terrace slope overlooks the confluence of Salt Creek with the Frio River roughly 200 m west of 41 MC 14. As recorded by THC surveyors, the site measures 600 m from northeast-southwest and is about 100 m wide. The northeast end of 41 MC 14 lies immediately south of the modern Frio River channel. A gravel road which once ran from Calliham to the small town of Whitsett cuts through the northern end of the site. An iron bridge, no longer in service, stands where the road crosses the river. Most of the site surface is covered with mesquite and brush. Erosion has been moderate to severe along the terrace slope. Deep gullies are present beside the river at the site's northeast end. Roads, oil field facilities, and erosion have all resulted in considerable disturbance to the site. In a particularly deep cut where the gravel road descends to the river channel, the CAR crew noted cultural debris including mussel shell, debitage, and fire-fractured rock eroding out at depths of up to 2 m below the original ground surface. THC analysts listed 41 MC 14 as containing cultural remains spanning Paleo-Indian to Late Prehistoric times (Lynn, Fox, and O'Malley 1977:44). The CAR crew conducted an unprovenienced surface collection on the site. This effort yielded three cores, a *Langtry* dart point fragment (Thin Biface Group 1, Form 2, Spec. 8), a distally beveled tool (Group 3, Form 1), and a uniface (Group 5).

41 MC 33

Prehistoric site 41 MC 33 is located on the southwest outskirts of Calliham (Fig. 1). The site rests on ancient terrace deposits overlooking the Salt Creek valley. The channel of Salt Creek is downhill and west at a distance of about 200 m from the site. As recorded by the THC surveyors, 41 MC 33 measures approximately 350 m northeast-southwest and is 200 m wide. The site is bordered on its north side by an extensive gully which trends from east-west down into Salt Creek. State Highway 72 runs east-west across the southern side of the site. A welder's shop is located at the east end by the highway. The entire site surface is heavily eroded and there are numerous gullies coursing down the terrace slope. Scattered brush and grasses grow in uneroded areas of the site. One quite unusual characteristic of this site is the amount of satin spar gypsum eroding out on the surface. Deposits of gypsum apparently occur naturally in the area.

The CAR crew conducted an unprovenienced surface collection at 41 MC 33. Artifacts found on the site include five cores, 10 thick bifaces, five thin bifaces, a distally beveled tool (Group 1--*Clear Fork*), and a trimmed flake. The *Clear Fork* tool suggests late Paleo-Indian or Early Archaic activity on the site. Other materials observed, but not collected, on the surface of 41 MC 33 were widely scattered mussel shell fragments, land snail shells, fire-fractured rock, and debitage.

41 MC 31

Prehistoric site 41 MC 31 rests on a second terrace above the Frio River and parallels the river's southeast (right) bank for a distance of 300 m (northeast-southwest). This site is on the same terrace system as contains the adjacent prehistoric sites 41 MC 8 and 41 MC 13 (Fig. 1). It is situated on a natural levee deposit forming a low knoll beside the river. The site is entirely within a cultivated field which contained maize stalks at the time of investigation.

Inspection of the 41 MC 31 surface by the CAR crew revealed a relatively dense scatter of debitage, chipped stone tools, modified sandstone, mussel shells, and *Rabdotus* shells occurring over an area of the site's northern end measuring about 20 m north-south and 50 m east-west. Little or no prehistoric cultural debris was seen on the surface southward from this primary concentration. It appears as if the debris scatter designated 41 MC 31 might better have been considered as a southwesterly extension of 41 MC 8 rather than a separate site altogether.

Within the area of maximal debris concentration at the north end of 41 MC 31, the subareas were defined on the basis of distinctive debris types. One area was defined by a number of sandstone grinding slab fragments and manos. The second area contained many mussel shells and shell fragments.

Three 1-m^2 test pits were excavated at 41 MC 31 by the CAR crew. Test Pit 1 was placed in the area where the sandstone grinding implements concentrated on the surface. Test Pit 2 was located amidst the surface scatter of mussel shell. Test Pit 3 was situated 10 m south of Test Pit 2, a location outside of both the recognized subareas. From four to five 10-cm thick levels of matrix were excavated from each unit. Debris recovered from the test pits is divided into assemblages representing Upper and Lower Horizons according to the following level combinations:

Test Pit No.	Upper Horizon Levels	Lower Horizon Levels
1	1-2	3-5
2	1-2	3-4
3	1-3	4-5

Test Pit 1 was excavated to a depth of 50 cm below surface. Matrix in the unit was described as a brown sandy loam. Rates of recovery for selected classes of material from the two horizons defined in this test pit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	119	194
Fire-Fractured Rock Weight (grams)	4	2
Mussel Shell Umbo Count	10	4
Mussel Shell Weight (grams)	48	20
Rabdotus Shell Count	10	18
Bone Weight (grams)	0	1
Primary Flake Count	0	0
Secondary Flake Count	2	0
Tertiary Flake Count	5	7
Chip Count	11	9

One sandstone grinding slab fragment (Modified Sandstone Group 1, Form 3) was found in Level 1.

Four 10-cm thick levels of brown sandy loam were excavated from Test Pit 2. Rates of recovery for selected classes of material recovered from the two horizons defined for this unit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	37	59
Fire-Fractured Rock Weight (grams)	28	0

Mussel Shell Umbo Count	94	18
Mussel Shell Weight (grams)	596	159
Rabdotus Shell Count	9	35
Bone Weight (grams)	0	0
Primary Flake Count	0	0
Secondary Flake Count	0	1
Tertiary Flake Count	2	1
Chip Count	4	1

No additional artifacts were found in Test Pit 2.

Test Pit 3 went down 50 cm into a matrix described as a grayish brown sandy clay loam. Rates of recovery for selected classes of material were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	21	0
Fire-Fractured Rock Weight (grams)	85	0
Mussel Shell Umbo Count	7	4
Mussel Shell Weight (grams)	31	9
Rabdotus Shell Count	0	6
Bone Weight (grams)	0	0
Primary Flake Count	0	0
Secondary Flake Count	2	0
Tertiary Flake Count	4	0
Chip Count	7	0

No other artifacts were found in this test pit.

Findings made in the three test pits excavated at 41 MC 31 indicate that the debris representing prehistoric cultural activity on the site is contained primarily in the top 20 cm of deposit. No recognized time-diagnostic artifacts were recovered during CAR excavations nor during previous investigations carried out by THC surveyors (Lynn, Fox, and O'Malley 1977:44). Remains believed to be derived from processing and consumption of food items on the site include mussel shell, *Rabdotus* shell, a small amount of bone (no species identified), and a number of sandstone grinding implements. In addition to the one grinding slab fragment found in Test Pit 1, there were seven other grinding slab fragments (Modified Sandstone Group 1, Forms 2 and 3), two manos (Modified Sandstone Group 2, Forms 1 and 2), and one piece of grooved sandstone (Modified Sandstone Group 3) collected from the surface of 41 MC 31. As previously noted based on surface observations, grinding implements and mussel shell were concentrated in two adjacent, but distinct areas at the site's north end. Sandstone, fire-fractured rock, and debitage were recovered in remarkably small amounts from this site.

41 MC 13

This open prehistoric site is situated on a high terrace bank immediately above (southeast of) the Frio River (Fig. 1). As recorded by the THC surveyors, 41 MC 13 measures almost 500 m from northeast-southwest and is from 100-150 m wide (Fig. 31--inset). The terrace slopes down to the river at a relatively steep angle and is quite heavily eroded, especially in the central and southwestern portions of the site. Long, deep gullies cut up into the site at the southwestern end. Most of the site is covered with a dense stand of brush. Mesquite, whitebrush, yucca, prickly pear, agarita, persimmon, and grasses grow on the terrace top and slopes. Elm, willow, and hackberry trees grow by the river at the foot of the terrace slope.

In preliminary reconnaissance activities at 41 MC 13, the CAR crew found surface scatters of prehistoric debris at either end of the site, but no material was seen over a substantial area in the central portion. Shovel testing in the central area revealed an absence of prehistoric cultural debris in the subsurface as well. These findings indicate that two smaller sites are actually present within the area defined as 41 MC 13. The CAR crew excavated three 1-m^2 test pits at 41 MC 13. Test Pit 1 was placed at the northeastern end and Test Pits 2 and 3 at the southwestern end (Fig. 31). Thus, both of the discrete areas defined within the site were tested.

In Test Pit 1, five 10-cm thick levels of matrix were excavated. The matrix was described as a light brown sandy loam. Rates of recovery for selected classes of material found in Test Pit 1 (all levels combined) were:

Sandstone Weight (grams)	467
Fire-Fractured Rock Weight (grams)	113
Mussel Shell Umbo Count	27
Mussel Shell Weight (grams)	564
Rabdotus Shell Count	54
Bone Weight (grams)	0
Primary Flake Count	1
Secondary Flake Count	8
Tertiary Flake Count	14
Chip Count	22

A distally beveled tool (Group 7, Form 1, Spec. 17) was found in Level 1 of Test Pit 1.

Test Pits 2 and 3 were excavated at the southwestern end of 41 MC 13 (Fig. 31). Erosion was particularly severe in this area of the site. Substantial amounts of prehistoric debris were exposed in the eroded areas (Fig. 30,d). The two units were located on apparently undisturbed ground immediately above erosional cuts where the cultural debris seemed to be most heavily concentrated. An especially large gully just west of the test pits had been filled with rolls of old barbed wire and other metal junk, probably in an effort to slow headward erosion of the gully. A small diameter metal pipeline runs across the site surface in the test pit area. The pipeline once carried water from the river up to pastures east of the site.

Test Pit 2 was excavated to a depth of 85 cm below ground surface. The first 40 cm of matrix was removed in 10-cm thick increments. Level 5 was 25-cm thick, going from 40-65 cm below surface. Levels 6 and 7 were both 10-cm thick. From surface to a depth of 50 cm, the matrix was described as a light

Figure 30. *Photographs Taken in the Vicinity of 41 LK 52, 41 MC 29, 41 MC 13, 41 MC 24, and 41 MC 39.*

a. General view of Frio River valley looking east-southeast from valley margin above sites 41 LK 52 and 41 LK 53. The Opossum Hollow drainage runs through the low area. Blackbrush, whitebrush, mesquite, prickly pear, and yucca are principle brush components in this photo.

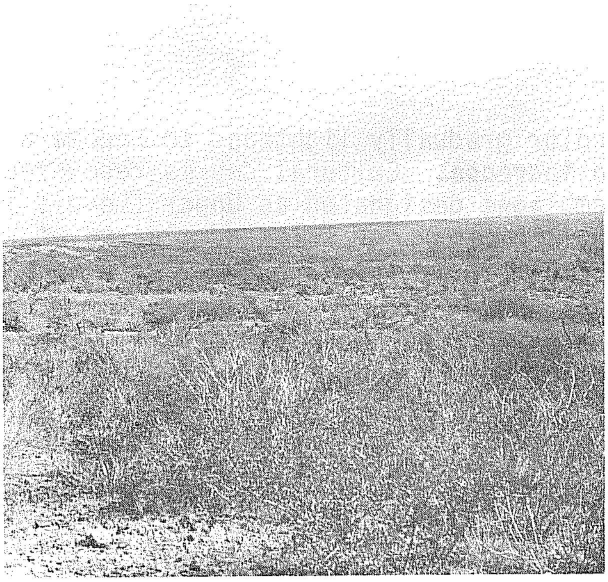
b. View east-southeast down channel of the slough below 41 MC 29. Note standing water in channel beyond dead trees.

c. Overview of Feature 1 in Test Pits 1 and 3 at 41 MC 29. All rocks are sandstone. Wood burned in this feature included oak, mesquite, juniper, and spiny hackberry (granjeno). Carbon from the feature yielded a radiocarbon assay of 390-270 B.C. (MASCA corrected).

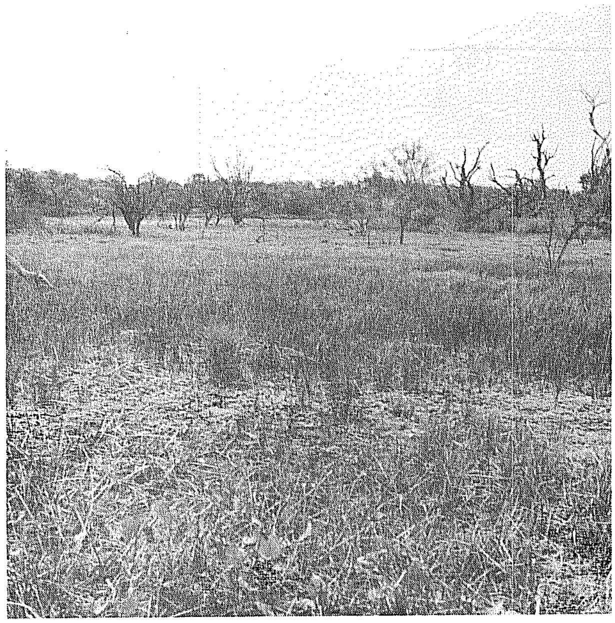
d. Prehistoric cultural debris exposed in erosional gullies at 41 MC 13. Including mussel shell, debitage, and fire-fractured rock, this scatter is typical of surface exposures at Choke Canyon.

e. Feature 1 in Test Pit 1 at 41 MC 24. All rocks are sandstone.

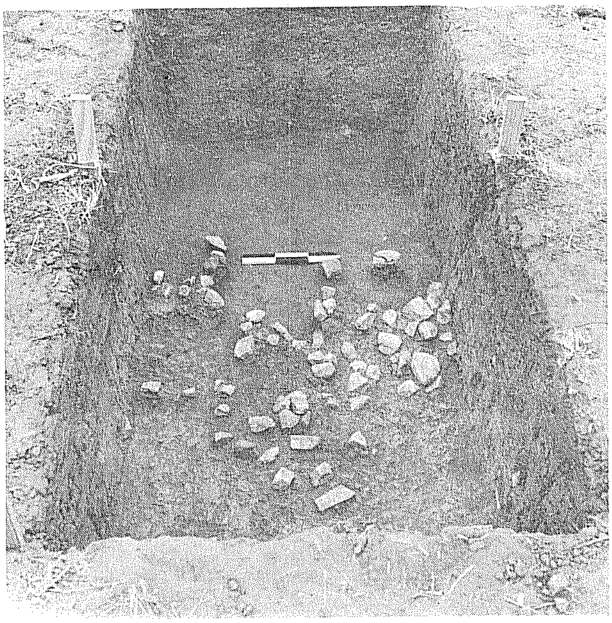
f. Prehistoric debris exposed in eroded area at the eastern end of 41 MC 39.



a

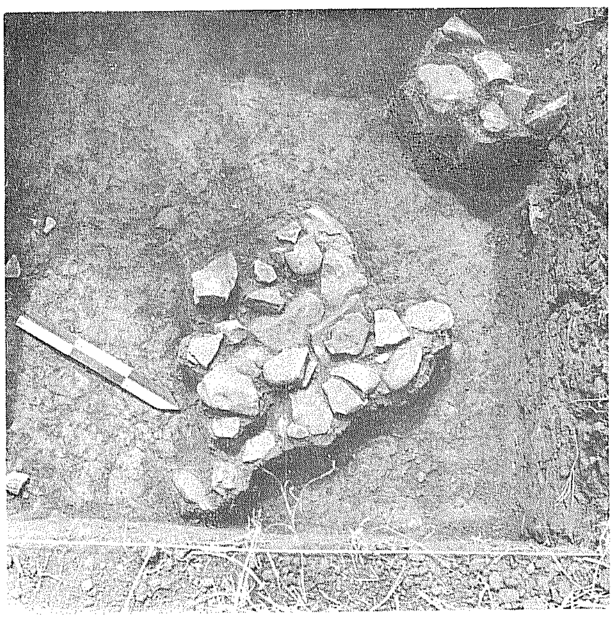


b

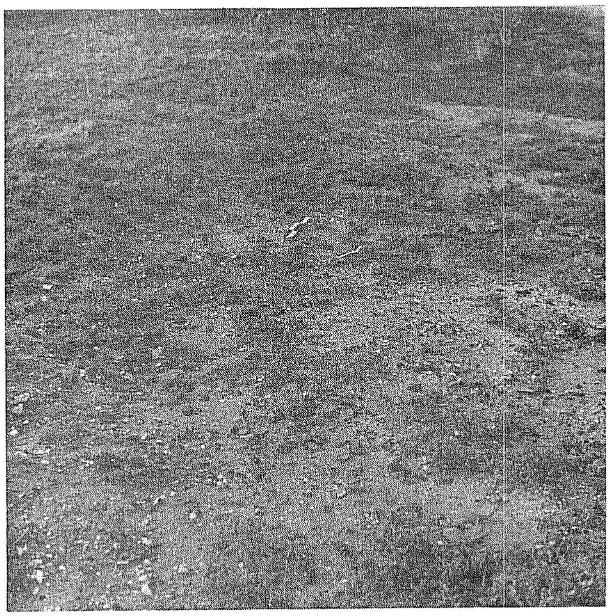


c

d



e



f

brown sandy loam. Below 50 cm, matrix color gradually lightened to become a yellowish tan and clay content seemed to increase. Cultural debris recovered from Test Pit 2 is divided into two assemblages designated as Upper (Levels 1-4) and Lower (Levels 5-7) Horizons. Rates of recovery for selected classes of material in the two horizons defined in Test Pit 2 were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	140	45
Fire-Fractured Rock Weight (grams)	177	254
Mussel Shell Umbo Count	46	6
Mussel Shell Weight (grams)	165	43
Rabdotus Shell Count	65	26
Bone Weight (grams)	0	0
Primary Flake Count	0	1
Secondary Flake Count	9	17
Tertiary Flake Count	13	24
Chip Count	39	60

Also found in Test Pit 2 were a core (Group 10, Level 5) and a thick biface (Group 4, Level 5).

Eight 10 cm thick levels of matrix were excavated from Test Pit 3, located a short distance south of Test Pit 2 (Fig. 31). Matrix in this unit was like that described for Test Pit 2. Again, debris recovered from Levels 1-4 is combined into an assemblage designated as the Upper Horizon while debris from Levels 5-8 represents a Lower Horizon. Rates of recovery for selected classes of material from the two horizons were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	64	0
Fire-Fractured Rock Weight (grams)	357	0
Mussel Shell Umbo Count	8	0
Mussel Shell Weight (grams)	52	1
Rabdotus Shell Count	21	4
Bone Weight (grams)	0	0
Primary Flake Count	1	0
Secondary Flake Count	13	1
Tertiary Flake Count	28	0
Chip Count	65	2

A fragment of a distally beveled tool (Group 9, Spec. 15) was found in Level 8 of Test Pit 3.

Artifacts collected from the surface of 41 MC 13 by the CAR crew include a core, two thin bifaces, two distally beveled tools, a trimmed flake, and two pieces of modified sandstone (one grinding slab fragment and one piece of

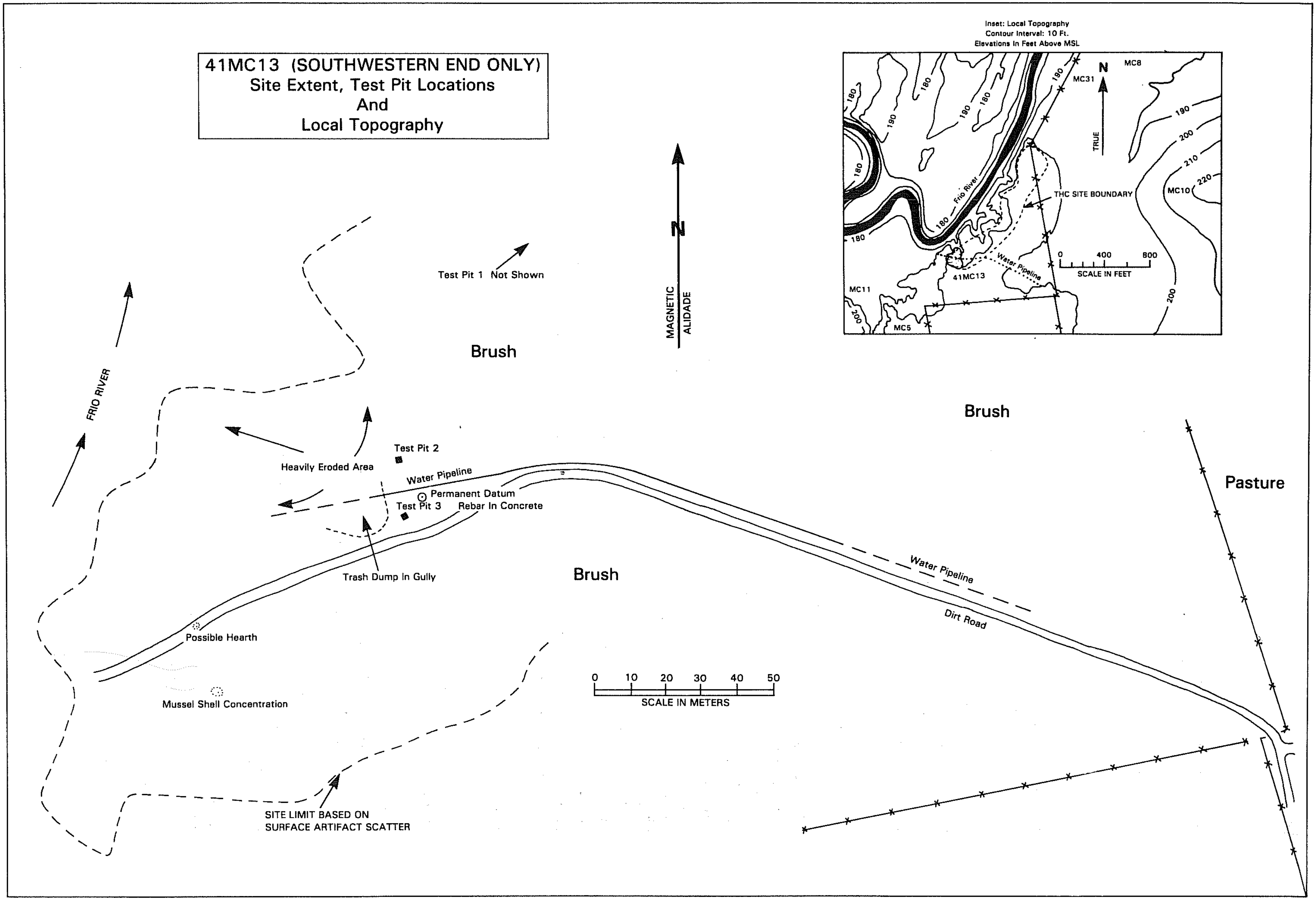

41MC13 (SOUTHWESTERN END ONLY)
Site Extent, Test Pit Locations
And
Local Topography
Inset: Local Topography
Contour Interval: 10 Ft.
Elevations In Feet Above MSL
MC8
MC31
N
TRUE
Frio River
THC SITE BOUNDARY
MC10
0 400 800
SCALE IN FEET
Water Pipeline
41MC13
MC11
MC5
180
190
200
210
220
MAGNETIC
ALIDADE
N
Test Pit 1 Not Shown
Brush
FRIO RIVER
Test Pit 2
Heavily Eroded Area
Water Pipeline
Permanent Datum
Test Pit 3
Rebar In Concrete
Trash Dump In Gully
Brush
Brush
Pasture
Water Pipeline
Dirt Road
Possible Hearth
Mussel Shell Concentration
0 10 20 30 40 50
SCALE IN METERS
SITE LIMIT BASED ON
SURFACE ARTIFACT SCATTER

FIGURE 31

grooved sandstone). The thin biface is triangular in outline with a rounded base (Group 4, Form 1). The distally beveled tools are of the small, triangular and subtriangular varieties (Group 3, Forms 1 and 2). These three artifacts indicate that debris evidencing 41 MC 13 dates to the Late Archaic.

Recognized subsistence-related remains found at 41 MC 13 are again limited to mussel shell, *Rabdotus* shell, and a single grinding slab fragment. No animal bone was recovered. Cultural debris is contained principally in the upper 40 cm of deposit on the site. These remains are attributed to Late Archaic cultural activity. Though sparse, debris recovered from 40-80 cm below surface is felt to represent a distinct, earlier occupation on the site. As at the nearby site 41 MC 31, amounts of sandstone, fire-fractured rock, and debitage seem relatively small in the 41 MC 13 deposits. This seems unusual in light of extensive gravel bars presently exposed in the bed of the Frio River immediately below the site.

41 MC 11

Site 41 MC 11 contains prehistoric remains, but within its limits there is also a historic cemetery which was given the separate permanent designation of 41 MC 4. The site is south of the Frio River on an ancient terrace ridge overlooking the floodplain (Fig. 1). As recorded by the THC crew, the site measures 500 m north-south and 250 m east-west. The area encompasses the ridge and its flanks at the north end of the site and the headward slopes of an extensive gully system at the southern end of the site. The gully system forms the eastern margin of 41 MC 11. The ridge top is a local prominence and provides an overlook in all directions except to the southwest. Along the northwest edge of the site, the terrace slopes directly down to the Frio River. Moderate to dense stands of brush grow on the site surface. Mesquite, acacias, guayacan, yucca, whitebrush, tasajillo, Mormon tea, and grasses are present. Sandstone crops out on the north and west faces of the terrace. Exposures of satin spar gypsum were also noted. Erosion has been particularly severe along the eastern slopes of the ridge leading down into the gully system.

The CAR crew conducted a provenienced surface collection at 41 MC 11. Twenty-seven artifacts were collected including seven cores, four thick bifaces, 12 thin bifaces, one distally beveled tool, and three pieces of modified sandstone (grinding slab fragments). Most of these specimens came from an area measuring 60 x 85 m at the highest elevations on the ridge near the center of the site (artifact provenience map on file at the CAR-UTSA). In this same general area, two possible hearth features consisting of concentrations of sandstone rock were observed. In gullies running down the eastern slope below the collection area, small amounts of debitage, mussel shell, and fire-fractured rock were seen eroding out as much as a meter below undisturbed ground surface.

The artifacts collected at 41 MC 11 appear to represent activity during the Archaic, but are generally not distinctive enough morphologically to permit a more refined statement as to period of occupation on the site. Among the thin bifaces are eight unstemmed specimens having triangular or leaf-shaped outlines with straight, concave, or convex bases (Groups 2, 3, and 5). The one distally beveled tool found at 41 MC 11 is a small, triangular specimen (Group 3, Form 1).

41 MC 223

The site was found and recorded by the CAR crew during the course of Phase I investigations at nearby localities. It is situated on the sandstone bluff approximately 200 m west of 41 MC 11 (Fig. 1). The main site area measures 150 m in diameter with the northern margin being on the immediate edge of the bluff overlooking the Frio River. A fingerlike sandstone ridge projects in a northeasterly direction from the main area, adding another 150 m to the site length. The drop-off from the bluff down into the Frio floodplain is almost vertical below the site. The fingerlike spur is formed by a deep ravine which cuts up into the bluff. There is a similar ravine on the site's west side. Thus, there are steep drop-offs on all except the southeast side of the site. The sandstone occurs in huge slabs as it crops out on and below the site (Fig. 36,c). Thick bifaces and chipping debris found in the main area of 41 MC 223 indicate that the prehistoric inhabitants were making tools from this extremely well-cemented sandstone.

Artifacts evidencing both Late Prehistoric and early Historic components were found on the surface of 41 MC 223. A subcircular concentration of cut sandstone rocks, brick fragments, glass, and metal fragments was observed in the central area of the site. The concentration measures approximately 4 m in diameter. Artifacts recovered in and around this concentration indicate an early 20th-century occupation of the site.

Prehistoric activity is evidenced at 41 MC 223 by surface scatters of mussel shell, *Rabdotus* shell, chert cores, debitage, stone tools, and fire-fractured rock. A *Cliffton* arrow point (Thin Biface Group 1, Form 4, Spec. 22), an arrow point fragment (Group 1, Form 7), and two "beveled knives" (Thin Biface Group 4, Form 2) collected from the site surface indicate the presence of a Late Prehistoric component. Sandstone cores, thick bifaces, and large pieces of debitage indicate that the site's prehistoric inhabitants were quarrying nearby quartzitic sandstone for manufacture into crudely fashioned chipped stone tools.

SITE GROUP 9

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 MC 39 41 MC 177	41 MC 41	41 MC 36 41 MC 40 41 MC 42 41 MC 43 41 MC 44 41 MC 45

Site Group 9 is located on the north side of the Frio River valley in an area extending from 9.0-11.0 km west of Choke Canyon Dam. The nine sites in the group are distributed along a 3.0 km stretch of Opossum Creek and its tributary channels (Fig. 1). Opossum Creek originates northwest of the project area and is primarily a conduit of upland drainage. The valley of Opossum Creek broadens considerably as it approaches the Frio River. In the site group area, the main channel of the creek is flanked by feeder channels which carry runoff from upland areas along either side of the valley. These feeder channels are probably relict courses of the creek. Sites 41 MC 40 and 41 MC 41 are situated along a divide separating Opossum Creek from Opossum Hollow. Opossum Creek flows directly south from the divide to meet the Frio River. Opossum Hollow trends off in a more easterly direction, gathers runoff from extensive areas of upland, and meets the Frio River in the vicinity of Site Group 5 discussed above. Thus, a quite complex system of drainage channels is present, especially in the area containing 41 MC 39, 41 MC 40, 41 MC 41, and 41 MC 45. The entire area containing the site group is brush covered. Mesquite, whitebrush, prickly pear, Mexican persimmon, spiny hackberry, tasajillo, and guayacan are all common. The northern extension of the Calliham Oil Field occurs in the southern area of Site Group 9. Oil storage tanks, surface pipelines, and pumps are numerous throughout this area.

41 MC 39

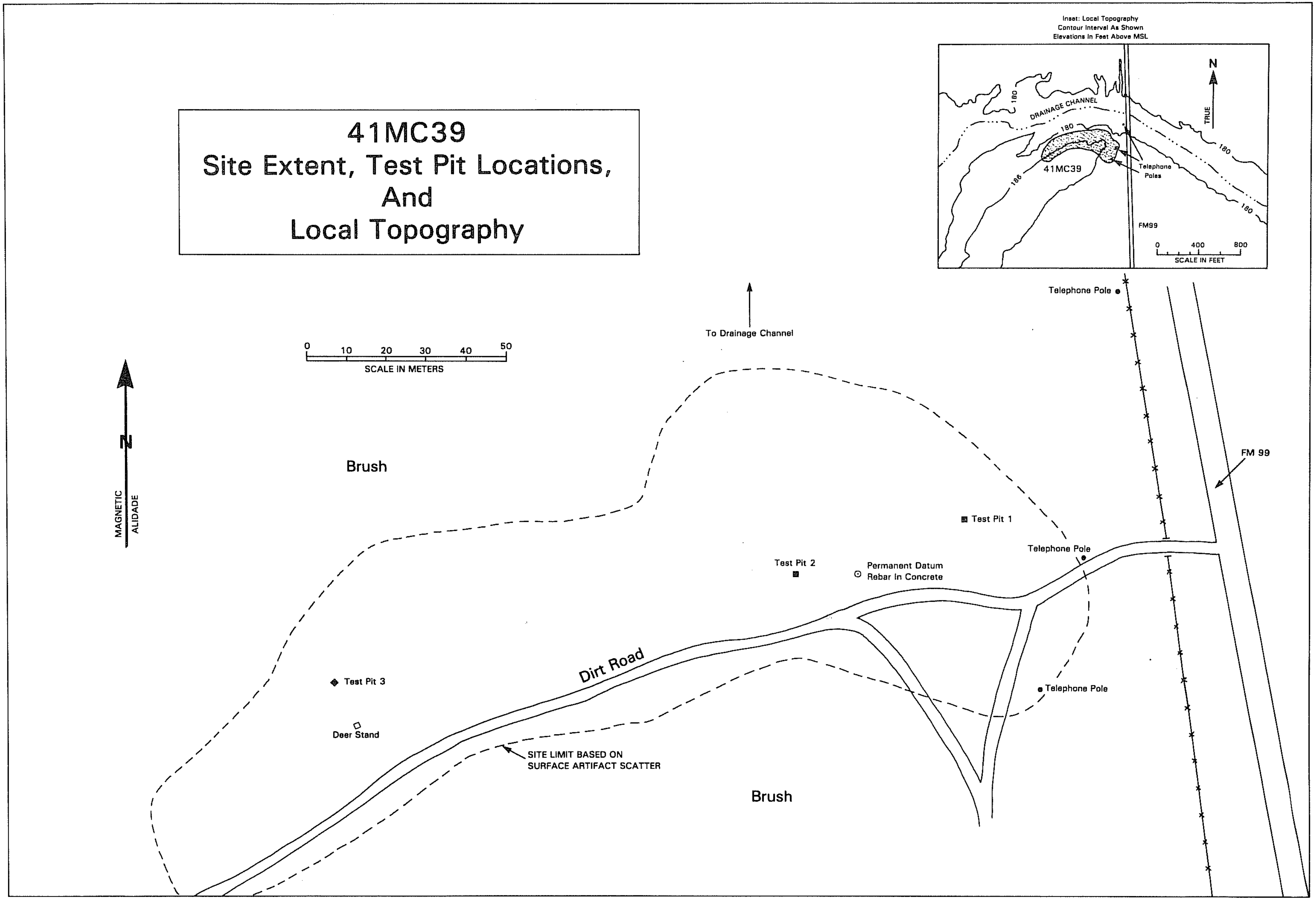
41 MC 39 is an open prehistoric site located 2.5 km north of the Frio River. Farm-to-Market Road 99 passes along the site's east end (Fig. 1). The site rests on a terrace levee along the south (right) bank of a header channel to Opossum Hollow. As recorded by THC surveyors, the site measures 600 m northeast-southwest and is about 200 m wide (northwest-southeast). The site surface supports moderate to dense stands of brush.

Initial inspection of 41 MC 39 by the CAR crew revealed that surface scatters of prehistoric cultural debris were primarily concentrated in a 75-m wide band paralleling the drainage channel for a distance of 250 m (Fig. 32). The site was not found to extend as far to the southwest as was originally recorded. Examination of the channel bank as it continued on the east side of Highway 99 revealed that the site actually extends 50-75 m further in that direction. Minor erosional gullies cutting down from the site to the drainage channel contained substantial concentrations of fire-fractured rock, sandstone, debitage, mussel shell, and land snail shell (Fig. 30,f).

Three 1-m^2 test pits were excavated at 41 MC 39. The units were located in central, undisturbed areas of the site adjacent to channel-edged gullies where particularly dense concentrations of debris were observed. The units were excavated to depths ranging from 80-90 cm below surface. Debris recovered from all units has been broken down into two assemblages designated as Upper and Lower Horizons. The Upper Horizon contains debris recovered in Levels 1-4 in all units. The Lower Horizon contains materials found in Levels 5-9.

Eight 10-cm thick levels were excavated from Test Pit 1 (Fig. 32). Matrix in this unit was described as light grayish brown sandy loam. Debris recovery rates for the two horizons defined in the unit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	496	725
Fire-Fractured Rock Weight (grams)	1477	2284



41MC39
Site Extent, Test Pit Locations,
And
Local Topography
Inset: Local Topography
Contour Interval As Shown
Elevations In Feet Above MSL
N
TRUE
DRAINAGE CHANNEL
180
186
41MC39
Telephone Poles
FM99
0 400 800
SCALE IN FEET
0 10 20 30 40 50
SCALE IN METERS
To Drainage Channel
N
MAGNETIC ALIDADE
Brush
Telephone Pole
FM 99
Test Pit 1
Telephone Pole
Test Pit 2
Permanent Datum
Rebar In Concrete
Dirt Road
Test Pit 3
Deer Stand
Telephone Pole
SITE LIMIT BASED ON
SURFACE ARTIFACT SCATTER
Brush

FIGURE 32

Mussel Shell Umbo	39	20
Mussel Shell Weight (grams)	108	36
Rabdotus Shell Count	47	105
Bone Weight (grams)	0	0
Primary Flake Count	0	1
Secondary Flake Count	21	38
Tertiary Flake Count	38	73
Chip Count	71	132

Other artifacts recovered from Test Pit 1 include two cores (Groups 3 and 7, Level 7) and three thin bifaces. Among the thin bifaces are a *Bulverde*-like dart point (Group 1, Form 1, Spec 19) from Level 6 and a *Tortugas* point (Group 2, Form 1, Spec. 29) from Level 4.

Test Pit 2 was excavated to a depth of 90 cm below surface in a matrix described as light grayish brown sandy loam. Rates of recovery for selected debris categories in the two horizons defined for this unit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	172	338
Fire-Fractured Rock Weight (grams)	437	940
Mussel Shell Umbo Count	7	26
Mussel Shell Weight (grams)	10	38
Rabdotus Shell Count	5	40
Bone Weight (grams)	0	0
Primary Flake Count	2	2
Secondary Flake Count	14	35
Tertiary Flake Count	13	73
Chip Count	25	119

One core (Group 6, Level 7) and a thin biface fragment (Group 10, Level 5) were also recovered from Test Pit 2.

Test Pit 3 also went down 90 cm below surface. Again, matrix was a light grayish brown sandy loam. The two horizons defined for the unit yielded selected classes of debris in the following amounts:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	16	683
Fire-Fractured Rock Weight (grams)	113	790
Mussel Shell Umbo Count	1	3
Mussel Shell Weight (grams)	1	15
Rabdotus Shell Count	24	19
Bone Weight (grams)	0	15
Primary Flake Count	0	0
Secondary Flake Count	6	7
Tertiary Flake Count	5	11
Chip Count	6	19

One small grinding slab fragment (Modified Sandstone Group 1, Form 3) was found in Level 4. The bone found in the Lower Horizon (Level 6) was a single piece of charred deer antler.

Five artifacts were collected from the surface of 41 MC 39. The collection includes a thick biface (Group 6, Form 1) and four thin bifaces. One of the thin bifaces is an unclassifiable stemmed dart point (Group 1, Form 3, Spec. 36). There is also another possible *Tortugas* point (Group 2, Form 1), an unstemmed, leaf-shaped specimen (Group 5), and a possible drill or perforator (Group 8).

The two stemmed dart points found during CAR investigations at 41 MC 39 (Thin Biface Group 1, Form 1, Spec. 19 and Group 1, Form 3, Spec. 36) are reminiscent of dart points diagnostic of the Middle Archaic in central Texas (such as the *Bulverde* type). Based solely on this comparison, 41 MC 39 is suggested to contain a Middle Archaic component. The occurrence of unstemmed thin biface forms classified as *Tortugas* (Group 2, Form 1) and *Refugio* (Group 5) along with these stemmed dart points would be of considerable significance for cross-dating purposes if such a Middle Archaic affiliation were definitely established.

Remains attributed to prehistoric subsistence activities at 41 MC 39 include mussel shell, *Rabdotus* shell, a deer antler fragment, and a grinding slab fragment. In this respect, the site is not remarkably different from many of the others. The presence of mussel shell at 41 MC 39 does suggest, however, that the drainage running along the north edge of the site was once a more substantial water course. As mentioned in the introduction to Site Groups 5 and 6, Opossum Hollow is apparently a relict channel of either Opossum Creek or the Frio River. It seems likely that the channel beside the site, now a major feeder of the Opossum Hollow system, carried water more regularly during periods of prehistoric encampment.

41 MC 177

Prehistoric site 41 MC 177 occurs on an older terrace surface on the west (right) side of the Opossum Creek valley (Fig. 1). As recorded by THC surveyors, the site measured 800 m northwest-southeast and is about 250 m wide. A relict channel of Opossum Creek parallels the site from northwest-southeast at a distance of from 75-150 m away from the site's northeastern side. The modern creek channel is 400 m or more northeast and east of the site. The northwestern end of 41 MC 177 is bounded by an easterly trending upland drainage channel which feeds down to the creek. The site area is 2.0-3.0 km north of the Frio River. On terrace bluffs at the north end of this site are natural deposits of gravel containing some of the largest cobbles seen in the reservoir (diameters as large as 15-25 cm). Brush cover is heavy on this site. Mesquite, whitebrush, agarita, persimmon, guayacan, prickly pear, and grasses are all present.

In initial reconnaissance of 41 MC 177 by the CAR crew, locally denser scatters of prehistoric cultural debris were found at the southeast and northeast ends of the site along the terrace edge nearest the creek. Very little material was seen in intervening areas. Based on findings made in shovel tests, the southeastern end was selected as the area containing subsurface deposits of cultural debris warranting test excavations. Two 1-m^2 test pits were excavated at the southeast end of 41 MC 177.

Test Pit 1 at 41 MC 177 was excavated to a depth of 70 cm below surface in 10-cm thick levels. The unit was then further excavated to a depth of 95 cm without regard for vertical levels. From surface to a depth of 50 cm, a light brown sandy loam was present. Below 50 cm, matrix color lightened to a yellowish tan and carbonate flecking increased gradually. Debris recovered in Test Pit 1 is divided into two assemblages representing Upper (Levels 1-3) and Lower (Levels 4-7 Horizons. Rates of recovery for selected categories of material in each horizon were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	122	223
Fire-Fractured Rock Weight (grams)	767	675
Mussel Shell Umbo Count	0	0
Mussel Shell Weight (grams)	2	0
Rabdotus Shell Count	11	16
Bone Weight (grams)	0	0
Primary Flake Count	1	0
Secondary Flake Count	3	4
Tertiary Flake Count	13	5
Chip Count	15	11

No other artifacts were found in Test Pit 1.

In Test Pit 2, eight 10-cm thick levels of matrix were removed. From surface to Level 4, matrix in this unit was described as light brown sandy loam. In Level 4, pockets of tan silt with gravel and caliche inclusions appeared. These pockets continued to occur in a matrix of brown sandy loam on down to the bottom of the unit. Debris recovered from Test Pit 2 is also divided into assemblages representing two horizons. The Upper Horizon consists of debris found in Levels 1-4. The Lower Horizon contains debris found in Levels 5-8. Rates of recovery for selected classes of debris were as follows:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	76	1146
Fire-Fractured Rock Weight (grams)	956	2383
Mussel Shell Umbo Count	2	3
Mussel Shell Weight (grams)	3	5
Rabdotus Shell Count	30	19
Bone Weight (grams)	0	0
Primary Flake Count	1	1
Secondary Flake Count	3	6
Tertiary Flake Count	4	9
Chip Count	12	16

A chunk of bituminous coal weighing 50 g was recovered from Level 7 of Test Pit 2. The piece exhibits a lustrous black sheen and distinct cleavage planes. The closest known source of such material is in the Piedras Negras, Mexico, area across the border from the Texas town of Eagle Pass. This source is approximately 240 km northwest of the recovery site. Assuming that prehistoric people brought the specimen to 41 MC 177, it is not known what they were doing with it.

Chipped stone artifacts collected from the surface of 41 MC 177 include two cores, a thick biface, a thin biface, one distally beveled tool, and a piece of modified sandstone (grinding slab fragment). The thin biface is unstemmed, triangular in outline, and has a convex base (Group 4, Form 1). The distally beveled specimen is a variety of *Clear Fork* tool (Group 2, Form 1). This tool alone suggests that late Paleo-Indian and/or Early Archaic components are represented at 41 MC 177. However, this is extremely limited information upon which to base a period assignment for such a large site.

41 MC 41

Prehistoric site 41 MC 41 is located on old terrace remnants forming a distinct knoll on the divide between Opossum Creek and Opossum Hollow (Fig. 1). Boundaries established by the THC surveyors show the site to be subcircular in outline with a diameter of 200 m east-west and about 250 m north-south. The site is listed as containing evidence of Pre-Archaic activity (*ibid.*). The site surface supports a dense stand of brush dominated by whitebrush. Other species present are guayacan, prickly pear, Mormon tea, tasajillo, mesquite, yucca, persimmon, and cenizo.

The CAR crew conducted a provenienced surface collection at 41 MC 41. Many of the artifacts were found along a 200 m stretch of dirt road cutting up through the southeast slope of the hill containing the site. Erosion in and alongside this road has exposed substantial amounts of fire-fractured rock, mussel shells, *Rabdotus* shells, debitage, chipped stone tools, and sherds of aboriginal pottery. A total of 46 specimens was collected. Individual locations of 37 of these specimens were recorded on a plane table map of the site (map on file at the CAR-UTSA). Found on the site were four cores, seven thick bifaces, 22 thin bifaces, three distally beveled tools, two unifaces, a trimmed flake, seven pieces of modified sandstone, and one sherd of aboriginal pottery. In this assemblage, a Late Archaic component is suggested by a *Darl* point (Thin Biface Group 1, Form 3, Spec. 19) and one of the distally beveled tools (Group 3, Form 3). Late Prehistoric activity is clearly evidenced by a sherd of prehistoric pottery and to a less reliable extent by distinctive cores (two specimens of Group 4), two unifaces (Group 3, Form 1), and a trimmed flake (Group 1). Other specimens in the collection, most notably 10 unstemmed thin bifaces and biface fragments (Groups 2-5), suggest earlier Archaic components may be present. However, no additional evidence for a Pre-Archaic component is recognized. Modified sandstone artifacts found at 41 MC 41 include two small grinding slab fragments (Group 1, Form 3), four manos (Group 2, Forms 1 and 2), and one piece of grooved sandstone (Group 3).

41 MC 40

Located on the east (left) bank of Opossum Creek, prehistoric site 41 MC 40 is situated a short distance south of 41 MC 41 and just east of 41 MC 39 (Fig. 1).

The three sites are separated from one another by tributary channels at the head of Opossum Hollow. As recorded by the THC surveyors, 41 MC 40 is roughly circular in outline and has a diameter of 200 m. THC analysts listed the site as containing undifferentiated Archaic remains (Lynn, Fox, and O'Malley 1977:44).

Inspection of 41 MC 40 by CAR personnel showed the site to be evidenced by a very light surface scatter of mussel shell fragments, *Rabdotus* shell, sandstone, and debitage. This debris was visible for the most part in a *sendero* running through the site. Outward from this path, little was seen. An unprovenienced surface collection conducted at this site yielded only three thin biface fragments (Group 2, Form 2; Group 4, Form 4; and Group 10). The CAR findings do not alter the chronological assessment presented for the site by THC analysts.

41 MC 45

Prehistoric site 41 MC 45 is located directly west of 41 MC 40 on a narrow terrace surface between the present Opossum Creek channel and one of its relict channels slightly farther to the west (Fig. 1). The southeast end of the site is at the confluence of the relict channel with the creek. It then extends northwestward, paralleling the east (left) bank of the relict channel, for a distance of about 400 m. The efforts of the CAR crew to relocate this site were totally frustrated by the dense brush and grass cover in the site area and the paucity of prehistoric debris on the site surface. No artifacts were collected from this site.

41 MC 44

Prehistoric site 41 MC 44 is located on the west (right) bank of Opossum Creek between sites 41 MC 45 and 41 MC 43 (Fig. 1). As recorded by THC surveyors, this site parallels the creek channel for a north-south distance of 450 m. Its width (east-west) is 150 m. In careful inspection of the entire recorded site area, the CAR crew was able to find prehistoric debris on the surface only in one small area of the site. Over an area of approximately 200 m^2 at the site's north end, a light scatter of fire-fractured rock and debitage was found. Six cores and one thick biface were the only specimens collected from 41 MC 44.

41 MC 43

This prehistoric site is located on the east (left) bank of Opossum Creek between sites 41 MC 44 and 41 MC 42 (Fig. 1). Site limits set by THC surveyors show 41 MC 43 to parallel the creek for a north-south distance of 800 m. It varies from 100-200 m in width. The CAR crew's reconnaissance of this site resulted in location of only two small concentrations of prehistoric debris, one at the extreme north end and the other at the south end. Over the main body of the site intervening between these two areas, only widely scattered pieces of debris were observed. The debris concentration found at the north end of 41 MC 43 consisted of a very light scatter of debitage and fire-fractured rock in a deflated area 30-40 m east of Opossum Creek. A *Langtry* dart point (Thin Biface Group 1, Form 2, Spec. 9) was collected here. This debris scatter covered an area of about 300 m^2. At the far south end of 41 MC 43, fire-fractured rock and debitage were exposed as a light scatter along a 100-m section of the east bank of Opossum Creek. Specimens collected in this area of the site include six cores, three thick bifaces, seven thin bifaces, a distally beveled tool, and two pieces of modified sandstone. Among the thin bifaces are two unstemmed, triangular specimens, one with a straight base (Group 2, Form 1) and another with a convex base (Group 4, Form 1). The distally beveled tool (Group 8, Form 1) is not one of the more common forms found at Choke Canyon. Modified sandstone artifacts consisted of two grinding slab fragments (Group 1, Forms 2 and 3).

THC analysts list 41 MC 43 as containing materials evidencing Pre-Archaic to Late Prehistoric activities (*ibid.*). The CAR investigation produced no recognizable Late Prehistoric material; but the *Langtry* dart point, unstemmed triangular thin bifaces, and distally beveled tool are indicative of cultural activity on the site during Middle Archaic times and perhaps even earlier. Based on distributions of prehistoric cultural debris visible at the time of CAR investigations on this site, it does not appear to be nearly as extensive as originally recorded. The two debris scatters recognized in Phase I work would more accurately be represented as two distinct sites at either end of the area now defining 41 MC 43.

41 MC 42

Located just south of 41 MC 43, 41 MC 42 is a prehistoric site situated on the east (left) bank of Opossum Creek 300-700 m northeast of the creek's confluence with the Frio River (Fig. 1). As defined by THC surveyors, this site measures 400 m northeast-southwest and is about 100 m wide. Pre-Archaic and Archaic (undifferentiated) components are listed for 41 MC 42 as a result of previous investigations (Lynn, Fox, and O'Malley 1977:44). The creek bank in the site area is heavily eroded. Large, deep gullies cut up through the site. Dense brush grows on uneroded areas of the site surface. An unprovenienced surface artifact collection was conducted on this site by the CAR crew. The collection includes eight cores, nine thick bifaces, four thin bifaces, one distally beveled tool, and one uniface. As indicated by the THC analysts, Archaic activity is clearly evidenced at 41 MC 42, but the artifact assemblage does not permit a more specific statement concerning this site's chronologic period affiliation.

41 MC 36

Comparatively small for a Choke Canyon prehistoric site, 41 MC 36 is located on the east (left) bank of Opossum Creek at its confluence withthe Frio River (Fig. 1). Oval in outline shape, the site measures 150 m east-west and 100 m north-south. It is evidenced by a very thin surface scatter of cores, debitage, and chipped stone tools. An unprovenienced surface collection carried out at 41 MC 36 yielded two cores, one thin biface (Group 4, Form 4), and one possible hammerstone. Period of Prehistoric activity on the site cannot be determined on the basis of these limited remains. Likewise, THC analysts were unable to establish period affiliation for 41 MC 36 (*ibid.*).

SITE GROUP 10

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 MC 24 41 MC 25 41 MC 29 41 MC 26	41 MC 22	41 MC 176 41 MC 28 4k MC 174

Eight prehistoric sites comprise Group 10. They are located on the north side of the Frio River valley from 11.0-14.0 km west of Choke Canyon Dam. Six of the eight sites are on the Resaca Ranch. *Resaca* is a Spanish word meaning a "slough" or "oxbow lake" (a south Texas Spanish usage of the word). The ranch is thus very appropriately named, for there are a series of oxbow lakes bordering the present Frio River channel on the southern and eastern sides of the ranch. All six of the prehistoric sites investigated on the Resaca Ranch are situated on terrace banks above oxbows and slough channels just north of the Frio River. Two of the sites are in cleared pastures, and four are in dense brush. The two remaining sites in Group 10 are on ancient, high terraces to the northwest of the sites beside the sloughs. Adjacent to the site group area, the Frio River wings northward into the downstream end of the broad, reverse S-curve known as Yarbrough Bend. The older terrace system containing 41 MC 174 and 41 MC 176 projects southward toward the river bend forming an extensive peninsulalike ridge. Where the terrace ridge surface broadens out to the north of these two sites, there appear a number of playa features known locally as "buffalo wallows." At the foot of the terrace ridge on its east and west sides are relict channel scars, those on the west being quite definitely abandoned courses of the Frio River. The origin of the channel on the east side beneath 41 MC 176 is less certain. It is now primarily a conduit of runoff from higher floodplain surfaces. Between the Frio River on the east and south sides and the high terrace ridge on the north and west sides, there is a large floodplain area. This surface seems relatively flat, but there is a gradual slope from northeast-southwest in the area. Gravels are present in the Site Group 10 area along the older terrace slopes and in the river channel. There are no substantial outcrops of sandstone on the north side of the Frio valley in this area. In sharp contrast are the steep sandstone bluffs on the south side of the valley directly across the river from several of the Group 10 sites. These bluffs are the most likely source of the sandstone commonly found in Group 10 sites.

41 MC 24

Prehistoric site 41 MC 24 covers an L-shaped area following the outside bend of an intermittent drainage channel which runs west-east across the floodplain, turning abruptly to meet the Frio River just south of the site (Fig. 1). The site occurs on the northeast (left) bank of the drainage. The site is located in a pasture and its surface is covered densely with low grasses. As recorded by the THC surveyors, each leg of 41 MC 24 is about 300 m long and 150 m wide. They listed the site as containing evidence of Archaic and Late Prehistoric activities (Lynn, Fox, and O'Malley 1977:44).

Three shovel tests and two 1-m^2 test pits were excavated at 41 MC 24. As a result of findings made in the shovel tests, both test pits were placed at locations along the southern leg of the site.

Test Pit 1 was located at the far south end of 41 MC 24 at a point approximately 100 m east of the drainage channel. The Frio River channel is about 200 m southwest of the test pit location. Five 10-cm thick levels of matrix were excavated from this unit. The matrix was described as a dark grayish brown clayey silt in Levels 1 and 2. In Level 3, a soft, dark gray, ashy matrix was encountered in conjunction with a habitational feature. This ashy soil was also present in Level 4. In Level 5, the matrix became a light brown clayey silt. Debris recovered from Test Pit 1 is divided into two assemblages representing Upper and Lower Horizons in the deposit. The Upper Horizon contains debris from Levels 1-3. The Lower Horizon contains debris from Levels 4 and 5. Rates of recovery for selected classes of debris for these two horizons were as follows:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	504	324
Fire-Fractured Rock Weight (grams)	132	338
Mussel Shell Umbo Count	91	117
Mussel Shell Weight (grams)	225	439
Rabdotus Shell Count	37	54
Bone Weight (grams)	0	0
Primary Flake Count	0	0
Secondary Flake Count	5	8
Tertiary Flake Count	12	16
Chip Count	28	28

Also found in Test Pit 1 were: a core (Group 3, Level 4) and a piece of grooved sandstone (Modified Sandstone Group 3, Spec. 9, Level 4).

A habitational feature consisting of two tightly packed clusters of sandstone rock was found in Test Pit 1. It was first encountered in Level 3 and continued down into Level 4. As initially exposed, the feature appeared as two distinct clusters of stone, one larger cluster occurring in the east central area of the unit and the smaller cluster in the western corner of the square (Fig. 30,e and 33). The larger cluster had dimensions of 40 x 55 cm while the smaller cluster measured 25 x 25 cm. The large cluster contained about 25 stones. The small cluster had eight. It was incorrectly assumed that this feature was a single-layered construct. As removal of the upper layer of stones in the larger cluster began, more stones appeared beneath. Further work with the feature revealed that the stones had apparently been packed into a shallow pit. The surface from which the pit originated could not be determined. However, it must have been at least 18 cm deep, this being the vertical difference between the top of the highest stone and the bottom of the pit (estimated to occur at 44 cm below surface). It appears that the stones were burned elsewhere (burning evidenced by fracturing and oxidation) and then placed in the pit. Judging from the appearance of the matrix into which the pit was dug, there was no fire or heat in the pit. Along with the sandstones, the pit contained a piece of grooved sandstone (Group 3, Spec. 9 mentioned above), a large nodule of baked clay, some mussel shell, and scattered bits of charcoal. Scattered mussel shells also occurred around the pit, most frequently just above the floor of Level 4. Of general interest is the fact that this well integrated, apparently intact feature was found in an open field which was probably cleared of brush in the recent past. The feature seems to have suffered no ill effects as a result of the brush-clearing activities on the site surface.

Test Pit 2 was placed roughly 30 m northwest of Test Pit 1. The unit was excavated to a depth of 70 cm below surface, but only the upper 20 cm of deposit was excavated in 10-cm thick levels and screened. The matrix was described as dark grayish brown clayey silt from surface to a depth of 50 cm. The matrix then lightened in color to a grayish yellow silt containing much calcium carbonate. Cultural debris was found only in the top 20 cm of deposit in Test Pit 2. Rates of recovery for selected classes of debris were:

Sandstone Weight (grams)	34
Fire-Fractured Rock Weight (grams)	38
Mussel Shell Umbo Count	8
Mussel Shell Weight (grams)	17
Rabdotus Shell Count	10
Bone Weight (grams)	0
Primary Flake Count	0
Secondary Flake Count	1
Tertiary Flake Count	0
Chip Count	1

No other artifacts were found in Test Pit 2.

Due to the thick grass cover over most of the site, few artifacts were collected from the surface of 41 MC 24. One core, one thick biface, a uniface, and three pieces of modified sandstone (Group 1, Forms 1 and 3; Group 2, Form 2) were the only specimens collected.

Data recovered during the CAR investigation at 41 MC 24 neither support not alter THC analysts' recognition of Archaic and Late Prehistoric components on the site. Excavations revealed one unusual habitational feature, but were not otherwise notably productive. Cultural debris appears to be contained within the upper 20-40 cm of deposit over much of the site. Remnants of subsistence activities are again limited to mussel shell, *Rabdotus* shell, and seed or nut grinding implements. Sandstone, fire-fractured rock, and debitage were recovered in relatively low amounts at 41 MC 24. This suggests that the site was somewhat remote from sources of such materials.

41 MC 22

Southwest across the drainage channel some 700 m from 41 MC 24 is the open prehistoric site 41 MC 22 (Fig. 1). The site parallels the western (left) bank of a relict Frio River channel scar for a northeast to south distance of 500 m. The site is up to 100 m wide based on boundaries established as THC surveyors recorded the site. Vegetation on the site includes a thin scatter of brush and grass-covered clearings. Mesquite, spiny hackberry, guayacan, prickly pear,

41MC24-Test Pit 1
Plan of Feature 1
Burned Rock Concentration

ALL ROCKS ARE SANDSTONE

ROCKS RESTED ON SURFACES
RANGING IN DEPTH FROM
25 TO 37 CM BELOW GROUND
SURFACE AT WEST CORNER.

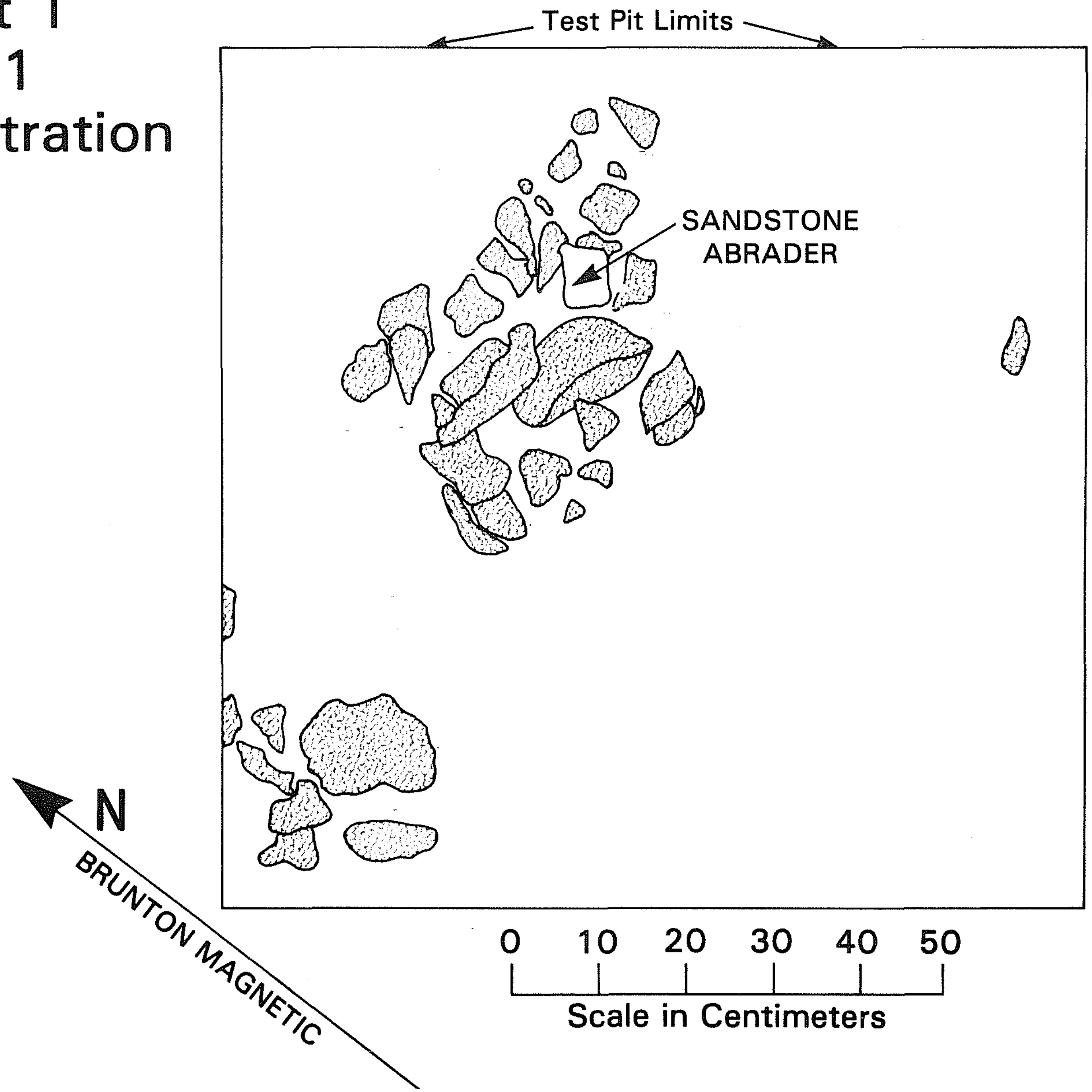


FIGURE 33

tasajillo, whitebrush, elm, and retama grow on and nearby the site. The site is bisected down its length by a field road. A moderate amount of erosion has occurred between the road and the channel scar. It was in this eroded area that most of the prehistoric cultural debris was observed.

Inspecting the surface of 41 MC 22, the CAR crew found debris to be restricted primarily to a 20-m wide band following the channel bank for about 100 m in the central area of the site between the field road and the channel. In addition, there is a distinctly separate concentration of surface debris scattered over a smaller area at the extreme northeast end of the site within 30 or 40 m of the present Frio River channel. A provenienced surface collection conducted by the CAR crew yielded 13 cores, two thick bifaces, six thin bifaces, a distally beveled tool, one uniface, two trimmed flakes, three pieces of modified sandstone, and a possible adze or celt fragment. The thin bifaces include an unclassified stemmed dart point (Group 1, Form 2, Spec. 12); an *Edwards* arrow point (Group 1, Form 5, Spec. 7); and three unstemmed specimens, two of which are triangular in outline with straight bases (Group 2, Form 1), while the third is triangular with a convex base (Group 4, Form 1). The distally beveled tool is of the small, subrectangular variety (Group 3, Form 3). Modified sandstone found at 41 MC 22 includes two grinding slab fragments (Group 1, Form 2) and a mano (Group 2, Form 2). A quite unusual artifact found on this site is what appears to be the bit of a ground stone celt or adze. The specimen is made of hematite-cemented sandstone (see Modified Quartzite and Igneous Rocks, Spec. 4).

Artifacts gathered during the CAR investigation at 41 MC 22 indicate that cultural debris was deposited at the location as a result of activities during Late Archaic and Late Prehistoric times. It is suggested that a Late Archaic component is represented by the stemmed dart point, unstemmed triangular bifaces, and the small distally beveled tool. Late Prehistoric activity is demonstrated by the *Edwards* arrow point and, less certainly, by the uniface and trimmed flakes found. Mussel shell and *Rabdotus* shell, a burned turkey bone, and the sandstone grinding implements are presumed subsistence-related residues observed and/or collected on the site surface. The number of cores found on the site suggests that a cobble source, perhaps a gravel bar exposed in the river channel, was present near 41 MC 22 during periods of prehistoric activity.

41 MC 176

Prehistoric site 41 MC 176 is situated on the slopes and upper edge of the high, ancient terrace system north of the Frio River in the Site Group 10 area (Fig. 1). The terrace trends east-northeast to west-southwest in the site area. As recorded by THC surveyors, 41 MC 176 follows the terrace for approximately 1.0 km and is 250 m in width. The upper end of the relict channel scar beside which 41 MC 24 is situated runs along the foot of the terrace slope below 41 MC 176. There is a difference in elevation of approximately 9 m between the channel and the terrace top. The Frio River is no closer than 1.5 km to the site. A thick stand of brush grows on the site surface. Mesquite, prickly pear, guayacan, tasajillo, acacias, agarita, and grasses are present. Just north of the site on the level expanse of the high terrace are the "buffalo wallows" (playa features) mentioned previously.

In reconnaissance of 41 MC 176, the CAR crew found prehistoric debris to be light and widely scattered. Debris consisted primarily of debitage, cores, and a small number of chipped stone tools. An unprovenienced surface collection conducted on the site produced four cores, two thick bifaces (Group 6, Form 1), eight thin bifaces, and one piece of modified sandstone (a mano--Group 2, Form 2). This limited collection permits no estimate of period of prehistoric activity on the site.

41 MC 29

Due south from 41 MC 176 are four prehistoric sites situated along the northern edge of a relict channel system of the Frio River. The westernmost of these four sites is 41 MC 29 (Fig. 1). The site occurs at the terrace edge overlooking a channel scar in which a lake forms during periods of flooding and/or heavy local rainfall (Fig. 30,b). Site 41 MC 29 is on the north (left) bank of the slough. As recorded by the THC surveyors, the site measures 250 m northeast-southwest and 150 m northwest-southeast. The site is covered with a moderately thick stand of brush interspersed with open, grass-covered clearings. Erosion has been severe along the terrace slope at the site's north side. Back from the terrace edge, there are localized areas of surface deflation, but substantial portions of the site surface remain apparently undisturbed. THC analysts listed 41 MC 29 as containing evidence of undifferentiated Archaic-aged activity (*ibid.*).

Surface scatters of prehistoric debris observed by CAR personnel as the site was initially inspected resulted in the excavation of three 1-m^2 test pits in the northeast central area of the site (Fig. 34). It was in this general area that the most substantial accumulations of surface debris were concentrated. Examination of gully walls along the terrace edge south of this area revealed that debris was occurring to depths of 50 cm or more below the site surface. Backdirt beside two potholes in the site (Fig. 34) contained modified sandstone, debitage, chipped stone tool fragments, and mussel shell.

Test Pit 1 was placed at a location about 40 m north of the terrace edge (Fig. 34). Discovery of a habitational feature in Test Pit 1 resulted in excavation of a contiguous 1-m^2 unit designated Test Pit 3. This second unit permitted further exposure of the feature revealed in Test Pit 1. Findings made in the two units are presented concurrently. Six 10-cm thick levels of matrix were excavated from each unit. The matrix was described as dark brown sandy clay loam. Its color lightened to brown in Level 4 and to a tannish brown midway through Level 6. Debris recovered from Test Pits 1 and 3 is divided into two assemblages designated as Upper and Lower Horizons. The Upper Horizon contains debris found in Levels 1-3. The Lower Horizon contains the debris from Levels 4-6. Rates of recovery for selected categories of debris for the two horizons recognized in Test Pits 1 and 3 were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	504	2232
Fire-Fractured Rock Weight (grams)	71	201

Mussel Shell Umbo Count	24	13
Mussel Shell Weight (grams)	101	45
Rabdotus Shell Count	14	69
Bone Weight (grams)	1	4.5
Primary Flake Count	0	1
Secondary Flake Count	5	3
Tertiary Flake Count	22	8
Chip Count	26	6

Other artifacts found in Test Pit 1 include a core (Group 6) and an arrow point fragment (Thin Biface Group 1, Form 7, Spec. 28), both in Level 1. In Test Pit 3, bones of turtle (Levels 3 and 4) and pocket gopher (Level 4) were identified.

A concentration of sandstone rocks designated Feature 1 was encountered in Levels 5 and 6 of Test Pits 1 and 3 (Fig. 35). The feature consisted of over 140 pieces of sandstone weighing a total of 9625 grams (only about 70 of the larger rocks are shown in Fig. 35). The sandstone was clustered primarily over an area measuring 75 cm north-south and 60 cm east-west. A few stones formed small satellite clusters outside this main concentration. Corresponding to the main concentration of sandstone was an area of dark grayish brown, ashy matrix which contained carbon mottling and had a general burned appearance. It stood out in clear contrast to the surrounding light brown matrix. Mussel shells and *Rabdotus* shells occurred in small numbers through the feature fill. A substantial sample of carbon was collected from amidst the rocks of Feature 1. This rock cluster was basically a single layer construct. No pit was recognized beneath the rocks.

The carbon sample collected from Feature 1 at 41 MC 29 was large enough to permit both wood species identifications and radiocarbon assay. Assay of the carbon yielded a radiocarbon date of 390-270 B.C. (TX-2873, MASCA corrected) for Feature 1. Incredibly, the wood of four different trees or plants--mesquite, spiny hackberry, live oak, and juniper--was burned to form the charcoal found in Feature 1. The presence of these four species together in a cultural feature dating to such an early time is extremely significant. (See Appendix IX, Table 37).

Test Pit 2 at 41 MC 29 was located near the terrace edge 45 m west of Test Pits 1 and 3 (Fig. 34). The unit was placed on apparently undisturbed ground at the head of a shallow gully where much prehistoric debris had eroded out. Six 10-cm thick levels of matrix were excavated. The matrix was described as dark gray-brown sandy clay loam. In Level 4, the matrix color changed to light gray-brown. Debris recovered in this unit has been divided into assemblages representing Upper and Lower Horizons according to the same level combinations used for Test Pits 1 and 3 above. Rates of recovery for selected classes of debris for these two horizons were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	96	361
Fire-Fractured Rock Weight (grams)	86	6
Mussel Shell Umbo Count	20	11
Mussel Shell Weight (grams)	374	54
Rabdotus Shell Count	1	2

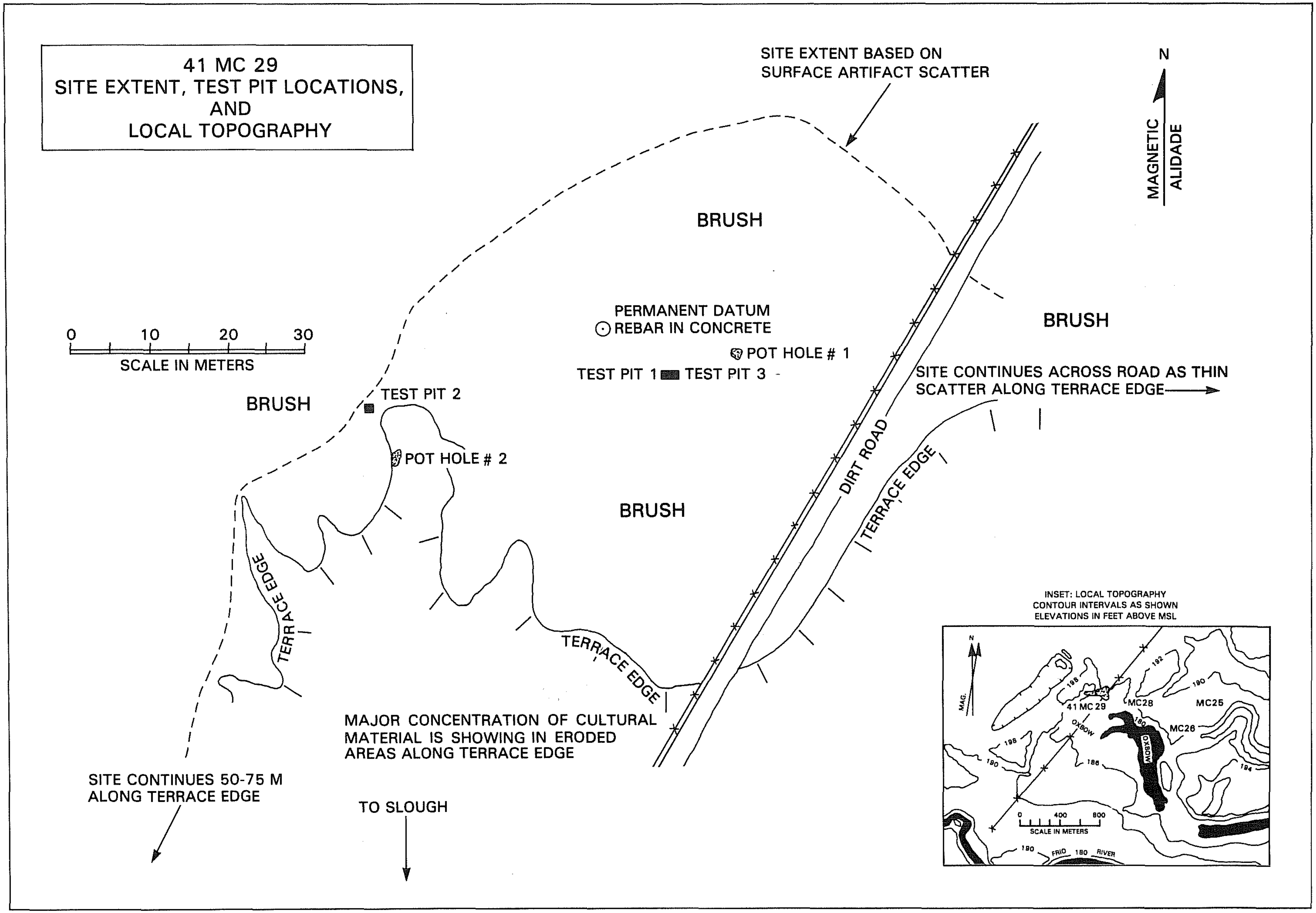

41 MC 29
SITE EXTENT, TEST PIT LOCATIONS, AND LOCAL TOPOGRAPHY
SITE EXTENT BASED ON SURFACE ARTIFACT SCATTER
N
MAGNETIC
ALIDADE
BRUSH
BRUSH
BRUSH
BRUSH
0
10
20
30
SCALE IN METERS
PERMANENT DATUM REBAR IN CONCRETE
POT HOLE # 1
TEST PIT 1
TEST PIT 3
TEST PIT 2
POT HOLE # 2
SITE CONTINUES ACROSS ROAD AS THIN SCATTER ALONG TERRACE EDGE
DIRT ROAD
TERRACE EDGE
TERRACE EDGE
TERRACE EDGE
MAJOR CONCENTRATION OF CULTURAL MATERIAL IS SHOWING IN ERODED AREAS ALONG TERRACE EDGE
SITE CONTINUES 50-75 M ALONG TERRACE EDGE
TO SLOUGH
INSET: LOCAL TOPOGRAPHY
CONTOUR INTERVALS AS SHOWN
ELEVATIONS IN FEET ABOVE MSL
N
MAG.
41 MC 29
MC28
MC25
MC26
OXBOW
OXBOW
192
190
198
198
190
186
180
194
0
400
800
SCALE IN METERS
190
FRIO
180
RIVER

FIGURE 34

Bone Weight (grams)	0	3.5
Primary Flake Count	0	0
Secondary Flake Count	30	2
Tertiary Flake Count	99	10
Chip Count	119	19

A thick biface (Group 6, Form 2) was recovered from Level 3 of Test Pit 2. A jackrabbit bone was found in Level 2.

Collected from the surface of 41 MC 29 were four cores, two thick bifaces, eight thin bifaces, three distally beveled tools, and nine pieces of modified sandstone.

In addition to the arrow point found in Test Pit 1, three other fragmentary arrow points were surface collected. All appear to have been stemmed points; however, the stems are missing from all specimens. These points are remarkable in that all exhibit pronounced blade serrations (see Thin Biface Group 1, Form 7, Specs. 28 and 29). David Naylor, a local rancher and artifact collector, found four arrow points at 41 MC 29. Three of his specimens also exhibit deep blade serrations. The fourth, identified as a *Scallorn* point, does not have serrations. One of the points with blade serrations has an expanding stem characteristic of the *Scallorn* type. Such arrow points with serrated blades occur elsewhere at Choke Canyon and in southern Texas, but the incidence at 41 MC 29 is unusually high. Their occurrence on the site indicates the presence of a Late Prehistoric component. Notably absent from the artifact assemblage representing this site are shreds of aboriginal pottery. This may simply be the result of sampling bias, but the possibility that a nonceramic or aceramic cultural group processing the bow and arrow occupied this location should also be considered.

Other thin bifaces found at 41 MC 29 include a proximal fragment of an unstemmed triangular point having a straight base (Group 2, Form 2) and an unstemmed oval biface (Group 4, Form 3).

The three distally beveled tools found at 41 MC 29 are of the small subtriangular and subrectangular varieties (two specimens of Group 3, Form 2 and one of Group 3, Form 3). Although surface collected, it is likely that these tools represent Late Archaic activities on the site, probably dating to the time period (390-270 B.C.) determined for Feature 1.

Implements made of sandstone found at 41 MC 29 include six grinding slab fragments (three specimens each of Group 1, Forms 2 and 3), two manos (Group 2, Forms 1 and 2), and a piece of grooved sandstone (Group 1). Almost all of these specimens came from the backdirt of Pothole #1 (Fig. 34) located east of Test Pits 1 and 3.

The data gathered at 41 MC 29 indicate the presence of Late Archaic and Late Prehistoric components on the site. Late Prehistoric debris is contained in the upper 20-30 cm of deposit on the site, while the Late Archaic living surface(s) occur between 40-60 cm below modern ground level. Discovery of carbon derived from mesquite, spiny hackberry, live oak, and juniper in a hearth feature dating to 390-270 B.C. is of great importance, not only by pointing to Late Archaic cultural activity on the site, but also in establishing such tree and plant species as possible constituents of local prehistoric vegetational communities.

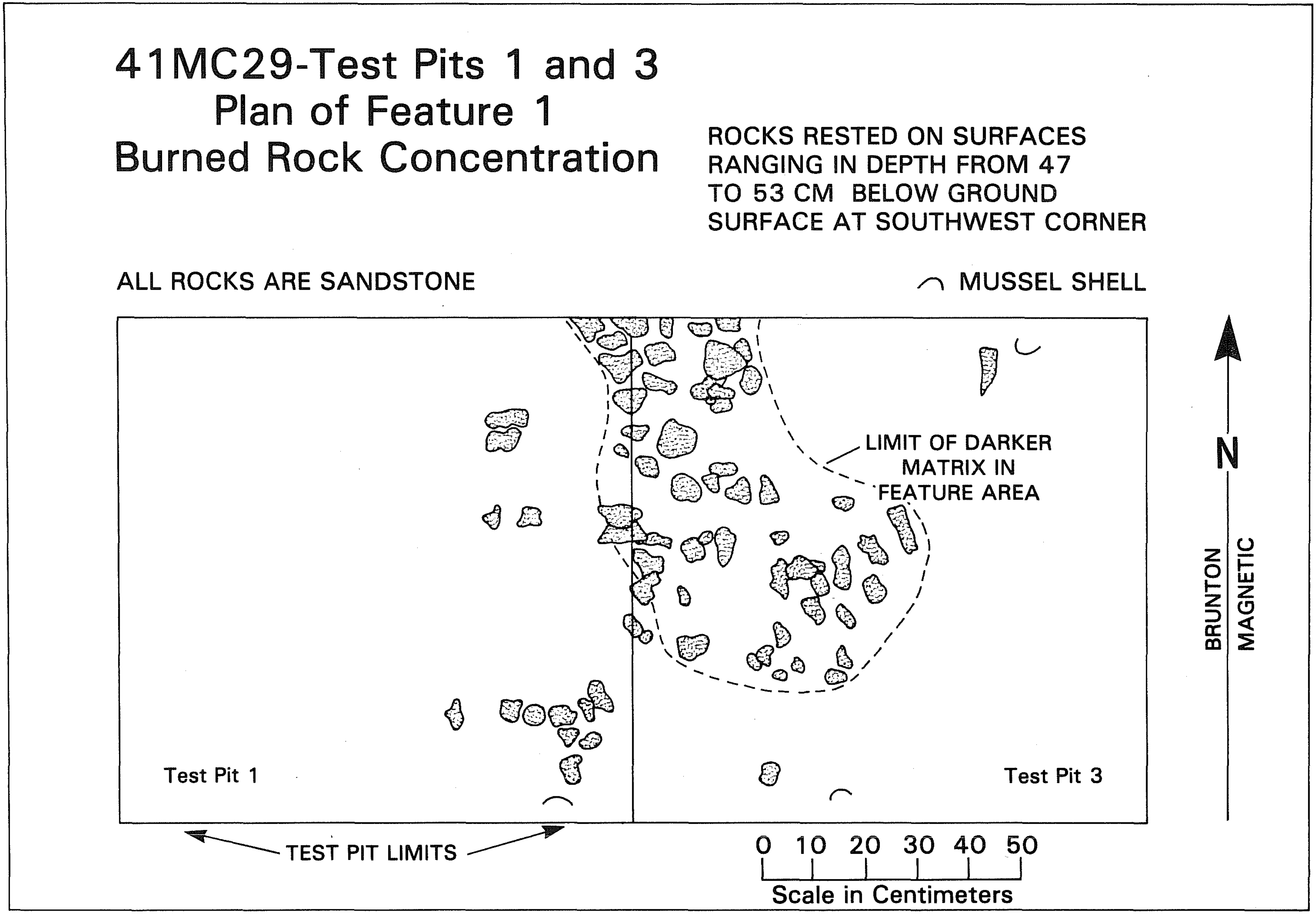

41MC29-Test Pits 1 and 3
Plan of Feature 1
Burned Rock Concentration
ROCKS RESTED ON SURFACES RANGING IN DEPTH FROM 47 TO 53 CM BELOW GROUND SURFACE AT SOUTHWEST CORNER
ALL ROCKS ARE SANDSTONE
MUSSEL SHELL
LIMIT OF DARKER MATRIX IN FEATURE AREA
Test Pit 1
Test Pit 3
TEST PIT LIMITS
0 10 20 30 40 50
Scale in Centimeters
N
BRUNTON
MAGNETIC

FIGURE 35

Probable subsistence-related debris found on this site includes mussel shell, *Rabdotus* shell, bones of turtle and jackrabbit, and seed and nut grinding implements. The gopher remains found in Test Pit 3 are believed to be a natural introduction.

41 MC 28

Southwest from 41 MC 29 along the north (left) bank of the same relict channel scar is prehistoric site 41 MC 28 (Fig. 1). As recorded by THC surveyors, this site measures 400 m east-west and is 100 m wide. Thick brush grows over most of the site surface. Mesquite, whitebrush, persimmon, soapbush, allthorn, yucca, and grasses are present. The slough bank is about 3 m high and is badly eroded. The site overlooks a pond in the relict channel which holds water in times of river flooding or heavy local rains (Fig. 30,b). THC analysts listed 41 MC 28 as containing a Late Archaic component (Lynn, Fox, and O'Malley 1977: 44).

An unprovenienced surface collection was conducted at 41 MC 28 by the CAR crew. The single specimen found on this site was a distally beveled tool (Group 3, Form 2). In accord with THC findings, a Late Archaic component is indicated.

41 MC 26

South across the relict channel from 41 MC 28 is a low levee or terrace remnant which occurs within a relict channel braid, i.e., the single channel running beneath 41 MC 29 forks into two channels which run north and south of the low levee and then reconverge a short distance to the east. On the low terrace inside this channel braid is prehistoric site 41 MC 26 (Fig. 1). As defined by THC surveyors, 41 MC 26 is oval shaped, measuring 300 m east-west and 200 m north-south. Brush cover is extremely dense on this site. Whitebrush, large mesquites, prickly pear, persimmon, elms, yucca, and grasses are thick.

During reconnaissance activities at 41 MC 26, the CAR crew observed prehistoric debris on the site surface only in a limited area at the extreme west end of the site. Erosion along a dirt road running through this area had exposed a small amount of mussel shell, fire-fractured rock, and some pieces of modified sandstone. A 1-m^2 test pit was excavated in this part of the site. In three 10-cm thick levels of matrix removed from the unit, only 24 *Rabdotus* shells and some wood rat bones were found. Additional shovel tests excavated on the site revealed little or no cultural debris in the subsurface. A grinding slab (Modified Sandstone Group 1, Form 1) was the only artifact collected on this site.

41 MC 25

Prehistoric site 41 MC 25 is located on the north (left) bank of the same relict channel system beside which the above three sites occur. The relict channel meets the Frio River immediately below (south of) 41 MC 25. The site rests on a high, relatively flat terrace forming a distinct bluff above the slough and the river. The site measures 200 m east-west and 150 m north-south according to boundaries set by the THC surveyors. The terrace edge on the south side of the site is heavily eroded. The site area is covered with dense brush.

Prehistoric debris was densest on the surface in the southeastern part of 41 MC 25, the area of the site closest to the Frio River. Mussel shell, snail shell, fire-fractured rock, sandstone, cores, and debitage were observed eroding from gully walls and on eroded ground along a dirt road running north-south through the site, down the terrace slope, and into the floodplain. A 1-m^2 test pit was excavated on undisturbed ground atop the terrace adjacent to this area of maximum surface debris concentration. Found in these five levels were: five grams of fire-fractured rock, one gram of mussel shell, 23 *Rabdotus* shells, four secondary flakes, and two tertiary flakes. These materials occurred more-or-less uniformly down through the deposit.

Two distally beveled tools (Group 3, Form 2 and Group 4) were collected from the surface of 41 MC 25. These artifacts suggest that debris evidencing the site was generated during Late Archaic times.

41 MC 174

A very large prehistoric site, 41 MC 174 is situated along the western edge of the high, ancient terrace ridge at the western side of the Site Group 10 area (Fig. 1). At the foot of the terrace ridge, running north-south, is a relict course of the Frio River. The Frio River also parallels the ridge, but is 700-800 m to the west. The extreme southern end of the ridge, and of 41 MC 174, is within 100 m of the Frio after the river swings abruptly to the east coming out of the north-south leg of Yarbrough Bend. Site limits defined by THC surveyors give 41 MC 174 a north-south length of 1.5 km and a width of from 200-300 m. Back away from the terrace edge, the site is in an open, grass-covered pasture. Scattered brush thickets grow along the terrace slope marking the western edge of the site. Historic structures stand at either end of the site. The structure at the north end was determined to be of historical significance and was assigned the permanent designation of 41 MC 175. THC analysts listed 41 MC 174 as containing undifferentiated Archaic remains (*ibid.*).

Surface reconnaissance performed on 41 MC 174 revealed prehistoric debris to be very widely and thinly scattered down the length of the site. Most of the debris was seen at the upper edge of the terrace slope along the site's western margin. Fire-fractured rock, sandstone, mussel shell, *Rabdotus* shell, cores, debitage, and a few chipped stone tools comprised the surface debris accumulations. Several distinct concentrations were noted down the site. They were separated from one another by gaps wherein little or no cultural material was seen.

An unprovenienced surface collection produced two cores, seven thick bifaces, seven thin bifaces, four distally beveled tools, and one uniface. Among these specimens, three of the thin bifaces (Group 1, Form 3, Spec. 43; Group 2, Form 2; Group 4, Form 4) and the four distally beveled tools indicate that cultural activities occurred on the site from Early to Late Archaic times.

SITE GROUP 11

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 MC 55	41 MC 56	41 MC 58
			41 MC 57	41 MC 59
				41 MC 54
				41 MC 224

Site Group 11 contains seven prehistoric sites located on the south side of the Frio River valley from 13.0-15.0 km west of Choke Canyon Dam. Five of the sites are situated along the edge and slopes of the southern valley margin. The land surface composition varies considerably over this 1.85 km-long segment of the valley margin. The slopes trend east-west and are quite steep. Elevational differences between the floodplain and upland edge are on the order of 20-24 m. The geologic formation in the area is the Jackson Group. It is expressed on the surface variably as ledges of sandstone, less consolidated sands and clays, and, at the west end of the study area, as fossil reef exposures. Draped over the slopes are ancient alluvial terrace deposits consisting of silty sands, clays, and extensive lag gravel deposits. These less-consolidated deposits have been severely eroded. Gullies and widespread areas of deflation are common at the foot of the valley margin slopes. Broad, deep gullies have also been cut higher up on the valley margin. The erosion has had a severe impact on archaeological remains in the area. The upland edge and valley margin slopes are covered with almost impenetrable stands of blackbrush interspersed with guajillo and other upland brush species (Fig. 36,d). In deeper alluvial and colluvial deposits at the foot of the valley margin grow large mesquites, whitebrush, prickly pear, allthorn, acacias, yucca, and grasses. Three upland drainage channels feed down to the Frio River from valley margin slopes along the southern side of the study area. Channels at the east and west ends run almost straight north into the river. The third channel originates near the west end, runs along the foot of the valley margin for more than a kilometer, then turns northeast to meet the river along the eastern side of the study area. This particular channel may possibly be a relict course of the Frio River. Two of the Group 11 sites are down on the floodplain. One is on the north side of the above-mentioned east-west drainage channel. The other is on a terrace levee system above an abandoned channel scar forming a major lake south of the present course of the Frio River. On the flat terrace surfaces back away from the river, parts of the land have been cleared for cultivation and pasturage. Other areas support very dense stands of whitebrush and large mesquite trees. Along the abandoned channel lake there is a well-developed riparian forest containing mesquite, elms, and a grove of remarkably large cottonwood trees. The Frio River flows along the north side of Site Group 11. Just upstream, it swings northward into the lower end of Yarbrough Bend.

41 MC 56

Prehistoric site 41 MC 56 is located along the lower reaches of the valley margin slope (Fig. 1). It is bounded on the west by a gravel road running north down into the floodplain. Just north of the site is the east-west drainage channel. Site limits defined by the THC survey crew show 41 MC 56 as being circular in outline with a diameter of 150 m. The site surface slopes gently from south-north and is cut by several well-developed gullies running south-north through the area. The site surface supports scattered stands of mesquite, whitebrush, allthorn, acacias, prickly pear, yucca, and grasses.

As 41 MC 56 was inspected by the CAR crew, prehistoric debris was seen in the walls and on the floors of gullies cutting through the site and in flat, deflated areas between the gullies. Mussel shell, fire-fractured rock, sandstone, cores, debitage, and chipped stone tools were noted. Surface debris was concentrated primarily over an area measuring 50 m east-west and 100 m north-south in the central part of the site. Two separate concentrations of material--one of fire-fractured rock and the other of debitage--and the distribution of chipped stone artifacts around them suggested that a provenienced collection might yield useful information.

A surface collection conducted at 41 MC 56 yielded 23 artifacts including five cores, one thick biface, six thin bifaces, one distally beveled tool, three trimmed flakes, and seven pieces of modified sandstone. Individual locations of 20 of these specimens were recorded on a plane table map of the site (on file at the CAR-UTSA). Potential time-diagnostic specimens in this assemblage include a stemmed thin biface classified as a *Morhiss* point (Group 1, Form 2, Spec. 3), an unstemmed thin biface with a triangular outline and convex base (Group 4, Form 1), and a distally beveled tool (Group 8, Form 3). Activity on the site during the Middle Archaic is tentatively indicated by these forms.

Possible subsistence-related remains recognized at 41 MC 56 include mussel shell, *Rabdotus* shell, and a number of sandstone grinding implements. Three grinding slab fragments (Modified Sandstone Group 1, Forms 1 and 2) and a mano (Group 2, Form 2) were found on the site. Three pieces of grooved sandstone (Group 3) were also collected.

As previously mentioned, two distinct concentrations of cultural debris were seen on the surface of 41 MC 56. One of these features is a loose, circular scatter of sandstone rocks which may once have formed a hearth. Diameter of the scatter is about three meters. It is located in the area where most of the surface artifacts were collected. The second feature is located 40 m north (downhill) from the sandstone cluster. It consists of a locally denser concentration of debitage, generally circular in outline with a diameter of eight meters. Only one thin biface fragment (Group 10) was found in or near this feature.

41 MC 57

West across the gravel road from 41 MC 56 is prehistoric site 41 MC 57 (Fig. 1). This site occurs in a setting similar to 41 MC 56 except that it extends farther up the valley margin slope. As recorded by the THC survey crew, 41 MC 57 measures 300 m east-west and from 100-200 m north-south. The site is bounded on the east by the upper reaches of the drainage channel which runs east along the base of the valley margin slope. On the site's west side, there is an extensive gully system which heads up another drainage channel running north to the Frio River.

Figure 36. *Photographs Taken in the Vicinity of 41 MC 9, 41 MC 55, 41 MC 56, and 41 MC 19.*

a. View looking north-northwest across 41 MC 9 west of Calliham. The site is located in a well-maintained pasture.

b. Looking north-northeast up the slough beside 41 MC 55. The Frio River channel runs behind the line of trees in the background. This slough holds water more-or-less continuously.

c. An outcrop of Jackson Group sandstone immediately below 41 MC 223 on Mason Point. Sandstone from similar outcrops was used extensively by prehistoric people in grinding slabs, manos, hearth construction, and abrading tools. Historic settlers used such sandstone for house foundation and chimney construction.

d. View looking west-northwest out across the Frio River Valley from the valley margin in the vicinity of sites 41 MC 56 to 41 MC 59. Most of the vegetation visible is blackbrush. To the left is a cuesta formed by resistant outcrops of the Jackson Group. Such features are common along the south side of the valley at the western end of Choke Canyon.

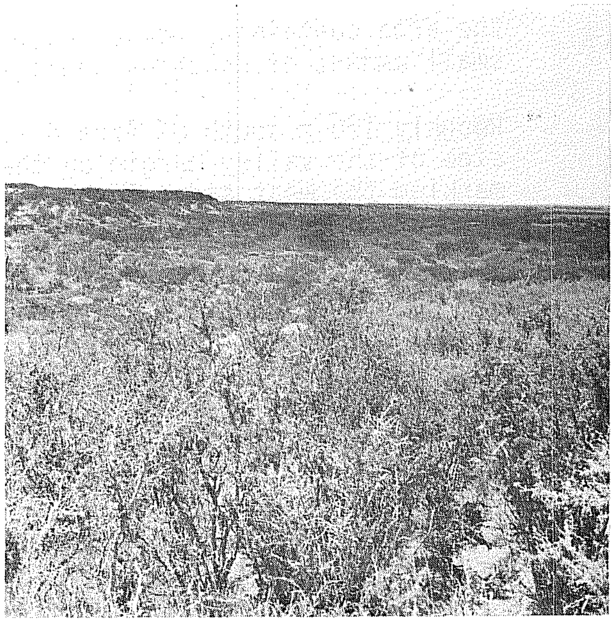
e. A typical view of the Frio River at normal stage. This channel stretch is just below 41 MC 19.

f. View looking southwest across 41 MC 19 to Skillet Mountain at the western end of the reservoir. The vast, flat expanse in the foreground is a floodplain pasture on the Bracken Ranch. The valley margin in the background is composed of Jackson Group cuestas.

a

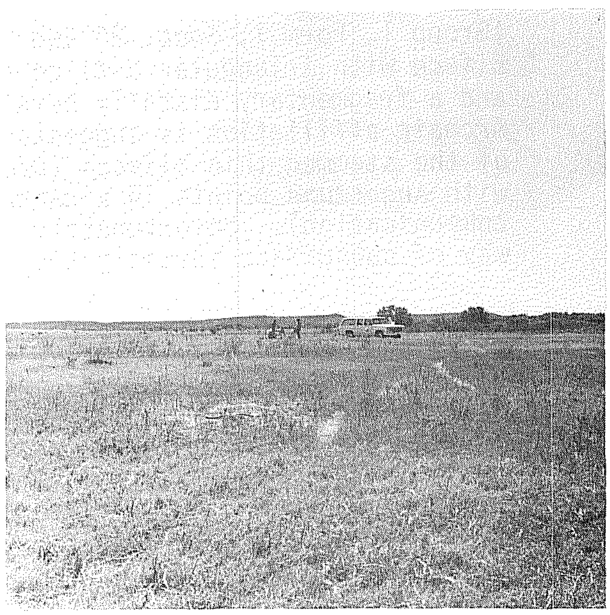
b

c



d

e



f

Mesquite, prickly pear, whitebrush, mountain laurel, and grasses grow at lower elevations on the slope containing the site. Higher up, in the southern reaches of the site, blackbrush, mesquite, yuccas, and cactus are present.

Reconnaissance activities at 41 MC 57 resulted in recognition of two areas of prehistoric debris concentration on the site. One concentration, designated Area A, is located on the gentle terrace slope at the foot of the valley margin. Severe sheet erosion and gullying in this part of the site have exposed three tight clusters of sandstone and two less tightly concentrated scatters of fire-fractured rock. All are assumed to be remnants of prehistoric hearths. Two of the sandstone clusters and one fire-fractured rock scatter are situated within 15 m of one another along the northern edge of the site. The second fire-fractured rock concentration is 15 m to the east of these three features. The third sandstone cluster is 30 m to the south. The sandstone hearths range from 75 cm-1.0 m in diameter. Firing is evidenced by reddish and grayish hues to the sandstone. Burned earth is visible beneath one of the features, but no carbon was evident. Cultural debris, mostly debitage, occurs very lightly over the area containing these features. Significantly, no mussel shell and only a small amount of *Rabdotus* shell was noted in this area.

Roughly 120 m south of Area A at 41 MC 57, Area B is situated high up on the side of the valley margin on the eastern slope of the extensive gully system marking the west side of the site. Here, in an area of less than 100 m^2, a subsurface "midden" zone about 30 cm thick was seen in gully walls and remnant pedestals of deposit formed by severe erosion. Burned sandstone, mussel shell, debitage, cores, chipped stone tools, and *Rabdotus* shells were observed on gully floors beneath the zone and appear to have eroded from it.

Twenty-one artifacts were collected from the surface of 41 MC 57. Individual locations of 13 of these specimens, as well as locations for the five features found on the site, were recorded on plane table maps (on file at the CAR-UTSA). The collection contains six cores, one thick biface, 11 thin bifaces, two distally beveled tools, and one uniface. Potential time-diagnostic artifacts found in Area A include stemmed thin bifaces, one classified as a *Langtry* (?) dart point (Group 1, Form 2, Spec. 10) and the other as an *Ensor* dart point (Group 1, Form 3, Spec. 7). These specimens suggest that the Area A remains are the result of Middle and/or Late Archaic activities. Area B yielded some quite unusual chipped stone specimens. These include two at present unclassified stemmed thin bifaces (Group 1, Form 1, Spec. 20 and Group 1, Form 3, Spec. 38); an unstemmed thin biface with triangular outline and straight base (Group 2, Form 1, Spec. 24); and a fragmentary distally beveled tool (Group 5). A late Paleo-Indian or Early Archaic affiliation is suggested for these remains based on similarity of one of the stemmed thin bifaces (Group 1, Form 1, Spec. 20) to specimens found along with *Angostura* points in a cache at 41 LK 28 (Charles M. Johnson, II, personal communication). Unfortunately, Area B is so severely eroded that little in the way of subsurface investigation is possible.

41 MC 59

Directly above (south of) 41 MC 56, prehistoric site 41 MC 59 is situated on the upland edge of the valley margin (Fig. 1). As defined by THC surveyors, the site is subcircular in outline with a diameter of about 150 m. Much of the site surface is covered by an extremely thick growth of blackbrush.

An unprovenienced surface collection was conducted at 41 MC 59 by the CAR crew. Specimens collected were: three thick bifaces, two thin bifaces (Group 4, Form 4 and Group 5), and one distally beveled tool (Group 3, Form 1). Based only on the distally beveled tool, remains evidencing 41 MC 59 are tentatively suggested to be the result of Late Archaic activity.

41 MC 58

A short distance east along the valley margin slope from 41 MC 56 is prehistoric site 41 MC 58. As recorded by THC investigators, the site measures 200 m east-west and 100 m north-south (Fig. 1). This site and 41 MC 56 are separated only by an arroyo cutting up into the valley slope. They might actually be considered a single site. Very little prehistoric debris was seen on the surface of 41 MC 58 as the site was inspected. Brush cover is very dense over most of the site. Only one specimen, a distally beveled tool (Group 2, Form 2), was collected on this site.

41 MC 224

East along the valley margin slope from 41 MC 58 is 41 MC 224, a prehistoric site recorded by the CAR crew during Phase I investigations at Choke Canyon. The site measures almost 1.0 km east-west and varies in width from 100-200 m (Fig. 1). The valley margin slope in the site area has been severely eroded. There are lag gravels scattered across the site surface. A number of deep gullies cut through the site. In less severely eroded areas grow mesquite, whitebrush, prickly pear, and other brush species in moderate to dense thickets.

Site 41 MC 224 is evidenced by exposures of sandstone, fire-fractured rock, mussel shell, *Rabdotus* shell, cores, debitage, and chipped stone tools in gullies and deflated areas down the length of the site. Several poorly integrated sandstone concentrations, assumed to be hearths, are present on this site. An unprovenienced surface collection done on this site yielded 11 cores, four thick bifaces, one thin biface, and one distally beveled tool. These limited remains indicate undifferentiated Archaic activity on the site.

41 MC 54

Prehistoric site 41 MC 54 is located down on the floodplain along the north (left) bank of the drainage channel west-east through the site group area (Fig. 1). The site limits set by THC surveyors give 41 MC 54 dimensions of 300 m east-west and a width of 100 m. The extreme west end of the site is in an open, grass-covered pasture. The rest of the site is covered with a heavy stand of brush. Whitebrush, mesquite, spiny hackberry, allthorn, yucca, and prickly pear are all present. Phase I investigation at this site consisted of an unprovenienced surface collection. Collected from the surface of 41 MC 54 were four cores, one thin biface fragment, two distally beveled tools, and seven pieces of modified sandstone. The two distally beveled tools, both varieties of the *Clear Fork* type (Group 1; Group 2, Form 2), suggest early activity on the site, perhaps during the late Paleo-Indian and/or Early Archaic periods. Modified sandstone specimens found at 41 MC 54 include three grinding slab fragments (Group 1, Forms 1 and 2), a mano (Group 2, Form 2), and three pieces of grooved sandstone (Group 3).

41 MC 55

41 MC 55 is the Group 11 site located closest to the present channel of the Frio River (Fig. 1). The site rests on a second terrace and levee system above the active floodplain on the south (right) bank of the Frio. Recorded limits for the site give it dimensions of 600 m northwest-southeast and a width of from 100-150 m. The Frio River is within 75 m of the site's west end, but then bends northward and is 300 m or more north of the greater portion of 41 MC 55. Relict channel scars are, however, visible at the foot of the terrace slope constituting the northern edge of the site. It appears as if the river flowed immediately beneath the site at some time in the past. The site is bordered on the east by a large oxbow lake which trends north-northeast to south-southwest and is about 500 m long (Fig. 36,b). Next to this lake in the northeast corner of 41 MC 55, there is a low, but distinct rise formed by a natural levee along the relict channel containing the lake. The eastern third of the site is covered with a dense growth of whitebrush and scattered large mesquite trees. High piles of tree trunks, limbs, and other brush occur here and there at this end of the site, an indication that the surface was mechanically cleared of brush not long ago. The whitebrush has apparently re-established itself since the clearing took place. Along the terrace slopes on the eastern and northern margins of the site grow elms, large mesquites, spiny hackberry, and a variety of low brush species. Along the immediate edge of the oxbow lake, especially on its eastern side, immense cottonwood trees are growing. The lake is lined with dense mustang grape canopies. The western portion of the site is in a cleared, grass-covered pasture. There are barns and corrals at the extreme western end. Mesquite and other brush grow only in a narrow fringe along the immediate edge of the terrace.

Phase I investigations at 41 MC 55 were initiated with a thorough reconnaissance of the site. Based upon surface observations and findings made in shovel tests excavated at intervals down the site, the extreme east end was recognized as containing subsurface deposits of prehistoric debris warranting test excavations. Elsewhere on the site, prehistoric debris occurred sporadically on the site surface and in eroded places along the terrace edge. No substantial amounts of debris were noted in the subsurface as shovel tests were dug. Surface debris was so lightly distributed over the western two-thirds of the site that the southern margin could not be confidently established. In the central area of the site, a previously unreported 19th-century historic component was recognized on the basis of sandstone building rock and historic artifacts found over a fairly restricted area above the relict channel scar.

Three 1-m^2 test pits were excavated at 41 MC 55. Final excavation depths in these units ranged from 70 cm-1.0 below modern ground surface. Based upon variations in rates of material recovery down through the levels, debris recovered from these test pits has been divided into three assemblages designated as Upper, Middle, and Lower Horizons. Debris collection resulting from the following level combinations represent each horizon in the three units:

Test Pit No.	Horizon Levels		
	Upper	Middle	Lower
1	1-3	4-6	7-9
2	1-3	4-7	8-10
3	1-3	4-7	--

Test Pit 1 at 41 MC 55 was excavated to a depth of 90 cm below surface (Fig. 37). The matrix in the unit was described as gray-brown silty clay loam from surface down through Level 6. In Level 7, the matrix color changed to light gray-brown and continued to lighten gradually down to the bottom of the test. Rates of recovery for selected categories of debris found in the three horizons defined for the site were:

	Horizon		
	Upper	Middle	Lower
Sandstone Weight (grams)	296	169	615
Fire-Fractured Rock Weight (grams)	249	1	10
Mussel Shell Umbo Count	10	6	10
Mussel Shell Weight (grams)	92	36	44
Rabdotus Shell Count	5	10	27
Bone Weight (grams)	18.5	0.5	0.5
Primary Flake Count	1	0	0
Secondary Flake Count	20	0	1
Tertiary Flake Count	22	2	6
Chip Count	51	1	10

Also recovered from Test Pit 1 were an unstemmed thin biface (Group 4, Form 2, Spec. 6, Level 2) and a distally beveled tool (Group 3, Form 3, Spec. 9, Level 2). One artiodactyl bone was recognized in the bone collected from the Upper Horizon (Level 1). Otherwise, no species were identified from the bone found in Test Pit 1.

In Test Pit 2 (Fig. 37), ten 10-cm thick levels of matrix were excavated. Matrix was like that described for Test Pit 1 above. Rates of recovery for selected classes of debris were as follows:

	Horizon		
	Upper	Middle	Lower
Sandstone Weight (grams)	2	116	832
Fire-Fractured Rock Weight (grams)	134	5	2
Mussel Shell Umbo Count	3	3	10
Mussel Shell Weight (grams)	38	33	21

Rabdotus Shell Count	10	6	36
Bone Weight (grams)	20	3.5	0
Primary Flake Count	1	1	0
Secondary Flake Count	32	7	6
Tertiary Flake Count	69	3	19
Chip Count	161	11	36

Additional artifacts found in Test Pit 2 include two cores (Group 3, Level 1; Group 10, Level 8), a *Perdiz* arrow point (Thin Biface Group 1, Form 4, Spec. 15, Level 2), three unstemmed thin biface fragments (Group 4, Form 4, surface; Group 9, two specimens, Levels 2 and 7), a trimmed flake (Group 3, Form 4, Spec. 6, Level 2), a marine gastropod shell bead (Level 9), three pieces of asphaltum (11 g from Levels 8 and 9), and eight sherds of aboriginal pottery (two in Level 1, four in Level 2, and two in Level 3). Animal bone recovered from Test Pit 2 was not identifiable as to species.

Test Pit 3 at 41 MC 55 was excavated to a depth of 70 cm below surface. A gray-brown silty clay loam was again encountered. Only the Upper and Middle Horizon levels were excavated in this unit. Rates of recovery for selected debris categories were as follows:

	Horizon		
	Upper	Middle	Lower
Sandstone Weight (grams)	2	49	--
Fire-Fractured Rock Weight (grams)	79	0	--
Mussel Shell Umbo Count	27	4	--
Mussel Shell Weight (grams)	93	46	--
Rabdotus Shell Count	5	12	--
Bone Weight (grams)	12	0.5	--
Primary Flake Count	0	0	--
Secondary Flake Count	8	1	--
Tertiary Flake Count	18	1	--
Chip Count	51	2	--

Also found in Test Pit 3 were two pieces of modified sandstone (Group 1, Form 3, Level 4; Group 3, Spec. 13, Level 2), a marine conch shell fragment (Level 2, Fig. 88,f), and two sherds of aboriginal pottery (Level 2). Animal bone found in this unit could not be identified as to species.

Artifacts collected on the surface of 41 MC 55 include six cores, four thick bifaces, 10 thin bifaces, one uniface, one trimmed flake, six pieces of modified sandstone, six sherds of aboriginal pottery, and one historic sherd (salt-glazed stoneware). Among the thin bifaces are a stemmed dart point fragment (Group 1, Form 3, Spec. 37), four arrow point fragments (Group 1, Form 7), and four unstemmed specimens with convex bases (Group 4, Forms 1-3). In the modified sandstone collection are two grinding slab fragments (Group 1, Forms 1 and 3), two manos (Group 2, Form 2), and two pieces of grooved sandstone (Group 3).

Artifactual remains and stratigraphic information collected during the Phase I

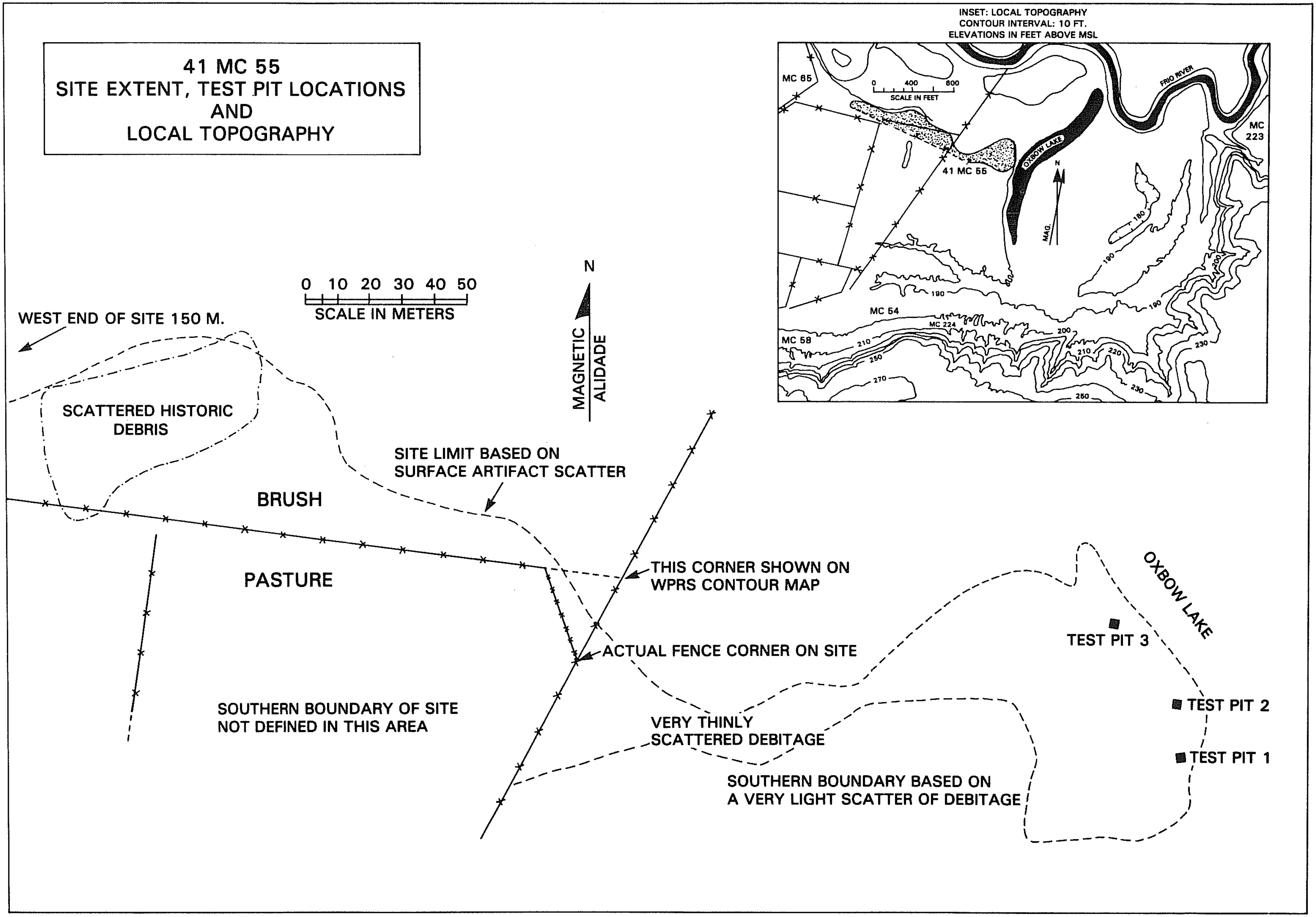

41 MC 55
SITE EXTENT, TEST PIT LOCATIONS
AND
LOCAL TOPOGRAPHY
INSET: LOCAL TOPOGRAPHY
CONTOUR INTERVAL: 10 FT.
ELEVATIONS IN FEET ABOVE MSL
0 400 800
SCALE IN FEET
FRIO RIVER
OXBOW LAKE
41 MC 55
MC 65
MC 223
MC 54
MC 224
MC 58
MAG.
N
180
190
200
210
220
230
250
270
0 10 20 30 40 50
SCALE IN METERS
N
MAGNETIC
ALIDADE
WEST END OF SITE 150 M.
SCATTERED HISTORIC
DEBRIS
SITE LIMIT BASED ON
SURFACE ARTIFACT SCATTER
BRUSH
PASTURE
THIS CORNER SHOWN ON
WPRS CONTOUR MAP
ACTUAL FENCE CORNER ON SITE
OXBOW LAKE
TEST PIT 3
TEST PIT 2
TEST PIT 1
SOUTHERN BOUNDARY OF SITE
NOT DEFINED IN THIS AREA
VERY THINLY
SCATTERED DEBITAGE
SOUTHERN BOUNDARY BASED ON
A VERY LIGHT SCATTER OF DEBITAGE

FIGURE 37

investigation at 41 MC 55 indicate that the site contains both Archaic and Late Prehistoric components. Debris evidencing these components is stratified within the upper 80-100 cm on the site. The remains found in the Lower Horizon deposits are tentatively suggested to represent Late Archaic activity. No recognizable time-diagnostic artifact forms were found in the horizon, but the presence of a small, stemmed dart point (Group 1, Form 3, Spec. 37), certain of the unstemmed triangular thin bifaces (Group 4, Forms 1, 3, and 4), and a distally beveled tool (Group 3, Form 3, Spec. 9) are interpreted as signs that Late Archaic people did inhabit the locale. Artifacts recovered from Upper Horizon deposits demonstrate a well-developed Late Prehistoric component. A *Perdiz* arrow point (Thin Biface Group 1, Form 4, Spec. 15), a "beveled knife" (Thin Biface Group 4, Form 2, Spec. 6), and sherds of aboriginal pottery, all found in Upper Horizon levels, evidence Late Prehistoric activity. Arrow point fragments, other "beveled knives," and additional prehistoric potsherds surface collected at 41 MC 55 probably also represent Late Prehistoric activity. The Middle Horizon deposits on the site are believed to contain materials derived from habitational zones above and below.

Certain of the materials gathered during the Phase I investigation at 41 MC 55 clearly indicate that the prehistoric people who inhabited the site, both Late Prehistoric and Archaic, had access to products derived from a coastal marine environment. This observation is based upon the recovery of two marine shell fragments, some pieces of asphaltum, and sherds of asphaltum-coated pottery from the surface and subsurface of 41 MC 55. This is the strongest evidence of coastal contact yet recognized at Choke Canyon.

Subsistence-related debris recovered at 41 MC 55 includes typical material such as mussel shell, snail shell, and grinding implements. Subsurface deposits, especially the Upper Horizon levels, contained considerable amounts of animal bone. Most of the bone from the test pits could not be identified, but there is nevertheless a good indication that preservation of vertebrate faunal remains is much better at 41 MC 55 than at most other sites in the Choke Canyon basin.

The testing operation conducted at 41 MC 55 indicates that the eastern end of the site, particularly the crest and flanks of a natural levee rise beside the oxbow lake, contains roughly a meter of deposit stratified into Archaic and Late Prehistoric components. The debris assemblage from the test pits is distinguished by the presence of artifacts and materials of marine origin and by unusually good bone preservation.

SITE GROUP 12

Extensive Excavation	Testing		Surface Collection	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	--	41 MC 64 41 MC 65 41 MC 67 41 MC 68	--

Site Group 12 contains four sites located on the west (right) side of the Frio River between 14.0-15.0 km west of Choke Canyon Dam. The sites rest on older terrace surfaces paralleling the present course of the river from north-south for a distance of 1.4 km. The river is from 250-350 m east of the sites. The valley margin slopes are from 450 m to 1.0 km to the west. Two upland drainage channels trend through the site group area on their way to the Frio River. A bedded sandstone belonging to the Jackson Group crops out of site 41 MC 67 at the northern end of the study area. Lag gravels eroded out of ancient terrace deposits are present in some parts of the area and also along the valley margin to the west. Two of the sites occur in cleared pastures or cultivated fields, and two are covered with light to moderate stands of brush.

41 MC 65

Open prehistoric site, 41 MC 65, is located in a cultivated field. The site parallels the east (right) bank of an upland drainage channel feeding down into the floodplain from higher areas to the south and southwest (Fig. 1). Running north past 41 MC 65 to the vicinity of 41 MC 64, the channel swings abruptly southeast, trends past the northeast end of 41 MC 65, and feeds into the Frio River. Site 41 MC 65 rests upon a terrace rise to the south (inside) of this drainage channel bend. The site and the terrace rise measure 400 m north-south and approximately 100 m east-west. During Phase I investigations, most of the site surface was covered with weeds and grass. Furrows visible on the surface demonstrated that the field had been cultivated not long before. Near the drainage channel at the north end of the site, the field had been mechanically terraced to alleviate erosion taking place along the channel bank. Hackberry, elm, and oak trees grow in the drainage channel off the site's north end.

A provenienced surface collection conducted at 41 MC 65 by the CAR crew yielded 87 cores, three thick bifaces, two thin bifaces, one distally beveled tool, one uniface, one trimmed flake, one hammerstone, and 22 pieces of modified sandstone. Individual locations of 51 of these specimens were recorded on a plane table map of the site (on file at the CAR-UTSA). The remaining specimens were gathered from a series of seven contiguous 10-m^2 units staked out at the north end of the site. Churning of deposits as the north end of the site was terraced resulted in there being much more prehistoric debris exposed on the surface in that area than elsewhere.

The number of cores found on the surface of 41 MC 65 is exceptionally large. The size of the collection can, to a certain extent, be attributed to the intensity of collecting activities on the site. Site 41 MC 65 was the first site upon which the CAR crew attempted a surface collection during the Phase I investigations. An effort was made to collect <u>every</u> artifact found on the site surface, especially in the seven 10-m^2 units at the north end. This collection effort, and a similar one at 41 MC 64, took much more time than was budgeted for the surface collections scheduled to be done during Phase I investigations. In all later collections, emphasis was placed on specimens having potential as time- and function-diagnostics. Even considering the more intensive collection technique applied at 41 MC 65, the site yielded an abnormally great number of cores.

Artifacts found at 41 MC 65 having potential as time diagnostics include a *Perdiz* arrow point (Thin Biface Group 1, Form 4, Spec. 16) and a small, triangular distally beveled tool (Group 3, Form 1). These specimens indicate remains evidencing the site were deposited during Late Archaic and Late Prehistoric times. Among numerous modified sandstone artifacts found on the site are 16 grinding slab fragments (Group 1, Forms 2 and 3), three manos (Group 2, Forms 1 and 2), and three pieces of grooved sandstone (Group 3).

41 MC 64

Northwest from 41 MC 65 on the west (left) bank of the drainage channel is prehistoric site 41 MC 64 (Fig. 1). As recorded by the THC survey crew, this site measures 400 m north-south and is from 100-150 m wide (east-west). The site rests on a relatively flat second terrace surface above the Frio River, now located 400 m or more to the east. The south end of this site is covered with moderately thick stands of brush. A modern residence and outbuildings occur in the middle of the site. The north end is in a cleared pasture where small mesquites and prickly pear cactus are again beginning to grow.

A surface collection conducted at 41 MC 64 produced an assemblage containing 83 cores, 11 thick bifaces, six thin bifaces, three distally beveled tools, two unifaces, one trimmed flake, seven pieces of modified sandstone, and one sherd of aboriginal pottery. Most of these specimens were collected at the site's north end where an area of 20 x 40 m was gridded into 5-m collection units. As at 41 MC 65, an attempt was made to collect all prehistoric debris occurring on the surfaces of the 32 collection units. This intensive collection technique partially accounts for the large number of cores found at 41 MC 64. However, even with consideration for the intensity of the collecting effort, the site yielded many more cores than comparably sized areas on other Choke Canyon sites.

The unstemmed thin bifaces (Group 3, Form 1; Group 4, Form 4; and Group 5), distally beveled tools (Group 3, Form 3; Group 8, Form 4), and a single prehistoric potsherd found at 41 MC 64 suggest possible Middle Archaic, Late Archaic, and Late Prehistoric activities on the site.

41 MC 68

Prehistoric site 41 MC 68 is on a gently sloping second terrace surface 250 m west of the Frio River (Fig. 1). As recorded by THC surveyors, this site measures 200 m north-northeast to south-southwest and is 200 m wide. In the central area of the site is the Byrne family residence, portions of which were constructed in the 1870s. A gravel road runs north-south past the west side of the house and bisects the prehistoric site. Most of the site surface, except in the immediate area of the Byrne residence and its outbuildings, supports low, scattered stands of mesquite, acacias, and prickly pear. Low grasses cover much of the area. Interviews with local residents revealed that 41 MC 68 has been repeatedly scoured by artifact collectors for a number of years.

A provenienced surface collection was carried out at 41 MC 68 by the CAR crew. Prehistoric debris observed on the site surface consisted of cores, debitage, fire-fractured rock, occasional chipped stone tools, and mussel shell. This material was very scarce at the south end of the site. Approaching the terrace edge along the northeastern margin of the site, erosion becomes more severe, and there is more prehistoric debris exposed. CAR collecting activities were concentrated at the site's north end. One core, four thick bifaces, and five thin bifaces were found. Although the evidence is limited and certainly not definitive, the presence of one stemmed thin biface (Group 1, Form 1, Spec. 22) suggests a possible Early or Middle Archaic affiliation for the remains evidencing 41 MC 68.

41 MC 67

The northernmost of the sites in Group 12, 41 MC 67 occurs on a terrace spur projecting northward out into the active Frio River floodplain (Fig. 1). The spur forms a quite prominent hill, the crest of which provides an overview of surrounding areas of floodplain and valley margin. The hill consists of ancient alluvial terrace deposits draped over an exposure of Jackson Group sandstone. Lag gravels have eroded out of the terrace deposits and are scattered over the site surface. Recorded limits for the site give it dimensions of 200 m northwest-southeast and 250 m east-west. A modern residence and barn are located at the highest elevations on the hill in the northwest area of the site.

When recorded by the THC survey crew, 41 MC 67 was recognized as containing prehistoric components only. During the course of Phase I investigations, the presence of a historic component on the site was reported to the CAR crew by USBR personnel (Curtis L. Dusek, personal communication). The historic component consists of a dugout cut into a sandstone face on the southwestern side of the hill. Early Historic period artifacts were strewn down the talus slope below the dugout. These artifacts indicate that the dugout was in use sometime between 1850 and 1870.

Prehistoric debris evidencing 41 MC 67 is concentrated over the surface of an extensive arroyo running southwest-northeast through the central area of the site. Cores, debitage, chipped stone tools, fire-fractured rock, mussel shell, snail shell, modified sandstone, and natural gravels are densely concentrated on the badly eroded northeast terrace slope. Collection activities were focused primarily on debris exposed in this area. At the site's extreme north end, overlooking an upland drainage channel which loops around the site, there are exposures of mussel shell, debitage, and fire-fractured rock indicating that prehistoric habitational activity also occurred higher up on the hill. Tracing exposures of debris out to the southeast, it was found that there is essentially no break in the scatter of prehistoric materials between 41 MC 67 and 41 MC 68.

Surface collection efforts at 41 MC 67 produced an assemblage containing 21 cores, four thick bifaces, six thin bifaces, one distally beveled tool, four pieces of modified sandstone, and, from the area of the historic dugout, 27 historic artifacts. Among the thin bifaces, a small, stemmed dart point (Group 1, Form 1, Spec. 21) and an arrow point fragment (Group 1, Form 7) indicate the presence of Late Archaic and Late Prehistoric components on the site.

Other forms, such as an unstemmed, triangular biface (Group 4, Form 1) and the distally beveled tool (Group 7, Form 1) are distinctive, but are not recognized as time-diagnostics. Modified sandstone artifacts found on the site include three grinding slab fragments (Group 1, Forms 1 and 2) and a piece of grooved sandstone. These grinding implements, along with mussel shells and *Rabdotus* snail shells seen eroding from the site, are assumed to provide evidence of food items prepared and consumed by the site's prehistoric inhabitants.

The historic dugout found at 41 MC 67 is a unique phenomenon at Choke Canyon. Analysis of the artifacts found on the slope below the dugout indicate that it is also one of the earliest historic sites to be found in the area. No subsurface testing was attempted, but there does appear to be a potential for buried remains and perhaps structural features within the dugout proper.

SITE GROUP 13

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	--	--	41 MC 53 41 MC 52 41 MC 184

In Site Group 13, three prehistoric sites are located between 13.0-14.5 km west of Choke Canyon Dam. Two of the sites are located on the west (right) side of the Frio valley and one is on the east side. The valley closes to its narrowest width (1.3 km or less) in the vicinity of these three sites due to an exposure of resistant sandstone which crops out in a broad band running southwest-northeast through the area. It is this resistant sandstone which caused the Frio River to assume a course resulting in the reserve S-curve known as Yarbrough Bend. The sites rest partly on valley margin slopes and partly on alluvial terraces above the river. Lag gravels are very common on the surface over most of the area.

41 MC 53

Site 41 MC 53 is located 600 m and more west of the Frio River (Fig. 1). It is apparent from relict channel scars visible on terrace surfaces between the site and the present river channel that the Frio River has flowed closer to this site at times in the past. As recorded by the THC survey team, 41 MC 53 is subcircular in outline with a diameter of 300 m. Mesquite, blackbrush, whitebrush, agarita, and other brush species grow in scattered thickets over the site. Sheet erosion has occurred over much of the surface. An unprovenienced surface collection conducted at this site yielded only 12 cores.

41 MC 52

Located a short distance north of 41 MC 53, prehistoric site 41 MC 52 occurs in a setting very much like that described for 41 MC 53. Recorded limits for this site show it to be oval in outline with dimensions of 300 m north-south and 150 m east-west (Fig. 1). The site surface supports a moderately dense stand of brush including mesquite, whitebrush, and huisache at lower elevations and blackbrush higher on its western slope. An unprovenienced surface collection conducted at this site yielded one thick biface and three distally beveled tools. The distally beveled tools (Group 2, Form 1; Group 4; and Group 7, Form 1) suggest activity on the site during the Archaic. These specimens were found in the western half of the site where lag gravels form a fairly dense pavement on the surface. Tested cobbles, cores, and debitage observed in this area suggest that 41 MC 52 served primarily as a source of raw materials for chipped stone tool manufacture.

41 MC 184

Prehistoric site 41 MC 184 was investigated by personnel from Texas A&M University (Weed and Shafer 1981:41). The site was not actually visited by the CAR crew during Phase I investigations. However, USBR surveyors collected several artifacts from the site and gave the specimens to CAR personnel. The five specimens are all thin bifaces. There is a *Frio* dart point (Group 1, Form 3, Spec. 21) and four unstemmed specimens with triangular outlines (two specimens, Group 2, Form 1; Group 3, Form 2; and Group 4, Form 1). These findings do not alter conclusions drawn by Texas A&M analysts concerning the site.

SITE GROUP 14

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	--	--	41 MC 92 41 MC 93 41 MC 91 41 MC 90

The four sites in Group 14 are located on the north side of the Frio River valley from 16.0-18.0 km west of Choke Canyon Dam. The present course of San Miguel Creek, a major tributary to the Frio River originating northwest of Choke Canyon, flows east-west between the sites and the Frio River. The San Miguel's confluence with the Frio River is from 0.5-1.3 km southeast of the sites. All Group 14 sites had not been acquired by the USBR at the time Phase I field work was underway. Results of investigations at these sites will be reported in later research volumes.

SITE GROUP 15

Extensive Excavation	Testing		Surface Collections	
	Intensive	Minimal	Provenienced	Unprovenienced
--	--	41 MC 84 41 MC 86	41 MC 94	41 MC 95 41 MC 69 41 MC 171

Site Group 15 contains six sites located on the north side of the Frio River valley from 20.5-22.5 km west of Choke Canyon Dam. Five of the sites are on terraces and levees beside the Frio River and an abandoned channel system immediately north of the river. The sixth site occurs on the west (right) bank of San Miguel Creek at a location some distance north of other sites in the group. The land surface rises very gradually away from the river on this side of the valley. The relatively steep valley margin slopes, common elsewhere in the valley, do not occur along the valley margin adjacent to the Group 15 sites. The sites occur in or on terrace deposits of varying ages. Geologic units of the Jackson Group underlie the site group area, but no sandstone or other bedrock formations crop out in the vicinity. Lag gravels which have eroded out of ancient alluvial terrace deposits along the valley margin occur in localized concentrations. There are two major relict channel scars and three upland drainage channels in the area. One of the relict channels holds water and is called Yarbrough Lake. A major upland drainage channel feeding into the Frio River south of 41 MC 86 is called Salt Branch. Grass-covered pastures, cultivated fields, and dense brush are all present.

41 MC 94

41 MC 94 is a long, narrow prehistoric site resting on a natural terrace levee paralleling the north (left) bank of the Frio River (Fig. 1). The site measures 800 m northeast-southwest and is less than 100 m wide. A relict channel scar runs along the northern edge of the site. The site is entirely within a cultivated field which supported a very light scatter of weeds at the time of Phase I investigation. Riparian species such as elm, oak, ash, and hackberry grow along the southern edge of the site, while mesquite, spiny hackberry, persimmon, prickly pear, allthorn, and huisache grow along the relict channel scar to the north.

Activities of the CAR crew at 41 MC 94 included a provenienced surface collection and excavation of a number of shovel tests. A total of 168 artifacts was collected from the surface of 41 MC 94. Individual locations of 156 of these specimens were plotted on a plane table map (on file at the CAR-UTSA). The collection consists of 47 cores, 29 thick bifaces, 49 thin bifaces, eight distally beveled tools, six unifaces, four trimmed flakes, one hammerstone, 22 pieces of modified sandstone, and two sherds of aboriginal pottery. These artifacts were scattered over an area 50 m wide and almost 700 m long. Also occurring throughout this area was debitage, fire-fractured rock, mussel shell, and *Rabdotus* shell.

Time diagnostic forms in the chipped stone tool collection from 41 MC 94 indicate that the site was occupied from late Paleo-Indian or Early Archaic times up through the Late Archaic and Late Prehistoric periods. Early activity is evidenced by distally beveled specimens of *Clear Fork* (Group 1) and *Guadalupe* (Group 6) tools. A third distally beveled tool form (Group 5) may also be a Paleo-Indian or Early Archaic diagnostic. Three stemmed dart points (Thin Biface Group 1, Form 1, Specs. 24 and 25; and Group 1, Form 3, Spec. 41) and a variety of unstemmed thin bifaces with triangular or leaf-shaped outlines (Groups 2-5) are not at present recognized as diagnostic of a specific period, but probably date to Early or Middle Archaic times. Late Archaic activity is evidenced by *Ensor* dart points (Thin Biface Group 1, Form 3, Specs. 9 and 10) and by three distally beveled tools (Group 3, Forms 1-3). The two sherds of aboriginal pottery found at 41 MC 94 indicate that the site also contains a Late Prehistoric component.

The numerous cores, thick bifaces, and thin biface fragments recovered at 41 MC 94 suggest that chipped stone tool manufacture was a common activity on the site. Nearby gravel deposits eroding from terrace slopes north of the site may have been one of its major attractions. Sandstone grinding implements, including eleven grinding slab fragments and ten manos, were unusually common on the site. In a study of artifact distributions across the site, no distinctive clusterings of specimens either as time- or function-diagnostics were recognized. Several shovel tests excavated at the western end of 41 MC 94 indicate the presence of a substantial amount of prehistoric debris, including some animal bone, within the upper meter of deposit on the site.

41 MC 69

Directly north across the relict channel scar from 41 MC 94 is prehistoric site 41 MC 69 (Fig. 1). Site 41 MC 69 is, in turn, bordered along its northern edge by a relict channel known as Yarbrough Lake. This site occurs in a landform setting and configuration almost identical to 41 MC 94. It rests on a terrace levee between two relict channels. The site measures approximately 700 m from northeast-southwest and it varies in width from 100-200 m. Most of the site is in a grass-covered pasture where small mesquites are present as light regrowth. The southwestern end of the site is in an area recently cleared of brush. Severe surface disturbance has resulted from the brush-clearing activities. Elm and oak grow along the southern bank of Yarbrough Lake. Also present is mesquite, spiny hackberry, allthorn, soapbush, prickly pear, retama, and whitebrush.

Surface reconnaissance activities carried out at 41 MC 69 by the CAR crew revealed surface cultural debris to occur within three distinct concentrations down the length of the site. Each concentration is basically evidenced by scatters of debitage, fire-fractured rock, mussel shell, and snail shell. Debris is densest in the concentration located at the site's northeastern end. The concentration at the southwestern end is within the area heavily disturbed by brush-clearing efforts. An unprovenienced surface collection done at this site produced eleven cores, three thick bifaces, six thin bifaces, and three pieces of modified sandstone. A stemmed arrow point (Thin Biface Group 1, Form 5, Spec. 10) and a "beveled knife" (Thin Biface Group 4, Form 2) clearly indicate a Late Prehistoric component on the site. Other thin biface forms (Group 2, Form 1; Group 4, Forms 3 and 4) likely represent Archaic activity, but do not permit specific period definitions.

41 MC 95

Prehistoric site 41 MC 95 is located on the north side of Yarbrough Lake (Fig. 1). The site rests on an ancient terrace surface, the slope of which has been heavily eroded. As recorded by the THC survey crew, 41 MC 95 measures 600 m east-west and averages about 200 m in width. Along the terrace edge near the center of the site is a modern residence with outbuildings and a corral complex. Activities related to modern inhabitation of the site area, including intensive artifact collecting, have had an adverse effect on the condition of prehistoric remains. Small upland drainage channels mark the eastern and western ends of 41 MC 95 as they cut north to south down through the terrace face to Yarbrough Lake. A large, abandoned gravel pit is located at the west end of the site.

Vegetation has been cleared from some portions, but mesquite, soapbush, prickly pear, spiny hackberry, and grasses still cover a considerable area of the site, especially on the terrace slope. THC analysts list 41 MC 95 as containing components spanning Pre-Archaic to Late Prehistoric times (Lynn, Fox, and O'Malley 1977:44).

Surface debris observed during CAR reconnaissance activities at 41 MC 95 consisted primarily of fire-fractured rock, cores, and debitage, most of which is exposed in gullies along the site's southern slope. Very little mussel and snail shell was seen on this site. Sandstone, except in the form of grinding implements, was very scarce.

An unprovenienced surface collection conducted at 41 MC 95 by the CAR crew yielded 14 cores, 27 thick bifaces, 39 thin bifaces, five distally beveled tools, four unifaces, two trimmed flakes, and three pieces of modified sandstone. A long span of Archaic activity on the site is represented by such specimens as a stemmed thin biface (Group 1, Form 3, Spec. 42) and three distally beveled tools (Group 3, Forms 2 and 3) clearly evidencing a Late Archaic component. The many unstemmed thin bifaces (Groups 2-5) found on the site probably represent older periods of habitation, but do not permit further specification. The Pre-Archaic and Late Prehistoric components listed for 41 MC 95 by THC analysts are not reinforced by CAR findings at the site. The numerous cores, thick bifaces, and thin bifaces found at 41 MC 95 indicate that one major prehistoric activity at the location was chipped stone tool manufacture. The gravels exposed in and around 41 MC 95 constitute the most ample lithic raw material source in the immediate vicinity. However, the presence of fire-fractured rock, sandstone grinding implements, and limited amounts of mussel shell and snail shell indicate that habitation also occurred. The relatively limited quantities of mussel and snail shell on this site are noteworthy.

41 MC 84

Prehistoric site 41 MC 84 is situated on a Pleistocene terrace remnant overlooking the Frio River floodplain (Fig. 1). As recorded by THC surveyors, the site is roughly circular in outline shape with a diameter of 250 m. The site rests on a peninsular ridge formed in the terrace edge by erosion along two short upland drainages located on the east and west sides of the site. The site surface slopes north-south. The relict channel scar which runs between 41 MC 69 and 41 MC 95 is approximately 200 m southeast of 41 MC 84. The upland drainage channel trending down along the west side of the site curves eastward along the southern margin of 41 MC 84 and meets the relict channel. A gravel-covered county road bisects the site north to south, the road running more-or-less along the ridge crest. Large portions of the eastern half of the site were mechanically cleared of brush shortly before the CAR investigation began. This clearing effort left a bare, heavily disturbed earth surface (Fig. 42,c). Thick stands of brush remain along the site's eastern margin and western half. Mesquite, spiny hackberry, persimmon, prickly pear, yucca, guayacan, and agarita are all present.

Activities of the CAR crew at 41 MC 84 included excavation of two test pits and a provenienced collection of numerous surface artifacts. Improved surface visibility, as a result of the brush clearing, permitted extension of the site 300 m farther to the northeast. Though locally heavier concentrations of prehistoric cultural debris are recognized in both sites, the extension of 41 MC 84 has resulted in there being essentially no separation between 41 MC 84 and 41 MC 95 (Fig. 1). Extensive surface gravel deposits occur in the area where the two sites join.

Two 1-m^2 test pits were excavated in uncleared areas along the southeastern edge of 41 MC 84. Test Pit 1 was excavated to a depth of 50 cm below surface. From surface to a depth of 30 cm, matrix in the unit was described as light grayish brown silty loam. In Level 4, matrix color lightened and clay content seemed to increase. Clay content continued to increase in Level 5. Debris recovered from Test Pit 1 is divided into assemblages designated as Upper and Lower Horizons. Debris found in Levels 1 and 2 is included in the Upper Horizon. The Lower Horizon contains debris found in Levels 3-5. Rates of recovery for selected classes of debris in these two horizons are as follows:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	190	584
Fire-Fractured Rock Weight (grams)	1453	1798
Mussel Shell Umbo Count	9	58
Mussel Shell Weight (grams)	17	79
Rabdotus Shell Count	27	32
Bone Weight (grams)	0.1	0
Primary Flake Count	1	3
Secondary Flake Count	13	33
Tertiary Flake Count	24	43
Chip Count	47	72

Also recovered from Test Pit 1 were nine unmodified chert cobbles (Core Group 10). Eight of these specimens occurred in Upper Horizon levels. All are believed to be examples of gravels common to the general site surface. Also recovered in all levels of this unit were numerous smaller pebbles. Both pebbles and cobbles are common as a natural constituent of the terrace formation containing the site. A wood rat mandible, likely a recent introduction, was found in Level 2.

Test Pit 2 at 41 MC 84 was also excavated to a depth of 50 cm below surface. Matrix in the unit was described as light brown, tightly compacted silt. Debris recovered from this unit is divided into two assemblages representing Upper (Levels 1-3) and Lower (Levels 4-5) Horizons. Rates of recovery for selected classes of debris in these two horizons were as follows:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	11	7
Fire-Fractured Rock Weight (grams)	229	251
Mussel Shell Umbo Count	10	46
Mussel Shell Weight (grams)	13	61
Rabdotus Shell Count	4	5
Bone Weight (grams)	0	0

Primary Flake Count	0	5
Secondary Flake Count	13	42
Tertiary Flake Count	16	45
Chip Count	27	80

Other artifacts found in Test Pit 2 include four cores, two in the Upper Horizon (Groups 3 and 10) and two in the Lower Horizon (both Group 6).

The surface artifact collecting done at 41 MC 84 produced an assemblage containing 203 specimens. In this collection are 23 cores, 62 thick bifaces, 62 thin bifaces, 19 distally beveled tools, six unifaces, five trimmed flakes, 13 pieces of modified sandstone, and 13 sherds of aboriginal pottery. Individual locations of 92 specimens were recorded on a plane table map of the site (on file at the CAR-UTSA). The majority of the surface-collected specimens were found on cleared ground in the east central area of the site. The major collection area measures 100 m north-south and 130 m east-west. Site 41 MC 84 was unusually productive in terms of the number and variety of chipped stone tools found on its surface. This productivity is attributed to the fact that site deposits were exposed and churned just before the CAR investigation took place. Surface visibility was thus very good and the CAR crew apparently arrived at the site before local artifact collectors had the opportunity to gather up all the desirable specimens. The artifact assemblage from this site is likely a good example of what many of the other sites investigated during Phase I might have yielded had they not already been intensively and repeatedly scoured by artifact collectors over the years.

Certain of the artifacts in the assemblage from 41 MC 84 indicate that the site was occupied in Paleo-Indian, Archaic, and Late Prehistoric times. Early activity on the site is evidenced by thin biface forms evidencing basal edge grinding (Group 1, Form 1, Spec. 23; Group 2, Form 2, Spec. 90), a possible *Angostura* point (Thin Biface Group 1, Form 2, Spec. 21), and distally beveled tools of the *Clear Fork* type (Group 1; Group 2, Form 1). Early Archaic activity is suggested by the presence of a *Pandale*-like dart point (Thin Biface Group 1, Form 2, Spec. 29) and perhaps also the distally beveled tool forms mentioned above. Middle and Late Archaic components are represented by various stemmed thin bifaces (Group 1, Form 2, Spec. 13; Group 1, Form 3, Spec. 8, *Ensor*; Group 1, Form 3, Spec. 16, *Edgewood*; and Group 1, Form 3, Spec. 39 and 40) and by various distally beveled tool forms (Group 2, Form 2; Group 3, Forms 1 and 3; and Group 4). Numerous unstemmed thin bifaces and biface fragments (Groups 2 to 5) and other distally beveled tool forms (Groups 7 to 9) are probably also diagnostic of Archaic (and perhaps, in some cases, Paleo-Indian) occupations, but specific period assignments are not now possible. *Scallorn* and *Edwards* arrow points (Thin Biface Group 1, Form 5, Specs. 4 and 8), a "beveled knife" (Thin Biface Group 4, Form 2, Spec. 10), and 13 sherds of aboriginal pottery represent a Late Prehistoric component at 41 MC 84.

Among the 13 modified sandstone artifacts found at 41 MC 84 are nine grinding slab fragments (Group 1, Forms 1-3), three manos (Group 2, Forms 1 and 2), and a piece of grooved sandstone (Group 3).

Limited distributional analysis of provenienced artifacts at 41 MC 84 suggests no distinct clustering of recognized time-diagnostic artifact forms by time period. Diagnostics of all periods are widely scattered throughout the collection area.

Test pits excavated at 41 MC 84 reveal that prehistoric remains in the site are confined to the upper 50 cm of deposit. Even though a very long span of prehistoric activity is evidenced on the site, only two gross horizons are recognized within the subsurface based on variations in rates of material recovery down through the deposit. Except to say that debris recovered from the Lower Horizon is probably older than debris in the Upper Horizon, it is not possible to confidently advance cultural period affiliations for any of the remains. No recognized time-diagnostic artifacts were recovered in the subsurface of the site.

41 MC 171

This prehistoric site is located on the west (right) bank of San Miguel Creek some 2.0 km or more north of the other sites in Group 15 (Fig. 1). The site rests on a relatively flat terrace surface above the creek channel. A drainage channel tributary to San Miguel Creek runs around the northern margin of the site. As recorded by the THC survey crew, 41 MC 171 measures 300 m north-south and 451 m east-west. A modern residence and outbuildings are located in the western area of the site. The brush has been cleared from roughly the western third of the site in the vicinity of the modern structures. The remainder of the site is densely covered with brush including mesquite, prickly pear, whitebrush, and grasses. THC analysts listed 41 MC 171 as containing evidence of Pre-Archaic and Archaic (undifferentiated) activities (*ibid.*).

Inspection of 41 MC 171 by the CAR crew revealed that prehistoric debris was exposed mainly along the eastern and northern margins of the site where erosion of terrace edges overlooking the creek and drainage channels has been most severe. An unprovenienced surface artifact collection was carried out in these areas of the site. The artifact assemblage resulting from this collection effort includes 18 cores, 11 thick bifaces, six thin bifaces, one possible hammerstone, four pieces of modified sandstone, and one piece of modified quartzite. The thin bifaces, all unstemmed, are generally suggestive of Archaic activity, but do not permit more specific period designations for remains evidencing this site.

41 MC 86

Prehistoric site 41 MC 86 is the southwesternmost of the sites in Group 15 (Fig. 1). The site rests on a terrace surface paralleling the north (left) bank of Salt Branch, a substantial upland drainage channel tributary to the Frio River. The drainage channel meets the river 500 m northeast of 41 MC 86. As recorded by THC surveyors, the site measures 700 m northeast-southwest and 300 m east-west. A short time before the CAR investigation commenced at 41 MC 86, the site surface was mechanically cleared of brush. A bare, churned earth surface resulted. Improved visibility resulting from clearing activities permitted extension of the site boundary 300 m farther to the northeast. This extension encompasses a terrace knoll overlooking Salt Branch Creek as its channel bends northward around the southwestern end of 41 MC 86. Much debitage, sandstone, mussel shell, land snail shell, and a few chipped stone tools were observed on the site surface by the CAR crew.

This site was scheduled for investigation by means of a surface collection only. However, observations made by the CAR crew on the site surface and in several uncontrolled shovel tests indicated that subsurface testing would be worthwhile. As a consequence, two 1-m^2 test pits were excavated in the newly discovered western extension of the site. Both were placed on the low knoll overlooking the channel of Salt Branch.

Test Pit 1 at 41 MC 86 was excavated to a depth of 70 cm below surface. Matrix in this unit was described as light yellowish brown sandy loam down to 60 cm, at which point the calcium carbonate content increased dramatically. Rates of recovery for selected classes of debris from all levels combined in Test Pit 1 were:

Sandstone Weight (grams)	1710
Fire-Fractured Rock Weight (grams)	87
Mussel Shell Umbo Count	20
Mussel Shell Weight (grams)	52
Rabdotus Shell Count	158
Bone Weight (grams)	0
Primary Flake Count	0
Secondary Flake Count	25
Tertiary Flake Count	39
Chip Count	42

Other artifacts found in Test Pit 2 include two cores (Group 3, Levels 1 and 3) and a thin biface fragment (Group 10, Level 3).

An unprovenienced surface collection conducted at 41 MC 86 yielded four cores, four thick bifaces, eight thin bifaces, and one distally beveled tool. The thin bifaces, all unstemmed, do not permit a specific determination of period of prehistoric activity on this site. An undifferentiated Archaic occupation is suggested.

SITE GROUP 16

Extensive Excavations	Testing		Surface Collection	
	Intensive	Minimal	Provenienced	Unprovenienced
--	41 MC 222	41 MC 19	--	41 MC 18
		41 MC 15		41 MC 72
		41 MC 17		41 MC 74
		41 MC 75		41 MC 78
				41 MC 79
				41 MC 80
				41 MC 219
				41 MC 220
				41 MC 83
				41 MC 88

Site Group 16 contains 15 sites located from 20.0-25.0 km west of Choke Canyon Dam at the upstream end of the future lake. Twelve of the sites are strung out virtually end-to-end on terraces paralleling the south side of the Frio River for a distance of almost 6.0 km. Two sites are on the north side of the Frio

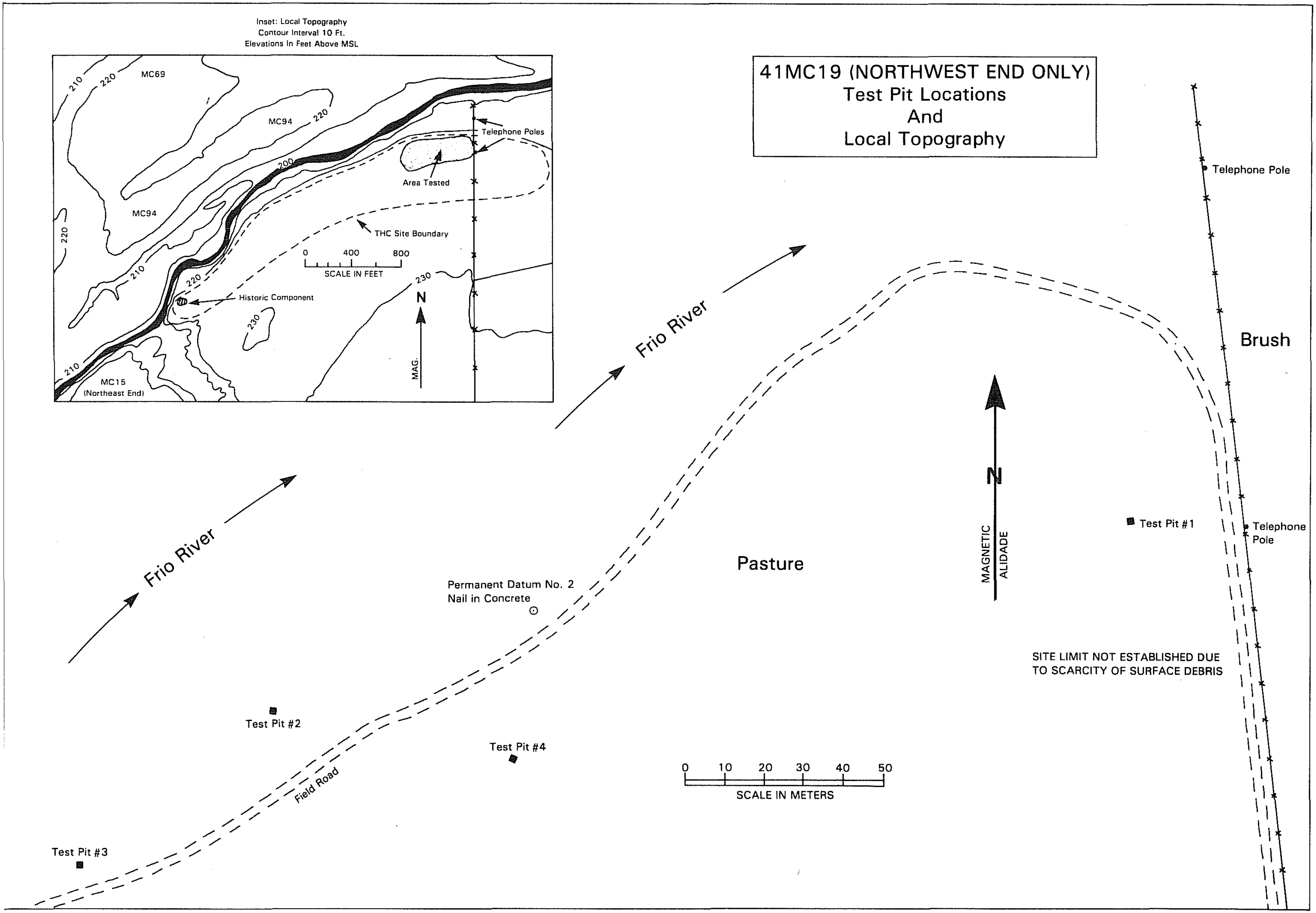

Inset: Local Topography
Contour Interval 10 Ft.
Elevations In Feet Above MSL
210
220
MC69
MC94
220
200
Telephone Poles
Area Tested
MC94
220
THC Site Boundary
0
400
800
SCALE IN FEET
210
220
230
Historic Component
N
230
210
MC15
(Northeast End)
MAG.
41MC19 (NORTHWEST END ONLY)
Test Pit Locations
And
Local Topography
Telephone Pole
Frio River
Brush
N
Frio River
Test Pit #1
Telephone
Pole
MAGNETIC
ALIDADE
Pasture
Permanent Datum No. 2
Nail in Concrete
SITE LIMIT NOT ESTABLISHED DUE
TO SCARCITY OF SURFACE DEBRIS
Test Pit #2
Test Pit #4
0
10
20
30
40
50
SCALE IN METERS
Field Road
Test Pit #3

FIGURE 38

River. In the site group area, the river valley is relatively broad at the east end, there being a gently sloping floodplain surface extending out away from the river to valley margin slopes located 1.5 km or more away. Both sides of the river valley are essentially the same over the downstream half of the Group 16 area. The area descriptions for the Group 16 sites provide a look at the northern side of the valley opposite the northeastern end of this study area. The southwestern half of the area containing Group 16 sites is much different. Upstream from 41 MC 72, the Frio River has collided with resistant rock units of the Jackson Group along the southern side of its valley. The result is a very narrow strip of floodplain on the south side of the river. It varies in width from 200-500 m. The floodplain gives way to steep slopes leading up to sandstone cuestas which line the southern margin of the valley. Skillet Mountain, with a maximum elevation of 372 feet (location of 41 MC 76), is the highest of these cuestas in the vicinity. Due to the northeast-southwest trend of the sandstone exposures, these steep slopes are not expressed on the north side of the valley in the Group 16 area. North from the river, the floodplain surface rises at a gradual rate, and there are no steep grades or nearby exposures of sandstone. On alternate sides of the river, the floodplain is laced with relict channels. Upland drainage channels scar both the cuesta slopes and the floodplain surface. Most of the study area is covered with stands of brush, but there is also some pasture and agricultural land present. As elsewhere, the river supports a dense riparian forest. On floodplain surfaces grow mesquite, whitebrush, prickly pear, spiny hackberry, and other lowland brush species. The slopes and tops of hills along the south side of the area are covered with blackbrush and guajillo. Natural gravels occur in the Group 16 area, but they are not as common as at some other locations downstream. Low-grade, nonsiliceous petrified woods are common on the Jackson Group exposures.

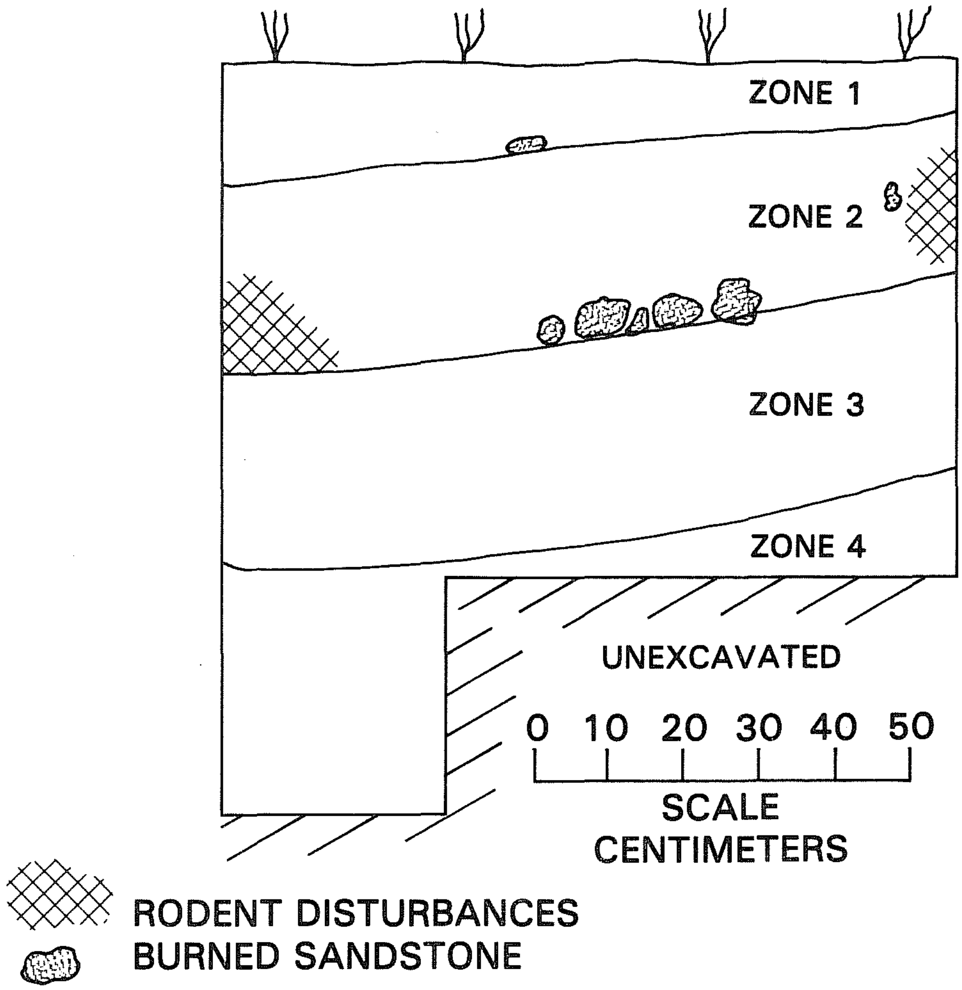
41 MC 18

Site 41 MC 18 rests on an old terrace surface south of the Frio River (Fig. 1). The site contains both prehistoric and historic components. The historic component is the Yarbrough Bend Cemetery, now evidenced only by two fragmentary tombstones (Everett 1981:43; for illustration of tombstones, see Roemer 1981:87). Based on distribution of prehistoric debris on the surface of 41 MC 18, THC surveyors defined an east-west dimension of 500 m and north-south dimension of 150 m. The site is listed as containing evidence of Archaic period activity (Lynn, Fox, and O'Malley 1977:44). The Frio River flows 300 m north of the site along most of its length. However, an oxbow in the Frio's channel brings it within 75 m of the site's east end. The site surface is covered with mesquite, yucca, prickly pear, and other lowland brush species. An unprovenienced surface artifact collection conducted at 41 MC 18 by the CAR crew yielded two cores, a thick biface, four thin bifaces, and a distally beveled tool. Among these specimens, an unstemmed thin biface with triangular outline and concave base (Group 3, Form 1, Spec. 13, *Tortugas*?) and the distally beveled tool (Group 3, Form 1) suggest a Late Archaic affiliation for remains on the site.

41 MC 19

As recorded by THC surveyors, 41 MC 19 parallels the south (right) bank of the Frio River northeast to southwest for a distance of 1.0 km (Fig. 1). It is

41MC19-Test Pit 2
South Wall Profile



Zone 1-
Light grayish brown sandy silt. Very hard, dry, and compact.

Zone 2-
Dark grayish brown sandy silt. Very soft and loose with much cultural debris.

Zone 3-
Light tannish brown sandy silt. Moderately compact.

Zone 4-
Tan sandy clay. Moderately compact. Contains small caliche nodules.

FIGURE 39

recorded as being 150-250 m in width. The site rests on a flat second terrace above the river which flows 50-100 m off the site's northwest edge (Fig. 36,e). Most of the site is in a cleared pasture sparsely covered with short grass (Fig. 36,f). The northeastern fifth of the site lies in mesquite brush similar to that described for 41 MC 18 above. A thin strip of brush also grows along the terrace edge leading down to the river. A typical riparian forest, consisting mainly of elms, grows down below the site along the Frio River. THC analysts list 41 MC 19 as containing evidence of activity during the Transitional Archaic period (*ibid.*).

Inspection of the 41 MC 19 surface by the CAR crew revealed prehistoric debris to be most visible along the northwestern margin of the site where erosion down the slope of the terrace face had exposed materials. Cultural debris was also observed in the field road running through the site near the terrace edge. Little or no debris was seen back away from (southeast of) the terrace edge in the area where the site's southeast boundary was recorded. A previously unrecorded historic component was recognized at the southwest end of the site (Figs. 38, 41, and 43). This historic component is evidenced by a scatter of sandstone building rocks and small amounts of pottery, glass, and metal. Surface observations and findings made in uncontrolled shovel tests indicated that a limited area at the northeast end of 41 MC 19 offered the best potential for subsurface testing (Fig. 38, inset). Four 1-m^2 test pits were excavated in this area of the site.

Based on variations in rates of material recovery down through the deposits in test pits excavated at 41 MC 19, the debris collected has been divided into assemblages representing Upper and Lower Horizons according to the following combinations of vertical excavation levels:

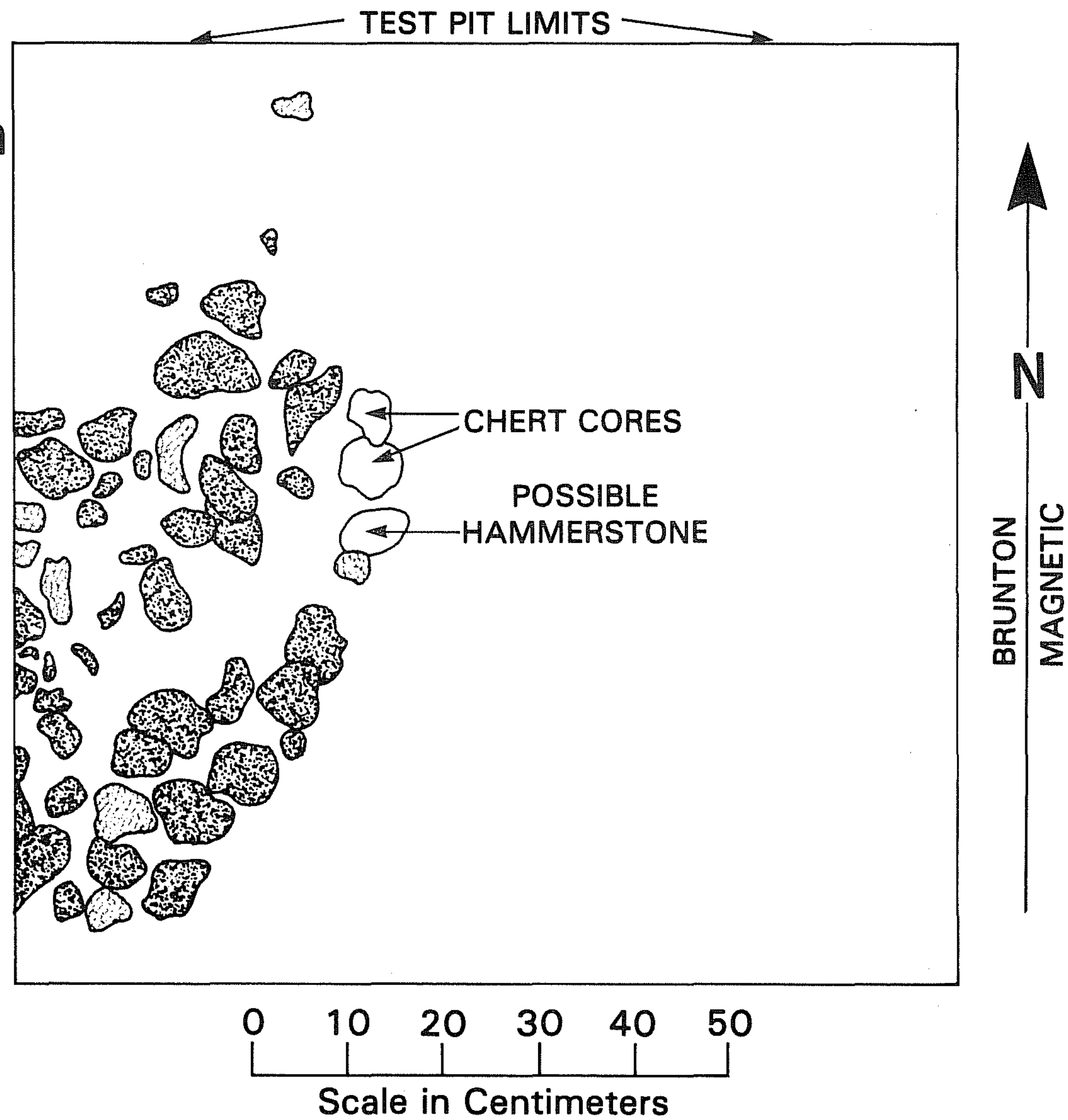
Test Pit No.	Upper Horizon Levels	Lower Horizon Levels
1	1-4	5-8
2	1-3	4-7
3	1-3	4-6
4	1-3	4-6

Test Pit 1 at 41 MC 19 (Fig. 38) was excavated to a depth of 80 cm below surface. The upper 10 cm of matrix in this unit was described as very compact light brownish gray silty loam. From 10-60 cm below surface, the matrix was a tannish brown sandy loam. In levels from 60-80 cm, the matrix became a yellowish brown sandy clay loam with calcium carbonate content increasing on down the unit floor. Rates of recovery for selected classes of debris found in each of the horizons defined for Test Pit 1 were:

41MC19 - Test Pit 4
Plan of Feature 3
Burned Rock Concentration

Fire Cracked Chert

Sandstone



ROCKS RESTED ON SURFACES RANGING IN DEPTH FROM 33 TO 46 CM BELOW GROUND SURFACE AT SOUTHWEST CORNER.

FIGURE 40

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	1496	292
Fire-Fractured Rock Weight (grams)	1099	571
Mussel Shell Umbo Count	66	48
Mussel Shell Weight (grams)	161	160
Rabdotus Shell Count	340	141
Bone Weight (grams)	0	0
Primary Flake Count	3	3
Secondary Flake Count	84	26
Tertiary Flake Count	116	78
Chip Count	178	77

Also found in Test Pit 1 was one core (Group 3, Level 7).

Seven 10-cm thick levels were excavated in Test Pit 2 (Fig. 38). Unlike most other soil profiles revealed during Phase I testing at Choke Canyon, very clear-cut stratigraphy was visible in the walls of Test Pit 2 (Figs. 39, 42,b). Zone 2, occurring 10-40 cm below surface, contained notably more cultural debris than did zones immediately above and below. Debris representing Zone 2 is contained primarily in the Upper Horizon. Rates of recovery for selected classes of debris found in the two horizons defined for Test Pit 2 were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	234	228
Fire-Fractured Rock Weight (grams)	1149	617
Mussel Shell Umbo Count	15	11
Mussel Shell Weight (grams)	38	20
Rabdotus Shell Count	77	46
Bone Weight (grams)	0	0
Primary Flake Count	0	2
Secondary Flake Count	18	12
Tertiary Flake Count	55	21
Chip Count	85	22

In addition to the above, Test Pit 2 yielded a core (Group 3, Level 6), a thin biface fragment (Group 9, Level 4), and a *Clear Fork* tool (Distally Beveled Biface Group 1, Level 5).

Test Pit 3 (Fig. 38) was excavated to a depth of 60 cm below surface. The matrix profile in this unit was like that described for Test Pit 1 above. The two horizons defined in this unit yielded the following amounts of debris:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	9	29
Fire-Fractured Rock Weight (grams)	178	111
Mussel Shell Umbo Count	5	7
Mussel Shell Weight (grams)	14	13
Rabdotus Shell Count	65	37
Bone Weight (grams)	5	0
Primary Flake Count	1	1
Secondary Flake Count	20	15
Tertiary Flake Count	41	27
Chip Count	93	47

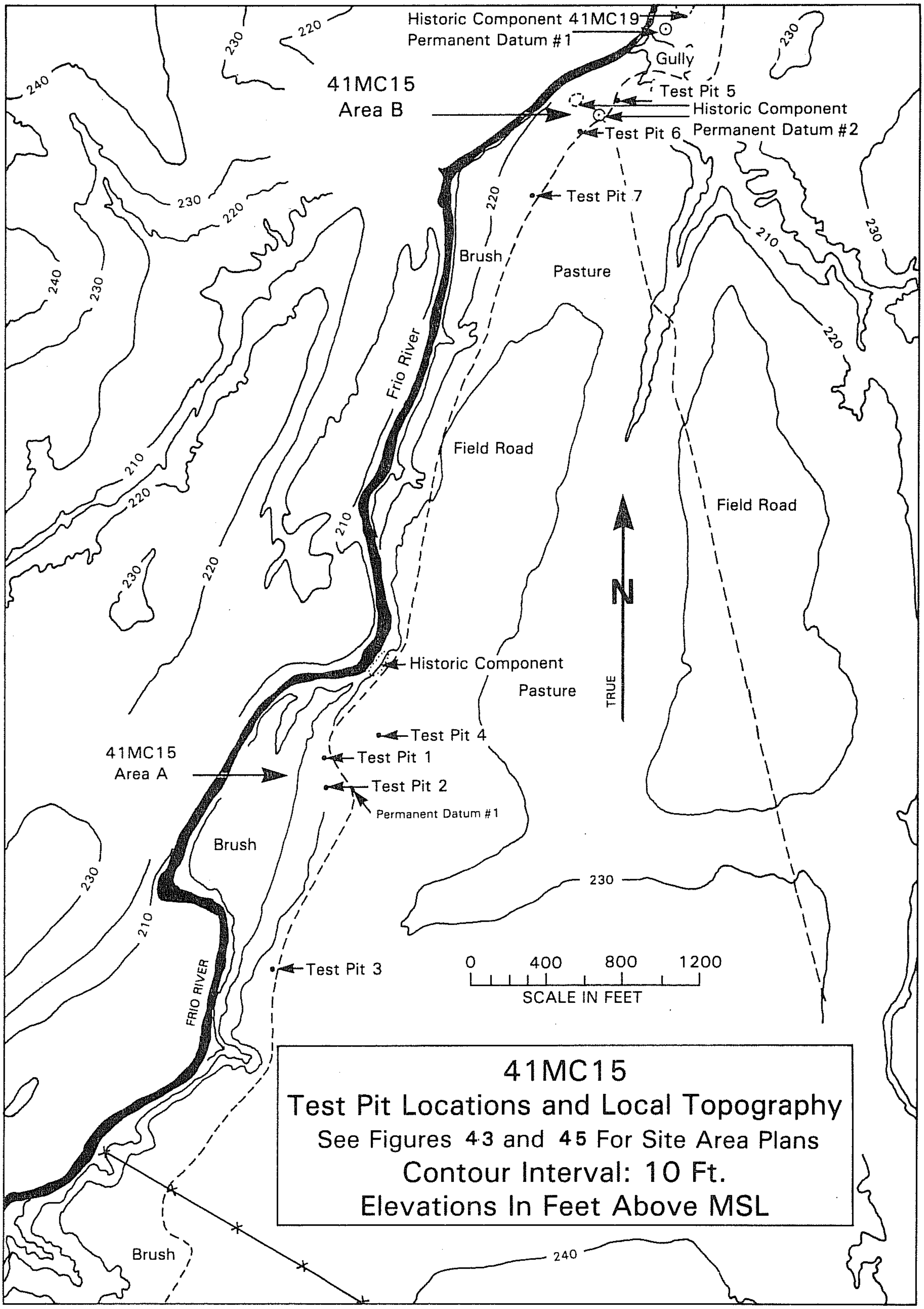
Other artifacts found in Test Pit 3 include a thick biface (Group 9, Level 2) and a *Perdiz* arrow point (Thin Biface Group 1, Form 4, Spec. 14, Level 4).

Test Pit 4 at 41 MC 19 also went to a depth of 60 cm below surface. The matrix was described as compact, light grayish brown silty clay loam. Rates of recovery for selected classes of debris in the two horizons defined for this unit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	69	180
Fire-Fractured Rock Weight (grams)	288	286
Mussel Shell Umbo Count	18	8
Mussel Shell Weight (grams)	45	19
Rabdotus Shell Count	59	77
Bone Weight (grams)	0	0
Primary Flake Count	0	0
Secondary Flake Count	10	8
Tertiary Flake Count	19	28
Chip Count	31	24

Also found in Test Pit 4 were a thick biface (Group 7, Form 2, Level 6) and a probable hammerstone (Spec. 8, Level 4: see discussion of Feature 3 below).

Feature 3, a concentration of fire-fractured rock and sandstone, was isolated in Levels 4 and 5 of Test Pit 4. This feature consists of approximately 50 rocks (diameters ranging from 2-10 cm) arranged in a single layer covering an area of 40 cm east-west and about 70 cm north-south (Figs. 40, 42,a). Except for eight pieces of sandstone, all rocks in Feature 3 were fire-fractured chert. Rock weights were: fire-fractured rock, 1298 g, and sandstone, 680 g. In amidst the feature rocks were several chert flakes, two chert cores, and a probable hammerstone (Spec. 8). No bone or shell was found in or around the feature. Only a very small amount of carbon was found beneath one rock in the feature. Continued excavation beneath the feature level revealed no subsurface structure such as a basin or additional rocks.



41MC15
Test Pit Locations and Local Topography
See Figures 43 and 45 For Site Area Plans
Contour Interval: 10 Ft.
Elevations In Feet Above MSL

FIGURE 41

At the extreme southwest end of 41 MC 19, two clusters of sandstone building rock evidence a historic component not recognized previous to the Phase I investigation at 41 MC 19. The rocks were exposed a short time before the CAR investigation as localized brush clearing was being done on the Bracken Ranch. The two clusters (designated Features 1 and 2) are each roughly 10 m in diameter and are about 10 m apart. They rest on a high terrace bluff above the confluence of a major upland drainage channel with the Frio River (Figs. 38, 41, 43). No *in situ* foundations were recognized amidst the ruins. This historic component is located roughly 150 m northeast of a similar sandstone concentration across the drainage channel at the extreme northeastern end of 41 MC 15.

Prehistoric artifacts collected from the surface of 41 MC 19 include one core, three thick bifaces, eight thin bifaces, three distally beveled tools, and a sherd of prehistoric pottery. All of the surface collected thin bifaces are fragments of unstemmed triangular forms with straight, concave, or convex bases (Groups 2-4). The three distally beveled tools are of the small subtriangular or subrectangular varieties (Group 3, Forms 2 and 3). Recognized time diagnostic artifacts found at 41 MC 19 suggest that prehistoric activities occurred during the Late Archaic (Distally Beveled Tools, Group 3, Forms 2 and 3) and Late Prehistoric (*Perdiz* arrow point and aboriginal potsherd) times. However, the recovery of a *Clear Fork* tool (Distally Beveled Tool, Group 1) from Level 5 of Test Pit 2 raises the possibility of earlier (that is, Paleo-Indian or Early Archaic) activity on the site.

In general, the inventory of debris recovered from 41 MC 19 is not remarkable. Mussel shell and *Rabdotus* shell are present as probable residues of food items consumed by the site's prehistoric inhabitants. Grinding implements were not found on this site. The single subsurface feature isolated in Test Pit 4 is distinguished from similar manifestations at other sites by an apparent absence of mussel shell and snail shell in any substantial amounts. The presence of a hammerstone, cores, and debitage in and around the feature suggest chipped stone tool manufacture as one important activity carried out in conjunction with the feature. Both the absence of shell and the presence of flintknapping equipment and residues may simply be a function of the particular portion of this particular activity area which was tested. The clear stratigraphy observed in the walls of Test Pit 2 was an unusual occurrence and was not, in fact, duplicated even in the three nearby test units. Debris recovered from the subsurface of 41 MC 19 was combined into two horizon assemblages suggested to represent distinct periods of activity on the site. The vertical position of a *Perdiz* arrow point (Level 4, Test Pit 3) and a *Clear Fork* tool (Level 5, Test Pit 2) indicate that vertical mixing has occurred, perhaps a result of past brush-clearing efforts in the site area.

41 MC 15

Site 41 MC 15 is recorded as paralleling the east (right) bank of the Frio River for a northeast to southwest distance of 2.0 km (Fig. 1). The site averages 250 m in width. Both prehistoric and early historic remains occur within the limits of 41 MC 15. The historic component consists of two separate concentrations of sandstone building rock, one located in the site's midsection and the other at its northeast end (Fig. 41). The historic ruins at the northeast

Figure 42. *Photographs Taken in the Vicinity of 41 MC 19, 41 MC 84, and 41 MC 220.*

a. Plan view of Feature 3 in Test Pit 4 at 41 MC 19. All rocks are sandstone.

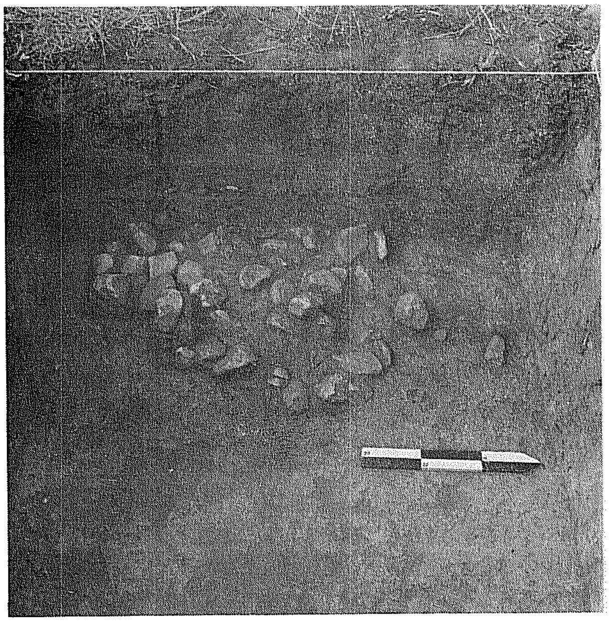
b. South wall profile of Test Pit 2 at 41 MC 19. Note dark zone containing hearth stones near bottom.

c. View of 41 MC 84 looking south across land recently cleared of brush. Numerous prehistoric artifacts were found on the surfaces of gentle rises in fore- and background. Test pits were located among mesquite trees seen to left in photo.

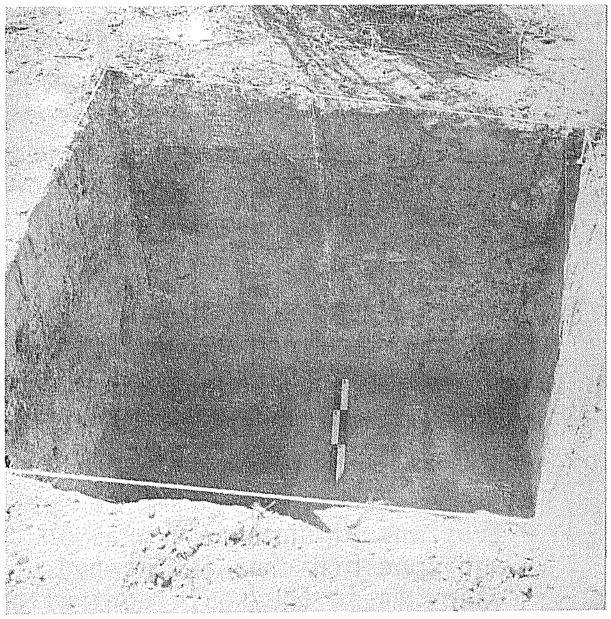
d. Area of 41 MC 220 looking southwest to valley margin just below Skillet Mountain.

e. Dense accumulations of fire-fractured sandstone at 41 MC 220. These piles of sandstone are not unlike the limestone burned rock middens of central Texas.

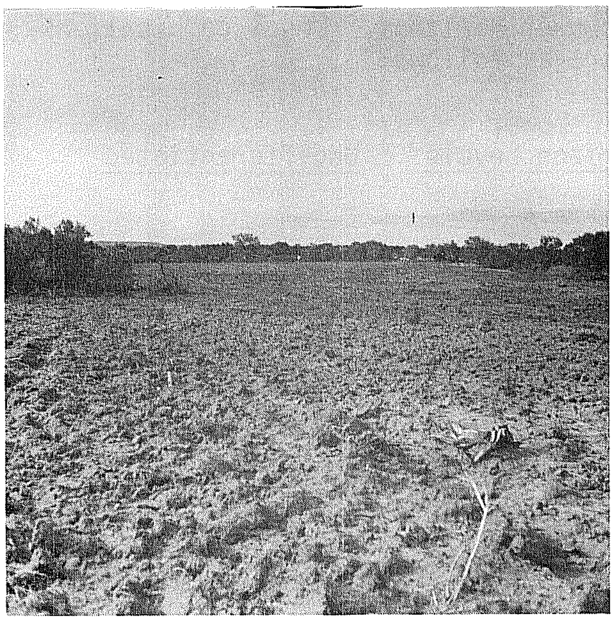
f. Close up of fractured sandstones in midden at 41 MC 220.



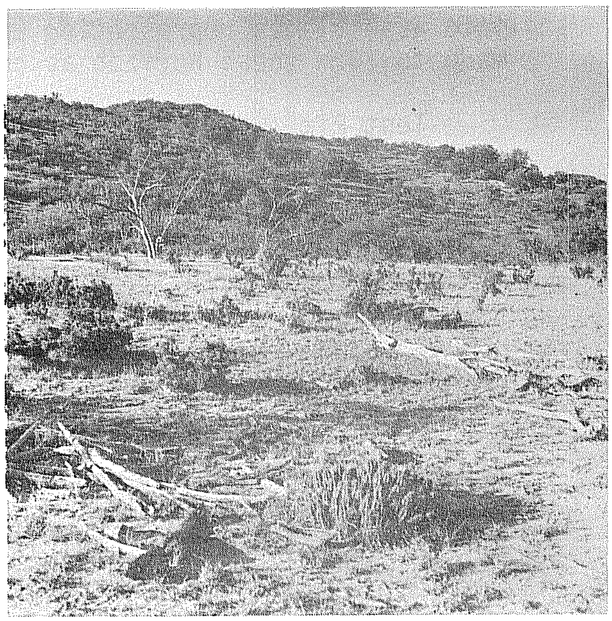
a



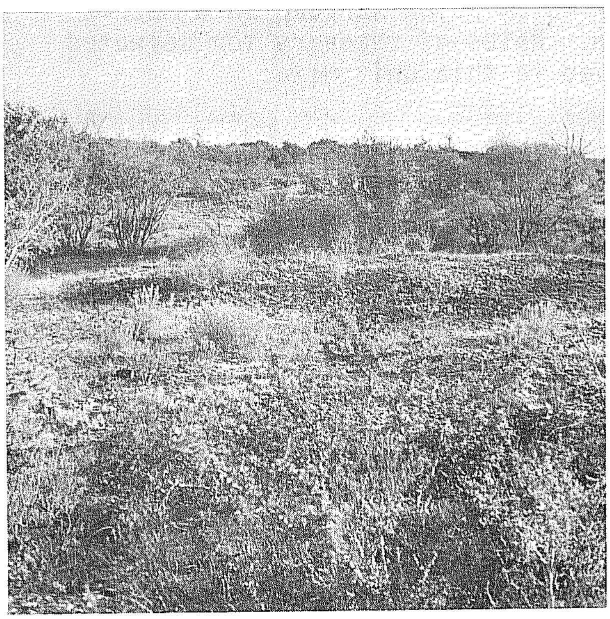
b



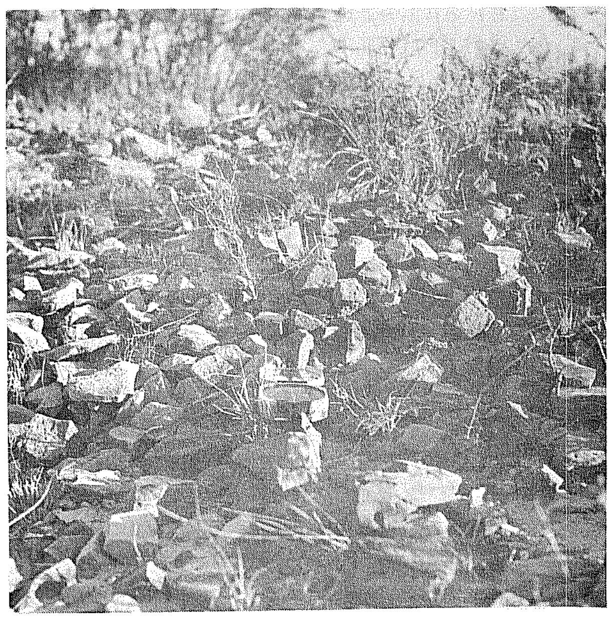
c



d



e



f

end of 41 MC 15 were not recorded prior to the Phase I investigation. For the most part, 41 MC 15 consists of widely spaced scatters of prehistoric debris. Although the site is recorded as being 250 m in width, most of the surface prehistoric debris was concentrated along and west of the field road running the length of the site (Fig. 41). This road follows the edge of the Frio River terrace upon which the site rests. Erosion along the terrace face leading down to the river channel is the apparent reason for greater surface debris densities in this area of the site. Most of 41 MC 15 is within a cleared, grass-covered pasture. A strip of brush parallels the site's western edge between the field road and the channel.

Inspection of the 41 MC 15 surface by the CAR crew revealed two major concentrations of surface debris on the site. Designated as Areas A and B (Fig. 41), one concentration is located at the northeast end of 41 MC 15 (Area B) and the other is in the south central portion of the site (Area A). Six 1-m^2 test pits were excavated in these two areas. A seventh test unit was excavated south of Area A. In six out of the seven test pits, recovered debris has been divided into assemblages representing Upper and Lower Horizons. Level combinations made to form these horizon assemblages are as follows:

Test Pit No.	Upper Horizon Levels	Lower Horizon Levels	Undifferentiated
1	1-3	4-6	
2	1-3	4-6	
3	1-3	4-6	
4	1-4	5-8	
5			1-4
6	1-4	5-8	
7	1-3	4-5	

Area B at the northeast end of 41 MC 15 is manifested by locally heavier concentrations of debitage, mussel shell, snail shell, and sandstone (Fig. 43). It was also in this area of the site that a previously unrecorded historic ruin was found by the CAR crew. Test Pits 5, 6, and 7 were excavated in Area B.

Test Pit 5 was the northwesternmost of the units excavated at 41 MC 15 (Figs. 41 and 43). The unit went to a depth of 40 cm below surface in a matrix described as light brown sandy clay loam. Rates of recovery for selected classes of debris from all levels combined in this unit were:

Sandstone Weight (grams)	83
Fire-Fractured Rock Weight (grams)	120
Mussel Shell Umbo Count	135
Mussel Shell Weight (grams)	759
Rabdotus Shell Count	46
Bone Weight (grams)	2
Primary Flake Count	0
Secondary Flake Count	3
Tertiary Flake Count	7
Chip Count	11

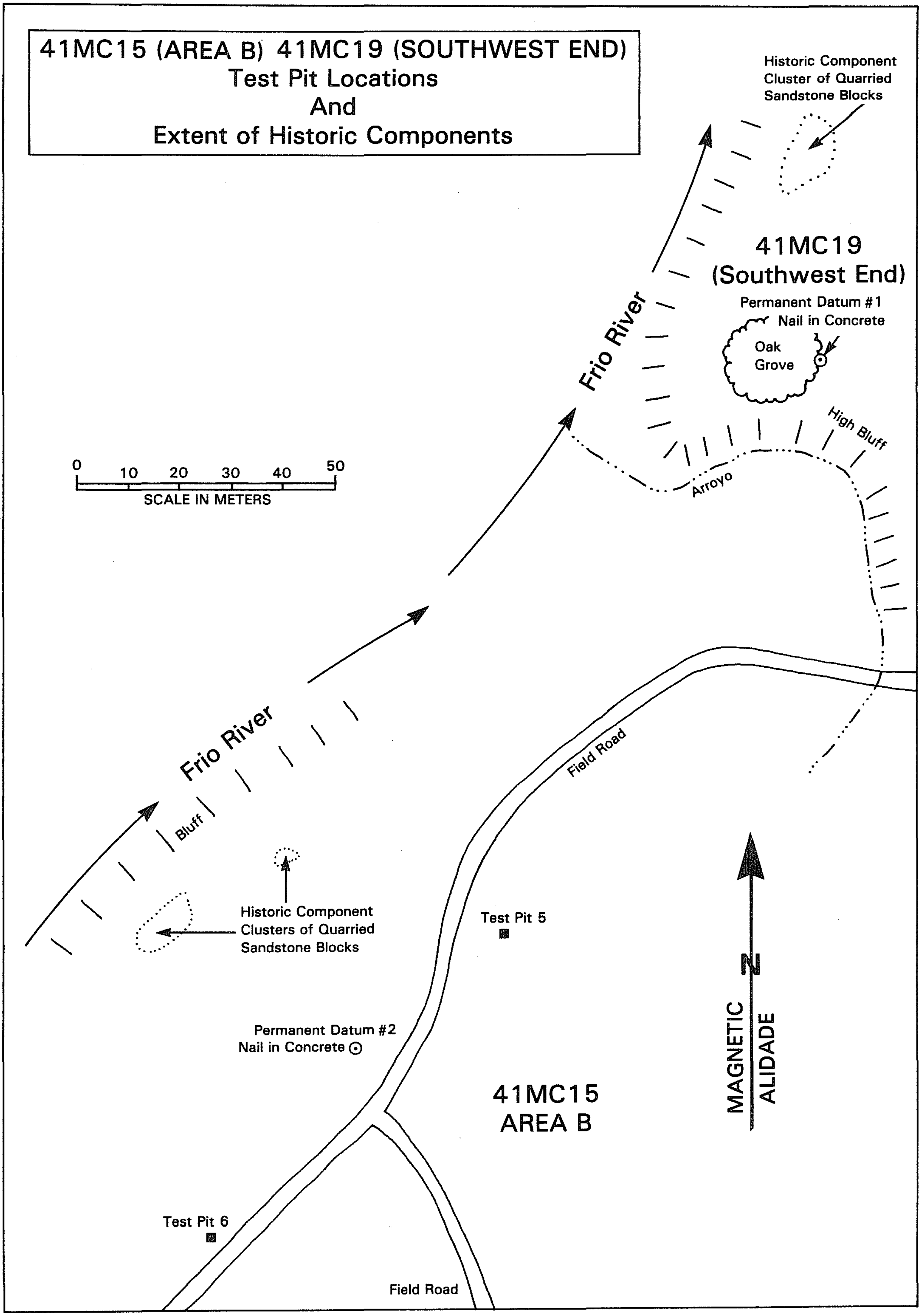

41MC15 (AREA B) 41MC19 (SOUTHWEST END)
Test Pit Locations
And
Extent of Historic Components
Historic Component
Cluster of Quarried
Sandstone Blocks
41MC19
(Southwest End)
Permanent Datum #1
Nail in Concrete
Oak
Grove
Frio River
High Bluff
Arroyo
0
10
20
30
40
50
SCALE IN METERS
Frio River
Field Road
Bluff
Historic Component
Clusters of Quarried
Sandstone Blocks
Test Pit 5
N
MAGNETIC
ALIDADE
Permanent Datum #2
Nail in Concrete
41MC15
AREA B
Test Pit 6
Field Road

FIGURE 43

No additional artifacts were recovered from Test Pit 5. Bones found in Levels 3 and 4 were identified as snake.

Test Pit 6 was placed roughly 80 m southwest of Test Pit 5 (Fig. 43). Eight 10-cm thick levels of matrix were excavated from this unit. The matrix was described as light brown sandy clay loam. Rates of recovery for selected classes of debris recovered from the two horizons defined for this unit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	475	2085
Fire-Fractured Rock Weight (grams)	132	220
Mussel Shell Umbo Count	7	8
Mussel Shell Weight (grams)	15	24
Rabdotus Shell Count	41	47
Bone Weight (grams)	0	0
Primary Flake Count	1	0
Secondary Flake Count	9	7
Tertiary Flake Count	28	20
Chip Count	57	36

Also found in Test Pit 6 were a thin biface fragment (Group 10, Level 5) and a small grinding slab fragment (Modified Sandstone Group 1, Form 3, Level 6).

Two sandstone rock clusters, designated Features 1 and 2, were isolated in Test Pit 6 at 41 MC 15 (Fig. 44). Feature 1 occurred in Levels 4 and 5, Feature 2 was in Levels 5 and 6. Feature 1 was composed of about 20 pieces of sandstone loosely clustered over an area measuring 32 cm north-south and 39 cm east-west. Feature 2, consisting of about 30 pieces of sandstone, was found at a slightly greater depth in the corner of the unit opposite Feature 1 (southeast). The rocks in both features had a burned appearance, but no carbon was found in the features, and the matrix surrounding the features had not obviously been subjected to intense heat or burning. Mussel and snail shells were present in relatively small quantities. Other types of debris such as debitage and fire-fractured rock were not more prevalent in the feature levels than they were above or below. Recovery rates presented above for the Lower Horizon provide an inventory of the debris recovered more generally from matrix in and around the features. The thin biface fragment and grinding slab fragment mentioned above also came from the general area of the features.

Test Pit 7 was placed approximately 120 m south of Test Pit 6 on 41 MC 15 (Fig. 41). The unit was excavated to a depth of 50 cm below surface into a matrix described as light brown sandy clay loam. Rates of recovery for selected classes of material found in the two horizons defined for the unit were:

41MC15-Test Pit 6
Plan of Features 1 and 2
Burned Rock Concentrations

ALL ROCKS ARE SANDSTONE

DEPTH TO BASE OF ROCKS FROM GROUND SURFACE AT SOUTHWEST CORNER:

FEATURE 1 - 38 TO 47 CM
FEATURE 2 - 46 TO 54 CM

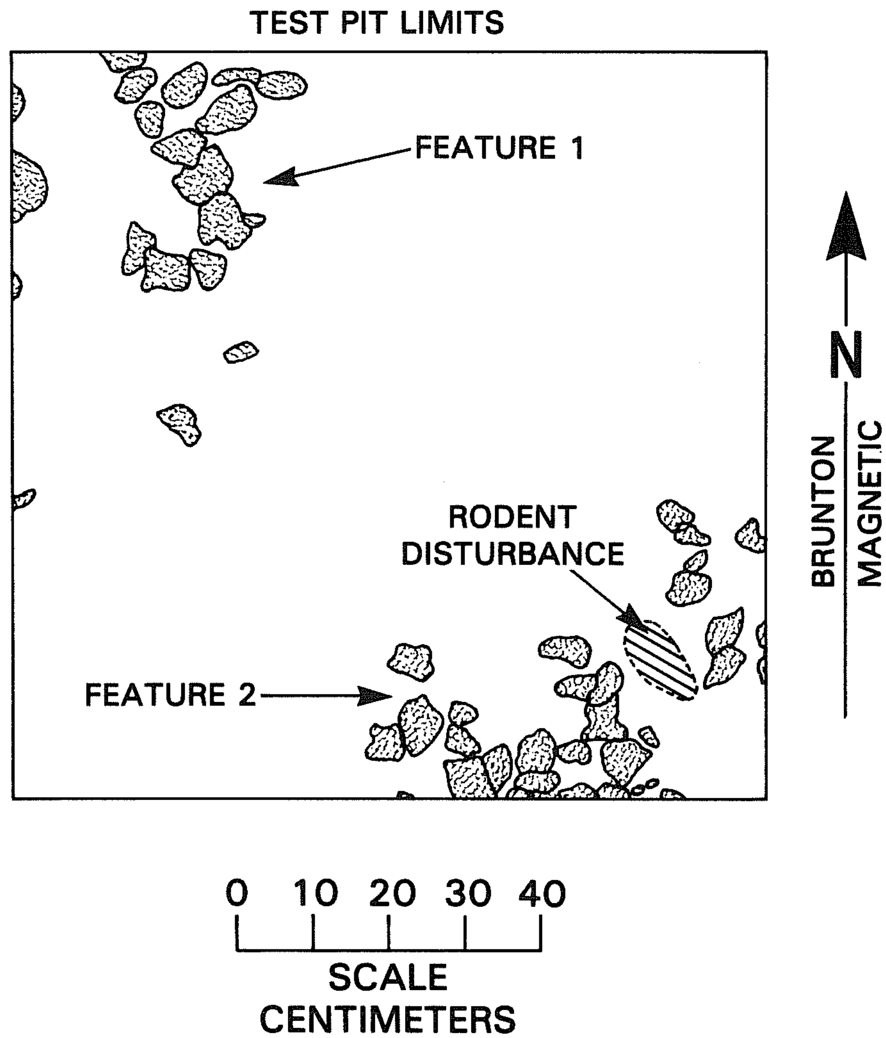


FIGURE 44

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	72	0
Fire-Fractured Rock Weight (grams)	231	0
Mussel Shell Umbo Count	4	0
Mussel Shell Weight (grams)	3	0
Rabdotus Shell Count	19	0
Bone Weight (grams)	0	0
Primary Flake Count	0	0
Secondary Flake Count	16	0
Tertiary Flake Count	15	0
Chip Count	34	1

A core (Group 3) was recovered from Level 2 of Test Pit 7.

The historic ruin found by the CAR crew at the northeast end of 41 MC 15 consists primarily of two concentrations of sandstone building rocks (Fig. 43). These ruins were exposed during brush clearing activities which took place in the area a short time before the CAR investigation began on the site. The two clusters of sandstone are separated by a distance of about 30 m. The cluster to the northeast is 2 m in diameter. The southwestern cluster is oblong with a north-south dimension of 20 m and is 10 m east-west. The rock clusters appear to have been badly disturbed and pushed about by the bulldozer used to clear the brush. Two whiteware sherds were the only historic artifacts observed in the area around the sandstone concentrations. As can be seen in Figure 43, the newly recorded historic ruins on 41 MC 15 and 41 MC 19 are roughly 180 m apart.

Moving southwestward down the length of 41 MC 15, the remnants of the original historic component recorded by THC surveyors are encountered near the midsection of the site. Investigations at this site were carried out by personnel from Texas Tech University (Everett 1981:42; Bandy 1981:146).

In the southwest central portion of 41 MC 15, the CAR crew found an area characterized by relatively dense surface concentrations of large, heavy mussel shell fragments and lesser amounts of debitage, snail shell, sandstone, and fire-fractured rock (Figs. 41, 45). Designated Area A, this mussel shell scatter was the second major concentration of prehistoric debris recognized at 41 MC 15. Closer inspection over the general area revealed that the surface west of the field road running through the site had been severely disturbed by recent brush clearing activities. The surface disturbances related to clearing of the brush served to increase the visibility of remains in Area A, especially the mussel shell.

The large, thick pieces of mussel shell found in Area A at 41 MC 15 were unlike other shell scatters seen at Choke Canyon sites in terms of both quantity and size. The fact that most of the shells were broken into very angular pieces is suggestive of shell tool or ornament manufacture. There were, however, no recognized shell tools or ornaments found in the immediate area. Mussel shells from Area A were collected in arbitrarily defined "shell clusters," the limits of which were recorded on a plane table map of the area (Fig. 45). The 94 shell

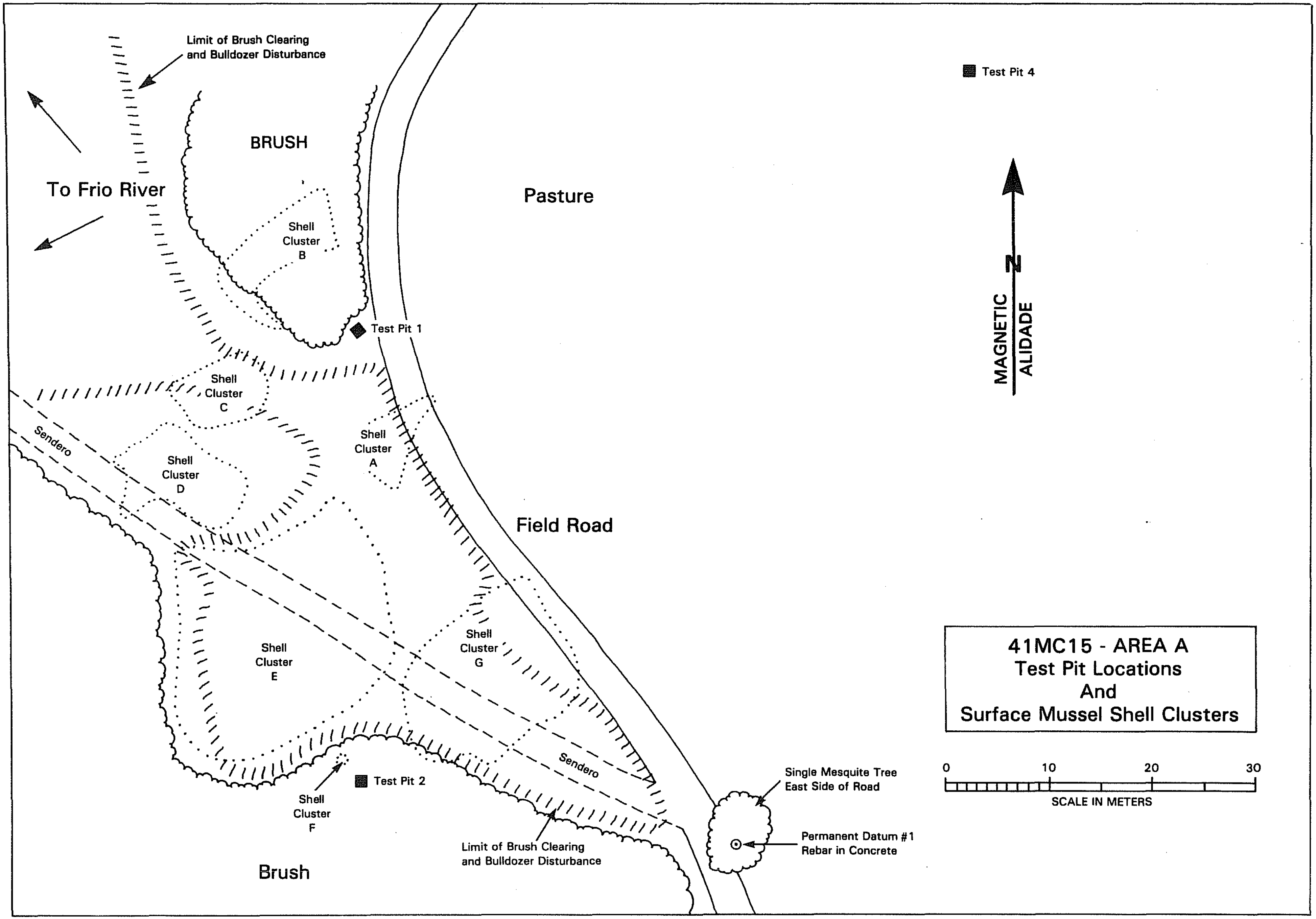

Limit of Brush Clearing and Bulldozer Disturbance
Test Pit 4
BRUSH
To Frio River
Pasture
Shell Cluster B
N
MAGNETIC ALIDADE
Test Pit 1
Shell Cluster C
Shell Cluster A
Sendero
Shell Cluster D
Field Road
Shell Cluster E
Shell Cluster G
41MC15 - AREA A
Test Pit Locations
And
Surface Mussel Shell Clusters
Sendero
0 10 20 30
SCALE IN METERS
Single Mesquite Tree East Side of Road
Test Pit 2
Shell Cluster F
Permanent Datum #1 Rebar in Concrete
Limit of Brush Clearing and Bulldozer Disturbance
Brush

FIGURE 45

fragments, apparently all from the species *Megalonaias gigantea*, have not been further analyzed in terms of shape or possible use-wear indications. Examples of these shell fragments are illustrated in Figure 88,k-n.

In addition to provenienced surface artifact collecting activities done in Area A at 41 MC 15, three 1-m^2 test pits were excavated. Two of the units were placed in the vicinity of the mussel shell scatters (Fig. 45). The third unit was located out in the cleared pasture east of Area A proper.

Test Pit 1 was excavated to a depth of 60 cm in a matrix described as light brown sandy clay loam down into Level 5. In Level 5, matrix color began to lighten. In Level 6, a homogeneous yellowish buff friable silty clay loam was encountered. Rates of recovery for selected classes of debris found in the two horizons defined for this unit were as follows:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	2440	2017
Fire-Fractured Rock Weight (grams)	506	482
Mussel Shell Umbo Count	41	15
Mussel Shell Weight (grams)	191	61
Rabdotus Shell Count	283	222
Bone Weight (grams)	0.7	0.5
Primary Flake Count	0	1
Secondary Flake Count	24	9
Tertiary Flake Count	44	12
Chip Count	52	33

A core (Group 10, Level 3) and a thin biface fragment (Group 10, Level 5) were also found in Test Pit 1. A bone fragment found in Level 1 is identified as rabbit.

Test Pit 2 was set out along the southern margin of Area A on a ground surface which had not been disrupted by brush clearing machinery (Fig. 45). Six 10-cm thick levels of matrix were excavated from this unit. Matrix was described as light grayish brown sandy loam. Rates of recovery for selected classes of debris from the two horizons defined in this unit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	739	1389
Fire-Fractured Rock Weight (grams)	116	245
Mussel Shell Umbo Count	13	23
Mussel Shell Weight (grams)	49	37
Rabdotus Shell Count	206	118
Bone Weight (grams)	0	0
Primary Flake Count	1	1
Secondary Flake Count	22	17
Tertiary Flake Count	25	21
Chip Count	40	37

Test Pit 2 also yielded one core (Group 2, Level 4), one sherd of aboriginal pottery (Level 1), and one gram of ocher (Level 4).

Test Pit 4 was the unit placed out in the pasture east of Area A (Fig. 45). The main reason for placing a unit at this particular location was to test the density of subsurface debris near the presumed eastern margin of the site as defined by surface material distribution. Test Pit 4, located from 90-100 m east of the terrace edge leading down to the river, was also in an area of the site where little erosion seems to have occurred. The unit was excavated to a depth of 80 cm below surface in a matrix described as grayish brown sandy clay loam down into Level 6. In Level 6, matrix color began to lighten while becoming more granular and friable. Rates of recovery for selected classes of debris representing the two horizons defined in this unit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	2191	1220
Fire-Fractured Rock Weight (grams)	471	100
Mussel Shell Umbo Count	47	53
Mussel Shell Weight (grams)	115	101
Rabdotus Shell Count	323	325
Bone Weight (grams)	0	0
Primary Flake Count	0	0
Secondary Flake Count	19	10
Tertiary Flake Count	32	34
Chip Count	64	70

A core (Group 6) was found in Level 5 of Test Pit 4.

Test Pit 3 was placed approximately 365 m southwest of Area A near the southwestern end of 41 MC 15 (Fig. 41). It was excavated to a depth of 60 cm below surface in a matrix characterized as light tannish brown sandy clay loam.

Rates of recovery for selected classes of material for the two horizons defined in this unit were:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	2635	1110
Fire-Fractured Rock Weight (grams)	90	29
Mussel Shell Umbo Count	41	55
Mussel Shell Weight (grams)	101	123
Rabdotus Shell Count	74	55
Bone Weight (grams)	0	0
Primary Flake Count	1	0
Secondary Flake Count	30	9
Tertiary Flake Count	61	22
Chip Count	106	37

Other artifacts found in Test Pit 3 include two thick bifaces (Group 7, Form 1 and Group 9, both in Level 1) and a thin biface fragment (Group 10, Level 3).

In addition to the debris and artifacts recovered from test pits excavated at 41 MC 15 and the 94 shell fragments surface collected in Area A, there were 55 other artifacts found on the site surface. Included in this surface assemblage are 13 cores, five thick bifaces, 30 thin bifaces, two distally beveled tools, a uniface, a trimmed flake, two pieces of modified sandstone, and another sherd of aboriginal pottery. Specimens in this assemblage having potential as time diagnostics include two stemmed dart points (Thin Biface Group 1, Form 1). One (Spec. 6) is classified as a *Bulverde* point and was found in the vicinity of Test Pit 3. A second dart point (Spec. 18) has a broad, square-based stem and was found in Area A. Comparing these forms to the central Texas sequence, a Middle Archaic component is indicated. Other stemmed thin bifaces found on the site were arrow points and arrow point fragments (Group 1, Forms 5 and 7). Two of these (Group 1, Form 5, Specs. 3 and 9) are *Scallorn* or *Scallorn*-like points. One each was found in Areas A and B. Three more arrow point fragments (Group 1, Form 7) were found in Area A. These points demonstrate that Late Prehistoric activities took place at 41 MC 15. Late Prehistoric activity is further evidenced by chipped stone specimens such as a "beveled knife" (Thin Biface Group 4, Form 2, Spec. 5), a perforator made on a flake (Thin Biface Group 8, Spec. 5). and two sherds of aboriginal pottery. Numerous unstemmmed thin bifaces with triangular outlines and straight, concave, or convex bases (Groups 2, 4-6) suggest activity during the Archaic, but do not now permit more exact definition of cultural/chronological periods which may be represented. Two distally beveled tools (Group 3, Forms 1 and 3) suggest that 41 MC 15 contains Middle and/or Late Archaic components.

The test excavations at 41 MC 15 indicate that prehistoric cultural debris is contained in the upper 60-80 cm of deposit over two restricted areas of the site (Areas A and B) and at its southwestern end (Test Pit 3). With a total of seven test pits excavated, the testing effort expended at 41 MC 15 was greater than at any of the other sites subjected to minimal testing during the Phase I program. However, even with the relatively greater amount of effort devoted to 41 MC 15, it was still not possible to test a site of such great size adequately. Given the site area involved, it would probably be ill-advised to project findings made in the seven test pits much beyond the limits of the immediate vicinity in which each was excavated. What follows then is a discussion of findings made over a limited portion of 41 MC 15. There remains a substantial area of the site which was not investigated through subsurface tests.

Analysis of debris recovered at 41 MC 15 suggests that Middle and/or Late Archaic, Late Prehistoric, and early Historic components are present on the site. In subsurface tests, the debris recovery has been divided into assemblages designated as Upper and Lower Horizons. Tentatively, the Upper Horizon is suggested to contain residues of Late Prehistoric activity while the Lower Horizon debris represents Archaic activity. In comparing rates of material recovery between the two horizons, no substantial differences are perceived. As usual, assumed residues of food items consumed by prehistoric residents of the site are limited to mussel and snail shells. However, both the mussel and snail shell do seem to be present in unusually large quantities, especially in Area A. A limited number of grinding implements suggest that seeds or nuts may have been processed on the site. Bones found in two test pits were

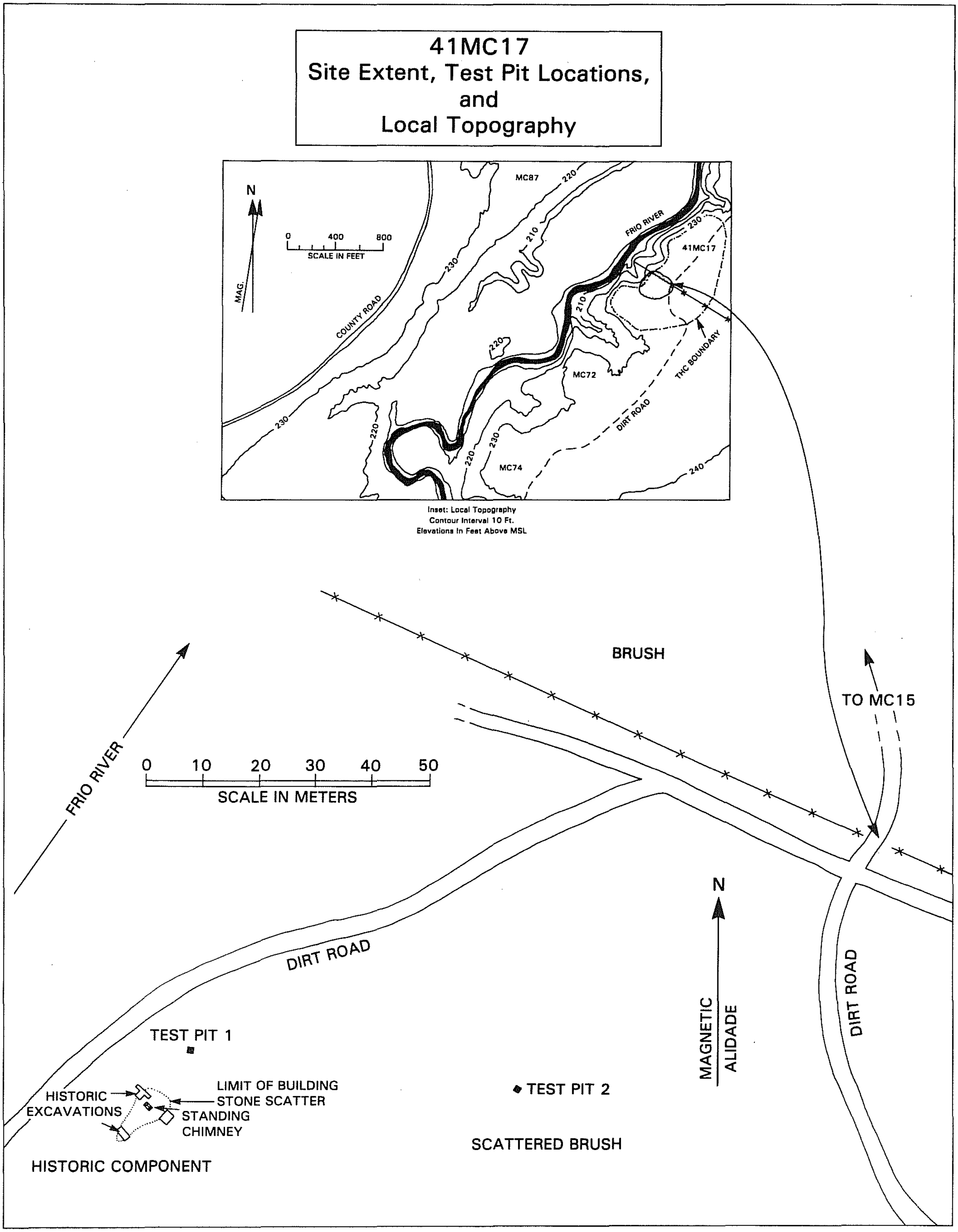

41MC17
Site Extent, Test Pit Locations, and Local Topography
N
MAG.
0 400 800
SCALE IN FEET
MC87
220
210
230
COUNTY ROAD
FRIO RIVER
41MC17
MC72
THC BOUNDARY
DIRT ROAD
MC74
240
Inset: Local Topography
Contour Interval 10 Ft.
Elevations In Feet Above MSL
BRUSH
TO MC15
FRIO RIVER
0 10 20 30 40 50
SCALE IN METERS
DIRT ROAD
N
MAGNETIC
ALIDADE
DIRT ROAD
TEST PIT 1
TEST PIT 2
HISTORIC EXCAVATIONS
LIMIT OF BUILDING STONE SCATTER
STANDING CHIMNEY
SCATTERED BRUSH
HISTORIC COMPONENT

FIGURE 46

identified as snake and rabbit. Due to the more general absence of bone elsewhere on the site, it is likely that these bones are modern introductions unrelated to prehistoric activity. The fragmented mussel shells collected in Area A are unusual by virtue of their size, thickness, and quantity. A shell tool or ornament industry is suggested, but, as previously mentioned, no such finished artifacts were recognized in the assemblage of artifacts found on the site. The shell species represented in the Area A collection--*Megalonaias gigantea*--is relatively uncommon at Choke Canyon. The shells found at 41 MC 15 constitute the largest single concentration of the species yet known in the project area.

41 MC 17

Southwest of 41 MC 15, 41 MC 17 is a site containing both prehistoric and historic components (Fig. 1). As recorded by the THC survey crew, 41 MC 17 measures 400 m northeast-southwest and 200 m northwest-southeast. The site rests on a second terrace surface above the Frio River which flows along the site's northwestern margin. Site 41 MC 17 is separated from 41 MC 15 to the northeast and 41 MC 72 to the southwest only by gully systems which cut up into the terraces from the river channel. Except for the gullies, there is essentially no separation between these three sites. Site 41 MC 17 contains a historic component manifested most prominently by a standing sandstone chimney. This historic component was investigated by workers from Texas Tech University (Everett 1981:42; Bandy 1981:151). The surface of 41 MC 17 is covered by moderate to heavy stands of brush including mesquite, guayacan, prickly pear, whitebrush, persimmon, spiny hackberry, and grasses (Fig. 50,c). Live oaks and elms grow near the river channel along the site's northwestern edge. THC analysts listed this site as containing evidence of activity dating to the Early Archaic (Lynn, Fox, and O'Malley 1977:44).

Activities of the CAR crew included excavation of two 1-m^2 test pits and an unprovenienced collection of surface artifacts. Test Pit 1 was placed at a location about 12 m northwest of the chimney (Fig. 46). This unit was excavated to a depth of 70 cm below surface in a matrix dexcribed as light brown sandy clay loam. Rates of recovery for selected classes of material from all levels combined were:

Sandstone Weight (grams)	4770
Fire-Fractured Rock Weight (grams)	442
Mussel Shell Umbo Count	127
Mussel Shell Weight (grams)	298
Rabtodus Shell Count	243
Bone Weight (grams)	0
Primary Flake Count	2
Secondary Flake Count	72
Tertiary Flake Count	145
Chip Count	198

Rates of recovery varied so slightly down through the levels of this unit that no horizons could be defined. Also recovered from Test Pit 1 were a core (Group 6, Level 2), a thick biface (Group 4, Level 4), and a piece of modified sandstone (Group 1, Form 3, Level 2).

Test Pit 2 at 41 MC 17 was staked out at a spot located 65 m east of the chimney (Fig. 46). Five 10-cm thick levels of matrix were removed from this unit. Matrix was like that described for Test Pit 1 above. Rates of recovery for selected classes of debris were as follows:

Sandstone Weight (grams)	2188
Fire-Fractured Rock Weight (grams)	112
Mussel Shell Umbo Count	66
Mussel Shell Weight (grams)	207
Rabdotus Shell Count	231
Bone Weight (grams)	4
Primary Flake Count	3
Secondary Flake Count	45
Tertiary Flake Count	61
Chip Count	65

As in Test Pit 1, it was not possible to define horizons with Test Pit 2 due to the relatively uniform rates of recovery down through the deposit. Mesquite (*Prosopis glandulosa* Torr.) was identified as the wood burned to produce a small amount of carbon collected in Level 2 of this unit. There is no corresponding radiometric date due to the small size of the carbon sample. Bone recovered in Level 4 could not be identified as to species.

Among artifacts collected from the surface are four cores, eight thin bifaces, and a sherd of aboriginal pottery. One of the thin bifaces is an *Ensor* dart point (Group 1, Form 3, Spec. 6). This dart point type is diagnostic of the Late Archaic. The single potsherd found at 41 MC 17 indicates the presence of a Late Prehistoric component. These two specimens are the only recognized time diagnostic artifacts in the collection made at the site. No additional evidence of an Early Archaic component was found.

The cultural debris recovered in test pits excavated at 41 MC 17 is remarkable only in that no horizons could be recognized vertically down through the site deposits. Mussel shell and snail shell are both common. Along with a grinding slab fragment, the mussel and snail shell constitute the usual array of assumed food preparation and consumption residues. A small amount of animal bone was recovered from one unit, but species could not be determined. The site was apparently occupied during the Late Archaic and Late Prehistoric periods, but earlier occupations cannot be ruled out entirely. Cultural debris is contained in the upper 50-70 cm of deposit on the site.

41 MC 72

Immediately southwest of 41 MC 17 is prehistoric site 41 MC 72 (Fig. 1). As recorded by the THC survey crew, this site measures 550 m northeast-southwest and 300 m northwest-southeast. The site rests on a heavily eroded second terrace surface above (southeast of) the Frio River. Within the limits of 41 MC 72 are two historic sandstone burial crypts which have been assigned a separate permanent designation of 41 MC 71. The site surface is covered with brush including mesquite, guayacan, blackbrush, whitebrush, spiny hackberry, and persimmon.

Reconnaissance activities carried out by the CAR crew revealed that visible prehistoric cultural debris was concentrated in gullies along the northwestern margin of the site. Little or no debris was apparent over the southern and eastern reaches of the site back away from the terrace edge leading down to the Frio River. Debitage, fire-fractured rock, sandstone, mussel and snail shells, and chipped stone tools were the materials most commonly observed in the gullies. The CAR crew found that there is essentially no break in the scatter of surface cultural debris between 41 MC 17 and 41 MC 72. A major gully system between the two sites was apparently selected as an arbitrary landform demarcation.

An unprovenienced surface collection conducted at 41 MC 72 yielded two cores, one thick biface, seven thin bifaces, one distally beveled tool, two trimmed flakes, and two pieces of modified sandstone (large grinding slab fragments). The one distally beveled tool (Group 3, Form 2) tentatively indicates the presence of a Late Archaic component on the site. The remaining artifacts are generally suggestive of Archaic period activity, but it is not possible to specify the time period(s) represented by the remains.

41 MC 74

This small site is located southwest of 41 MC 72 and northwest of 41 MC 78 (Fig. 1). As recorded by the THC crew, 41 MC 74 measures 100 m east-west and 75 m north-south. The site rests on a terrace remnant forming a small knoll overlooking the Frio River floodplain. The river flows approximately 75 m west of the site. Steep sandstone bluffs rise up to the south and east. The site surface is heavily brush covered. Mesquite, blackbrush, allthorn, whitebrush, spiny hackberry, guayacan, and catclaw are present. Live oak, elm, willow, hackberry, ash, and huisache all grow just off the site toward the river. This site contains both prehistoric and historic components. Investigations conducted on the historic component of 41 MC 74 are reported by Everett (1981:42) and Bandy (1981:158). THC analysts listed 41 MC 74 as containing Pre-Archaic and Archaic (undifferentiated) remains (Lynn, Fox, and O'Malley 1977:44).

An unprovenienced surface collection conducted at 41 MC 74 by the CAR crew yielded four cores, three thick bifaces, five thin bifaces, and one uniface. Debitage, snail shell, mussel shell, fire-fractured rock, and sandstone were also observed on the site surface, but not collected. A stemmed dart point fragment (Thin Biface Group 1, Form 6, Spec. 12) and two unstemmed thin bifaces (Group 5, Spec. 47; Group 6, Spec. 4) indicate activity occurred on the site during the Archaic, but it is not possible to be any more specific about the time period(s) represented.

41 MC 78

The next site southwest of 41 MC 74 is prehistoric site 41 MC 78 (Fig. 1). This site is recorded as being roughly circular in outline shape with a diameter of about 150 m. It lies at the base of a steep sandstone bluff forming the southern valley margin in the area. The site surface is strewn with large pieces of sandstone derived from the bluff slope. An upland drainage channel runs south-north

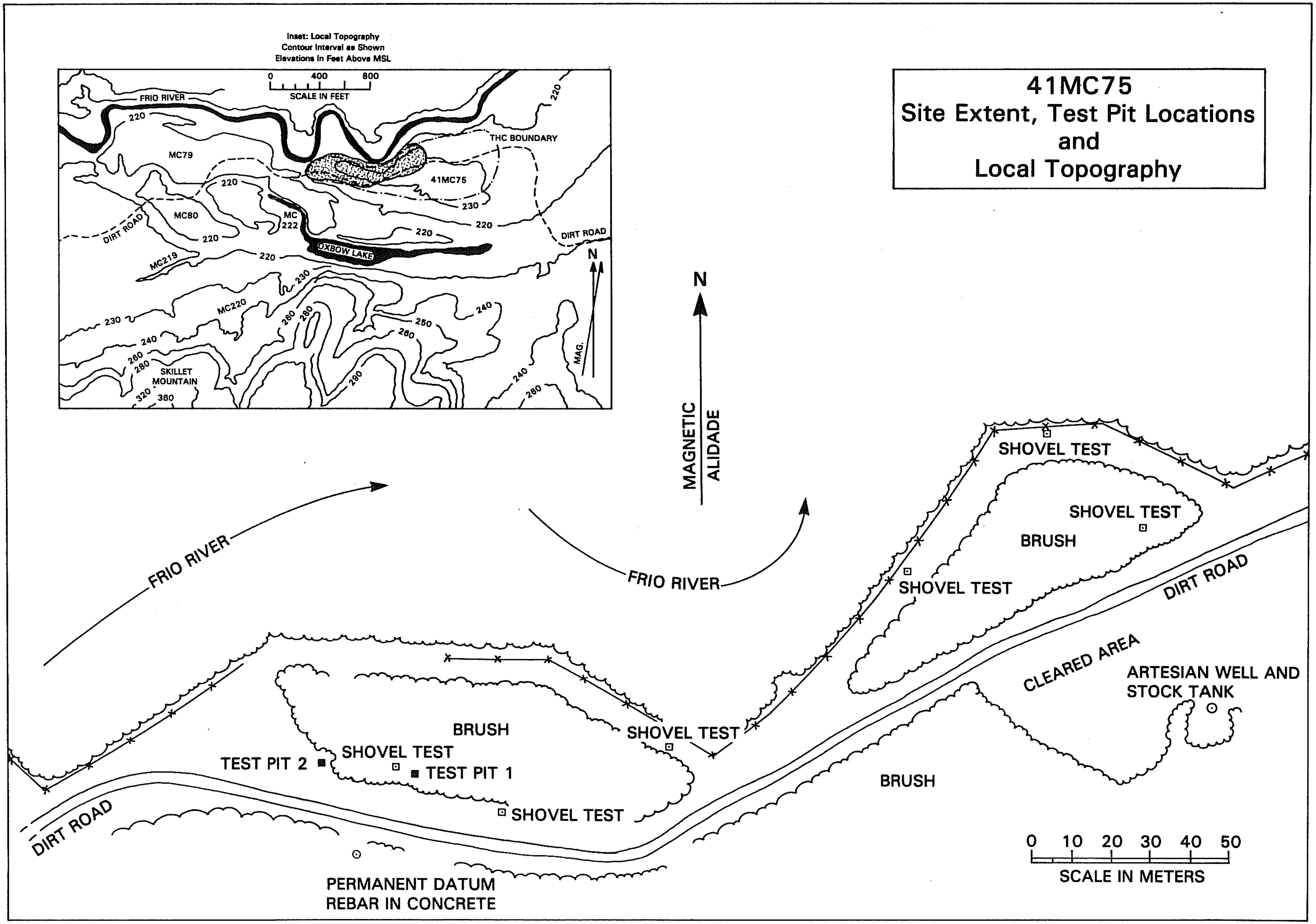

41MC75
Site Extent, Test Pit Locations and Local Topography
Inset: Local Topography
Contour Interval as Shown
Elevations In Feet Above MSL
0 400 800
SCALE IN FEET
FRIO RIVER
THC BOUNDARY
MC79
41MC75
MC80
MC 222
OXBOW LAKE
MC219
MC220
DIRT ROAD
SKILLET MOUNTAIN
MAG.
N
MAGNETIC ALIDADE
FRIO RIVER
FRIO RIVER
SHOVEL TEST
SHOVEL TEST
BRUSH
SHOVEL TEST
DIRT ROAD
CLEARED AREA
ARTESIAN WELL AND STOCK TANK
BRUSH
SHOVEL TEST
TEST PIT 2
SHOVEL TEST
TEST PIT 1
SHOVEL TEST
BRUSH
DIRT ROAD
PERMANENT DATUM
REBAR IN CONCRETE
0 10 20 30 40 50
SCALE IN METERS

FIGURE 47

along the east side of 41 MC 78. A short distance downslope (northwest) of the site is a relict channel of the Frio River which meets the river about 50 m from the site. The surface supports blackbrush, guayacan, agarita, mesquite, allthorn, guajillo, spiny hackberry, tasajillo, and persimmon. Cultural debris including debitage, cores, and a small amount of mussel and snail shell was observed on the site surface. It was concentrated primarily along the western edge of the site where the surface begins to slope down to the river channel. An unprovenienced surface collection conducted at 41 MC 78 by the CAR crew yielded four cores, three thick bifaces, five thin bifaces, and one distally beveled tool. Among the thin bifaces is an unusual stemmed dart point (Group 1, Form 3, Spec. 15) typed as an *Edgewood*, but which may actually be an "Early Corner Notched" point, coming to be recognized as a Pre-Archaic or Early Archaic diagnostic. The distally beveled specimen (Group 2, Form 1) is a variety of *Clear Fork* tool. Together, these two specimens suggest that 41 MC 78 contains Pre-Archaic and/or Early Archaic remains. This suggestion is at variance with the recognition of Late Prehistoric remains on the site made by THC analysts (*ibid.*).

41 MC 75

Prehistoric site 41 MC 75 is located down in the floodplain along the south (right) bank of the Frio River (Fig. 1). As recorded by the THC survey crew, 41 MC 75 measures 400 m east-west and from 75-150 m north-south. The site rests on a natural levee terrace surface immediately above the river. A complex network of relict channels run along the south side of the site. Beyond these relict channels, the foot of Skillet Mountain is about 300 m south of 41 MC 75 (Fig. 47). Brush is very dense over parts of the site. Mesquite, live oak, guayacan, persimmon, spiny hackberry, whitebrush, and grasses are present. Shortly before Phase I investigations began on this site, a substantial amount of brush was bulldozed down along the fence and dirt road running through the area. Brush was pushed up into big piles here and there over the site.

As the surface of 41 MC 75 was inspected by the CAR crew, cultural debris including fire-fractured rock, sandstone, debitage, mussel shell, and snail shell was seen eroding out along the dirt road, in the newly bulldozed *senderos* through the brush, and in several gullies which cut down through the site to the river. Surface debris is most common at the west end. It was in this area that two 1-m^2 test pits were excavated. In addition to these test pits, six uncontrolled shovel tests were excavated eastward across the site (Fig. 47). Findings made in these shovel tests indicated that subsurface deposits of cultural debris were confined primarily to the west end.

Test Pit 1 at 41 MC 75 was excavated to a depth of 1.0 m below surface in a matrix described as dark gray silty clay loam. Rates of recovery for selected classes of material from all levels combined in this unit were:

Sandstone Weight (grams)	867
Fire-Fractured Rock Weight (grams)	53
Mussel Shell Umbo Count	3
Mussel Shell Weight (grams)	7
Rabdotus Shell Count	317

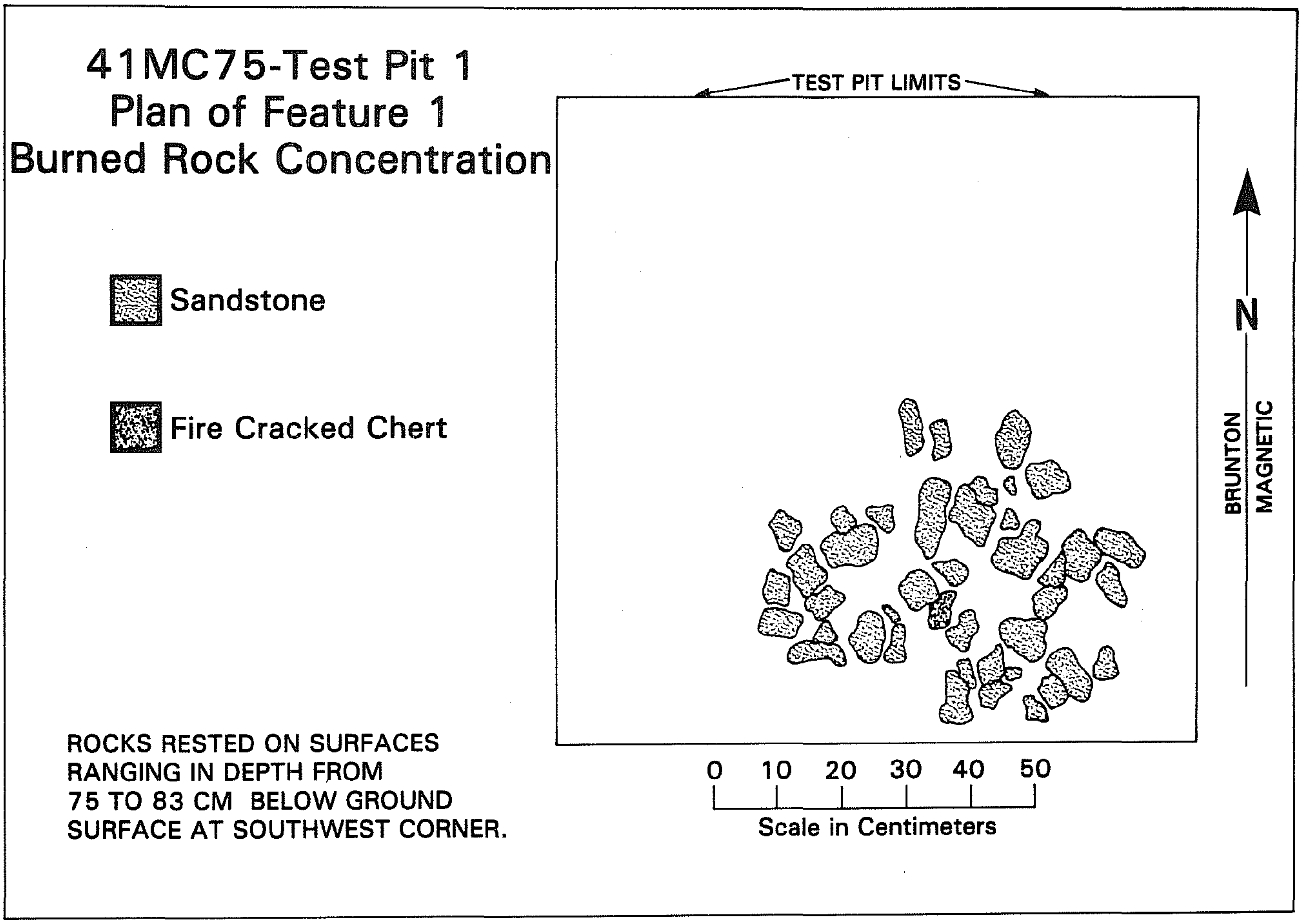


FIGURE 48

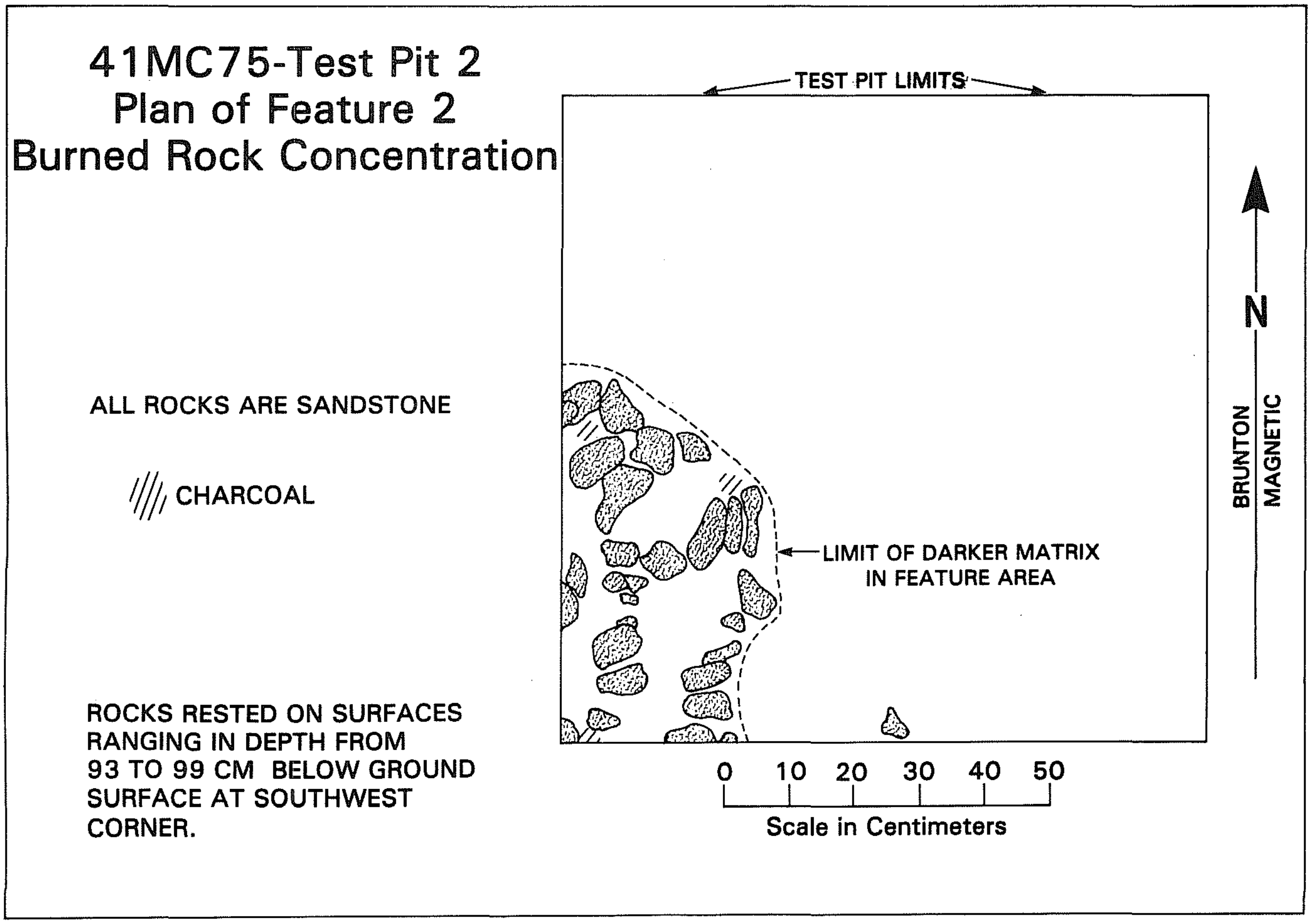


FIGURE 49

Bone Weight (grams)	0
Primary Flake Count	3
Secondary Flake Count	30
Tertiary Flake Count	41
Chip Count	51

Also found in Test Pit 1 were two cores (Group 6) in Level 1.

A subcircular cluster of sandstone rocks was encountered in Test Pit 1 at 41 MC 75. Designated Feature 1, this rock cluster occurred between 75-83 cm below ground surface (Fig. 48). Consisting of about 42 pieces of rock, this feature was subcircular in outline shape with an east-west dimension of 60 cm and a north-south dimension of 50 cm. With the exception of one piece of fire-fractured chert, all rocks in the feature were sandstone (total weight 3104 g). They were deposited in a single layer. No basin or additional rocks were found beneath the feature. No carbon was found amidst the rocks.

Test Pit 2 at 41 MC 75 was located about 25 m west of the Test Pit 1 location (Fig. 47). This unit was excavated to a depth of 1.2 m below surface in a matrix described as dark gray-brown silty clay loam. In Level 5, the matrix color became light brown and sand content seemed to increase. This light brown sandy clay loam continued on down to the bottom of the unit. Based on variations in rates of debris recovery down through the deposit in Test Pit 2, materials retrieved from the unit have been divided into assemblages representing Upper and Lower Horizons. The Upper Horizon contains debris found from surface to a depth of 40 cm below surface. The Lower Horizon contains debris recovered from 40-120 cm below surface. Rates of recovery for selected classes of debris found in the two horizons defined for this unit were as follows:

	Horizon	
	Upper	Lower
Sandstone Weight (grams)	1043	339
Fire-Fractured Rock Weight (grams)	217	76
Mussel Shell Umbo Count	5	16
Mussel Shell Weight (grams)	12	29
Rabdotus Shell Count	31	25
Bone Weight (grams)	0	0
Primary Flake Count	6	6
Secondary Flake Count	23	14
Tertiary Flake Count	40	16
Chip Count	56	51

Also found in Test Pit 2 was a core (Group 6, Level 1) and a perforated mussel shell fragment (Level 4).

A concentration of sandstone rocks was encountered from 94-99 cm below surface in Test Pit 2 at 41 MC 75. Designated Feature 2, this cluster contains approximately 30 pieces of sandstone (total weight 2597 g) concentrated in the southwest corner of the unit (Fig. 49). The cluster covers an area measuring 56 cm north-south and 32 cm east-west. Matrix surrounding the rocks was darker than soil out away from the feature. There was carbon amidst the rocks of this feature, but the quantity collected was insufficient for radiocarbon assay or wood species identification. Small quantities of debitage, mussel shell, and land snail shell were found in the matrix removed from the feature. The rocks were laid down in a single layer. No additional rocks or basin were found beneath the feature components after removal.

Artifacts collected from the surface of 41 MC 75 include three cores, two thick bifaces, eight thin bifaces, two distally beveled tools, a trimmed flake, and four pieces of modified sandstone (three medium-sized grinding slab fragments and a mano). A stemmed dart point fragment (Thin Biface Group 1, Form 6, Spec. 13), three unstemmed thin bifaces with triangular outlines (Groups 2-4), and the two distally beveled tools (Group 3, Form 1) indicate that 41 MC 75 was inhabited during Archaic times, but the artifacts in the assemblage do not permit a more specific estimate of period(s) of occupation.

Mussel shell was recovered in remarkably small amounts from the test pits at 41 MC 75, especially considering the site's proximity to modern and relict river channels. There were very few *Rabdotus* shells in Test Pit 2, while the deposits in Test Pit 1 yielded an unusually large number of snail shells. The two sandstone clusters isolated in the subsurface of the site are probably hearth remnants, but the materials found in and around the features do not readily suggest uses to which the hearths may have been put. The occurrence of both of these features at roughly the same vertical level relative to the modern surface indicate a definite "living surface" buried by 75-100 cm of later deposition. The separation of debris recovered in Test Pit 2 into two horizons suggests that the site was occupied during more than one period in prehistory. The Lower Horizon materials are probably related to the period during which Features 1 and 2 were constructed. As previously mentioned, both horizons are apparently Archaic in age.

41 MC 79

Prehistoric site 41 MC 79 is in a landform setting much like that described for 41 MC 75 above. It is situated on a terrace levee along the south (right) bank of the Frio River (Fig. 1). As recorded by the THC survey crew, 41 MC 79 measures 400 m east-west and is about 100 m in width. The upstream end of the relict channel complex running beneath Skillet Mountain diverges from the main Frio River channel at the western end of the site and then trends off along its southern side. Surface cultural debris observed by the CAR crew during inspection of the site consisted of a thin scatter of debitage, fire-fractured rock, and a few chipped tools which were distributed into a few small concentrations separated by larger areas where almost no debris was visible. The most concentrated debris accumulation was found at the west end on the slope leading down into the relict channel scar. An unprovenienced surface collection carried out at 41 MC 79 yielded only one thin biface (Group 10), a distally beveled tool (Group 8, Form 1), and a mano (Modified Sandstone Group 2, Form 2). The distally beveled tool indicates that activity occurred on this site during the Archaic.

41 MC 222

This previously unrecorded prehistoric site was located by the CAR crew during the course of Phase I investigations at nearby 41 MC 75 and several other sites on the Bracken Ranch at the western end of Choke Canyon. Still under private ownership in 1977, extensive areas of the floodplain on the south side of the Frio River (from 41 MC 19 to 41 MC 79 in Fig. 1) were being cleared of brush to facilitate the handling of cattle on the Bracken Ranch. The brush was being cleared using a bulldozer equipped with a 12-foot blade on the front end and a drag made of anchor chain and train rails which was pulled along behind (Fig. 50,d). This equipment was in use at the time of CAR activity in the area.

Inspection of a newly cleared location approximately 200 m southwest of the test pit locations at 41 MC 75 revealed that the bulldozer had turned up large pieces of animal bone, debitage, mussel shell, sherds of aboriginal pottery, and chipped stone tool fragments. Most of this material came out of one deep blade swath cut by the bulldozer from east-west across the area. The blade appeared to have cut down about 30 cm below the original ground surface in this swath, but it was difficult to tell exactly where the original surface was. Tree trunks, brush, and the bladed earth were pushed off into a relict channel (slough) running along the western margin of the area containing the debris exposure. In the deepest reaches of the blade cut, other large bone pieces were still partially buried in relatively undisturbed condition. Brushing the dirt away from these bones, it became apparent that a mass of bones lay just beneath the surface.

Designated as Skillet Mountain No. 4, this site was later assigned the permanent designation of 41 MC 222. It rests on a crescent-shaped natural levee. This natural levee forms a distinct rise inside a tight oxbow in a relict channel running more-or-less east-west through the area. The upstream end of this channel cuts away from the Frio River just west of 41 MC 79, still on the Bracken Ranch, some 500 m west-northwest of Skillet Mountain No. 4. The channel again meets the river 1300 m northwest of the site just northwest of 41 MC 78. The channel generally follows a semicircular course trending southward away from the modern channel of the Frio River and runs up against the sandstone bluffs composing the southern valley wall. Skillet Mountain, the highest of these bluffs, is 600 m southwest of 41 MC 222. A slightly lower bench in the bluffs is within 300 m of the site (Fig. 50,a).

Skillet Mountain No. 4 is at the western end of an east-west trending lake having a length of about 500 m. The lake is contained in the relict channel and is fed by an abandoned oil well which now flows salt water. Although brackish, the lake supports much aquatic life. Upstream from the west end of the lake, the slough trends northwest for about 150 m and then makes a very sharp, abrupt turn back to the southeast for about the same distance. The channel then makes a much more gradual turn back to the northwest. The natural levee rise on the south (right) side of the channel inside the oxbow trends in the same direction as does the oxbow--from southeast to northwest.

From a central prominence, the natural levee rise containing 41 MC 222 slopes down to the southeast and northwest to meet the relict channel. The main site area lies on the prominence of the rise with cultural material also being scattered down the southern and southeastern slopes (Figs. 50,b; 51). On the surface, cultural debris was visible over an area measuring approximately 48 m northwest to southeast and from 5-12 m southwest to northeast.

Due to the brush clearing done prior to its discovery, the surface of 41 MC 222 was essentially denuded of vegetation. There were some dead limbs and stalks laying around (Fig. 50,e). Drifts of wood splinters, bark, dry leaves, and twigs were thrown up here and there on the site. Immediately south of the site area is a large grove of oak trees growing beside the relict channel. Mesquite, elm, huisache, retama, persimmon, sugar hackberry, and various grasses grow immediately around the barren site area.

Although not scheduled for Phase I investigation, 41 MC 222 was nevertheless given considerable attention by the CAR crew. The site was immediately recognized as a particularly unusual and significant resource. It was possible that the site would be further damaged or destroyed by additional bulldozer activity underway nearby. In consideration of these factors, the crew spent about five days at work on the site.

Horizontal and vertical controls were established at 41 MC 222. A steel spike driven into the trunk of an oak tree south of the site was assigned an arbitrary elevation of 100 m (Fig. 51). Horizontal control was established by arbitrarily placing a stake near the southeast edge of the site. This stake was assigned metric coordinates of N100 E100. Centering a survey transit over a set point on the top of this stake, the transit was aligned to magnetic north. The instrument was then rotated 90° to the west and an east-west baseline set by driving a second stake at the N100 E86 coordinate. The N100 E100 and N100 E 86 stakes were later replaced with rebar rods (1" diam., 12" length) set in concrete. From this baseline, additional 1-m^2 excavation units were staked out using both the survey transit and measuring tape triangulation.

One block of seven 1-m^2 units was set out over the bone bed partially exposed by the bulldozer. Grid coordinates at the corners of this area are N98 E87 (southwest), N98 E90 (southeast), N101 E89 (northeast), N101 E87 (northwest). In these seven units, up to 16 cm of matrix was excavated from the existing ground surface down to the floor upon which many of the bones and other materials were resting (Fig. 52). Insofar as possible, the 16 cm of deposit over the bone bed was removed in 5-cm vertical increments within each 1-m^2 unit. Excavating with trowels and brushes, all objects noted during the course of excavations were left *in situ*. Locations of small or fragile objects which could not conveniently be left in place were recorded upon exposure and then the object was removed. A plan of objects exposed in six of these seven 1-m^2 units is shown in Figure 52 (also see Fig. 50,f).

In Figure 52, all bones for which identifications were possible are *Bison* sp. Also shown are sandstone rocks, mussel shell, pieces of modified sandstone (grinding slab and mano), an area of maximal debitage concentration, and several chipped stone tools. Matrix excavated from these units was described as dark gray-brown silty clay which was hard and compact, but friable. Rates of recovery for selected classes of debris, including relevant materials shown in Figure 52, were as follows for the seven units excavated to expose the bone bed at 41 MC 222:

Figure 50. *Photographs Taken in the Vicinity of Skillet Mountain, 41 MC 222, and 41 MC 17.*

a. View looking northeast across Frio River valley from the "summit" of Skillet Mountain (elevation 372 feet above msl). Note Jackson Group cuestas along southern valley margin at right. North side of valley rises much more gradually at the western end of Choke Canyon. The Frio River runs through the gallery of large trees near center of photo.

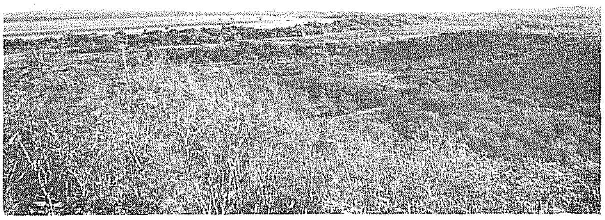
b. Overview looking north of excavations in progress at Skillet Mountain No. 4 (41 MC 222) on the Bracken Ranch. Note effects of recent brush clearing on site. Located in a tight slough oxbow, the slough channel runs both to the right and left of the excavations. The Frio River is located in the tall trees in the background.

c. View looking south across 41 MC 17. Skillet Mountain is visible in the background. Prickly pear, soapbush, and mesquite are seen in photo.

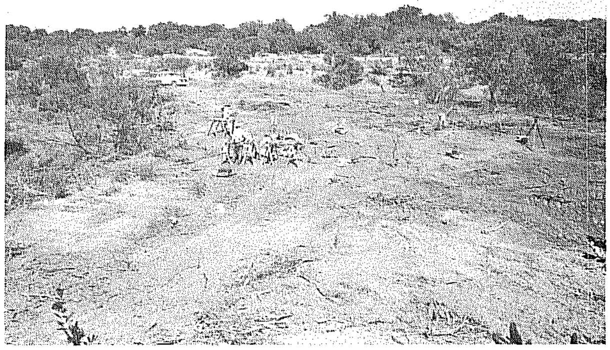
d. Brush drag made of train rails and anchor chain. Pulled by a bulldozer, it was this drag that exposed Skillet Mountain No. 4 as brush was being cleared on the floodplain at Bracken Ranch.

e. View looking southwest across Skillet Mountain No. 4 to bluffs along south side of valley. Site lies between slough channel in foreground and large oak tree in background. Trees and brush were uprooted by brush drag shown above.

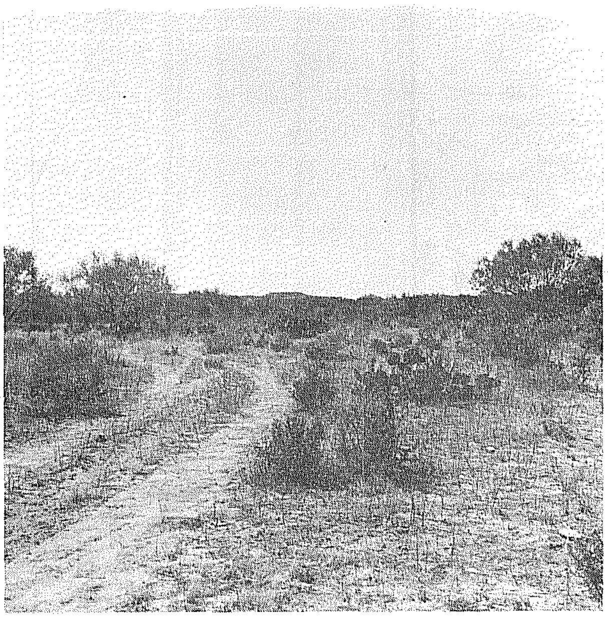
f. Bison bone exposed *in situ* at 41 MC 222.



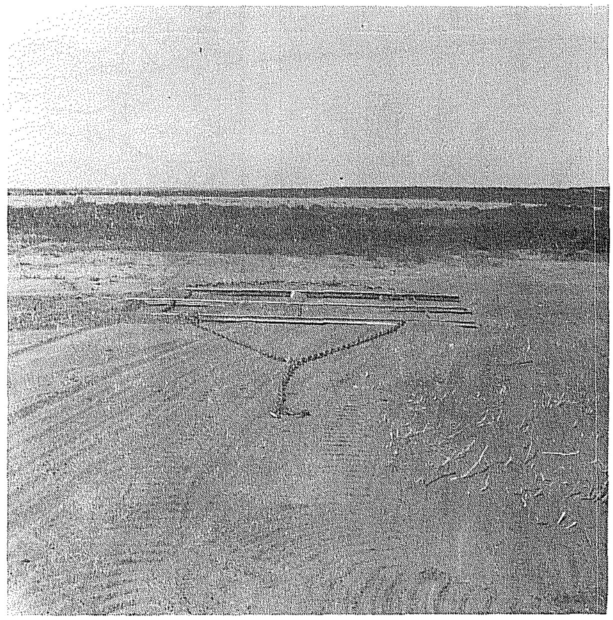
a



b

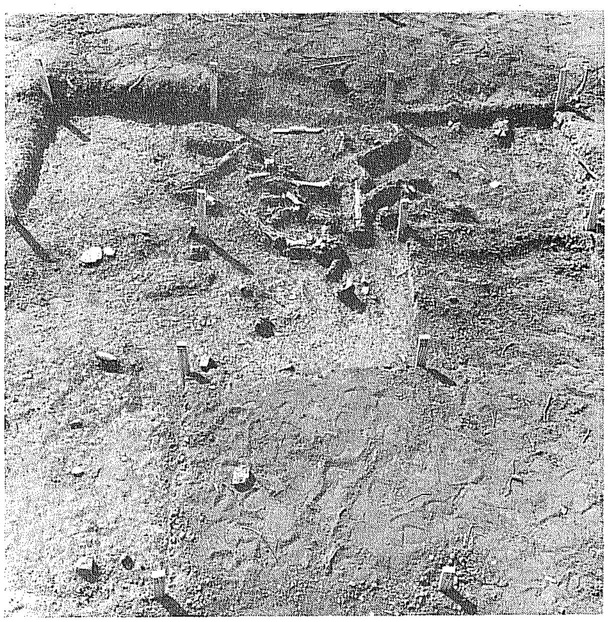


c



d

e



f

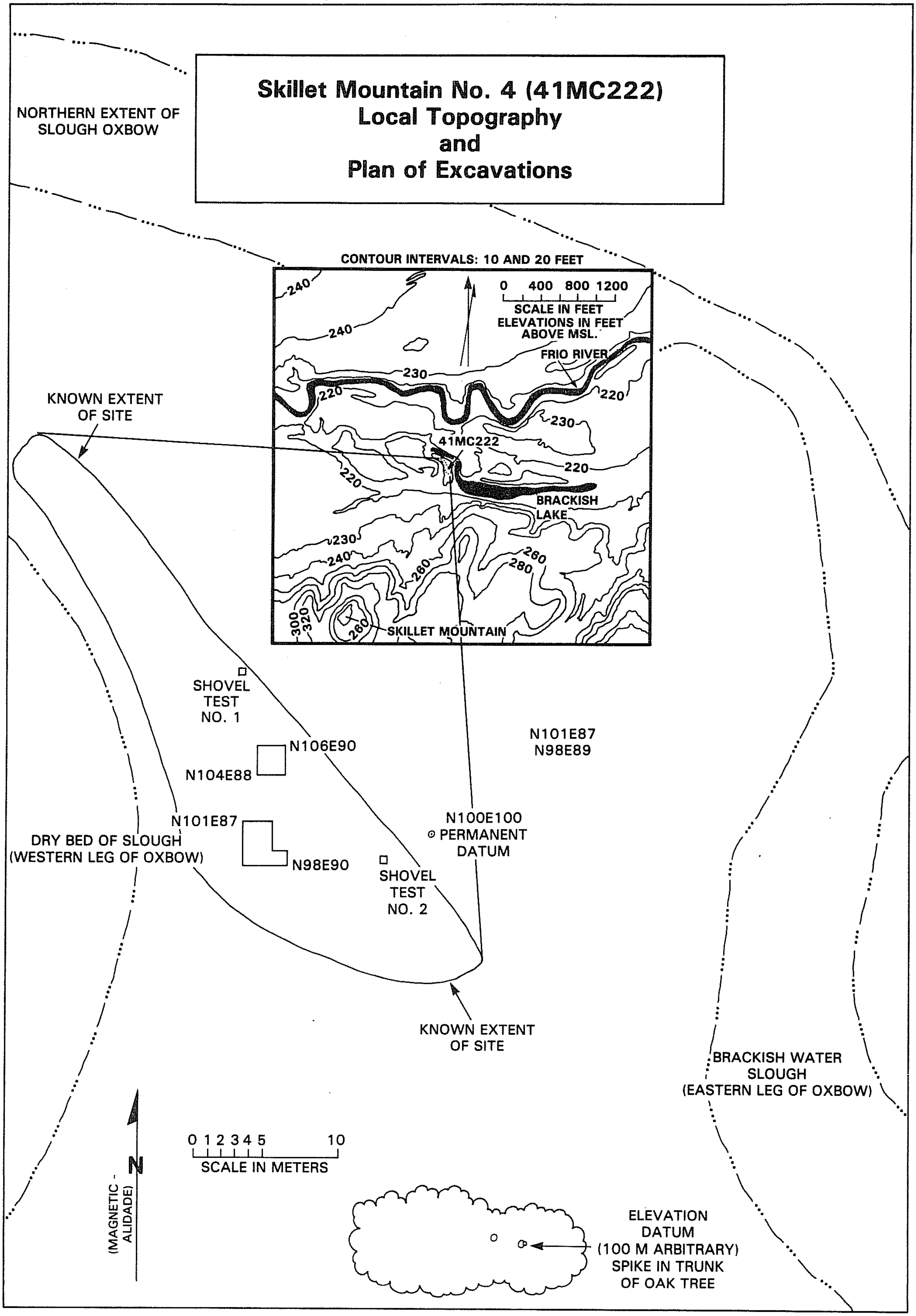

Skillet Mountain No. 4 (41MC222)
Local Topography
and
Plan of Excavations
NORTHERN EXTENT OF SLOUGH OXBOW
CONTOUR INTERVALS: 10 AND 20 FEET
0 400 800 1200
SCALE IN FEET
ELEVATIONS IN FEET ABOVE MSL.
FRIO RIVER
240
230
220
41MC222
BRACKISH LAKE
260
280
300
320
SKILLET MOUNTAIN
KNOWN EXTENT OF SITE
SHOVEL TEST NO. 1
N106E90
N104E88
N101E87
N98E89
N101E87
N98E90
N100E100
PERMANENT DATUM
SHOVEL TEST NO. 2
DRY BED OF SLOUGH (WESTERN LEG OF OXBOW)
KNOWN EXTENT OF SITE
BRACKISH WATER SLOUGH (EASTERN LEG OF OXBOW)
0 1 2 3 4 5 10
SCALE IN METERS
N
(MAGNETIC - ALIDADE)
ELEVATION DATUM (100 M ARBITRARY) SPIKE IN TRUNK OF OAK TREE

FIGURE 5I

Sandstone Weight (grams)	1324
Fire-Fractured Rock Weight (grams)	234
Mussel Shell Umbo Count	31
Mussel Shell Weight (grams)	105
Rabdotus Shell Count	195
Bone Weight (grams)	1572
Primary Flake Count	5
Secondary Flake Count	107
Tertiary Flake Count	239
Chip Count	342

Material recovery on a unit and level basis is shown in the Material Analysis Records for 41 MC 222 in Appendix IX. Other artifacts found in this area include two arrow point fragments (Thin Biface Group 1, Form 7, Specs. 32, 33), a thin biface fragment (Group 9), two small grinding slab fragments (Modified Sandstone Group 1, Form 3, Specs. 110, 111), and 30 sherds of aboriginal pottery (17 of which were found in Unit N98 E88). In addition to bison, other animals represented by bones recovered from the seven units in this area include wood rat, raccoon, jackrabbit, and snake.

Four additional 1-m^2 units comprising a 2 x 2-m block were also excavated at 41 MC 222 (Fig. 51). Grid coordinates at the corners of this excavation block were N104 E88 (southwest), N104 E90 (southeast), N106 E90 (northeast), and N106 E88 (northwest). A short distance north of the portion of 41 MC 222 most heavily disrupted by the bulldozer, the surface upon which these units were staked out was less severely disturbed. Each of the four units in this block was excavated to a depth of 30 cm below surface in arbitrary vertical increments of 10 cm. Substantial amounts of cultural debris were recovered from all levels. Matrix in these units was again a dark gray-brown silty clay. Rates of recovery for selected classes of debris in all levels and units combined were:

Sandstone Weight (grams)	2812
Fire-Fractured Rock Weight (grams)	410
Mussel Shell Umbo Count	373
Mussel Shell Weight (grams)	1428
Rabdotus Shell Count	1430
Bone Weight (grams)	231
Primary Flake Count	1
Secondary Flake Count	61
Tertiary Flake Count	113
Chip Count	118

Breakdowns by unit and level are provided in the Material Analysis Records, Appendix IX. Other artifacts found in this excavation block include three cores (Group 3, Level 3 and two specimens of Group 4, Levels 1 and 2) an arrow point (Thin Biface Group 1, Form 5, Spec. 17, Level 2), two arrow point fragments (Thin Biface Group 1, Form 7, Specs. 17 and 39, Level 3), three unstemmed thin bifaces with triangular outlines and straight bases (Group 2, Form 1, Specs. 43, 45, and 46, surface and Levels 2 and 3), three grinding slab fragments (Modified Sandstone Group 1, Form 1, Spec. 30, Level 3; Group 1, Form 3, Specs. 112 and 113, Levels 2 and 3), and one sherd of aboriginal pottery (Level 1). Species identified from animal bones recovered in this area include wood rat, gopher, pocket mouse, unidentified bird, wild turkey, gar, rabbit, jackrabbit, *Canis*, bobcat, javelina (collared peccary), white-tailed deer (or antelope ?), and bison. *Cyrtonaias tampicoensis* is the most common mussel species represented by shells collected at 41 MC 222. *Lampsilis* sp. and several other species are also present in smaller numbers (see Appendix V). Carbon recovered as the units in this 2 x 2-m block were being excavated has yielded two radiocarbon assays. Corrected dates ranging from A.D. 1260 to A.D. 1290 (±50 to 150 years) were obtained (see Table 36, Appendix IX). Radiocarbon analysis of a mussel shell sample from the same context yielded a corrected date of A.D. 600 ±60. Ash (*Fraxinus* sp.) and willow (*Salix* sp.) have been identified as the wood burned to produce at least some of the carbon found in this excavation block.

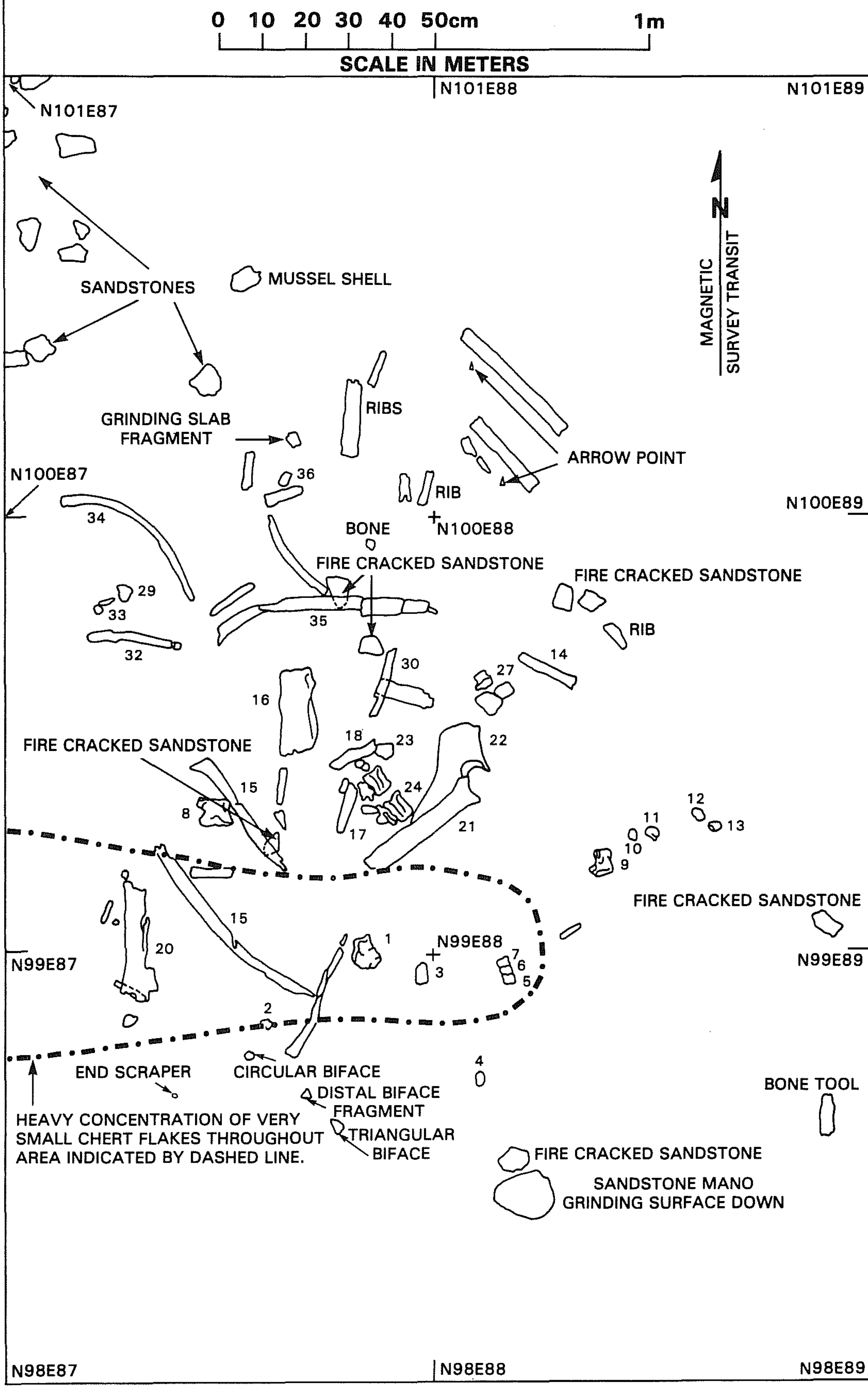
Artifacts collected from the surface of 41 MC 222 (other than excavation units) during the Phase I investigation include 11 cores, one thick biface, seven thin bifaces, three pieces of modified sandstone, and 16 sherds of aboriginal pottery. Noteworthy among these specimens are three of the unstemmed thin bifaces (Group 3, Form 1, Spec. 16; Group 4, Form 1, Spec. 32; and Group 6, Spec. 5). In addition to two more small grinding slab fragments (Modified Sandstone Group 1, Form 3), a mano (Modified Sandstone Group 2, Form 2) was also collected.

The prehistoric cultural debris unearthed at 41 MC 222 indicates that the site was inhabited on one or more occasions during the Late Prehistoric period. Radiocarbon data at present indicates that this activity occurred sometime around A.D. 1260 to A.D. 1290. Debris evidencing the site is contained within the upper 15-30 cm of deposit, but the present depth of materials has likely been influenced by recent mechanical alterations of the surface. The 30-cm thick deposits are felt to be more representative of the original, undisturbed site than are the shallower deposits.

Site 41 MC 222 provides one of the best collections of faunal material recovered during Phase I investigations at Choke Canyon. The large amount of bison bone exposed in one area indicates that such animals were present in the vicinity and being hunted by the site's Late Prehistoric inhabitants. Arrow points and flake tools found amidst the bones may have been used to kill and/or butcher the animal(s). Notably absent from the inventory of bison bone anatomical parts found at 41 MC 222 were cranial (other than teeth) and pelvic elements (see Table 35, Appendix IX). The absence of these key elements suggests that the animal was killed away from the site and that only selected portions of the carcass were transported back to the camp. Most of the bones are fragmentary. Some of the breakage was undoubtedly caused by passage of the bulldozer over the site. Mechanical action of soil may also account for some of the fracturing. For the largest of the bones (such as Nos. 20-22 in Fig. 52), intentional breakage by prehistoric inhabitants for marrow extraction or other purposes is suggested.

An array of smaller species is also represented in the faunal collection from 41 MC 222. The birds, fish, and animals represented by these remains indicate that hunting efforts were diversified to include nearby river, floodplain, and upland microenvironments. The javelina (collared peccary) bone found is significant in two respects. First, it is the earliest radiocarbon dated occurrence of the species in Texas. Secondly, presence of the species suggests that low, dense thickets of vegetation (thorny brush?) were growing in the area

Skillet Mountain No. 4 (41MC222) Plan Map of Bison Bone Bed and Associated Materials



Skeletal Elements Represented (All Bison sp.)

Number	Element
1	right naviculo-cuboid
2	right fibula
3	right magnum
4	proximal sesamoid
5	proximal sesamoid
6	not shown
7	proximal sesamoid
8	right astragulus
9	right cuneiform
10	proximal sesamoid
11	proximal sesamoid
12	proximal sesamoid
13	proximal sesamoid
14	rib fragment
15	rib fragment
16	right distal scapula
17	rib fragments
18	long bone fragment (percussion splinter)
19	not shown
20	right distal tibia
21	right proximal radius
22	right proximal ulna
23	unidentified
24	vertebra
25	not shown
26	not shown
27	thoracic vertebra
28	unidentified
29	proximal sesamoid
30	unidentified
31	unidentified
32	unidentified
33	unidentified
34	unidentified
35	rib fragments
36	unidentified

FIGURE 52

during the A.D. 1260 to A.D. 1290 period. The javalina required this type of habitat in order to survive. Sandstone grinding implements are present on the site and indicate that plant foods--perhaps beans, seeds, and/or nuts--were being processed. Mussel shells and *Rabdotus* shells, both present in substantial numbers, show a reliance on freshwater mussels and land snails as a food source. Wood species identified in carbon samples include ash and willow. These species were likely elements of the local floral community at the time of prehistoric activity on 41 MC 222.

Arrow points and pottery are expected elements of a Late Prehistoric artifact assemblage. The style of arrow points found at 41 MC 222--having strongly barbed shoulders and slightly expanding stems--is somewhat unusual. Unstemmed thin bifaces with triangular outlines and straight or concave bases were also found in deposits at 41 MC 222. The appearance of these triangular forms in Late Prehistoric context at Choke Canyon serves an important role in demonstrating that such forms are not restricted to the Archaic. The presence of cores, one thick biface, and a substantial amount of debitage at 41 MC 222 evidences a full range of chipped stone tool manufacture and maintenance activities. Eleven of the total 15 cores found on the site belong to Core Groups 3 and 4. These types of cores are expected from Late Prehistoric lithic technologies where production of long, narrow flakes suitable for arrow point and flake tool manufacture was the goal.

Skillet Mountain No. 4 (41 MC 222) stands out clearly as a prehistoric site of major importance among all sites studied during Phase I investigations at Choke Canyon. The site apparently contains only Late Prehistoric remains and so offers a period assemblage unadulterated by debris from earlier periods of activity. Faunal (vertebrate and invertebrate) and floral (carbonized) remains are exceptionally well preserved in the deposits. The distribution of cultural debris observed in the limited excavations conducted on the site suggests that remains are, to a certain extent, patterned according to the prehistoric activities resulting in their generation and deposition. This site unquestionably deserves further, more intensive investigations.

41 MC 80

A relatively small site, 41 MC 80, is located on the floodplain a short distance west of 41 MC 222 (Fig. 1). Site dimensions based on limits recorded by the THC surveyors are 200 m northwest-southeast and a width of 50-75 m. This site also occurs on a natural levee forming a rise between two relict channel scars on the floodplain approximately 150 m south of the Frio River. As with most of the sites in the area, 41 MC 80 had been somewhat disturbed by brush clearing activities shortly before the Phase I investigation took place. The site area was an open grassy clearing with scattered small mesquites and spiny hackberry widely spaced across the surface. Prehistoric debris was very sparsely scattered over the surface. The CAR crew observed a small amount of debitage, fire-fractured rock, modified sandstone, and a core in the southeastern area of the site. The only specimen collected from this site was a distally beveled tool (Group 8, Form 5). Based on this extremely limited evidence, the site is suggested to have been occupied sometime during the Archaic.

41 MC 219

Site 41 MC 219 is a small prehistoric site recorded by the CAR crew during the course of Phase I investigations at sites on the Bracken Ranch. Located a short distance west-southwest of 41 MC 222, 41 MC 219 is situated on the southwest (right) bank of a small slough which drains northwestward into the Frio River (Fig. 1). As recorded by the CAR crew, this site extends along the bank of the slough for a distance of about 100 m (northwest to southeast). It is approximately 50 m in width. The site area is 200 m north of the foot of Skillet Mountain and 350 m south of the Frio River. Elm, huisache, and retama trees grow in the slough channel. The site is covered with sparse grass and scattered small mesquites. There is also blackbrush, allthorn, spiny hackberry, persimmon, and tasajillo in the area. Observed cultural debris, primarily fire-fractured sandstone, is most common along the bank of the slough at the northeastern side of the site. Surface debris density is very light overall. Debitage and a few chipped stone tools were also noted. Artifacts collected from 41 MC 219 include an unstemmed thin biface (Group 2, Form 1, Spec. 44), a thin biface fragment (Group 9), and a trimmed flake (Group 1). This very limited collection suggests that the remains on the site are the result of activity sometime during the Archaic.

41 MC 220

This very interesting and unusual prehistoric site was also recorded by the CAR crew as Phase I investigations were carried out at sites on the Bracken Ranch. Site 41 MC 220 is located on a talus slope at the foot of Skillet Mountain on its north side (Fig. 1). Limits recorded for 41 MC 220 by the CAR crew show the site as being oval in outline with an east-west dimension of 200 m and a north-south dimension of 100 m. The talus fan deposits upon which the site rests are bounded on the east by a deep, narrow drainage channel which runs down out of a canyon cutting back up (south) into the bluffs of Skillet Mountain (Fig. 42,d). The site area is bounded on the west by a short, shallow drainage that has cut down about one meter below the talus fan deposits. It is along the bank of this shallow gully that thick piles of fire-fractured sandstone are exposed (Fig. 42,e). The deposits of sandstone are thickest at the foot of the talus slope (nearly a meter high at one point) and then thin northward away from the base of the slope. The deposits consist of small, angular chunks of sandstone (Fig. 42,f). These fragments are more angular and uniform in size than those exposed higher up on the slope. Matrix between the rocks is gray silty clay loam. There are two sandstone accumulations resembling burned rock middens at the head of the small gully along the site's western edge. The westernmost of the two is about one meter high, four meters in width, and eight meters in length and oriented northeast-southwest. The other accumulation is on the east edge of the gully. It is roughly circular in outline with a diameter of three meters and height of one meter. In the main site area east of the sandstone heaps, only scattered artifacts and burned sandstones are exposed on the surface. This area is flat to gently sloping and generally free of vegetation other than grass. Artifacts seen, but not collected, on the surface of 41 MC 220 include unstemmed triangular and leaf-shaped thin bifaces, a side-notched dart point (possibly of the *Ensor* type), two trimmed flakes, a grinding slab fragment, and a mano fragment. These materials suggest a Late Archaic affiliation for the site. A site similar to 41 MC 220 was recorded by Texas Tech surveyors as they worked in the vicinity of Opossum Creek in the north central part of Choke Canyon. Site 41 MC 209 is characterized by heaps of sandstone much like those found at 41 MC 220 (Thoms, Montgomery, and Portnoy 1981:187). Remains evidencing 41 MC 209 are suggested to date to Middle and Late Archaic times. The presence of these unusual sandstone accumulations at two prehistoric sites in Choke Canyon is worthy of note. They are very reminiscent of the "burned rock middens" found so commonly in central Texas. Origin and function of the Choke Canyon examples are unknown.

41 MC 83

Site 41 MC 83 is one of two prehistoric sites in Group 16 located on the north side of the Frio River. As recorded by the THC survey crew, 41 MC 83 measures almost 1.1 km northwest-southeast and is from 150-300 m in width. The site rests on a series of low terraces beside the river (Fig. 1). The site is bounded along its north side by a relict channel which diverges from the Frio River just west of 41 MC 83 and then meets the river again just east of the site. Except for brush covering a small area at the west end, 41 MC 83 occurs in an open, grassy pasture. Grass cover was thick on the surface at the time the site was under investigation. As a consequence, there were no cultural materials observed or collected.

41 MC 88

Prehistoric site 41 MC 88 is situated on an old, high terrace surface 150 m or more north of the Frio River (Fig. 1). As recorded by THC surveyors, the site measures 500 m northeast-southwest and is up to 200 m in width. The site surface is completely clear and open, but it is covered with a thick carpet of grass. The grass cover inhibited inspection of the surface over most of the site. In occasional bare patches across the pasture, debitage, fire-fractured rock, and sandstone were observed in small amounts. Artifacts collected by the CAR crew from the surface of 41 MC 88 included two cores (Group 5), a small grinding slab fragment (Modified Sandstone Group 1, Form 3), and a mano (Modified Sandstone Group 2, Form 2). Period of prehistoric activity on the site cannot be determined from this limited assemblage.

LITHIC ARTIFACTS

Lithic artifacts recovered during the Phase I archaeological investigations at Choke Canyon are organized into ten categories for analysis and description: cores, thick bifaces, thin bifaces, distally beveled bifaces and unifaces, unifaces, trimmed flakes, debitage, hammerstones, ground stone, and miscellaneous artifacts and materials. In this section, all lithic material recovered during the Phase I investigation is analyzed. Materials from 41 LK 31/32 and 41 LK 67 are included, even though these assemblages are given individual attention in Brown, Potter, Hall, and Black (1982) and Scott and Fox (1982).

The first six categories include all chipped stone artifacts, as well as by-products of chipped stone tool manufacture. Chert in stream-rolled cobble form, available at numerous locations in the lower Frio River valley, was the most commonly used raw material in the production of chipped stone tools by local prehistoric peoples. Occurring as cobbles up to 15 cm in diameter, these cherts are predominantly cream, gray, tan, or brown in color. Sandstone, quartzite, petrified wood, chalcedony, jasper, and gray siliceous quartzite were used much less commonly in chipped stone tool manufacture. All of these rocks are also easily obtained in cobble form from local gravel deposits. A summary of rock material types within the collection follows the descriptions of chipped stone tools. Also summarized are data relating to patination of stone tool surfaces, a process of possible significance to site age and paleoenvironment.

In the other lithic categories--hammerstones, ground stone, and miscellaneous materials--diverse rock types are represented. Hammerstones are made of chert, quartzite, metamorphosed sandstone, and various igneous rocks, including rhyolite, felsite, and porphyry. All of these rocks are found in local gravel deposits. The majority of ground stone specimens are grinding slab fragments made of fine- to medium-grained sandstone, probably derived from outcrops of the Eocene Jackson Group found between Calliham and Tilden. Other ground stone artifacts include manos, abraders, and grooved stones, mostly made of sandstone and gypsum and occurring as elongate, stream-rolled pebbles known as "satin spars." Gypsum is found in surface seams of the Frio Formation near Calliham and in gravel deposits almost everywhere in the Frio valley eastward from Calliham. Miscellaneous lithic materials include pumice, ocher, bituminous coal, and asphaltum. Pumice, found in rounded pieces up to 20 cm in diameter, is a minor constituent of the volcanically derived Catahoula Formation outcropping at the eastern end of the project area. Pumice is especially prevalent on the surface in the area of 41 LK 204. Smaller pieces are occasionally found elsewhere in the area. Bituminous coal, possibly brought in from the Piedras Negras, Mexico, area was found at 41 MC 177. Pieces of asphaltum (a petroleum derivative) were also found at 41 MC 55 and may have been brought in from the Gulf Coast. Asphaltum is the only material discussed in this section that is probably not of local origin.

Unless otherwise indicated, all dimensions and weights used are in centimeters and grams, respectively. Asterisks (*) indicate measurements or weights of incomplete artifacts.

CHIPPED STONE

Cores (1307 Specimens)

Cores are stream-rolled cobbles or large, thick flakes from which two or more flakes have been struck, possibly to produce flakes or to reduce the cobble or flake into a finished tool form. The cores are grouped according to the direction(s) from which flakes were struck, striking platform preparation, striking platform morphology, size, shape, and degree of reduction. The following groupings are used:

- Group 1. Natural Platform
- Group 2. Bidirectional, Natural and Prepared Platforms
- Group 3. Multidirectional, Natural and Prepared Platforms, Single and Multiple Facets
- Group 4. Unidirectional, Prepared Platforms, Single Facet
- Group 5. Multidirectional, Natural and Prepared Platforms, Single Facet
- Group 6. Core Nuclei
- Group 7. Flat, Circular to Elliptical in Outline, Unifacially Cortex-Covered
- Group 8. Tested Cobbles
- Group 9. Core Fragments
- Group 10. Unmodified Cobbles

The directional references pertain to trends of flake scars relative to one another on the cobble or flake. Where a prepared platform was used, the flakes struck to form the platform are not considered when the core is grouped according to direction of flake removals. For unidirectional cores, flakes were removed in the same direction relative to the platform such that the remaining scars parallel or overlap one another *en echelon*. On bidirectional cores, flakes were removed from opposite directions of the same platform area. The scars of multidirectional cores run in trends other than parallel or opposite one another; flakes were struck both from the same and different platforms. Natural platforms consist of the cobble's cortex. Prepared platforms occur where a single flake scar forms the striking surface. Multiple facet platforms are made when the scars of two or more removals merge to form ridges in the striking area. Direction of flake removal and platform character were used to sort cores into Groups 1-5. Size, outline, and degree of reduction were used to sort cores into Groups 6-8.

Group 1. Natural Platform (182 Specimens)

Group 1 cores are cortex-covered cobbles from which flakes have been removed using natural platforms. The cobbles are irregularly shaped, varying from round to oval to angular. Nineteen of the specimens had flakes removed unidirectionally. The majority were flaked multidirectionally. This particular group is not subdivided according to direction of flake removals, since so few scars occurred. Flake scars tend to be restricted to one end or edge. Most of the specimens within this group retain 80-95% of the cortex. Some retain as little as 50% of the cortex. Metric attributes are summarized below:

Cores (continued)

	Maximum	Minimum	Average
Length Range:	11.3	5.7	8.4
Width Range:	10.0	4.5	5.8
Thickness Range:	6.2	3.2	4.8
Weight Range:	802.0	73.8	285.3

Examples of Group 1 cores are illustrated in Figure 53,c,d. Provenience is presented in Tables 2 and 3.

Group 2. Bidirectional, Natural and Prepared Platforms (116 Specimens)

These cores are made of cobbles struck bidirectionally at one end or along one side. Flakes were removed initially using natural cortex platforms. Flake scars resulting from initial removals were then used as platforms for flake removals from the opposite direction. Specimens exhibit 2-8 large flake scars. Most specimens retain 80-95% of the cortex; some retain as little as 50% of the cortex. Metric attributes are summarized below:

	Maximum	Minimum	Average
Length Range:	14.0	5.2	8.3
Width Range:	8.8	4.2	6.7
Thickness Range:	6.8	2.8	5.0
Weight Range:	903.0	73.0	273.0

Examples of Group 2 cores are illustrated in Figure 53,a,b. Provenience is presented in Tables 2 and 3.

Group 2. Cores--Possible Tools

Seven Group 2 cores were worked into shapes suggesting use as "chopping" tools. Ranging from elliptical to subcircular in outline, these specimens are characterized by sharp, bidirectionally knapped edges at one end and smooth, rounded cortex at the other. Function is inferred from the comfortable, convenient feel of the cortex end when held in the hand, the sharp edge at the opposite end, and the battered, crushed appearance of the flaked edges. However, these edge characteristics may be nothing more than the products of platform preparation corollary to removal of flakes from the core. Site provenience and metric attributes for these seven specimens follow:

Specimen No.	Site	Length	Width	Thickness	Figure No.
1	41 LK 14	9.2	6.1	5.0	
2	41 LK 15	11.5	10.2	3.9	54
3	41 LK 41	12.5	7.6	4.8	56
4	41 LK 201	8.2	6.9	4.5	
5	41 MC 44	9.0	7.7	3.4	54
6	41 MC 65	10.2	8.4	3.6	
7	41 MC 94	7.2	7.3	3.3	54

TABLE 2. PROVENIENCE OF CORES RECOVERED IN EXCAVATIONS

SITE	UNIT	LEVEL	ELEVATION
	CORE GROUP 1		
41 LK 8	TP4	2	
"	"	3	
41 LK 14	TP3	4	
"	"	5	
"	TP4	1	
"	"	5	
41 LK 31/32	N1056 E863	2	99.25-99.00
"	" "	9	97.73-97.60
"	N1062 E875 (2 specimens)	3	99.25-99.00
"	N1059 E863	12	97.55-97.45
"	N1063 E873 (4 specimens)	4	98.35-98.25
41 LK 34	TP1	1	
41 LK 41	N1116 E1400	1	99.61-99.50
41 LK 51	TP1	2	
"	TP3	5	
41 LK 53	TP1	4	
41 LK 59	N954 E557	4	98.90-98.80
41 LK 67	N847 E1055	2	98.55-98.50
"	" "	3	98.50-98.45
"	N904 E1004	3	98.75-98.70
"	N841 E1056	2	
"	N842 E1052	1	98.61-98.50
"	N847 E1054	3	98.50-98.45
"	N902 E1006		98.49
"	N904 E1006		98.71
"	N907 E1006	4	98.80-98.75
"	N908 E1008	9	98.75-98.70
"	N909 E1000	5	98.80-98.75
"	N909 E1001		98.63
"	N909 E1007	2	99.05-99.00
"	" "	6	99.85-98.80
"	N910 E1000	1	99.05-98.95
	CORE GROUP 1 (continued)		
41 LK 67	N910 E1006		98.67
"	N910 E1007		98.71
"	N908 E1003	1	99.04-98.95
41 LK 74	TP2 (2 specimens)	2	
41 LK 91	TP1	2	
"	TP2	2	
41 LK 201	TP3	7	
"	"	19	
	CORE GROUP 2		
41 LK 8	TP3	6	
41 LK 15	TP4	7	
41 LK 31/32	N1059 E861	12	97.65-97.55
41 LK 51	TP3	5	
41 LK 67	N848 E1057	5	98.40-98.35
"	N909 E997	1	99.04-98.95
"	N987 E1054	4	98.45-98.40
41 LK 87	TP1	5	
41 LK 201	TP3	12	
41 MC 15	TP2	4	
	CORE GROUP 3		
41 LK 8	TP2	8	
41 LK 14	TP1	2	
"	TP2	5	
"	TP4	4	
41 LK 15	TP4	2	
41 LK 17	TP3	7	
41 LK 31/32	N1055 E863		97.20-97.15
"	N1062 E875	2	99.50-99.25
"	" "	3	99.25-99.00

TABLE 2. (continued)

SITE	UNIT	LEVEL	ELEVATION
	CORE GROUP 3 (continued)		
41 LK 31/32	N1063 E875		Zone 2, F-10
"	N1064 E875		Zone 2, F-10
"	N1057 E861	16	97.35-97.25
"	N1059 E863	8	97.95-97.85
"	N1059 E865	9	97.85-97.75
"	N1061 E873	6	98.25-98.15
"	" "	12	97.65-97.55
"	N1063 E873	4	98.35-98.25
"	N1065 E875	2	98.55-98.45
"	N1117 E999	7	99.10-98.90
41 LK 202	N1004 E997 (2 specimens)		
41 LK 41	N1145 E1474	4	98.80-98.70
"	N1153 E1470	1	99.39-99.30
"	N1115 E1401	3	99.40-99.30
"	N1116 E1402	1	99.61-99.50
"	N1117 E1401	2	99.50-99.40
41 LK 51	TP3	3	
41 LK 59	N954 E556	5	98.79-98.70
"	N957 E556	5	98.80-98.70
"	N958 E555	5	98.80-98.70
"	N1010 E949	1	
41 LK 67	N904 E997	4	98.65-98.60
"	N845 E1055	2	98.55-98.50
"	N990 E1006	2	100.15-100.10
"	N990 E1009	3	100.15-100.10
"	N841 E1048	5	98.30-98.25
"	N841 E1054	1	98.62-98.50
"	N843 E1048	2	98.50-98.45
"	N844 E1053	3	98.45-98.40
"	N845 E1054	1	98.58-98.50
"	N847 E1053	3	98.50-98.45
"	N847 E1054	1	98.61-98.55
"	N906 E1006	7	98.65-98.60

SITE	UNIT	LEVEL	ELEVATION
	CORE GROUP 3 (continued)		
41 LK 67	N910 E998	1	99.05-98.95
41 LK 87	TP2	1	
41 LK 201	TP1	7	
"	"	11	
41 MC 15	TP7	2	
41 MC 19	TP1	7	
"	TP2	6	
41 MC 24	TP1	4	
41 MC 30	TP3	3	
41 MC 39	TP1	7	
41 MC 55	TP2	1	
41 MC 84	TP2	3	
41 MC 86	TP1	3	
"	TP2	1	
"	"	3	
41 MC 222	N104 E88	3	98.90-98.80
	CORE GROUP 4		
41 LK 8	TP2	5	
"	"	9	
41 LK 15	TP4	1	
41 LK 31/32	N1056 E863	1	99.60-99.25
"	N1061 E873	7	98.15-98.05
"	N1065 E875	10	97.75-97.65
"	N1083 E1108 (2 specimens)	7	98.55-98.35
41 LK 67	N841 E1056		
"	N845 E1059	2	98.55-98.50
"	N908 E1001	3	98.90-98.85
41 MC 222	N105 E88	2	99.00-98.90
"	N105 E89	1	99.13-99.00

TABLE 2. (continued)

SITE	UNIT	LEVEL	ELEVATION
	CORE GROUP 5		
41 LK 14	TP2	1	
41 LK 15	TP5	7	
41 LK 59	N955 E556	2	99.10-99.00
"	N982 E824	1	98.96-98.86
41 LK 67	N904 E1002	4	98.70-98.65
"	N905 E1001		98.65
"	N901 E1003		
"	N841 E1055		
"	N843 E1048	1	98.58-98.50
"	N846 E1059		98.43
"	N906 E1008		
"	N904 E1008	5	98.75-98.70
41 LK 74	TP1 (2 specimens)	2	
41 LK 87	TP2	1	
"	TP1	9	
	CORE GROUP 6		
41 LK 8	TP2	7	
"	TP3	6	
"	"	11	
"	TP4	1	
41 LK 17	TP4	2	
41 LK 31/32	N1056 E863 (2 specimens)	4	98.75-98.50
"	N1062 E875	3	99.25-99.00
"	N1059 E861	3	98.55-98.45
"	N1061 E873	6	98.25-98.15
"	N1083 E1108	7	98.55-98.35
"	" "	8	98.35-98.15
"	N1083 E1108 (3 specimens)	9	98.15-97.95

SITE	UNIT	LEVEL	ELEVATION
	CORE GROUP 6 (continued)		
41 LK 31/32	N1083 E1108	10	97.95-97.75
"	" "	11	97.75-97.55
41 LK 41	N1154 E1470	1	99.41-99.30
"	N1116 E1400	3	99.40-99.30
"	N1116 E1402	2	99.50-99.40
41 LK 51	TP1	4	
"	TP2	3	
"	TP3	3	
41 LK 53	TP2	5	
"	TP3	4	
41 LK 59	N955 E556	1	
"	N982 E823	1	98.96-98.80
"	N982 E826	1	98.96-98.80
"	" "	2	98.80-98.70
"	N983 E824	1	98.96-98.80
"	N983 E825	2	98.80-98.70
41 LK 67	N902 E998	2	98.75-98.70
"	N906 E1001	2	98.90-98.85
"	N906 E999	7	98.65-98.60
"	N903 E1002		
"	N846 E1057 (2 specimens)	2	98.55-98.50
"	N849 E1056	1	98.61-98.50
"	N841 E1052	1	98.61-98.50
"	" "	3	98.45-98.40
"	N841 E1054	1	98.62-98.50
"	N841 E1058	4	98.45-98.40
"	N842 E1058	1	98.64-98.55
"	N843 E1052	1	98.62-98.50
"	N844 E1059	1	98.64-98.55
"	N908 E1003	3	98.90-98.85
"	N910 E1003	2	99.00-98.95
41 LK 201	TP2	7	

TABLE 2. (continued)

SITE	UNIT	LEVEL	ELEVATION
	CORE GROUP 6 (continued)		
41 MC 15	TP4	5	
41 MC 17	TP1	2	
41 MC 29	TP1	1	
41 MC 39	TP2	7	
41 MC 75	TP1 (2 specimens)	1	
"	TP2	1	
41 MC 84	TP2	4	
"	"	5	
41 MC 222	N100 E86		Surface
	CORE GROUP 7		
41 LK 31/32	N1055 E861		Feature 17
41 LK 74	TP1	1	
41 LK 201	TP1	9	
"	TP3	3	
41 MC 39	TP1	7	
	CORE GROUP 8		
41 LK 31/32	N1116 E998	7	99.10-98.90
41 LK 41	N1114 E1402	4	99.30-99.20
41 LK 67	N846 E1054		
"	N910 E998		98.74

SITE	UNIT	LEVEL	ELEVATION
	CORE GROUP 9		
Provenience of subsurface recoveries not provided for Group 9.			
	CORE GROUP 10		
41 LK 59	N956 E555	6	98.70-98.59
41 LK 67	N841 E1055		
"	N902 E1006		
"	N907 E1004		
"	N908 E1002	2	98.95-98.90
"	N909 E1002	5	98.80-98.75
"	N909 E1004		
"	N910 E998	2	98.95-98.90
"	N910 E1003	2	99.00-98.95
41 MC 13	TP2	5	
41 MC 15	TP1	3	
41 MC 55	TP2	8	
41 MC 84	TP1 (3 specimens)	3	
"	" (3 specimens)	2	
"	"	1	
"	"	4	
"	TP2	2	

TABLE 3
PROVENIENCE OF CORES BY SITE.

SITE NO.	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	GROUP 7	GROUP 8	GROUP 9	GROUP 10
41LK8	2	1	1	2		5			5	
41LK9										
41LK10	1	1	4						2	
41LK13	1								1	
41LK14	7	7	16	5	4				17	
41LK15	1	2	2	2	1	1	1		5	
41LK17			4			1			2	
41LK18		1	1	2						
41LK20				1				1	1	
41LK27	1		2			1				
41LK31/32	9	1	15	6		13	1	1	18	
41LK34	1			1					1	
41LK41	31	24	57	23	14	8	5	3	15	
41LK48										
(same as MC30)										
41LK49										
41LK50			1			1			1	
41LK51	5	3	11	2	2	4			2	
41LK52	1	3	4	2		1	1			
41LK53	1					2			7	
41LK59	1		5		2	6			8	1
41LK64			3	1		2				
41LK65										
41LK67	27	5	23	4	8	17		3	50	16
41LK69	12	2	15	6	4	11	3	5	37	
41LK73			1				1		1	1
41LK74	2				2		1		3	
41LK75		1	3	3					1	1
41LK77										
41LK83										
41LK85										
41LK86		1								
41LK87	1	1	1		2	1			1	
41LK88										
41LK91	2								1	
41LK92										
41LK93				1						
41LK94									1	
41LK97										
41LK197										
41LK198			1							
41LK201	3	4	13	3	1	2	3		8	
41LK202										
41LK203	1		2		1			2		
41LK204	1		3				1			
41LK205										
41LK206			1	1		1				
41LK207		1		1						
41MC8		1					1		1	
41MC9										
41MC10			1						1	
41MC11		1		1	1	1	1		2	
41MC13									2	1
41MC14				2			1			
41MC15	1	3	4	2		2		1	3	1
41MC17						2			3	
41MC18							2			
41MC19			2						1	
41MC22	2	1	4	1		2			3	
41MC24			1							

TABLE 3
PROVENIENCE OF CORES BY SITE (CONTINUED)

SITE NO.	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	GROUP 7	GROUP 8	GROUP 9	GROUP 10
41MC25										
41MC26										
41MC28										
41MC29		1	2			1			1	
41MC30			1				1		1	
(same as LK48)										
41MC31										
41MC33	1		1			1	2			
41MC36	1						1			
41MC39			1			1	1			
41MC40										
41MC41		1	1	2						
41MC42		2	3			2			1	
41MC43	1		3	1	1					
41MC44	1	1	2			2				
41MC45										
41MC48		1					1		1	
41MC50										
41MC52										
41MC53	1	1	3	1	2		1		3	
41MC54		2	1						1	
41MC55	1		4	2						1
41MC56			1	1	2				1	
41MC57	1		1	2	2					
41MC58										
41MC59										
41MC64	19	8	18	9	5	6	1	4	9	7
41MC65	21	9	11	10	9	4	4	7	7	5
41MC67	2	3	2	2			1	2	9	
41MC68			1							
41MC69	3	2	4			1			1	
41MC72		1							1	
41MC74	1					2			1	
41MC75	2					3				1
41MC78			2	1					1	
41MC79										
41MC80										
41MC83										
41MC84		3	5	2	1	8	1		3	12
41MC86		1	4			1			1	
41MC88					2					
41MC90										
41MC91										
41MC92										
41MC93										
41MC94	6	12	10	8	2	4	4	1		
41MC95		1	4	1	1	4	2		1	
41MC171		1	7	5	2	1	1		1	
41MC174	1				1					
41MC176			2			2				
41MC177								1	1	
41MC184										
41MC189	3		2	2						
41MC219										
41MC222	1		5	3		1			5	
41MC223			1							
41MC224	2	2	4	1		1			1	

Cores (continued)

Specimen 2 was recovered from Level 7 of Test Pit 4 at 41 LK 15. All other specimens were surface collected.

Group 3. Multidirectional, Natural and Prepared Platforms, Single and Multiple Facets (308 Specimens)

Group 3 cores have both natural and prepared platforms with single and multiple facets from which flakes have been removed multidirectionally. The group includes cobbles and large, thick flakes derived from cobbles. The cobble cores generally reflect the shape of the original unmodified cobble. There are 237 cobbles and 57 flakes. The cobble cores retain up to 90% of their cortex. Many of the flakes retain no cortex. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	11.7	5.0	8.1
Width Range:	8.7	4.6	6.5
Thickness Range:	6.6	3.2	5.3
Weight Range:	633.0	68.0	272.0

Examples of Group 3 cores are illustrated in Figure 55,d,e. Provenience is presented in Tables 2 and 3.

Group 3. Cores--Possible Tools

Twelve Group 3 cores have shapes suggesting use as chopping, cutting, or scraping tools. Specimens 3, 8, 10, and 11 are elliptical. Specimens 3 and 8 are made of petrified wood and retain little or no cortex; both are broad and blunt at one end and thinned into rounded, sharp edges at the other end. Specimen 11 was apparently formed by splitting a large cobble longitudinally. The resulting core flake is curved, the dorsal side retaining cortex over most of its surface. A bulb of percussion is preserved at one end. The end opposite this bulb is thicker and pronouncedly curved to the ventral side of the flake. The edge at this end was accentuated by removing cortex flakes from the dorsal side using the ventral flake surface as a prepared platform. The resulting sharp, steep edge would serve well as a scraping tool. Specimen 7 is made of gray-white siliceous petrified wood. Subcircular in outline, Specimen 7 was shaped by removal of flakes around its periphery. One end is thin and dull; the other is thick with a sharp edge. The remaining eight specimens are smaller than Specimens 3, 7, 8, and 11 and, except for Specimen 10, are circular to subcircular. Apparently made from split cobbles, these specimens are thick and covered with cortex along one edge. The edge opposite the cortex is bifacially thinned to a sharp, rounded edge. A tool suitable for cutting or chopping is thus formed. Site provenience and metric attributes for these specimens follow:

Figure 53. *Cores: Groups 1 and 2.* a,b, Group 2; c,d, Group 1.

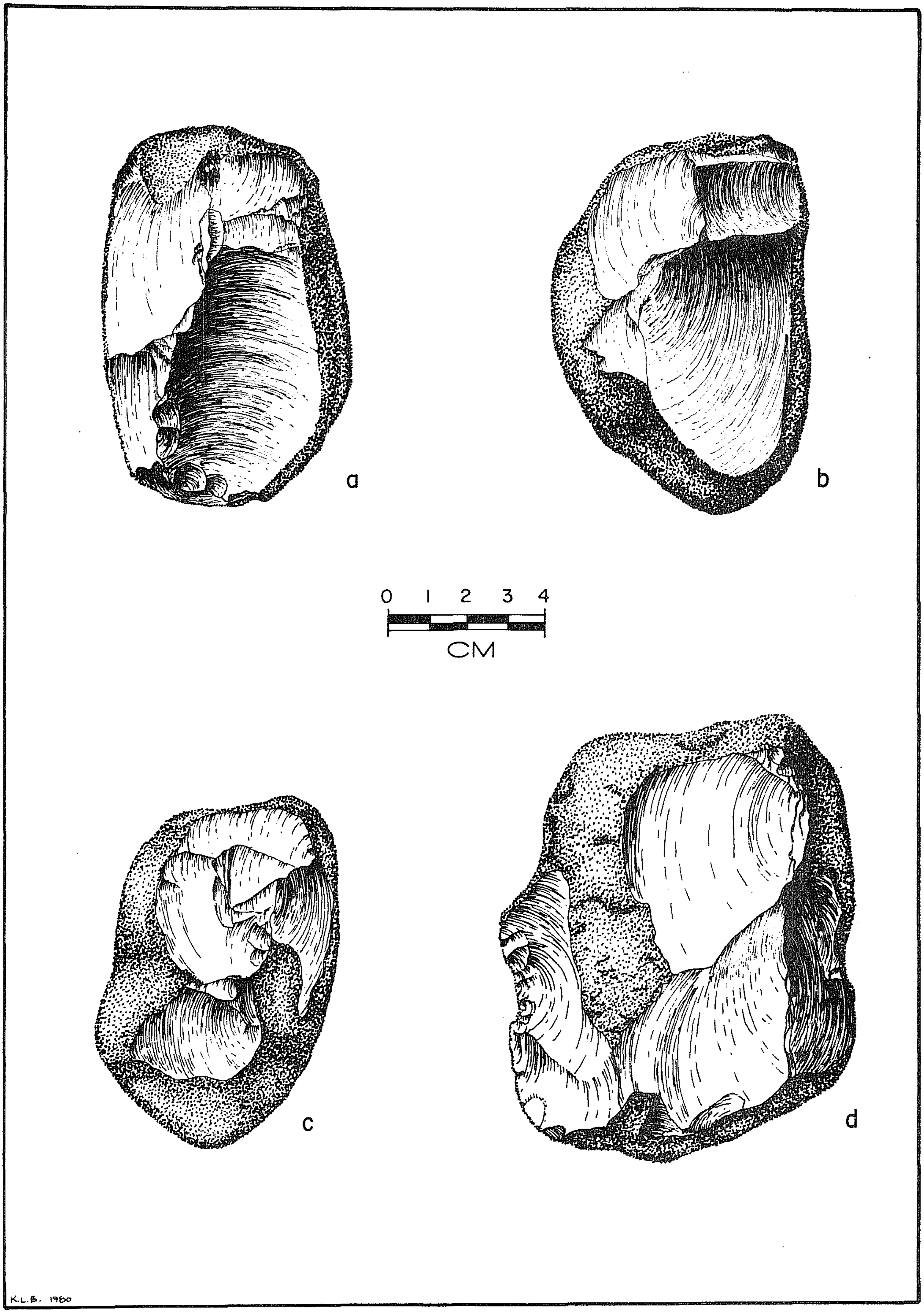


FIGURE 53

Cores (continued)

Specimen No.	Site	Length	Width	Thickness	Figure No.
1	41 LK 14	6.8	5.8	3.4	56
2	41 LK 15	6.6	6.7	3.5	
3	41 LK 17	16.0	7.1	4.8	54
4	41 LK 27	9.0	8.8	3.7	
5	41 LK 41	8.1	8.2	3.2	
6	41 LK 51	8.8	6.6	4.4	54
7	41 LK 75	12.5	11.2	4.1	56
8	41 LK 75	13.2	6.6	4.8	
9	41 LK 201	6.4	6.4	3.9	56
10	41 MC 43	7.6	4.7	3.5	
11	41 MC 69	11.7	7.6	3.6	54
12	41 MC 94	5.6	5.7	2.6	

Specimen 2 was recovered from Level 2 of Test Pit 4 at 41 LK 15. The remaining specimens were surface collected. The function of the specimens was subjectively inferred from "feel" and overall configuration.

Group 4. Unidirectional, Prepared Platform, Single Facet (125 Specimens)

This group of cores is characterized by prepared, single facet platforms from which flakes have been unidirectionally removed, usually more-or-less perpendicular to the prepared platform. Platforms were prepared by splitting a cobble or by knocking a large flake from the cobble. In some cases, large flakes served as the core. Most Group 4 specimens retain 50-80% of the cortex; some retain 25% or less. Ninety-seven cores are cobbles, and 22 are flakes. Metric attributes are summarized:

	Maximum	Minimum	Average
Length Range:	10.3	5.0	8.1
Width Range:	8.6	4.0	6.6
Thickness Range:	6.2	3.1	4.9
Weight Range:	634.0	60.3	300.0

Examples of Group 4 cores are illustrated in Figure 55,a-c. Provenience is presented in Tables 2 and 3.

Group 4. Cores--Possible Tools

Two Group 4 cores may have functioned as tools. Specimen 1 is roughly circular and consists of a unifacially worked split cobble. A steep, sharp edge runs three-quarters of the way around its periphery. The sharp edge was formed by removing flakes downward from the flat, ventral surface of the flake core. A

Figure 54. *Cores: Possible Tools--Groups 2 and 3.* Group and specimen numbers are shown by each artifact.

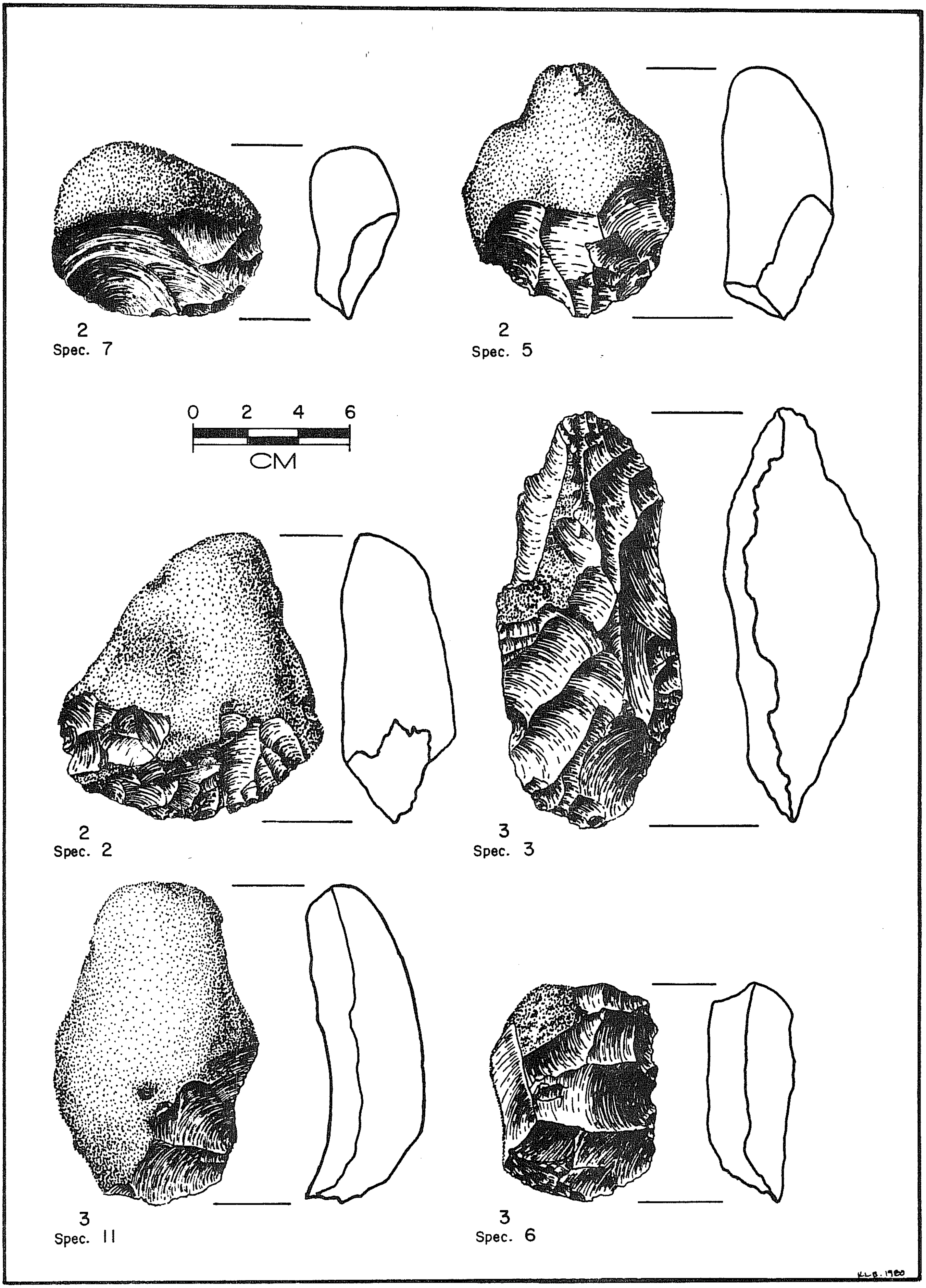


FIGURE 54

Cores (continued)

patch of cortex remains near the center of the dorsal surface. A tool suitable for scraping is thus formed. Specimen 2 is similar to the "choppers" described in Groups 2 and 3 cores. The specimen was formed by removal of a large cortex flake from a subrectangular cobble. The scar of this initial flake removal was then used as a platform from which five additional flakes were removed, leaving a sharp, cortex-free edge opposite the smooth, rounded cortex end. Site provenience and metric attributes for these two specimens follow:

Specimen No.	Site	Length	Width	Thickness	Figure No.
1	41 MC 14	6.6	6.0	3.0	56
2	41 MC 64	9.9	7.6	5.7	56

Both specimens were surface collected.

Group 5. Multidirectional, Natural and Prepared Platforms, Single Facet (72 Specimens)

These cores show evidence of flakes struck multidirectionally from single facet prepared and natural platforms. Thirty specimens are large flakes or split cobbles from which additional flakes have been removed. Most specimens retain 25-50% cortex; some retain 25% or less. Metric attributes are summarized:

	Maximum	Minimum	Average
Length Range:	9.9	5.2	7.5
Width Range:	9.0	4.3	6.4
Thickness Range:	6.6	2.7	4.4
Weight Range:	559.0	53.7	216.0

Examples of Group 5 cores are illustrated in Figure 57,e,f. Provenience is presented in Tables 2 and 3.

Group 6. Core Nuclei (129 Specimens)

This group includes core nuclei or exhausted cores that have been reduced to the point where further flake removal is impossible or impractical. All are smaller than the average-sized specimens of other core groups. Shapes vary considerably from oval to subcircular to angular and irregular. Flakes scars indicate use of cortex and prepared platforms with single and multiple facets. Flakes were removed multidirectionally. Platforms are commonly crushed or battered. Many retain no cortex. Some retain 25% or less, and a smaller number retain 50% of their cortex. Metric attributes are summarized as follows:

Figure 55. *Cores: Groups 3 and 4.* a-c, Group 4; d,e, Group 3.

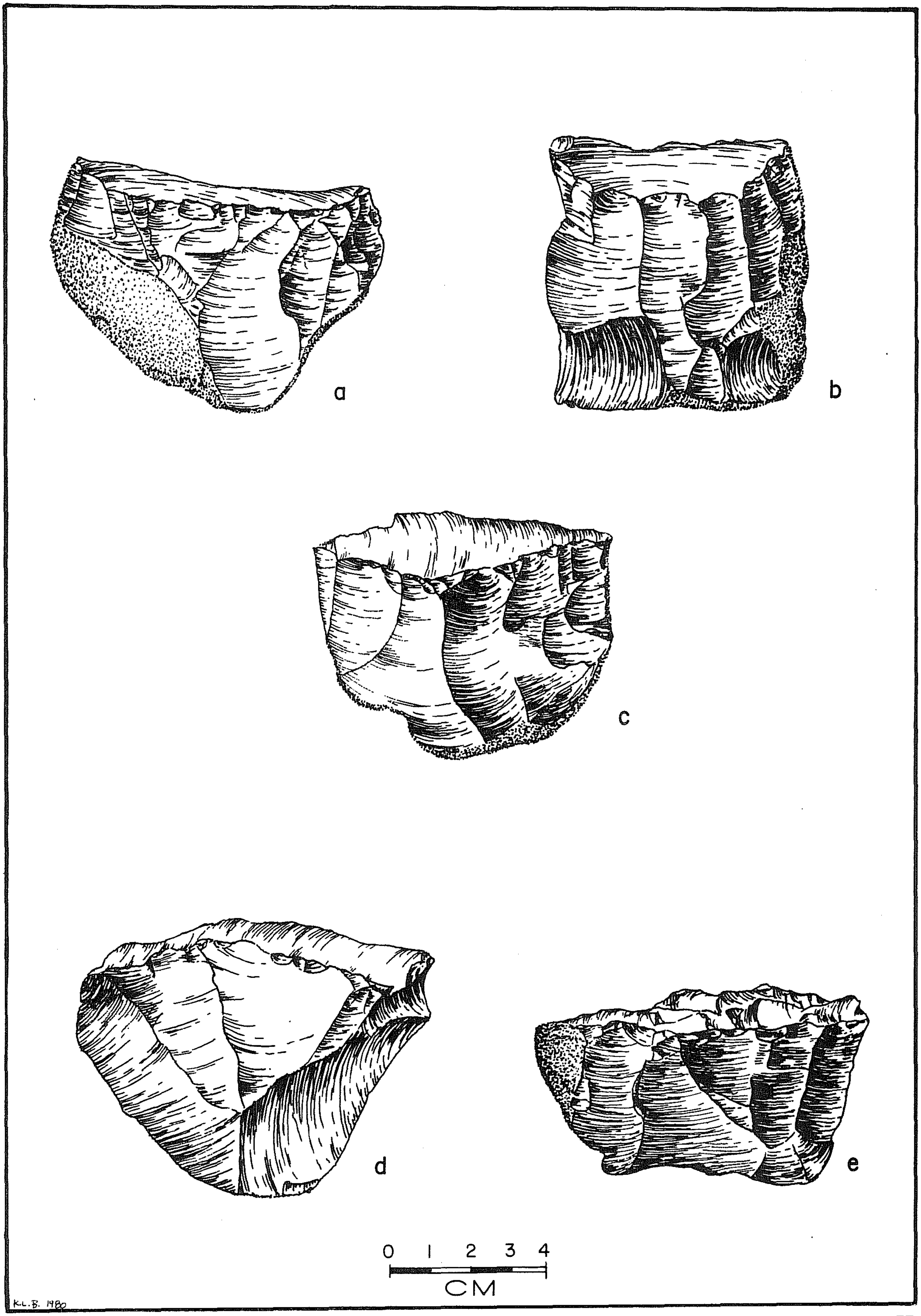


FIGURE 55

Cores (continued)

	Maximum	Minimum	Average
Length Range:	6.7	3.7	5.2
Width Range:	4.5	2.9	3.9
Thickness Range:	3.4	1.8	2.8
Weight Range:	99.0	18.0	63.0

Group 6 cores are illustrated in Figure 57,c,d. Provenience is presented in Tables 2 and 3.

Group 7. Flat, Circular to Elliptical in Outline, Unifacially Cortex Covered (43 Specimens)

Group 7 cores are flat, circular to elliptical, and more-or-less biconvex in cross section. On most specimens, one face is completely covered with cortex. On others, two or more flake removals from the cortex face have eliminated from 10-50% of the cortex. The other face is covered by flake scars of removals made from peripheral cortex platforms. Many of the specimens are portions of split cobbles or large flakes derived from cobbles. In a few cases, the curvature of surviving cortex suggests unifacial reduction of flat, subcircular cobbles. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	10.2	4.3	6.9
Width Range:	8.1	3.5	5.6
Thickness Range:	3.4	1.9	2.6
Weight Range:	315.0	32.8	125.0

Examples of Group 7 cores are illustrated in Figure 57,e,f. Provenience information is shown in Tables 2 and 3.

Group 8. Tested Cobbles (31 Specimens)

Group 8 consists of cortex-covered cobbles from which one to four natural platform flakes have been removed, possibly to "test" the quality of the material. Metric attributes are summarized:

	Maximum	Minimum	Average
Length Range:	13.5	5.6	10.0
Width Range:	9.5	4.6	7.2
Thickness Range:	7.0	3.6	4.8
Weight Range:	928.0	106.0	590.0

Group 8 specimens are not illustrated. Provenience information is provided in Table 3.

Figure 56. *Cores: Possible Tools--Groups 2, 3, and 4.* Group and specimen numbers are shown by each artifact.

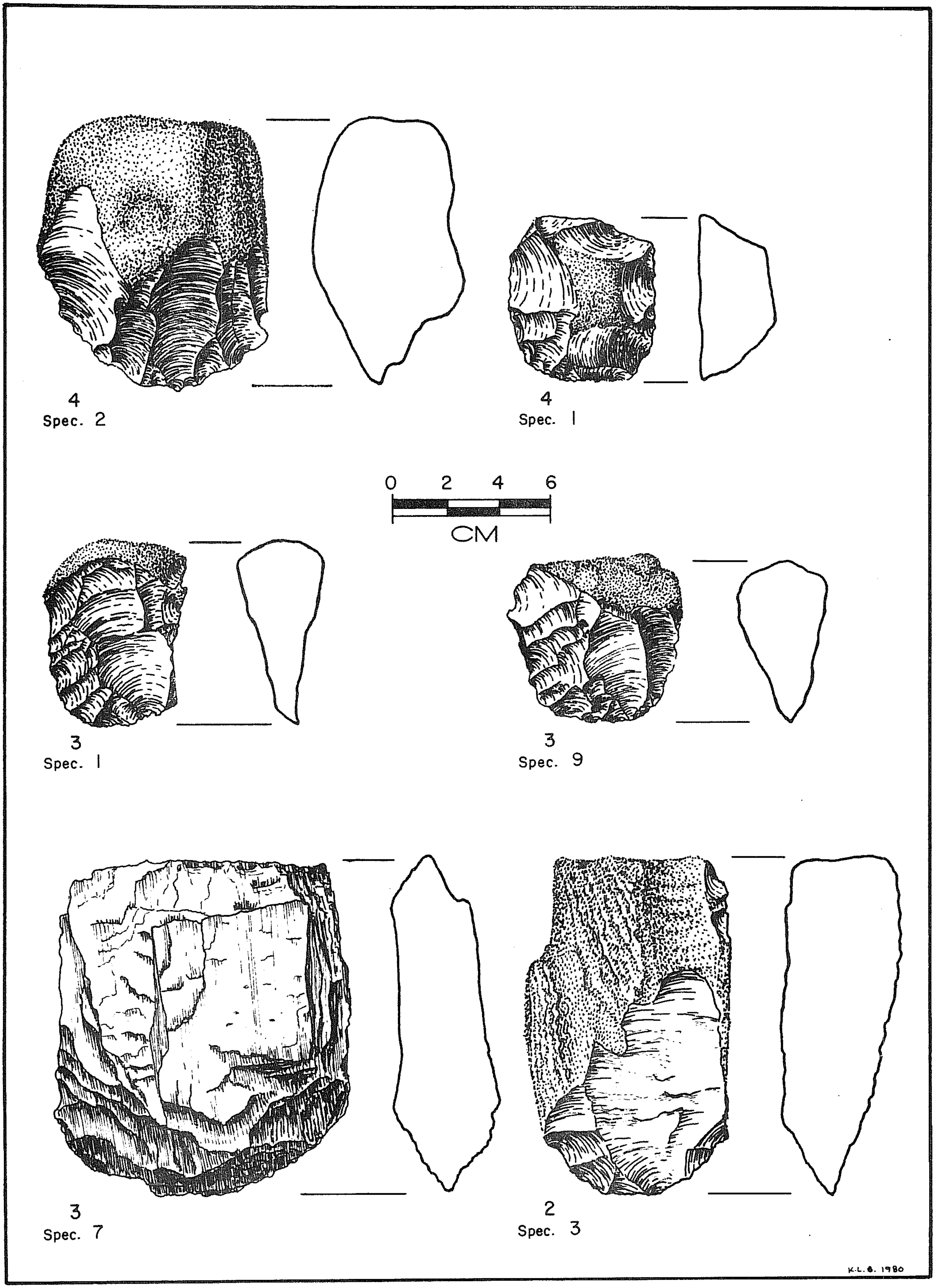


FIGURE 56

Group 9. Core Fragments (255 Specimens)

Group 9 contains unclassifiable core fragments. Most are believed to be remnants of shattered cores and trimmings resulting from platform preparation and general shaping. No metric attributes are provided, and no specimens are illustrated, but provenience is provided in Table 3.

Group 10. Unmodified Cobbles (46 Specimens)

This group consists of unmodified, cortex-covered cobbles. These specimens are not actually cores, but may have been brought to the sites for eventual reduction. Sizes range from a maximum of 14 x 8 x 6.5 cm to a minimum of 5 x 2.5 x 2 cm. There are three specimens of petrified wood and one of gray siliceous quartzite. The remainder appear to be chert cobbles. No specimens are illustrated, but provenience is provided in Tables 2 and 3.

Thick Bifaces (626 Specimens)

This category consists of percussion-flaked bifaces which (1) measure 1.3 cm or more in thickness; (2) exhibit 10-30 flakes scars, each greater than 1 cm^2; and (3) do not have forms or wear patterns suggestive of their function. All are assumed to be discarded manufacturing failures; however, careful microscopic examination of edges might reveal that some were used as tools. Both cobble cores and flake cores were used in production of these specimens. Many specimens retain cortex on one or both faces, the degree of coverage on either face ranging from 80% to traces. The majority of specimens retains thick knots or ridges, usually centrally located and surrounded by severe hinge fractures. The distinction between bifacial cores and thick bifaces, especially thick biface Groups 1-4, should be clearly noted. Bifacial cores exhibit less than nine flake scars and are usually thinned more at one end than the other. Thick bifaces have ten or more flake scars and are usually thinned more uniformly than the cores. It is emphasized that the distinction made between cores and bifaces is arbitrary. Some of the bifacial cores may have been intended for reduction to finished bifacial tools. Likewise, artifacts grouped as thick bifaces, especially in thick biface Groups 1-4, could easily have been flake sources and not intended for reduction to finished bifacial tools. The distinction is made merely to facilitate and standardize the descriptive classifications. The thick bifaces are divided into nine morphological groupings:

- Group 1. Large, Crudely Flaked Oval to Elliptical
- Group 2. Elliptical
- Group 3. Oval to Subcircular
- Group 4. Circular to Subcircular
- Group 5. Triangular
- Group 6. Fragments with Pointed Ends
  - Form 1. Elongate
  - Form 2. Triangular

Figure 57. *Cores: Groups 5, 6, and 7.* a,b, Group 6; c,d, Group 7; e,f, Group 5.

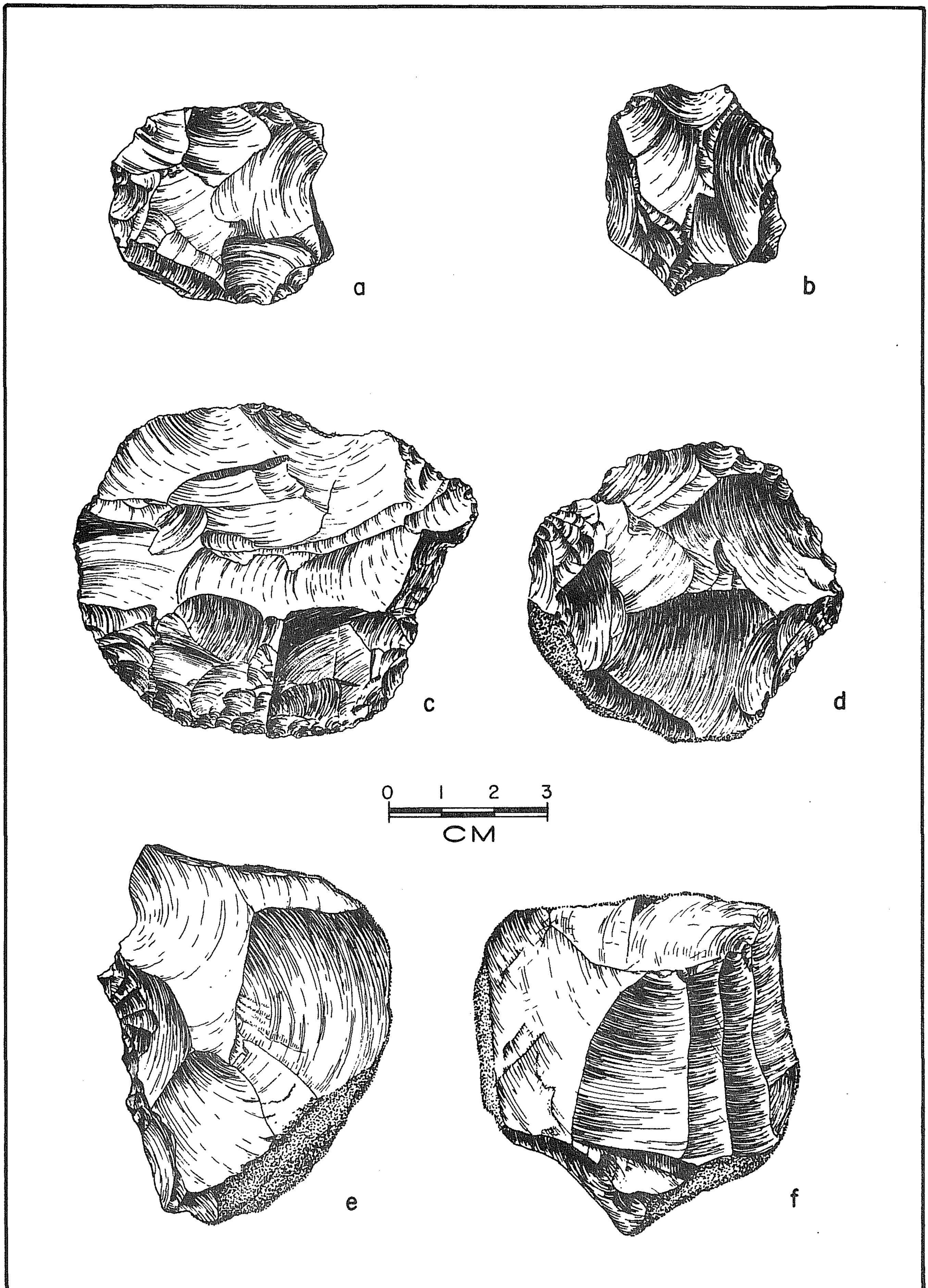


FIGURE 57

Thick Bifaces (continued)

Group 7. Fragments with Rounded Ends
Form 1. Subcircular to Oval
Form 2. Large, Broad, Thin Fragments
Form 3. Elliptical
Form 4. Remnant Cortex Striking Platforms
Group 8. Odd and Miscellaneous Forms--Whole and Fragmentary
Group 9. Lateral and Medial Fragments

Group 1. Large, Crudely Flaked Oval to Elliptical (98 Specimens)

Group 1 thick bifaces are mostly oval to elliptical and represent the largest and most crudely flaked thick biface specimens. A few are irregularly shaped or subrectangular. It is apparent from these outline configurations, and from cortex remnants, that relatively flat, oval to subcircular and elliptical cobbles were being selected for reduction. Flakes were struck from both natural and prepared platforms around the periphery in attempts to thin the cobbles. Edges are very sinuous. Most specimens exhibit a pronounced central ridge or knot on one or both face, often consisting of cortex that apparently could not be further thinned. Most are thick and biconvex in cross section. In most cases, the specimens are longer than they are wide and more-or-less half as thick as they are wide. Forty-eight specimens retain cortex on one face or end. The amount of cortex retained ranges from 50% to traces; however, most retain 25% or less. The total number of distinct flake scars greater than 1 cm^2 on both faces of the Group 1 thick bifaces ranges from 10-30 scars. Fifty-seven specimens have 14-20 scars. Metric attributes for Group 1 specimens are summarized as follows:

	Maximum	Minimum	Average
Length Range:	11.1	4.4	8.2
Width Range:	7.6	2.8	5.9
Thickness Range:	5.8	1.7	3.4
Weight Range:	309.0	53.0	125.0

Examples of Group 1 thick bifaces are illustrated in Figure 58. Provenience is presented in Tables 4 and 5.

Group 2. Elliptical (109 Specimens)

These specimens are elliptical in greater or lesser degrees of uniformity with edges varying from moderately undulating and sinuous to fairly smooth and straight. In cross section, most are biconvex, although some are plano-convex. Group 2 specimens are uniformly smaller than Group 1 thick bifaces. Group 2 specimens are pronouncedly more elongate than oval; the lengths are consistently two times the width. Thicknesses more nearly approach widths than those of Group 1. Group 2 specimens are flatter than Group 1 specimens, but still retain the thick central ridges suggestive of thinning difficulties. Forty-four specimens retain cortex on one face or end. Only three specimens retain cortex on both faces. Some retain up to 50% cortex on one face; most retain less than 25% on either face. The total number of flake scars greater

TABLE 4

Provenience of Thick Bifaces Recovered in Excavations

GROUP	FORM	SITE	LOT NO.	PROVENIENCE	
				UNIT	LEVEL
1		41LK14	5	TEST PIT 1	5
		41LK31/32	100	N1064 E877	97.65-97.38
		41LK77	1	TEST PIT 1	1
2		41LK15	27	TEST PIT 5	1
		41LK31/32	678-2	N1083 E1108	98.35-98.15
		41LK41	78	N1117 E1401	99.62-99.50
		41LK51	15	TEST PIT 2	3
		41LK67	394	N841 E1053	98.62-98.50
			492	N843 E1052	98.62-98.50
3		41LK31/32	61	N1062 E875	99.50-99.25
		41LK67	78	N905 E1001	98.93-98.85
			413	N841 E1056	98.55-98.50
		41LK74	15	TEST PIT 4	4
		41LK201	30	TEST PIT 2	10
4		41MC13	9	TEST PIT 2	5
		41MC17	4	TEST PIT 1	4
5		41LK31/32	194B	N1055 E861	FEATURE 17
		41LK67	921	N908 E1000	98.90-98.85
		41LK201	11-3	TEST PIT 1	11
6	2	41LK8	22	TEST PIT 3	8
		41LK17	6	TEST PIT 1	6
		41LK87	15	TEST PIT 2	5
		41MC29	12	TEST PIT 2	3
7	1	41LK14	27	TEST PIT 4	6
		41LK41	19-1	N1154 E1470	99.41-99.30
			19-2	N1154 E1470	99.41-99.30
7	1	41LK51	14	TEST PIT 2	2
			15	TEST PIT 2	3
		41LK67	895	N907 E1007	98.65-98.60
		41LK201	33	TEST PIT 2	13
		41MC15	13	TEST PIT 3	1
7	2	41LK31/32	588	N1065 E873	97.95-97.85
		41LK67	390	N841 E1052	98.61-98.50
		41MC19	33	TEST PIT 4	6
7	3	41LK74	13	TEST PIT 4	2
7	4	41LK53	19	TEST PIT 2	11
8		41LK8	8	TEST PIT 2	3
9		41LK8	6	TEST PIT 2	1
			18	TEST PIT 3	4
		41LK31/32	100	N1064 E877	97.65-97.38
			670	N1083E1108	98.75-98.55
			670	N1083E1108	98.75-98.55
			674	N1083E1108	98.55-98.35
			758	N1116 E998	99.10-98.90
		41LK59	86	N981 E824	98.98-98.79
		41LK67	42	N903 E1000	98.75-98.70
			585	N846 E1053	98.61-98.55
			760	N904 E1007	98.75-98.70
		41LK201	5	TEST PIT 1	5
		41MC15	13	TEST PIT 3	1
		41MC19	17	TEST PIT 3	2

TABLE 5

Provenience of Thick Bifaces by Site

SITE	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6		GROUP 7				GROUP 8	GROUP 9
						FORM 1	FORM 2	FORM 1	FORM 2	FORM 3	FORM 4		
41LK8							1	1				1	3
41LK9													
41LK10		5		1		2	2	1	1				
41LK13													
41LK14	4	6	5	2	1	1	2	7				1	3
41LK15		6		1	1	2	1	2	1	1			
41LK17							2						
41LK18			2										
41LK20													
41LK27		2	1					1		1		1	
41LK31/32	2	2	3		1		3	1	1		1		6
41LK34													
41LK41	5	5	2	6	1			3				1	
41LK48													
(Same as MC30)													
41LK49													
41LK50									1				
41LK51	4	1	1	1			1	6				3	5
41LK52	6	3	2	3	1		5	2	1	1	1	4	3
41LK53	1	1	1					1			1		
41LK59		1											1
41LK64	5	2	1	4	1		2	2		1		1	1
41LK65		1					1						
41LK67		5	2		2			2	2	1		1	4
41LK69	6	8	2	3	1	1	3	3			2	2	3
41LK73													
41LK74			2		1			1		1			1
41LK75	3	2	3	1			1		1				
41LK77	1												
41LK83			1										
41LK85								1					
41LK86	2	1						4					
41LK87							1						1
41LK88							1						
41LK91	2							2	1				1
41LK92													
41LK93	3												1
41LK94													
41LK97							1						
41LK197													
41LK198	1											1	
41LK201			2		1			1					1
41LK202													
41LK203													
41LK204	6	7	3	1	1	1	1	2					
41LK205	1	1			1					1			
41LK206	4	4	2	3		1				1			1
41LK207	5	4	2		1	1	1	7		3		1	
41MC8								1					
41MC9													
41MC10													
41MC11								2			1		1
41MC13				1									
41MC14													
41MC15			1	1				2					3
41MC17				1									
41MC18	1												
41MC19	1						1	1	1				1
41MC22													2

TABLE 5

Provenience of Thick Bifaces by Site (Continued)

SITE	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6		GROUP 7				GROUP 8	GROUP 9
						FORM 1	FORM 2	FORM 1	FORM 2	FORM 3	FORM 4		
41MC24			1										
41MC25													
41MC26													
41MC28													
41MC29					1		1	1					
41MC30	1	1											
(Same as LK48)													
41MC31													
41MC33		4		1				3				1	1
41MC36													
41MC39						1							
41MC40													
41MC41		2		1			1				1		2
41MC42	1	1		2	1			1					3
41MC43			1					1					1
41MC44								1					
41MC45													
41MC48								1	1			1	
41MC50													
41MC52													
41MC53													
41MC54													
41MC55		1	2	1									
41MC56							1						
41MC57			1				2						
41MC58													
41MC59						1						1	1
41MC64	3	2	1		1		1	1					2
41MC65	1		1	1									
41MC67		2	1	1									
41MC68	1	2	1										
41MC69	2								1				
41MC72			1										
41MC74	1			1			1						
41MC75			2										
41MC78		1	1										1
41MC79													
41MC80													
41MC83													
41MC84	6	13	4	1	1	1	7	10	1	2	1	7	8
41MC86		1		1				2					
41MC88													
41MC90													
41MC91			1										
41MC92													
41MC93							1						
41MC94	13	4	1	2	1			2		1	1	3	1
41MC95	3	4	2	4		1	2	3		2	2	1	3
41MC171	2	2	3	1	1	1		1					
41MC174					1			2			1	1	2
41MC176						2							
41MC177		1											
41MC189	1												
41MC222	1												
41MC223													2
41MC224	1	1	1										1

Thick Bifaces (continued)

than 1 cm^2 on both faces of the Group 2 thick bifaces ranges from 10-32 scars; 93 specimens exhibit 14-24 scars. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	10.8	4.1	6.4
Width Range:	5.5	2.1	3.4
Thickness Range:	2.7	1.1	2.0
Weight Range:	109.0	13.0	37.0

Examples of Group 2 thick bifaces are illustrated in Figure 58. Provenience is presented in Tables 4 and 5.

Group 3. Oval to Subcircular (64 Specimens)

These specimens are oval to subcircular. Edges vary from moderately undulating and sinuous to fairly smooth and straight. Most specimens are biconvex in cross section, although there are several plano-convex examples. The widths of Group 3 bifaces are more nearly equal their lengths, and the thickness of most specimens is less than half the width. Twenty-seven specimens retain cortex on one face or end. Only two specimens retain cortex on both faces. Most retain less than 25% on either face, but some retain 50-80% cortex on one face. Total number of flake scars greater than 1 cm^2 on both faces of the Group 3 bifaces ranges from 11-28 scars; fifty-three exhibit 12-21 scars. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	7.7	4.0	6.2
Width Range:	5.7	3.1	4.5
Thickness Range:	2.7	1.2	1.9
Weight Range:	92.0	20.0	54.0

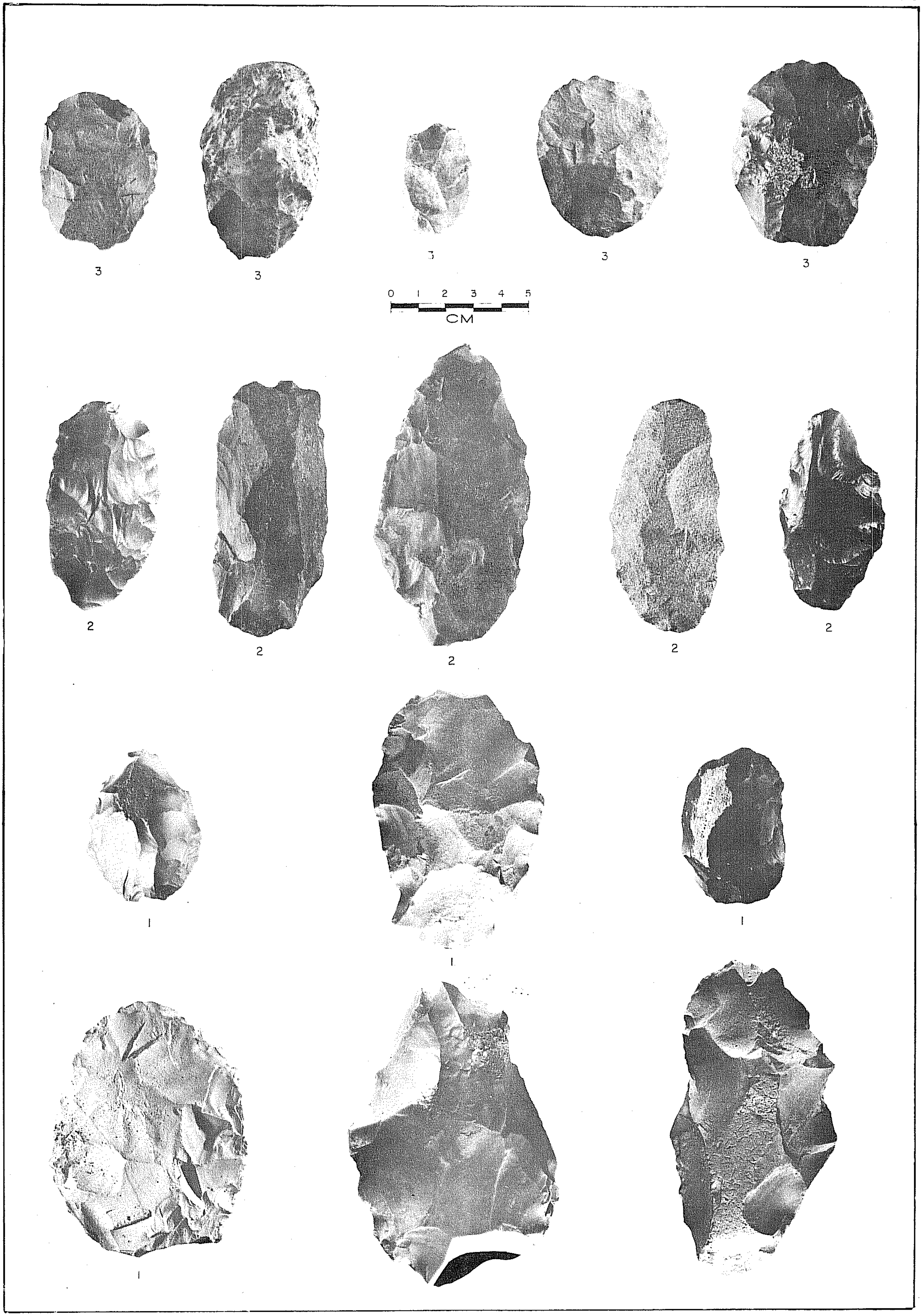
Examples of Group 3 thick bifaces are illustrated in Figure 58. Provenience is presented in Tables 4 and 5.

Group 4. Circular to Subcircular (46 Specimens)

These specimens are circular to subcircular, and edges are moderately sinuous and undulating. Cross sections are mostly biconvex with a few plano-convex specimens also represented. Widths equal, or nearly equal, lengths. Thicknesses range from one-half to three-quarters of the length and width dimensions. Twenty-two specimens retain cortex on one face or end. Three specimens retain

---

Figure 58. *Thick Bifaces: Groups 1, 2, and 3.* Numbers beneath each specimen indicate group affiliation.


3
3
3
3
3
0 1 2 3 4 5
CM
2
2
2
2
2
1
1
1
1

Thick Bifaces (continued)

cortex on both faces. Four specimens retain 50% cortex on one face. The remaining specimens retain 25% or less cortex on either face. Total number of flake scars greater than 1 cm^2 on both faces ranges from 11-25 scars with most specimens (33) exhibiting 14-19 scars. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	7.9	3.8	5.6
Width Range:	6.9	2.2	5.0
Thickness Range:	4.0	0.6	2.0
Weight Range:	164.0	23.0	58.0

Thick biface Group 4 examples are illustrated in Figure 59. Provenience data is presented in Tables 4 and 5.

Group 5. Triangular (21 Specimens)

Group 5 specimens are triangular with slightly sinuous to straight edges and biconvex cross sections. Lengths approach twice the widths in most cases. Thicknesses are usually half the widths. Seven specimens retain patches of cortex on one face. All specimens retain less than 25% cortex. Number of flake scars greater than 1 cm^2 on both faces ranges from 12-26 scars with 19 specimens exhibiting 12-20 scars.

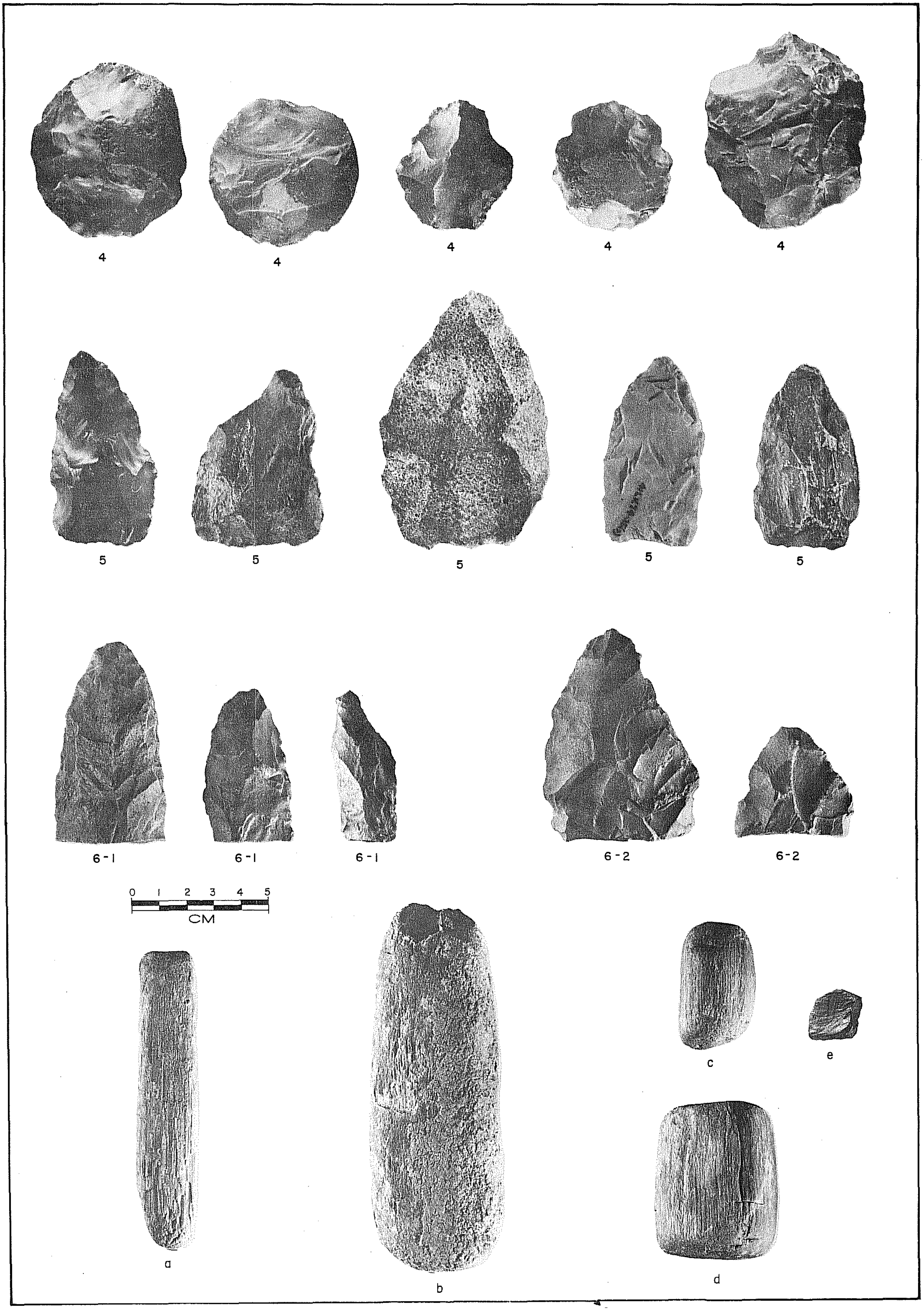
	Maximum	Minimum	Average
Length Range:	7.2	3.6	6.3
Width Range:	5.9	2.7	4.1
Thickness Range:	2.2	1.3	1.6
Weight Range:	60.0	10.0	37.0

Examples of Group 5 specimens are illustrated in Figure 59. Provenience is presented in Tables 4 and 5.

Group 6. Fragments with Pointed Ends (63 Specimens)

Group 6 contains biface fragments with pointed ends as a common characteristic. The group is further divided into two forms--elongate and triangular--based on outline. All are probably incomplete examples of Group 2 (elliptical) and Group 5 (triangular) thick bifaces. Except that they are broken, the Group 6 specimens are otherwise similar to Group 2 and Group 5 with respect to cross section shape, degree of cortex removal, and number of flake scars. Length and weight ranges represent incomplete measurements due to the fragmentation of the specimens.

Figure 59. *Thick Bifaces: Groups 4, 5, and 6, Forms 1 and 2.* Numbers beneath each specimen indicate group and form affiliation. a-d, examples of satin spar gypsum; e, ocher. Note striations on surface.


4
4
4
4
4
5
5
5
5
5
6-1
6-1
6-1
6-2
6-2
0 1 2 3 4 5
CM
a
b
c
d
e

Thick Bifaces (continued)

Form 1. Elongate (16 Specimens)

	Maximum	Minimum	Average
Length Range:	8.0*	7.9*	7.4*
Width Range:	4.1	2.9	3.5
Thickness Range:	2.0	1.3	1.7
Weight Range:	66.0*	29.0*	47.0*

Form 2. Triangular (47 Specimens)

	Maximum	Minimum	Average
Length Range:	6.3*	4.1*	5.1*
Width Range:	5.3	3.4	4.3
Thickness Range:	2.4	1.2	1.6
Weight Range:	66.0*	21.0*	37.0*

Examples of Group 6 thick bifaces are illustrated in Figure 59. Provenience is supplied in Tables 4 and 5.

Group 7. Fragments with Rounded Ends (125 Specimens)

Group 7 thick bifaces are fragments with characteristically rounded ends. The group is further subdivided into four forms. Form 1 specimens are broken examples of Group 2 (elliptical) and/or Group 3 (oval to subcircular) thick bifaces. Form 2 specimens are fragments of large, broad, relatively thin bifaces, not analogous to any of the previous thick biface groups. The Form 2 specimens probably represent failures in attempts to produce large, knifelike thin bifaces (e.g., Group 4, Form 3, thin bifaces). Form 3 specimens may be fragments of Group 2 (elliptical) thick bifaces in that their broken lengths substantially exceed their widths. Form 4 specimens are unique in that a cortex striking platform is preserved on the rounded end. Cross section, degree of cortex removal, and number of flake scars of Group 7 specimens are similar to thick biface Groups 2 and 3. Length and weight ranges represent incomplete measurements due to the fragmentation of the specimens.

Form 1. Fragments of Subcircular and Oval Bifaces (84 Specimens)

	Maximum	Minimum	Average
Length Range:	6.3*	2.8*	4.7*
Width Range:	5.5	2.1	4.0
Thickness Range:	2.5	1.0	1.5
Weight Range:	52.0*	12.0*	23.0*

Thick Bifaces (continued)

Form 2. Large, Broad, Thin Fragments (13 Specimens)

	Maximum	Minimum	Average
Length Range:	6.9*	3.9*	5.9*
Width Range:	6.3	3.1	5.4
Thickness Range:	1.9	0.9	1.5
Weight Range:	78.0*	13.0*	48.0*

Form 3. Elliptical (16 Specimens)

	Maximum	Minimum	Average
Length Range:	7.2	5.0	5.9
Width Range:	5.0	2.7	3.8
Thickness Range:	2.1	1.2	1.7
Weight Range:	*	*	*

Form 4. Cortex Striking Platform (12 Specimens)

	Maximum	Minimum	Average
Length Range:	*	*	*
Width Range:	4.3	3.2	3.8
Thickness Range:	1.6	1.3	1.5
Weight Range:	*	*	*

Examples of Group 7 thick bifaces are illustrated in Figure 60. Provenience data is presented in Tables 4 and 5.

Group 8. Odd and Miscellaneous Forms--Whole and Fragmentary (32 Specimens)

This group consists of whole and fragmentary thick biface specimens having odd and miscellaneous shapes unlike any of the previously described groups.

	Maximum	Minimim	Average
Length Range:	6.2	5.2	5.9
Width Range:	6.5	3.1	4.6
Thickness Range:	3.4	1.4	2.2
Weight Range:	63.0	30.0	48.0

Group 8 specimens are not illustrated, but provenience is provided in Tables 4 and 5.

Thick Bifaces (continued)

Group 9. Lateral and Medial Fragments (69 Specimens)

This group consists of unclassifiable fragments, probably derived from specimens from previous thick biface groupings. Length, width, and weight are incomplete measurements, due to the fragmentation of the specimens.

	Maximum	Minimum	Average
Length Range:	7.0*	4.8*	5.9*
Width Range:	5.5*	2.0*	3.6*
Thickness Range:	2.2	1.0	1.6
Weight Range:	56.0*	14.0*	30.0*

Group 9 specimens are not illustrated, but provenience information is provided in Tables 4 and 5.

Thin Bifaces (1029 Specimens)

Specimens classed as thin bifaces measure less than 1.3 cm thick; generally have straight, smooth edges; and show signs of being worked into their present shapes more by pressure flaking rather than by percussion. Only rarely is cortex retained on these specimens. Flake scars are generally much less than 1 cm^2 in area and coalesce to the extent that it is impossible to count them. Functional categories believed to be represented include dart points, arrow points, knives, and manufacturing failures representing each of these tool types. To avoid implying function with terminology, the thin bifaces are divided into groups and forms based on general morphological characteristics. The group divisions are based primarily on outline and size. Forms reflect more specific details such as thickness, workmanship, and manufacture. Previously established type names have been given to groups or individual artifacts when confident assignment was possible. If the group, type, or specimen is diagnostic of a time period, the age range is noted along with a reference to the source from which the information is derived. For the most part, the time ranges of diagnostic types are derived from the better known chronologies developed for central Texas and the Trans-Pecos. To a lesser extent, dates from southern Texas are used. Site proveniences for thin bifaces are presented in Table 6. Except for Groups 9 and 10, all groups are illustrated in Figures 61-69. The thin bifaces are divided into ten morphological groupings:

Group 1. Stemmed
- Form 1. Large with Straight Stems
- Form 2. Large with Contracting Stems
- Form 3. Large with Expanding Stems
- Form 4. Small with Contracting Stems
- Form 5. Small with Expanding Stems
- Form 6. Unclassifiable Fragments of Large Stemmed Bifaces
- Form 7. Unclassifiable Fragments of Small Stemmed Bifaces

Figure 60. *Thick Bifaces: Group 7, Forms 1-4 and Hammerstones.* a-e, hammerstones.

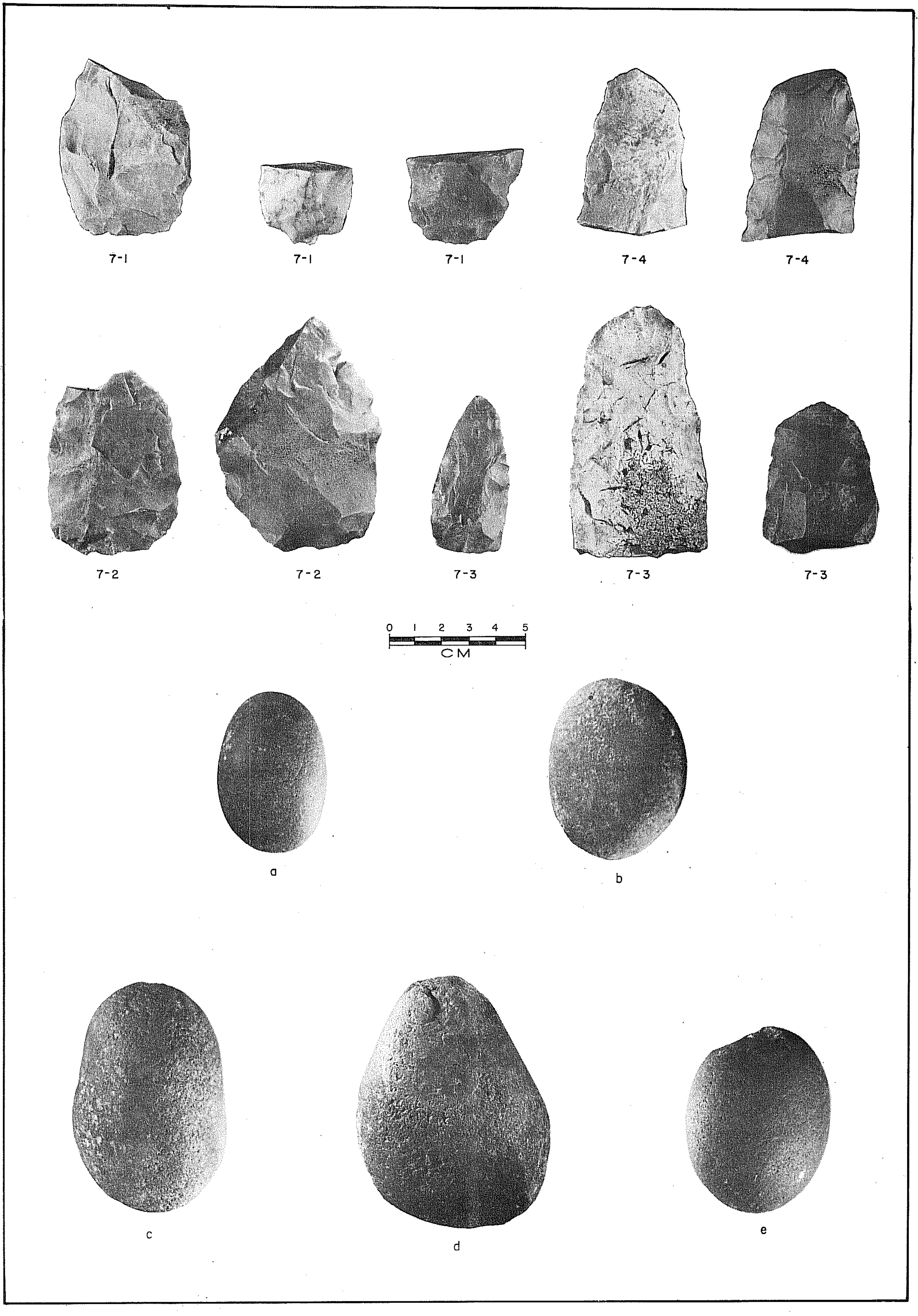

7-1
7-1
7-1
7-4
7-4
7-2
7-2
7-3
7-3
7-3
0 1 2 3 4 5
CM
a
b
c
d
e

TABLE 6

PROVENIENCE OF THIN BIFACES BY SITE

SITE NO.	GROUP 1 FORMS							GROUP 2 FORMS		GROUP 3 FORMS		GROUP 4 FORMS				GROUP 5	GROUP 6	GROUP 7	GROUP 8	GROUP 9	GROUP 10
	1	2	3	4	5	6	7	1	2	1	2	1	2	3	4						
41LK8	1								1		1		1			1				2	3
41LK9																					
41LK10	1										1				2	2	1			1	
41LK13																					1
41LK14		2	2	1	1		1	1	7	1	1	2			4	2			1	14	15
41LK15			3			2			3	1	2				3	1				7	6
41LK17														1	1					1	
41LK18				1					1												
41LK20																					
41LK27		1	1		1				3	1		2	1		5					2	4
41LK31/32	2	4	1			1		4	4		6	3		1		3				11	14
41LK34										1											
41LK41	1		1	4	3		10	1	6	1	1	1			1	1		1	2	7	8
41LK48																					
(Same as MC30)																					
41LK49								1													
41LK50											1									1	
41LK51	2	3	4	3				5	6		2	1			3	1				9	6
41LK52	2					1		2	8	1	1	1		1	12	2				5	12
41LK53						1		1	3		1			1	6	1				6	2
41LK59						1					1										5
41LK64	1		1					1	8		2	1			5	3				3	7
41LK65					1	1															
41LK67	1	1	6	7	2		4	1		2	1	1	1		7	3			1	12	10
41LK69		1	1			1		2	3	1	1				1	1				3	4
41LK 73	1																				
41LK74	1	1								1		1			1						
41LK75		1						1	1		1			1	5	1				4	1
41LK77																					
41LK83																				1	
41LK85	1														1						2
41LK86					1				1											2	1
41LK87			1		1		1	2	1		1				1	1				4	
41LK88																					
41LK91			1				1		1											2	3
41LK92															1						
41LK93																					
41LK94									1												
41LK97																1					
41LK197																					
41LK198																					1
41LK201			2	1			3	2				2	1	1	2	2			2	2	
41LK202																					
41LK203																					
41LK204	1					1			1											3	3
41LK205			1													1					2
41LK206									1							1				2	
41LK207								2	1											1	3
41MC8																					
41MC9							1														
41MC10																					
41MC11								1	4	1	1					1			1	2	1
41MC13												1								1	
41MC14		1																			
41MC15	2				2		3	2	3			1	1		5	1	1		1	2	9
41MC17			1						2			1			1					2	1
41MC18									1	1					1					1	
41MC19				1					2		1			1	3					2	
41MC22		1			1			2				1								1	

TABLE 6

PROVENIENCE OF THIN BIFACES BY SITE (CONTINUED)

SITE NO.	GROUP 1 FORMS							GROUP 2 FORMS		GROUP 3 FORMS		GROUP 4 FORMS				GROUP 5	GROUP 6	GROUP 7	GROUP 8	GROUP 9	GROUP 10
	1	2	3	4	5	6	7	1	2	1	2	1	2	3	4						
41MC24										1											
41MC25																					
41MC26																					
41MC28																					
41MC29							4		1					1						2	1
41MC30			1												1					1	
(same as LK48)																					
41MC31																					
41MC33									1						1					1	2
41MC36															1						
41MC39	1		1					2								1			1	2	3
41MC40									1						1						1
41MC41			1					1	2		2				3	2			1	4	6
41MC42								1												1	2
41MC43		1						1				1			1					1	3
41MC44																					
41MC45																					
41MC48																				1	
41MC50									1												1
41MC52						1															
41MC53																					
41MC54																					1
41MC55			1	1			4					1	3	1	1					3	
41MC56		1										1			2		1				1
41MC57	1	1	2					2				1		1		1					2
41MC58																					
41MC59															1	1					
41MC64										1					1	1				1	2
41MC65				1																	1
41MC67	1						1					1								3	
41MC68	1					1			1											1	1
41MC69					1			1					1	1	2						
41MC72											1	1			1	1				1	2
41MC74						1										1	1			2	
41MC75						1		1			1				1					1	3
41MC78			1						2						1						1
41MC79																					1
41MC80																					
41MC83																					
41MC84	1	3	4		2	1	1	1	3		1	2	1		15	3			1	9	14
41MC86								2	3						1					1	2
41MC88																					
41MC90																					
41MC91																					
41MC92																					
41MC93																					
41MC94	2		3					1	7		2	2	1	1	11	3			1	9	6
41MC95			1			1			6	1		1		1	10	2				10	6
41MC171								1	1						1	1				1	1
41MC174			1						1						1						4
41MC176									1						2					3	2
41MC177												1									
41MC184			1					2			1	1									
41MC189																					
41MC219								1												1	
41MC222					1		4	3	1	1		1			1		1			3	
41MC223				1			1						2		2						
41MC224														1							

Thin Bifaces (continued)

Group 2. Unstemmed with Straight Bases
- Form 1. Complete Triangular
- Form 2. Proximal Fragments

Group 3. Unstemmed with Concave Bases
- Form 1. Complete Triangular
- Form 2. Proximal Fragments

Group 4. Unstemmed with Convex to Semicircular Bases
- Form 1. Complete Triangular
- Form 2. Steeply Beveled Blades
- Form 3. Oval to Elliptical
- Form 4. Fragments with Convex to Semicircular Ends

Group 5. Unstemmed Leaf Shaped
Group 6. Circular to Subcircular
Group 7. Diamond Shaped
Group 8. Bifaces with Sharp, Slender Projections
Group 9. Fragments with Pointed Ends
Group 10. Lateral and Medial Fragments

Group 1. Stemmed (183 Specimens)

Form 1. Large with Straight Stems (25 Specimens)

This group includes large-stemmed bifaces with more-or-less straight stems or parallel edges. Seven specimens fall comfortably into previously established dart point typological groups, including *Scottsbluff*, *Pedernales*, *Bulverde*, and *Bell*. There is so much diversity among the 18 other specimens that each must be described individually. Provenience and metric data are provided in Table 7.

Specimen 1: *Scottsbluff*. This specimen is triangular (Fig. 61), with straight blade edges and weak shoulders. The stem is long and broad. The stem edges are lightly ground. Uniformly spaced diagonal thinning flake scars are visible on both faces. The distal end appears to have been broken by impact fracture. One basal corner is reddened, suggesting burning or heat treatment during manufacture. The material is a light orange to brown-marbled jasper. This type is representative of the late Paleo-Indian Stage, ca. 7000-6000 B.C.

Specimens 2-5: *Pedernales*. These specimens are triangular with straight to slightly convex blade edges and a concave base. All four specimens are made of fine-grained chert. Specimens 1 and 3 appear to have been broken by impact fracture. *Pedernales* is a form diagnostic of the Middle Archaic Stage, based on central Texas and Trans-Pecos chronologies (Suhm and Jelks 1962:235-238).

Specimen 6: *Bulverde*. This specimen is triangular with straight to slightly convex blade edges. The shoulders have short barbs, and the stem is square. The distal end has been snapped off, possibly by impact fracture. The specimen (Fig. 61) is made of fine-grained chert. The *Bulverde* type is diagnostic

---

Figure 61. *Thin Bifaces: Group 1, Forms 1 and 2*. Numbers beneath each specimen indicate group, form, and specimen number.

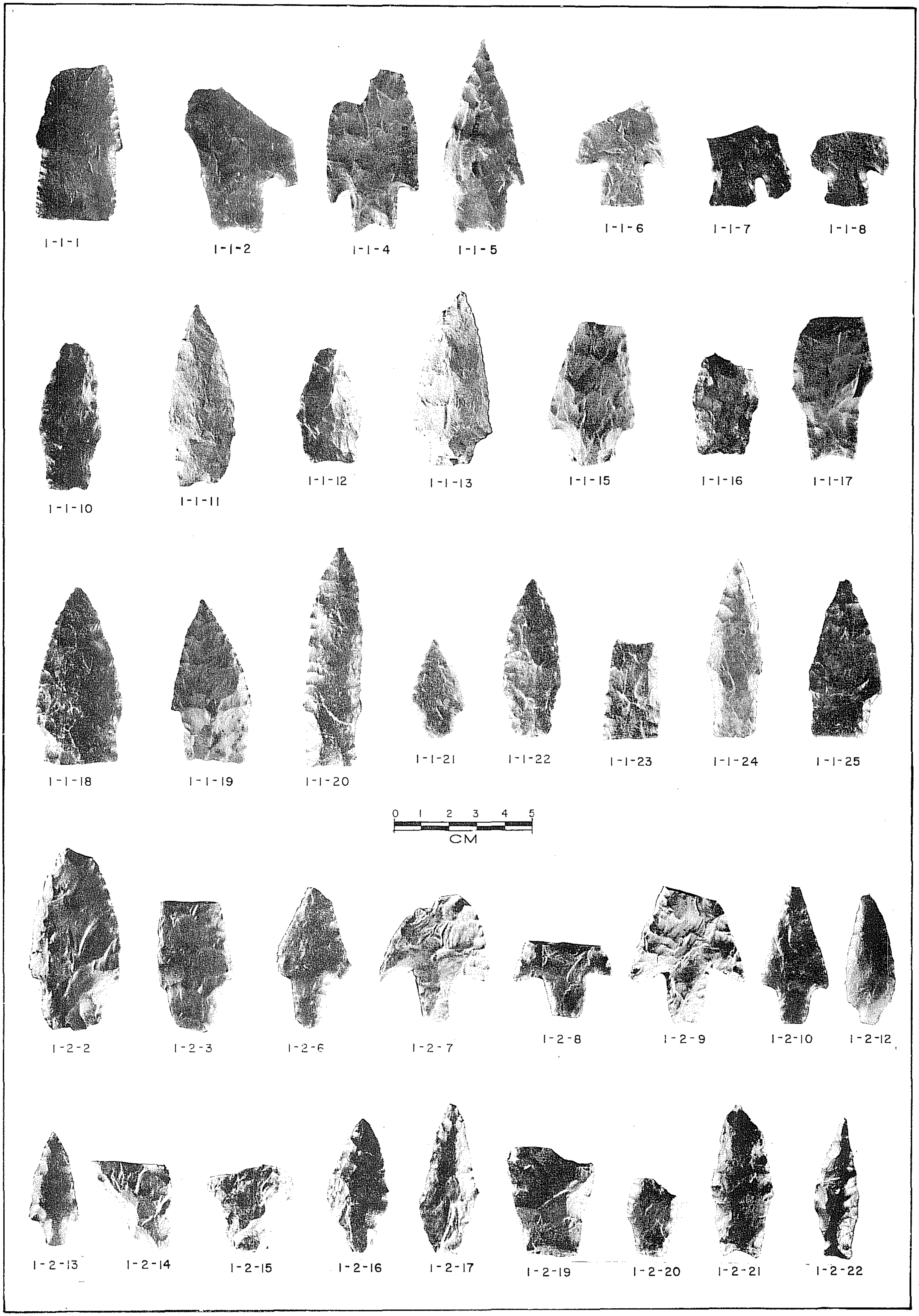

1-1-1
1-1-2
1-1-4
1-1-5
1-1-6
1-1-7
1-1-8
1-1-10
1-1-11
1-1-12
1-1-13
1-1-15
1-1-16
1-1-17
1-1-18
1-1-19
1-1-20
1-1-21
1-1-22
1-1-23
1-1-24
1-1-25
0 1 2 3 4 5
CM
1-2-2
1-2-3
1-2-6
1-2-7
1-2-8
1-2-9
1-2-10
1-2-12
1-2-13
1-2-14
1-2-15
1-2-16
1-2-17
1-2-19
1-2-20
1-2-21
1-2-22

TABLE 7

Provenience and Metric Data for Stemmed Thin Bifaces

GROUP	FORM	SPECIMEN NO.	TYPE	SITE	LOT NO.	PROVENIENCE UNIT	PROVENIENCE LEVEL	LENGTH	WIDTH	THICKNESS	STEM LENGTH	STEM WIDTH	NECK WIDTH	WEIGHT	ILLUSTRATION
1	1	1	Scottsbluff	41LK204	17 (17)			5.6•	3.1	0.7	2.5	3.0	2.8	16.3	61
1	1	2	Pedernales	41LK10	5 - 3			•	3.9	0.8	1.8	2.1	1.9	•	61
1	1	3	Pedernales	41LK31/32	151			7.1	2.8	0.6	2.0	2.1	2.1	11.0	
1	1	4	Pedernales	41LK51	1 - 3			•	3.3	0.7	1.5	1.7	1.8	•	61
1	1	5	Pedernales	41LK73	11			7.1	3.0	0.8	2.0	2.1	2.0	14.3	61
1	1	6	Bulverde	41MC15	81 - 1			•	3.3	0.6	1.7	1.7	1.6	•	61
1	1	7	Bell	41LK52	1 - 8			•	•	0.5	1.0	1.7	1.5	•	61
1	1	8		41LK8	45			•	2.9	0.5	1.3	1.6	1.4	•	61
1	1	9	Nolan?	41LK31/32	53	N1058E864	Zone 4 97.69	5.8	2.5	0.7	1.5	2.1	2.0	11.4	
1	1	10		41LK41	395(268)			5.3•	2.2	0.8	1.6	1.6	1.8	9.7	61
1	1	11		41LK51	1 - 4			6.5	2.4	0.9	1.7	1.9	1.9	14.2	61
1	1	12		41LK52	1 - 18			4.0•	2.4	0.8	1.4	2.0	2.0	7.8	61
1	1	13		41LK64	89 (89)			6.2	2.7	0.7	1.1	1.5	1.5	13.1	61
1	1	14		41LK67	428	N841E1058	98.55 - 98.50	5.3•	2.9	1.1	2.1	2.0	2.0	•	
1	1	15		41LK74	28 (5)			5.1•	3.2	1.0	1.3	1.7	1.7	18.2	61
1	1	16		41LK83	2			•	2.4	0.7	1.7	2.0	2.1	•	61
1	1	17		41LK85	23			•	2.9	0.9	1.9	1.8	1.9	•	61
1	1	18		41MC15	53 (4)			6.4	3.1	1.0	1.7	2.7	2.5	19.5	61
1	1	19	Bulverde?	41MC39	6	Test Pit 1	Level 6	5.8	2.9	1.0	1.8	2.3	2.4	12.9	61
1	1	20		41MC57	19 (6)			7.8	2.0	0.8	1.8	2.0	1.8	15.3	61
1	1	21		41MC67	2			3.6	2.0	0.5	1.0	1.2	1.3	3.2	61
1	1	22		41MC68	4 (1)			5.7	2.1	0.7	1.3	1.6	1.5	9.4	61
1	1	23		41MC84	101 (25)			•	2.0	0.9	2.0	1.7	1.8	•	61
1	1	24		41MC94	29 (29)			6.3	2.0	0.7	2.3	1.5	1.6	9.2	61
1	1	25		41MC94	11 (11)			5.6	2.6	0.8	1.6	2.0	2.1	11.6	61
1	2	1	Almagre	41LK67	372			•	3.5	0.9	1.6	1.5	2.1	•	
1	2	2	Morhiss	41LK14	47 (18)			6.5•	3.3	0.8	1.8	2.2	2.3	19.5	61
1	2	3	Morhiss	41MC56	18 (18)			4.6•	2.6	0.7	1.6	1.7	2.0	•	61
1	2	4	Morhiss	41LK31/32	143			5.5	3.0	1.0	1.8	2.6	2.6	17.8	
1	2	5	Morhiss	41LK31/32	794			4.8	2.9	0.9	1.7	2.2	2.2	•	
1	2	6	Langtry	41LK69	73 (69)			5.1	2.6	0.6	1.9	1.4	1.4	6.7	61
1	2	7	Langtry	41LK75	30 (30)			4.5•	3.9	0.6	1.7	1.8	1.8	8.9•	61
1	2	8	Langtry	41MC14	1 - 1			•	3.5	0.6	1.5	1.5	1.5	•	61
1	2	9	Langtry	41MC43	1 - 7			4.8•	4.2	0.5	1.8	1.6	1.6	•	61
1	2	10	Langtry	41MC57	3 (3)			4.9	2.4	0.5	1.4	1.2	1.2	4.6	61
1	2	11		41LK31/32	676			5.0•	1.9	0.7	0.8•	1.4	1.4	7.5	
1	2	12		41MC22	8 (1)			4.7	1.7	0.9	0.6•	0.8	0.8	8.0	61
1	2	13		41MC84	129 (108)			4.2	1.8	0.7	1.0	0.9	0.9	5.3	61
1	2	14		41LK27	8 (8)			•	2.7•	0.9	1.7	1.5	1.5	•	61
1	2	15		41LK51	1 - 9			•	3.0	0.8	1.5	1.9	1.9	•	61
1	2	16		41LK51	135 (98)			4.9	2.1	0.8	1.3	1.2	1.2	7.0	61
1	2	17	Angostura?	41LK14	94 (65)			5.4	2.3	0.7	2.2	2.3	2.3	9.5	61
1	2	18		41LK31/32	781			5.3	2.5•	1.0	2.0	1.8•	1.8•	•	
1	2	19		41LK51	138(101)			•	3.1	1.0	2.0	2.2	2.2	•	61
1	2	20		41LK74	18 - 2			•	1.8	0.5	1.3	1.5	1.5	•	61
1	2	21		41MC84	103 (29)			5.5	2.3	0.9	2.1	1.8	1.9	11.3	61
1	2	22		41MC84	116-20			5.0	1.5	0.8	1.2	1.1	1.1	5.8	61
1	3	1	Ensor	41LK15	61 (20)			3.0	2.0	0.6	1.0	2.0	1.6	4.5	62
1	3	2	Ensor	41LK51	2	Test Pit 1	Level 2	3.1•	2.8	0.6	1.0	2.4	1.7	•	62
1	3	3	Ensor	41LK64	85 (85)			3.5	2.4	0.6	1.1	2.2	1.5	5.6	62
1	3	4	Ensor	41LK87	1 - 6			3.6	2.1	0.8	0.7	2.1	1.7	4.6	62
1	3	5	Ensor	41LK205	1 (1)			3.5	1.8	0.6	1.0	1.6	1.3	3.7	62
1	3	6	Ensor	41MC17	16 (4)			•	2.3	0.7	0.9	2.1	1.7	•	62
1	3	7	Ensor	41MC57	9 (9)			3.3	2.2	0.6	0.9	2.2	1.6	4.7	62
1	3	8	Ensor	41MC84	119 - 12			3.2	•	0.7	1.0	•	1.2	•	62
1	3	9	Ensor	41MC94	28 (28)			3.7•	2.9	0.6	1.0	2.4	1.9	7.8•	62
1	3	10	Ensor	41MC94	26 (26)			3.4	1.9	0.6	1.0	•	•	•	62
1	3	11	Fairland	41LK51	29	Test Pit 3	Level 5	4.4	2.1	0.7	1.0	1.6	1.3	5.4	62
1	3	12	Fairland	41LK67	1189			3.3•	2.2	0.7	1.0	1.9	1.3	5.5•	
1	3	13	Fairland	41LK67	172	N 901E1004	98.85 - 98.75	3.6	2.1•	0.7	1.1	•	1.5	4.2•	
1	3	14	Fairland	41LK201	10 - 4			2.9	2.2	0.6	1.1	2.2	1.5	3.6	62
1	3	15	Edgewood	41MC78	1 - 1			2.6	2.9•	0.6	1.0	2.3	1.9	4.4	62
1	3	16	Edgewood	41MC84	26 (22)			2.8	3.2•	0.7	1.2	2.2	1.7	5.3	62
1	3	17	Darl	41LK14	46 (17)			3.6•	2.0	0.7	1.1	1.6	1.3	5.3	62
1	3	18	Darl	41LK91	1			3.7	1.7	0.5	1.5	1.2	1.2	2.7	62

TABLE 7

Provenience and Metric Data for Stemmed Thin Bifaces (Continued)

GROUP	FORM	SPECI-MEN NO.	TYPE	SITE	LOT NO.	PROVENIENCE		LENGTH	WIDTH	THICK-NESS	STEM LENGTH	STEM WIDTH	NECK WIDTH	WEIGHT	ILLUS-TRATION
						UNIT	LEVEL								
1	3	19	Darl	41MC41	19 (19)			3.3	2.0	0.6	1.3	1.4•	1.4	3.5	62
1	3	20	Marcos	41LK67	1191			3.7•	3.6	0.6	1.0	2.8	2.2	•	
1	3	21	Frio	41MC184	1			•	3.2	0.9	1.5	2.2	2.0	•	62
1	3	22		41LK14	123 (90)			•	2.6	0.8	0.9	•	1.7	•	62
1	3	23		41LK15	37 - 1			•	2.1	0.6	1.6	1.6	1.4	•	62
1	3	24		41LK15	81 (38)			•	2.1	1.0	2.2	1.8	1.4	•	62
1	3	25		41LK27	19 (19)			•	1.9	0.6	1.2	1.8	1.3	•	62
1	3	26		41LK31/32	251 A	N1057E861	97.65 - 97.55	4.7	2.9	0.6	1.4	2.3	2.0	8.8	
1	3	27		41LK41	500(374)			•	2.3	0.8	1.2	2.0	1.7	•	62
1	3	28		41LK51	116 (79)			•	2.6	0.7	1.4	2.6	1.7	•	62
1	3	29		41LK51	119 (82)			3.7	2.5	0.5	0.9	•	1.2	5.0	62
1	3	30		41LK67	1199			6.6	2.4	0.9	1.3	•	1.5	15.4	
1	3	31		41LK67	94			•	2.4	0.8	1.6	1.8•	1.5	•	
1	3	32		41LK67	1194			•	3.0	0.8	1.2	2.3	2.1	•	
1	3	33		41LK69	27 (23)			4.9	2.1	0.7	1.2	1.9	1.7	7.2	62
1	3	34		41LK201	74			3.7	2.8	0.8	1.0	•	•	5.9•	62
1	3	35		41MC30	3	Test Pit 1	Level 3	3.7	2.2	0.6	1.6	1.5	1.4	5.0	62
1	3	36		41MC39	30 (5)			4.2	3.0	0.6	1.2	2.6•	2.2	7.7	62
1	3	37		41MC55	47 (15)			•	1.8	0.5	1.2	1.2	1.0	•	62
1	3	38		41MC57	17 (4)			4.7	1.3	0.7	1.1	1.5	1.1	4.5	62
1	3	39		41MC84	96 - 3			•	3.6	0.8	1.1	1.3	1.1	•	62
1	3	40		41MC84	119 - 11			6.2	2.8	0.6	1.6	2.7	2.3	12.0	62
1	3	41		41MC94	14 (14)			5.2•	2.5	1.0	1.6	2.0	1.9	12.1	62
1	3	42		41MC95	2 - 1			3.0	2.3	0.6	1.2	1.6	1.3	3.2	62
1	3	43		41MC174	1 - 26			•	2.2	0.6	1.4	2.2	1.7	•	63
1	4	1	Perdiz	41LK18	2 (2)			2.5•	2.0	0.4	1.2	0.6	0.6	0.9	63
1	4	2	Perdiz	41LK41	19	N1154E1470	99.41 - 99.30	1.9•	•	0.2	0.8	0.5	0.5	•	63
1	4	3	Perdiz	41LK41	106	N1144E1476	99.09 - 99.00	2.9	1.7	0.3	1.0	0.8	0.8	1.1	63
1	4	4	Perdiz	41LK41	453(326)			2.5•	2.0	0.4	0.7	0.5	0.5	2.0	63
1	4	5	Perdiz	41LK51	1 - 1			2.9	1.5	0.4	1.0	0.7	0.7	1.0	63
1	4	6	Perdiz	41LK51	1 - 2			3.2	1.7	0.4	0.9	0.5	0.5	1.3	63
1	4	7	Perdiz	41LK51	50 (13)			3.2	2.0	0.4	1.0	0.6	0.6	1.3	63
1	4	8	Perdiz	41LK67	402	N841E1055	98.65 - 98.55	•	1.4	0.3	•	0.5	0.5	•	
1	4	9	Perdiz	41LK67	473	N842E1059	98.55 - 98.50	2.0•	1.5•	0.2	•	0.5	0.5	0.3	
1	4	10	Perdiz	41LK67	580	N846E1052	98.61 - 98.55	2.2	1.1	0.3	0.5	0.5	0.5	0.5	
1	4	11	Perdiz	41LK67	591	N846E1054	98.55 - 98.50	1.9•	1.3	0.2	•	0.5	0.5	0.4•	
1	4	12	Perdiz	41LK67	647	N848E1055	98.62 - 98.55	1.9•	1.4	0.2	•	0.5	0.5	0.5•	
1	4	13	Perdiz	41LK201	21	Test Pit 2	Level 2	1.7•	1.1•	0.2	0.6•	0.5	0.5	•	63
1	4	14	Perdiz	41MC19	19	Test Pit 3	Level 4	2.0	1.4	0.2	0.5	0.6	0.6	0.6	63
1	4	15	Perdiz	41MC55	14 - 2	Test Pit 2	Level 2	2.3	1.5	0.3	0.7	0.7	0.7	0.9	63
1	4	16	Perdiz	41MC65	2 - 1			2.4•	1.6	0.3	0.9	0.7	0.7	0.9	63
1	4	17	Cliffton	41LK14	26	Test Pit 4	Level 5	3.0•	2.3	0.5	1.1	1.1	1.1	•	63
1	4	18	Cliffton	41LK41	128 (2)			4.0	2.5	0.3	0.6	0.9	0.9	3.0	63
1	4	19	Cliffton	41LK67	294	N844E1056	98.61 - 98.50	2.9	1.9	0.3	0.7	0.9	0.9	1.7	
1	4	20	Cliffton	41LK67	541	N844E1054	98.58 - 98.50	3.0•	2.0	0.4	0.7	0.8	0.8	•	
1	4	21	Cliffton	41LK201	11 - 7			2.6	2.2	0.4	•	0.7	0.7	•	63
1	4	22	Cliffton	41MC223	1 - 2			3.4•	2.0	0.4	1.0	1.0	1.0	2.6	63
1	5	1	Scallorn	41LK27	1 (1)			3.2	1.5	0.5	0.7	1.2	0.8	1.8	63
1	5	2	Scallorn	41LK41	56	N1116E1400	99.61 - 99.50	2.8	1.9	0.5	0.8	1.5	0.8	1.7	63
1	5	3	Scallorn	41MC15	77			2.7	1.5	0.4	0.7	1.1	0.7	1.4	63
1	5	4	Scallorn	41MC84	118 - 17			•	1.9	0.4	0.7	1.8	0.9	•	63
1	5	5	Edwards	41LK41	129 (3)			2.8•	2.3	0.4	0.5	1.1•	0.8	•	63
1	5	6	Edwards	41LK86	3			4.4	1.8	0.4	0.7	1.2	0.6	1.5	63
1	5	7	Edwards	41MC22	18 (11)			3.4•	2.0	0.4	0.9	1.5	0.8	2.2	63
1	5	8	Edwards	41MC84	116 - 17			•	2.1	0.3	1.0	2.0	0.8	•	63
1	5	9		41MC15	85			•	1.7	0.3	0.6	1.4	0.8	•	63
1	5	10		41MC69	2 - 1			3.2•	2.0•	0.3	0.8	1.5	0.9	•	63
1	5	11		41LK14	15	Test Pit 3	Level 1	3.1	1.3	0.3	0.6	0.5	0.5	1.0	63
1	5	12		41LK41	347(220)			2.3•	1.6	0.3	0.6	•	0.6	•	63
1	5	13		41LK65	1 - 5			3.4	1.5	0.6	0.6	0.8	0.8	2.8	63
1	5	14		41LK67	295	N844E1056	98.50 - 98.40	3.0	1.3	0.6	1.0	•	0.5	1.5•	
1	5	15		41LK67	307	N845E1056	98.61 - 98.50	3.7	1.2•	0.4	0.5	0.5	0.4	1.3	
1	5	16		41LK87	18 - 7			3.1•	1.5	0.5	0.6	•	0.8	•	63
1	5	17		41MC222	50	N104E88	99.00 - 98.90	4.9	2.3	0.4	0.7	0.6	0.5	2.3	63

Thin Bifaces (continued)

of the Middle to Late Archaic in central Texas and the Trans-Pecos (Suhm and Jelks 1962:169).

Specimen 7: *Bell*. The specimen (Fig. 61) consists of the base and one barb. The base is slightly convex and notched to form the long, broad barb. Material is fine-grained chert. The *Bell* type is diagnostic of the Early Archaic Stage in central Texas (Sorrow, Shafer, and Ross 1967:12-14).

Specimen 8: Fragmentary. This specimen is basally notched with a medium length barb. One stem edge is slightly convex, the other slightly concave. Base is straight. A reddish hue and a potlid suggest that the specimen was burned. Material is fine-grained chert (Fig. 61).

Specimen 9: This specimen is triangular with convex blade edges and weak shoulders. The point is needlelike, and the base is convex. The material is a light brown chert. This biface was recovered from the Early to Middle Archaic horizon at 41 LK 31/32 dating between 3380 and 2340 B.C. Compare with thin biface Group 1, Form 3, Specimen 26 (this volume, page 290).

Specimen 10: Blade outline is leaf shaped and slightly asymmetrical. One blade edge is straight, the other convex. Blade is slightly twisted due to beveling of convex edge. Shoulders are very weak, and the base is straight. Material is dark brown-gray chert (Fig. 61).

Specimen 11: Blade is triangular with slightly convex blade edges. The shoulders are very weak, and the base is convave. Its needlelike point is suggestive of the *Travis* type, but the concave base is suggestive of the weak-shouldered *Pedernales*. Material is a coarse-grained, gray-tan chert (Fig. 61).

Specimen 12: The blade is triangular, and the blade edges are sinuous. Its shoulders are weak, the stem is short and poorly pronounced, and the base is straight. Material is a brown chert (Fig. 61).

Specimen 13: The blade is triangular, but asymmetrical. One blade edge is straight with light serrations. The other edge is convex. The shoulders are fairly strong, the stem is short, and the base is straight. Material is a coarse-grained, gray chert (Fig. 61).

Specimen 14: Fragmentary. Its shoulders are strong, but not barbed. The stem is long, and the base is convex. The distal break may have been reworked. Material is a brown, patinated chert.

Specimen 15: Fragmentary. Blade is triangular with straight blade edges. Its shoulders are pronounced, but not barbed. The base is convex and retains a striking platform. Material is a light brown, fine-grained chert (Fig. 61).

Specimen 16: Fragmentary. The shoulders are weak, and the stem is square. This specimen has been burned gray-black (Fig. 61).

Thin Bifaces (continued)

Specimen 17: Fragmentary. The shoulders are weak, and the long stem may be lightly ground. The base is concave. This specimen may be a broken *Pedernales*. Material is a tan, fine-grained chert (Fig. 61).

Specimen 18: Blade is leaf shaped with convex blade edges. The shoulders are weak, the stem is short and broad, and the base is straight. Material is a brown, fine-grained chert (Fig. 61).

Specimen 19: Blade is triangular with slightly convex blade edges. The shoulders are weak, the stem is broad and fairly long, and the base is straight. The specimen is asymmetrical due to one shoulder being more pronounced than the other. The specimen bears some resemblance to the *Bulverde* type. Material is tan, fine-grained chert (Fig. 61).

Specimen 20: The blade is slender and leaf shaped with slightly convex blade edges. The blade edges are beveled to the extent that a twist is imparted to the blade. The point is needlelike. Shoulders are barely recognizable nubs, and the base is slightly concave. Stem edges are heavily ground. The ground stem and uniformly spaced, long pressure flakes along the blade suggest a Pre-Archaic origin. Blade beveling just above the shoulders indicates that the specimen was retouched while still hafted. It may have served as a knife rather than as a projectile point. Material is brown, fine-grained chert (Fig. 61).

Specimen 21: Blade is triangular with straight, lightly serrated blade edges and weak shoulders. The base is convex. This specimen's small size and blade serrations suggest that it may be an arrow point rather than a dart point. Material is gray-tan chert (Fig. 61).

Specimen 22: Blade is slender and leaf shaped with convex blade edges. The shoulders are weak, the stem is short, and the base is straight. Material is a gray-brown, fine-grained chert (Fig. 61).

Specimen 23: Fragmentary. The shoulders are barely perceptible, and the long stem has lightly ground edges. The base is concave. Specimen 23 is much like Specimen 10. Except for the base, material is a brown, fine-grained chert (Fig. 61).

Specimen 24: Blade is slender and triangular. Blade edges are straight with one edge slightly beveled. The shoulders are weak, and the base is straight. The stem is long, almost half the length of the specimen. One stem edge is beveled. It is made of light brown, fine-grained chert and resembles the *Wells* or *Nolan* types (Fig. 61).

Specimen 25: Blade is triangular with one straight edge and one slightly convex edge. The shoulders are weak. A 1.8-cm segment of the convex blade edge, extending from the shoulder toward the point, is heavily ground or worn, probably from use rather than for hafting purposes. Material is dark brown, fine-grained chert (Fig. 61).

Thin Bifaces (continued)

Form 2. Large with Contracting Stems (22 Specimens)

Ten of these dart points fall into previously established types: *Almagre*, *Morhiss*, and *Langtry*. The remaining twelve specimens do not conform to any defined types (Fig. 61).

Specimen 1: *Almagre*. This specimen is fragmentary. The blade is triangular with straight blade edges. From pronounced shoulders, the stem tapers to a rounded base. Material is light brown, fine-grained chert. Suhm and Jelks (1962:161) note that *Almagre* is "characteristic of the Pecos River Focus and also occurs as a minor type in the Falcon Focus." The type is known to occur down into southern Tamaulipas.

Specimens 2-5: *Morhiss*. Blades are leaf shaped to triangular with straight and convex blade edges. Weak to moderate shoulders give way to broad, slightly contracting stems with convex or rounded bases. *Morhiss* was first mentioned, but not defined, by Kelley (1959). Although not yet a widely recognized point type, it has been accepted by several recent investigators (Calhoun 1965; Fox and Hester 1976; D. E. Fox 1979) as a viable type within southeast Texas. Radiocarbon assays of deposits yielding *Morhiss* points in Goliad County place the type in the time period of 1250-500 B.C. (D. E. Fox 1979:62).

Specimens 6-10: *Langtry*. Blades are triangular with straight to slightly concave blade edges. Shoulders are moderately to strongly pronounced. Long stems taper down to rounded, straight, or concave bases. All are made of tan and brown fine-grained cherts. Specimens 7-9 lack distal ends. Specimen 7 was reworked subsequent to being broken, and Specimen 9 is heavily patinated. As noted by Suhm and Jelks (1962:205), *Langtry* points are "exceedingly thin and finely chipped." The type is most common in the Trans-Pecos area, but is not unexpected in the Choke Canyon area or farther south.

Specimens 11-13: Blade is slender and leaf shaped with weak to moderately pronounced shoulders. The short stems narrow from the shoulders down to straight bases. Each base is a striking platform. All are made of tan or gray fine-grained chert.

Specimens 14-16: The shoulders are weak with a slightly contracting stem and a rounded base. All are roughly flaked, and all are made of fine-grained chert. Specimens 14 and 15 are fragmentary. Specimen 15 is moderately patinated, and the blade of Specimen 16 is triangular, with slightly convex blade edges (Fig. 61).

Specimen 17: This specimen (Fig. 61) is unusual in that the triangular blade narrows substantially from the shoulders to the distal tip. One blade edge is straight, the other slightly recurved. The stem, roughly one-third the length of the specimen, contracts less sharply to a slightly concave base. The stem of this specimen is suggestive of an *Angostura* point; however, the stem edges are not ground. Material is a heavily patinated fine-grained chert.

Thin Bifaces (continued)

Specimen 18: This specimen is fragmentary. Its surviving blade edge appears to be straight. The shoulder is moderately strong, the stem is relatively long, and the base is irregularly convex. Material is dark gray chert.

Specimen 19: This specimen is fragmentary. The shoulders are weak and poorly pronounced, and the broad stem contracts very slightly to a wide, straight base. Material is brown, fine-grained chert.

Specimen 20: This specimen is fragmentary. The blade appears to be leaf shaped with convex blade edges. Shoulders are weak, the stem contracts slightly, and the base is concave. The specimen (Fig. 61) is smaller than the others and may actually be an arrow point or arrow point preform rather than a dart point. Material is light brown chert.

Specimen 21: Blade is subtriangular, and blade edges are irregular due to rough retouch. Shoulders are pronounced because both stem and blade contract away from them. The stem edges are moderately ground, and the base is concave. The specimen's form is suggestive of the *Angostura* type. Material is heavily patinated chert (Fig. 61).

Specimen 22: The blade is long, slender, and leaf shaped. The point is needle-like. Blade edges are convex and beveled, giving the specimen a twisted appearance. Shoulders are hardly recognizable. The short stem contracts slightly, and the base is more-or-less straight (Fig. 61). Material is tan and reddish pink chert. This specimen may represent the *Pandale* type, a form very common in the Trans-Pecos (Suhm and Jelks 1962:231).

Form 3. Large with Expanding Stems (43 Specimens)

Twenty-one of these dart points resemble the *Ensor, Fairland, Darl, Marcos*, and *Frio* types. Twenty-two specimens do not fit any recognized typological groupings (Fig. 62).

Specimens 1-10: *Ensor*. Blades are triangular with straight to slightly convex blade edges. Shoulders are strong, sometimes with slight barbs. Stems are short and expand strongly to straight or slightly convex bases. Most of the specimens are side notched, but some are corner notched. Specimens 1 and 10 are made of chalcedony; the rest are made of fine-grained cherts of gray, tan, and brown. Specimen 4 is heavily patinated. The *Ensor* type is diagnostic of the Terminal Archaic period in central Texas and the Trans-Pecos. It is common between A.D. 200 and A.D. 700 in central Texas (Prewitt 1974, 1976). Reference: Suhm and Jelks (1962).

Specimens 11-14: *Fairland*. Blades are triangular; blade edges are straight. Shoulders are strong with short barbs. Short stems flare out to concave bases which equal or exceed widths at the shoulders. All are corner notched and made of fine-grained cherts. Like the *Ensor* type, *Fairland* is diagnostic of the Terminal Archaic period in central Texas (Prewitt 1974:32). Specimens 12

Thin Bifaces (continued)

and 13 were recovered from deposits at 41 LK 67 yielding radiocarbon assays ranging from 800-400 B.C. Reference: Suhm and Jelks (1962).

Specimens 15-16: *Edgewood*. The blade of the complete specimen is short, broad, and triangular. Blade edges are convex. The shoulders are strong with short barbs. The stems flare to a basal width somewhat less than the shoulder widths. Bases are concave. Both are made of brown, fine-grained chert. As noted by Suhm and Jelks (1962:183) in comparing *Edgewood* with *Fairland* and *Frio*, "*Edgewood* points are smaller and broader in proportion to length . . . ."

Specimens 17-19: *Darl*. Blades are triangular with straight blade edges. Shoulders are moderately strong. Stems expand very slightly to straighter concave bases. All are delicately flaked and made of tan and gray fine-grained chert. The *Darl* type, consisting of several subvarieties, was in use over a long span of time in central Texas. The small size and fine workmanship of Choke Canyon specimens suggest a Late Archaic affiliation. Reference: Suhm and Jelks (1962:179).

Specimen 20: *Marcos*. This specimen is fragmentary. Blade edges appear to be straight. Shoulders have short barbs formed by corner notches. The short stem expands to a convex base, the width of which is slightly less than at the shoulders. Material is a brown, fine-grained chert. Reference: Suhm and Jelks (1962:209).

Specimen 21: *Frio*. Fragmentary. Blade edges straight. Shoulders moderately pronounced. Stem expands at basal corners, and base is deeply concave, imparting an "eared" appearance to the stem and base. Suhm and Jelks (1962:195) note that the type is most common in southwest Texas.

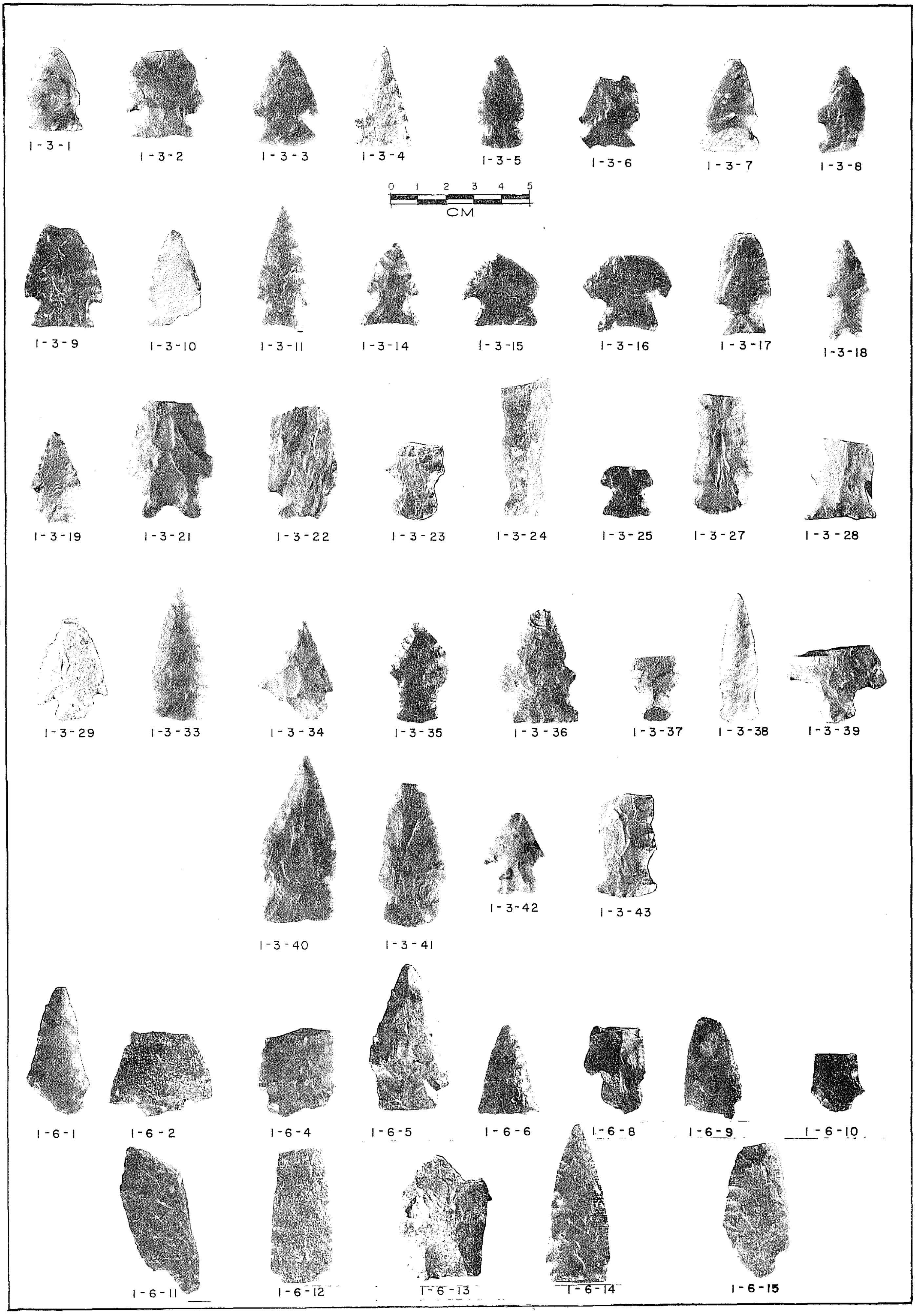
Specimen 22: Fragmentary. Blade edges straight. Side notched. Shoulders moderately strong. Short stem expands to a slightly concave base. Basal width is less than shoulder width. Made of gray-banded chert. Specimen apparently broken by impact fracture.

Specimen 23: Fragmentary. Moderate to weak shoulders. Open, rounded side notches create an expanding, rounded stem. Made of petrified wood or chalcedony, lightly patinated.

Specimen 24: Long, but fragmentary. Blade edges uneven. Shoulders weak, almost imperceptible. Stem long, expanding on one side right at base. Base is straight. Made of brown, lightly patinated chert. Very crudely flaked.

Specimen 25: Fragmentary. Shoulders moderately pronounced. Stem expands to convex base with width equaling that at the shoulders. Made of dark brown petrified wood.

Figure 62. *Thin Bifaces: Group 1, Forms 3 and 6*. Numbers beneath each specimen indicate group, form, and specimen number.


1-3-1
1-3-2
1-3-3
1-3-4
1-3-5
1-3-6
1-3-7
1-3-8
0 1 2 3 4 5
CM
1-3-9
1-3-10
1-3-11
1-3-14
1-3-15
1-3-16
1-3-17
1-3-18
1-3-19
1-3-21
1-3-22
1-3-23
1-3-24
1-3-25
1-3-27
1-3-28
1-3-29
1-3-33
1-3-34
1-3-35
1-3-36
1-3-37
1-3-38
1-3-39
1-3-40
1-3-41
1-3-42
1-3-43
1-6-1
1-6-2
1-6-4
1-6-5
1-6-6
1-6-8
1-6-9
1-6-10
1-6-11
1-6-12
1-6-13
1-6-14
1-6-15

Thin Bifaces (continued)

Specimen 26: Blade outline is triangular with straight blade edges. One blade edge is beveled. Shoulders pronounced. Stem expands slightly to irregular base. Made of brown chert. Specimen was recovered from Middle Archaic Horizon at 41 LK 31/32 dating between 3380 and 2340 B.C. Compare with thin biface Group 1, Form 1, Specimen 9 recovered from same horizon.

Specimen 27: Fragmentary. One blade edge is convex. The other, apparently reworked, is concave. Shoulders are weak. The short stem expands to a convex base having same width as shoulders. Made of gray-tan chert.

Specimen 28: Fragmentary. Shoulders are weak. Stem expands to a width greater that at shoulders. Base is straight. Made of gray-tan chert, lightly patinated.

Specimen 29: Blade outline triangular with slightly convex blade edges. Corner notches result in short barbs. Stem expands to relatively narrow straight base. The specimen's distal end appears unfinished. Made of heavily patinated chert.

Specimen 30: Blade outline is leaf shaped with convex blade edges. The tip is worked to a sharp point. Shoulders are moderately pronounced. The stem and base are fragmentary. Made of gray chert.

Specimen 31: Fragmentary. Blade edges are straight. Notches are wide and U-shaped. The base is straight. Made of heavily patinated chert.

Specimen 32: Fragmentary. Blade edges are convex. Shoulders slight. Stem expands to a base somewhat narrower than shoulder width. The base is straight. Made of brown chert. Possibly broken by impact fracture.

Specimen 33: Blade outline is triangular. Blade edges are slightly convex. Shoulders weak. Shallowly side notched. Stem is short with a convex base.

Specimen 34: Blade outline is triangular. Blade edges are straight. Weakly barbed. Small side notches create stem. Stem is fragmentary. The specimen was recovered from a stratum at 41 LK 201 yielding a radiocarbon date of 1300 B.C. A Late Archaic affiliation is thus inferred for this point.

Specimen 35: Blade outline is triangular. The blade has apparently been reworked. One blade edge is straight, the other convex. Shoulders are weak. The stem is almost as long as the blade. Stem flares slightly at base. The base is convex. Made of reddish brown chert, possibly burned.

Specimen 36: Blade outline is triangular. Blade edges are straight. Shoulders are fragmentary, but appear to have been strongly barbed. Corner notched. The base is straight. Made of brown chert.

Specimen 37: Fragmentary. Blade apparently leaf shaped with convex edges. Shoulders very weak or nonexistent. Stem expands slightly to straight base. Made of heavily patinated brown chert.

Thin Bifaces (continued)

Specimen 38: Blade is slender and leaf shaped with slightly convex edges. Side notches are shallow, and shoulders are weak. The stem expands abruptly near the convex base. This specimen's long, narrow shape is unusual. Made of light tan chert.

Specimen 39: Fragmentary. Shoulders are very strong due to an unusually narrow stem relative to shoulder width. The short stem expands slightly to a convex base. Made of light brown chert.

Specimen 40: Blade outline is leaf shaped with one edge convex and the other recurved. The tip is needlelike. Both blade edges are beveled, giving the blade a twist. Shoulders are weak. At the base, the stem is as wide as the blade. The base is irregular. Made of light brown chert.

Specimen 41: Blade outline is leaf shaped with straight edges. The tip is thick and blunt as if unfinished. Side notched, the shoulders are weak. The stem is asymmetrical, straight on one side and expanding on the other. The base is convex. Made of gray-brown chert.

Specimen 42: Blade outline is triangular. Blade edges are straight. Shoulders are barbed. The stem expands roundly to an irregular base. Made of cream-colored chert.

Specimen 43: Fragmentary. Blade edges irregular. Shoulders weak. Broad, shallow side notches. Base convex. Made of tan chert.

Form 4. Small with Contracting Stems (22 Specimens)

Sixteen specimens fall comfortably into the widely recognized *Perdiz* arrow point type. The remainder, often called *Cliffton* points, are probably preforms or unfinished examples of the *Perdiz* type (Fig. 63).

Specimens 1-16: *Perdiz*. Blade outlines are triangular. Blade edges on most specimens are straight, but both convex and concave edges also occur. The shoulders are strongly barbed. Slender stems contract to points or to slightly rounded bases. All are made of fine-grained chert. In south Texas, as elsewhere, the *Perdiz* type is diagnostic of the Late Prehistoric Stage. Radiocarbon assays of carbon samples recovered from deposits yielding *Perdiz* commonly date around A.D. 1300 to as late as A.D. 1650 (Hester and Hill 1975; Hester 1977a). Two radiocarbon assays from site 41 MC 222 suggest that human activities represented by the *Perdiz* points also occurred during the above time span in the Choke Canyon area. Reference: Suhm and Jelks (1962:283).

Specimens 17-22: *Cliffton*. Blade outline basically triangular, but blade edges are fairly irregular. Shoulders are well pronounced. Short stems contract to dull points or rounded bases. All specimens are predominantly unifacially worked. Bifacial flaking is especially evident on the stems, to a

Thin Bifaces (continued)

lesser extent along the blade edges. Although these specimens fit the type description of *Cliffton* (Suhm and Jelks 1962:269), they are probably preforms of the *Perdiz* type (Fig. 63).

Form 5. Small with Expanding Stems (17 Specimens)

Specimens 1-4: *Scallorn*. Blade outlines are triangular (Fig. 63). Blade edges are straight. The blade edges of Specimens 2 and 4 are serrated. Each is side notched to form a stem with a narrow and wide flaring base. Bases are straight, concave, and convex. Basal width is slightly less than width at shoulders. Specimens 1-3 are made of opaque gray-white chalcedony. Specimen 4 is of chert. The *Scallorn* arrow point type is diagnostic of the Late Prehistoric Stage and is believed to date in the A.D. 1300 to A.D. 1600 range in southern Texas (Hester and Hill 1975). Reference: Suhm and Jelks (1962:285).

Specimens 5-8: *Edwards*. Blade outlines are triangular, two with convex blade edges, one with slightly concave edges, and one with straight edges (Fig. 63). The blade edges of Specimens 5 and 6 are serrated. The shoulders are strongly barbed. From narrow necks, the bases flare out almost to shoulder width. The bases are concave and impart a delicate, recurved appearance to the stem ears. All are made of chert. The type is described by Sollberger (1978:14). Hester (1978e:21) cites evidence from the La Jita site suggesting that *Edwards* is the earliest arrow point type to occur in the southwestern Edwards Plateau region. He dates deposits yielding *Edwards* points at La Jita between A.D. 900 and A.D. 1000. The largest reported collection of *Edwards* points is illustrated by Highley *et al.* (1978:139-194).

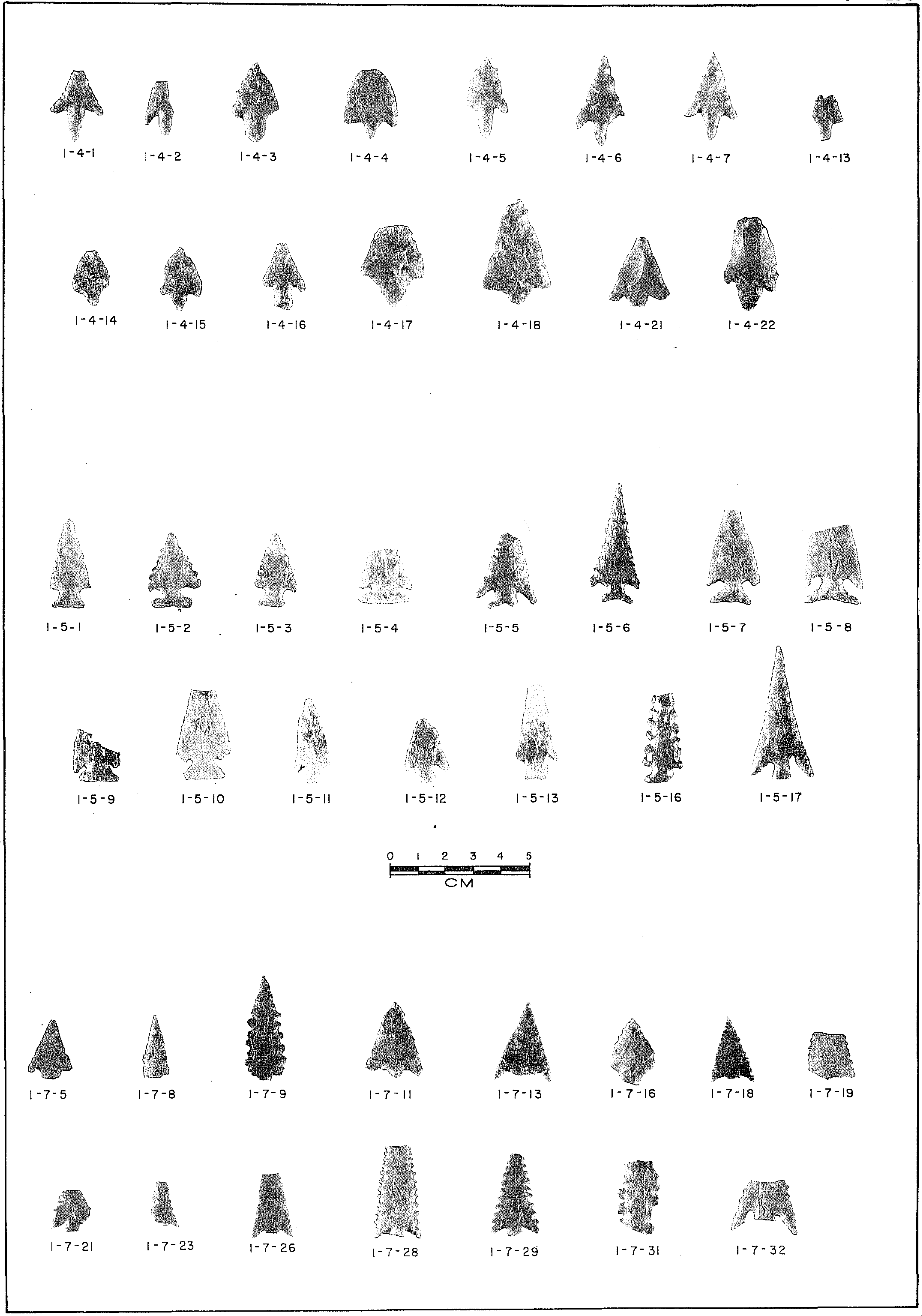
Specimens 9-10: Specimen 9 is fragmentary. Blade outline of Specimen 10 is triangular. Shoulders are barbed. The stems are formed by narrow corner notches. Stems expand to straight bases and are triangular in outline. Differing from the *Edwards* type described above, the corner notches are thinner, and the bases are straight. The stems are thus much more angular than those of the *Edwards*. Both specimens are made of chert.

Specimen 11: Blade outline triangular. Blade edges slightly convex. Shoulders barbed. Stem is narrow like *Perdiz*, but base is straight. Stem expands only slightly. Made of gray-banded chert.

Specimen 12: Blade outline triangular. Blade edges straight. Shoulders barbed. Stem expands, but is fragmentary. Made of brown chert.

Specimen 13: Blade outline triangular. Blade edges are straight, except at shoulders where they flare out slightly. Shoulders are moderately strong, but not barbed. The stem expands very slightly to a straight base. Made of chalcedony.

Figure 63. *Thin Bifaces: Group 1, Forms 4, 5, and 7.* Numbers beneath each specimen indicate group, form, and specimen number.


1-4-1 1-4-2 1-4-3 1-4-4 1-4-5 1-4-6 1-4-7 1-4-13
1-4-14 1-4-15 1-4-16 1-4-17 1-4-18 1-4-21 1-4-22
1-5-1 1-5-2 1-5-3 1-5-4 1-5-5 1-5-6 1-5-7 1-5-8
1-5-9 1-5-10 1-5-11 1-5-12 1-5-13 1-5-16 1-5-17
0 1 2 3 4 5
CM
1-7-5 1-7-8 1-7-9 1-7-11 1-7-13 1-7-16 1-7-18 1-7-19
1-7-21 1-7-23 1-7-26 1-7-28 1-7-29 1-7-31 1-7-32

Thin Bifaces (continued)

Specimen 14: Blade outline triangular. Blade edges convex. Shoulders pronounced. Stem formed by broad U-shaped side notches. Narrow neck expands to straight base. Made of tan chert.

Specimen 15: Blade outline triangular. One blade edge straight, the other irregular. Intact shoulder is barbed. Corner or basal notching forms a short, narrow stem with straight base. This point was made on a flake, the ventral face of which was flaked only at the point and at the stem. Made of brown chert.

Specimen 16: Blade is relatively long and slender with very deep serrations along each blade edge. The side notches forming the stem are hardly discernible from the blade serrations, being only slightly larger. The base is slightly concave. Made of dark brown chert. See discussion on page 298 concerning arrow point fragments with blade serrations.

Specimen 17: The largest arrow point recovered during the Phase I investigations at Choke Canyon, this specimen has a triangular blade outline with concave blade edges. Very strong, deep barbs are formed by basal notches. The barb ends are on a line with the stem base. The short, narrow stem expands slightly to a straight base. Made of tan chert. This specimen was recovered from deposits at 41 MC 222 yielding radiocarbon dates ranging from A.D. 1260 to A.D. 1290.

Form 6. Unclassifiable Fragments of Large Stemmed Bifaces (15 Specimens)

These 15 specimens are fragmentary, but retain features indicating that they were stemmed before being broken (Fig. 62). Fourteen specimens are made of chert. One specimen is made of light brown quartzite. Lengths range from 2.1-5.8 cm, widths from 1.9-3.7 cm, and thicknesses from 0.5-0.8 cm. Provenience by site is presented in Table 8.

Form 7. Unclassifiable Fragments of Small Stemmed Bifaces (39 Specimens)

Included in this category are distal, medial, and proximal fragments of thin, small bifaces, all believed to be pieces of arrow points. For most of these specimens, only provenience and limited metric data are presented; however, five of the stemless pieces warrant further discussion.

Specimen 9: Complete, except for absence of stem (Fig. 63). Long and slender, this point is distinguished by deep blade serrations running from the shoulders up to within 1.4 cm of the point. Made of reddish brown chert. This point is much like Specimen 16 in thin biface Group 1, Form 5 (small with expanding stems).

TABLE 8. PROVENIENCE OF THIN BIFACE GROUP 1, FORMS 6 AND 7

SPEC. NO.	SITE	UNIT	LEVEL
GROUP 1, FORM 6			
1	41 LK 15		
2	"		
3	41 LK 31/32		
4	41 LK 52		
5	41 LK 53		
6	41 LK 59	N982 E823	1
7	41 LK 67		
8	41 LK 69		
9	41 LK 204		
10	41 MC 52		
11	41 MC 68		
12	41 MC 74		
13	41 MC 75		
14	41 MC 84		
15	41 MC 95		
GROUP 1, FORM 7			
1	41 LK 41	N1117 E1400	1
2	"	N1117 E1401	1
3	"	" "	"
4	"		
5	"		
6	41 LK 67	N904 E997	3
7	41 LK 87		
8	41 LK 201	TP2	1
9	41 MC 9		
10	41 MC 15		
11	"		
12	41 MC 29	TP3	2
GROUP 1, FORM 7 (continued)			
13	41 MC 29		
14	41 MC 55	TP2	2
15	"	"	"
16	41 MC 84		
17	41 MC 222	N104 E88	3
18	41 MC 223		
19	41 LK 14		
20	41 LK 41	N1136 E1441	1
21	"	N1144 E1475	2
22	"		
23	"		
24	41 LK 67		
25	"	N902 E1006	1
26	41 LK 201		
27	41 MC 15		
28	41 MC 29	TP1	1
29	"		
30	41 MC 55	TP2	1
31	41 MC 67		
32	41 MC 222	N100 E88	Surface
33	"	" "	"
34	41 LK 41	N1114 E1400	1
35	41 LK 67	N848 E1053	1
36	41 LK 91	TP2	4
37	41 LK 201	TP2	5
38	41 MC 55	TP2	2
39	41 MC 222	N104 E88	3

Thin Bifaces (continued)

Specimens 28-29: Both lack tips and portions of their stems. Blade edges have uniformly spaced, very pronounced serrations running from the shoulders to the distal ends. The shoulders are barbed. Stems are snapped off at the neck. Both were collected at 41 MC 29. Three very similar specimens were found on the same site by a local collector named David Naylor. One of Naylor's specimens retains an expanding stem similar to the *Scallorn* points described above. The known occurrence of five arrow points with distinctively serrated blade edges at 41 MC 29, their general scarcity elsewhere, and the absence of pottery from the site combine to make 41 MC 29 unique at Choke Canyon with respect to this particular assemblage.

Specimen 31: Distal tip missing. Base rudimentary if present at all. Specimen distinguished by deep, crude serrations along both blade edges (Fig. 63).

Specimen 32: Lacking the tip and part of the stem, this piece has very long, sharp barbs (Fig. 63). The barbs make this point look very much like Specimen 17 in thin biface Group 1, Form 5 (small with expanding stems). Both are recovered from 41 MC 222.

Group 2. Unstemmed with Straight Bases (157 Specimens)

Form 1. Complete Triangular (51 Specimens)

Specimens 1-46: Blade edges of most specimens are slightly convex, although straight, concave, and recurved edges are also present in small numbers (Fig. 64). Basal corners range from fairly sharp and angular to slightly rounded. Bases are more-or-less straight. In most cases, the bases are thinned more than other portions by removal of two or more flakes perpendicular to the base on one or both sides. The following specimens have beveled blade edges: Specimens 3, 7, 13, 14, 20, 21, 22, 25, 29, 30, 34, and 43. The combination of triangular outlines, thinned bases, and beveled edges characterizing these 12 specimens place them well within the *Tortugas* type grouping as defined by Suhm and Jelks (1962:249). The remaining 39 specimens could theoretically be typed as *Tortugas*, but certain contextual and associational evidence indicates that inclusion of all specimens in the *Tortugas* type grouping would strain the temporal limits intended for this type. Specimens 45 and 46, for instance, were recovered from deposits at 41 MC 222, dated around A.D. 1290. Specimen 2 is made of brown quartzite. Specimen 5 is made of gray siliceous quartzite. All remaining specimens are of fine-grained chert. Site proveniences by specimen number are presented in Tables 9 and 10. Matrix data is shown in Table 11.

Figure 64. *Thin Bifaces: Group 2, Form 1 and Group 6.* Numbers beneath each specimen indicate group, form, and specimen number.

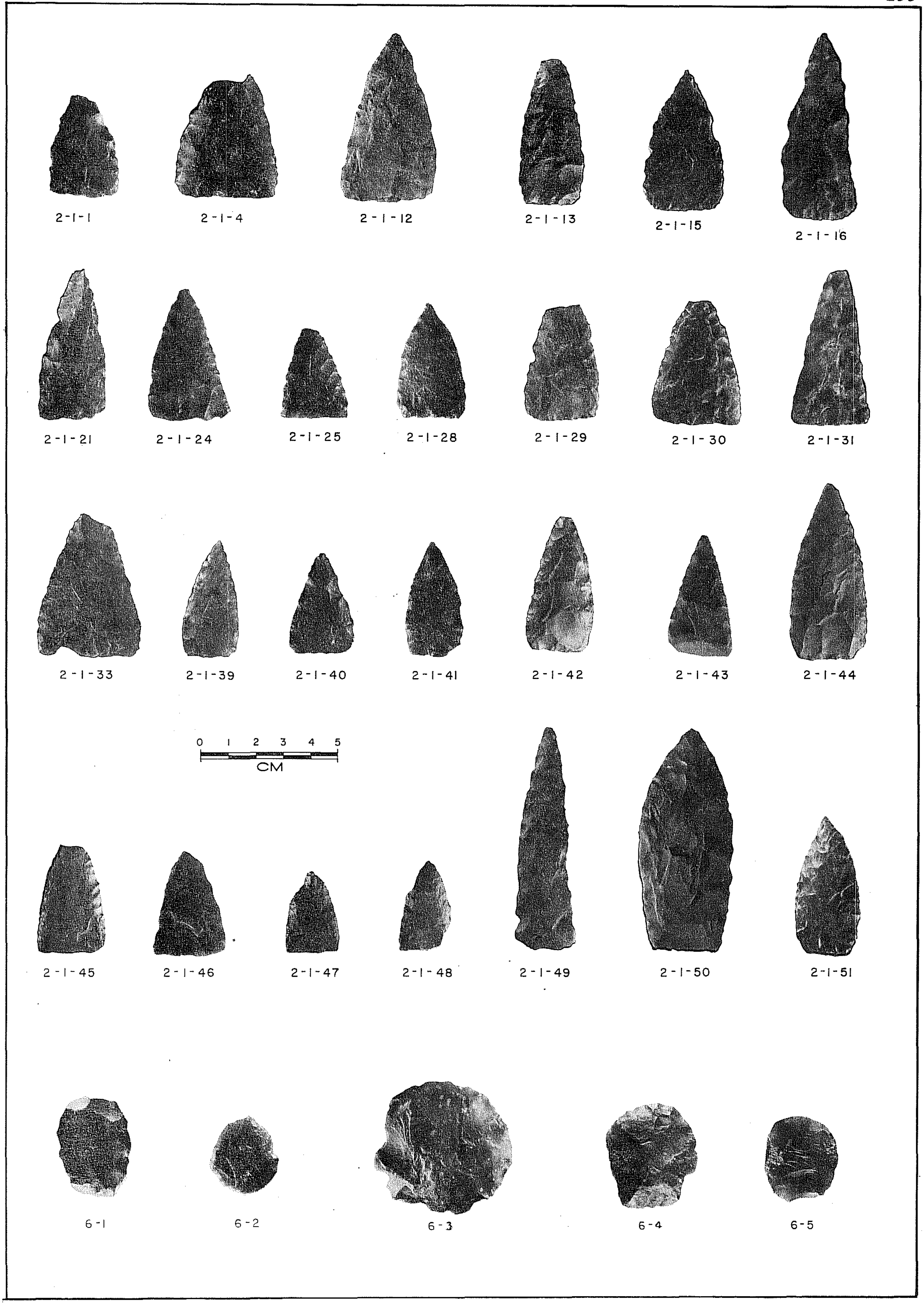

2-1-1
2-1-4
2-1-12
2-1-13
2-1-15
2-1-16
2-1-21
2-1-24
2-1-25
2-1-28
2-1-29
2-1-30
2-1-31
2-1-33
2-1-39
2-1-40
2-1-41
2-1-42
2-1-43
2-1-44
0 1 2 3 4 5
CM
2-1-45
2-1-46
2-1-47
2-1-48
2-1-49
2-1-50
2-1-51
6-1
6-2
6-3
6-4
6-5

TABLE 9. UNSTEMMED THIN BIFACES--SITE PROVENIENCE BY SPECIMEN NUMBER

SPECIMEN NO.	SITE NO.	SPECIMEN NO.	SITE NO.	SPECIMEN NO.	SITE NO.
GROUP 2, FORM 1		GROUP 2, FORM 1 (cont.)		GROUP 2, FORM 2 (cont.)	
1	41 LK 14	48	41 MC 11	41	41 MC 95
2	41 LK 31/32	49	41 LK 201	42	"
3	"	50	41 MC 57	43	41 MC 176
4	"	51	41 MC 75	44	41 LK 18
5	"			45	41 LK 31/32
6	41 LK 41	GROUP 2, FORM 2		46	41 LK 41
7	41 LK 49			47	41 LK 51
8	41 LK 51	1	41 LK 8	48	41 LK 52
9	"	2	41 LK 14	49	41 LK 64
10	"	3	"	50	"
11	"	4	"	51	"
12	"	5	"	52	"
13	41 LK 52	6	"	53	41 LK 87
14	"	7	41 LK 15	54	41 LK 206
15	41 LK 53	8	"	55	41 MC 11
16	41 LK 64	9	41 LK 27	56	41 MC 40
17	41 LK 67	10	41 LK 31/32	57	41 MC 86
18	41 LK 69	11	"	58	"
19	"	12	41 LK 41	59	41 MC 94
20	41 LK 87	13	"	60	41 MC 95
21	"	14	41 LK 51	61	41 LK 15
22	41 LK 201	15	41 LK 52	62	41 LK 27
23	"	16	41 LK 51	63	41 LK 31/32
24	41 LK 207	17	41 LK 52	64	41 LK 41
25	41 MC 15	18	"	65	41 LK 51
26	"	19	"	66	41 LK 53
27	41 MC 22	20	"	67	41 LK 201
28	"	21	41 LK 64	68	41 MC 41
29	41 MC 39	22	41 LK 69	69	"
30	"	23	"	70	41 MC 86
31	41 MC 41	24	41 LK 75	71	41 MC 94
32	41 MC 42	25	41 LK 91	72	"
33	41 MC 43	26	41 LK 204	73	41 MC 171
34	41 MC 57	27	41 MC 11	74	41 MC 174
35	41 MC 69	28	"	75	41 LK 14
36	41 MC 84	29	41 MC 15	76	41 LK 69
37	41 MC 86	30	41 MC 17	77	41 LK 207
38	"	31	41 MC 29	78	41 LK 86
39	41 MC 94	32	41 MC 33	79	41 MC 94
40	41 MC 171	33	41 MC 50	80	41 LK 14
41	41 MC 184	34	41 MC 68	81	41 LK 41
42	"	35	41 MC 78	82	41 LK 64
43	41 MC 222	36	"	83	"
44	41 MC 219	37	41 MC 84	84	41 LK 94
45	41 MC 222	38	41 MC 94	85	41 MC 15
46	"	39	41 MC 84	86	"
47	41 LK 75	40	41 MC 95	87	41 MC 95

TABLE 9. (continued)

GROUP 2, FORM 2 (cont.)

SPECIMEN NO.	SITE NO.
88	41 MC 222
89	41 LK 51
90	41 MC 84
91	41 LK 27
92	41 LK 41
93	41 LK 51
94	41 LK 52
95	"
96	41 LK 53
97	"
98	41 LK 64
99	41 MC 11
100	41 MC 17
101	41 MC 18
102	41 MC 19
103	"
104	41 MC 94
105	"
106	41 MC 95

GROUP 3, FORM 1

SPECIMEN NO.	SITE NO.
1	41 LK 15
2	41 LK 27
3	41 LK 67
4	41 LK 69
5	41 MC 11
6	41 MC 24
7	41 MC 95
8	41 LK 14
9	41 LK 34
10	41 LK 41
11	41 LK 52
12	41 LK 74
13	41 MC 18
14	41 MC 64
15	41 LK 67
16	41 MC 222

GROUP 3, FORM 2

SPECIMEN NO.	SITE NO.
1	41 LK 8
2	41 LK 51
3	41 LK 31/32
4	"
5	"
6	"

GROUP 3, FORM 2 (cont.)

SPECIMEN NO.	SITE NO.
7	41 LK 31/32
8	41 LK 50
9	41 MC 41
10	41 MC 94
11	41 MC 18
12	41 LK 10
13	41 LK 31/32
14	41 LK 41
15	41 LK 52
16	41 LK 64
17	"
18	41 LK 69
19	41 LK 75
20	41 MC 11
21	41 MC 19
22	41 LK 15
23	"
24	41 LK 87
25	41 MC 41
26	41 MC 75
27	41 LK 14
28	41 LK 51
29	41 LK 53
30	41 LK 59
31	41 LK 67
32	41 MC 72
33	41 MC 84
34	41 MC 94

GROUP 4, FORM 1

SPECIMEN NO.	SITE NO.
1	41 LK 14
2	"
3	41 LK 27
4	41 LK 31/32
5	"
6	"
7	41 LK 41
8	41 LK 52
9	41 LK 201
10	41 MC 13
11	41 MC 43
12	41 MC 56
13	41 MC 57
14	41 MC 67
15	41 MC 72
16	41 MC 84

GROUP 4, FORM 1 (cont.)

SPECIMEN NO.	SITE NO.
17	41 MC 94
18	41 MC 177
19	41 LK 67
20	41 MC 15
21	41 MC 17
22	41 MC 95
23	41 LK 27
24	41 LK 51
25	41 LK 64
26	41 LK 201
27	41 MC 22
28	41 MC 55
29	41 MC 94
30	41 MC 184
31	41 MC 186
32	41 MC 222
33	41 LK 74
34	41 MC 84

GROUP 4, FORM 2

SPECIMEN NO.	SITE NO.
1	41 LK 8
2	41 LK 27
3	41 LK 67
4	41 LK 201
5	41 MC 15
6	41 MC 55
7	"
8	"
9	41 MC 69
10	41 MC 84
11	41 MC 94
12	41 MC 223
13	"

GROUP 4, FORM 3

SPECIMEN NO.	SITE NO.
1	41 LK 17
2	41 LK 31/32
3	41 LK 52
4	41 LK 53
5	41 LK 64
6	"
7	41 LK 75
8	41 LK 201
9	41 MC 19
10	41 MC 29

TABLE 9. (continued)

SPECIMEN NO.	SITE NO.
GROUP 4, FORM 3 (cont.)	
11	41 MC 55
12	41 MC 57
13	41 MC 69
14	41 MC 94
15	41 MC 95
16	41 MC 224
Group 4, Form 4 Specimen Numbers not provided	
GROUP 5	
1	41 LK 10
2	41 LK 14
3	41 LK 31/32
4	"
5	"
6	41 LK 41
7	41 LK 15
8	41 LK 52
9	41 LK 64
10	41 LK 67
11	41 LK 69
12	41 LK 97
13	41 LK 201
14	41 LK 206
15	41 MC 11
16	41 MC 15
17	41 MC 41
GROUP 5 (cont.)	
18	41 MC 41
19	41 MC 57
20	41 MC 72
21	41 MC 84
22	"
23	"
24	41 MC 94
25	"
26	41 MC 95
27	41 MC 171
28	41 LK 8
29	41 LK 14
30	41 LK 38
31	41 LK 52
32	41 LK 64
33	41 LK 67
34	"
35	41 LK 75
36	41 MC 95
37	41 LK 10
38	41 LK 51
39	41 LK 53
40	41 LK 64
41	41 LK 87
42	41 LK 201
43	41 LK 205
44	41 MC 39
45	41 MC 59
46	41 MC 64
GROUP 5 (cont.)	
47	41 MC 74
48	41 MC 94
GROUP 6	
1	41 LK 10
2	41 MC 15
3	41 MC 56
4	41 MC 74
5	41 MC 222
GROUP 7	
1	41 LK 41
GROUP 8	
1	41 LK 41
2	"
3	41 LK 201
4	"
5	41 MC 15
6	41 MC 11
7	41 MC 39
8	41 LK 14
9	41 MC 84
10	41 MC 94
11	41 LK 67
12	41 MC 41

TABLE 10. PROVENIENCE OF UNSTEMMED THIN BIFACES RECOVERED IN EXCAVATIONS

GROUP	FORM	SPECIMEN NO.	SITE	UNIT	LEVEL	ELEVATION
2	1	3	41 LK 31/32	N950 E838	L-2	100.10-99.90
		17	41 LK 67	N842 E1054	L-1	98.61-98.55
		21	41 LK 87	TP2	L-5	40-50 cm
		23	41 LK 201	TP1	L-10	
		29	41 MC 39	TP1	L-4	
		43	41 MC 222	N104 E88	L-3	98.90-98.80
		45	41 MC 222	N103 E87	Surface	
		46	41 MC 222	N104 E89	L-2	99.00-98.90
2	2	7	41 LK 15	TP3	L-1	
		10	41 LK 31/32	N1057 E861	L-3	98.65-98.55
		45	41 LK 31/32	N1059 E861	L-12	97.65-97.55
		67	41 LK 201	TP1	L-4	30-40 cm
		84	41 LK 94	TP2	L-1	0-10 cm
		89	41 LK 51	TP3	L-8	70-80 cm
3	1	3	41 LK 67	N910 E997	L-2	98.95-98.90
3	2	2	41 LK 51	TP3	L-11	100-110 cm
		4	41 LK 31/32	N1055 E861	L-5	97.35-97.25
		5	41 LK 31/32	N1055 E861	L-5	97.35-97.25
		6	41 LK 31/32	N1055 E861		
		30	41 LK 59	N982 E823	L-1	98.96-98.80
		31	41 LK 67	N845 E1056		98.39
4	1	1	41 LK 14	TP4	L-7	
		6	41 LK 31/32	N1059 E863	L-10	97.75-97.65
		9	41 LK 201	TP1	L-10	
4	2	1	41 LK 8	TP3	L-9	80-90 cm
		6	41 MC 55	TP1	L-2	10-20 cm
4	3	2	41 LK 31/32	N1059 E865	L-9	97.85-97.75
		8	41 LK 201	TP2	L-13	120-130 cm
4	4		41 LK 17	TP1	L-8	70-80 cm
			41 LK 51	TP2	L-3	20-30 cm
			41 LK 74	TP4	L-4	30-40 cm
			41 LK 201	TP1	L-11	100-110 cm
			41 MC 55	TP2	Surface	
5		4	41 LK 31/32	N1117 E999	L-7	99.10-98.90
		10	41 LK 67	N847 E1059	L-2	
		13	41 LK 201	TP3	L-9	80-90 cm
		33	41 LK 67	N881 E1001	Surface	
		42	41 LK 201	TP3	L-7	60-70 cm
8		1	41 LK 41	N1135 E1442	L-1	99.57-99.50
		3	41 LK 201	TP2	L-2	10-20 cm
		4	41 LK 201	TP2	L-2	10-20 cm
		11	41 LK 67	N903 E999	L-4	98.65-98.60
9			41 LK 8	TP3	L-8	70-80 cm
			41 LK 31/32	N1056 E863		97.25-97.20
			41 LK 31/32	N1055 E861	L-6	97.25-97.15
			41 LK 31/32	N1055 E861	L-6	97.25-97.15
			41 LK 31/32	N1059 E865	L-8	97.95-97.85
9			41 LK 31/32	N1065 E875	L-9	97.85-97.75
			41 LK 31/32	N1083 E1108	L-6	98.75-98.55
			41 LK 31/32	N1116 E998	L-6	99.30-99.10
			41 LK 51	TP2	L-3	20-30 cm
			41 LK 67	N903 E999	L-1	98.81-98.75

TABLE 10. (continued)

GROUP	FORM	SPECIMEN NO.	SITE	UNIT	LEVEL	ELEVATION
			41 LK 67	N906 E1002	L-1	98.95-98.90
			41 LK 67	N844 E1058	L-2	98.55-98.50
			41 LK 67	N845 E1058	L-1	98.62-98.55
			41 LK 67	N848 E1055	L-1	98.62-98.55
			41 LK 67	N908 E1006	L-1	99.05-98.95
			41 LK 67	N909 E1008	L-11	98.65-98.60
			41 LK 87	TP1	L-6	50-60 cm
			41 LK 201	TP2	L-2	10-20 cm
			41 MC 19	TP2	L-4	30-40 cm
			41 MC 30	TP1	L-3	20-30 cm
			41 MC 39	TP1	L-5	40-50 cm
			41 MC 55	TP2	L-2	10-20 cm
			41 MC 55	TP2	L-7	60-70 cm
			41 MC 222	N98 E89		98.65
10			41 LK 8	TP2	L-3	20-30 cm
			41 LK 8	TP2	L-3	20-30 cm
			41 LK 8	TP4	L-1	0-10 cm
			41 LK 13	TP1	L-1	0-10 cm
			41 LK 14	TP4	L-6	50-60 cm
			41 LK 15	TP5	L-1	0-10 cm
			41 LK 31/32	N1055 E863		97.30
			41 LK 31/32	N950 E838	L-3	99.90-99.70
			41 LK 31/32	N1055 E861	L-5	
			41 LK 31/32	N1059 E863	L-14	97.35-97.25
			41 LK 31/32	N1063 E873	L-1	98.67-98.55
			41 LK 31/32	N1083 E1108	L-6	98.75-98.55
			41 LK 31/32	N1083 E1108	L-8	98.35-98.15
			41 LK 31/32	N1116 E998	L-7	99.10-98.90
			41 LK 31/32	N1116 E998	L-7	99.10-98.90
			41 LK 51	TP1	L-5	50-60 cm
			41 LK 59	N958 E556	L-1	99.22-99.10
			41 LK 59	N981 E823	L-3	98.80-98.70
			41 LK 59	N982 E823	L-1	98.96-98.80
			41 LK 59	N983 E823	L-1	98.96-98.80
			41 LK 59	N983 E825	L-1	98.96-98.80
			41 LK 67	N906 E1001	L-6	98.70-98.65
			41 LK 67	N906 E998	L-2	98.90
			41 LK 67	N843 E1053	L-1	98.58-98.50
			41 LK 67	N844 E1054	L-5	98.40-98.35
			41 LK 67	N848 E1055		
			41 LK 67	N848 E1055	L-3	98.50-98.45
			41 LK 67	N904 E1005	L-3	98.75-98.70
			41 LK 67	N904 E1005	L-3	98.75-98.70
			41 LK 67	N904 E1006	L-1	98.91-98.85
			41 LK 67	N909 E1005	L-6	98.75-98.70
			41 MC 15	TP1	L-5	40-50 cm
			41 MC 15	TP3	L-3	20-30 cm
			41 MC 15	TP6	L-5	40-50 cm
			41 MC 19	TP1	L-2	10-20 cm
			41 MC 19	TP4	L-1	0-10 cm
			41 MC 24	TP1	L-4	30-40 cm
			41 MC 39	TP2	L-5	40-50 cm
			41 MC 86	TP2	L-3	20-30 cm

TABLE 11

Metric Data - Unstemmed Thin Bifaces

GROUP	FORM	SPECIMEN	LENGTH RANGE			WIDTH RANGE			THICKNESS RANGE			WEIGHT RANGE		
		NUMBERS	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE
2	1	1-46	6.7	3.2	4.9	3.7	1.9	2.7	1.3	0.1	0.8	29.1	4.4	10.7
		47-48	3.3	3	3.2	2	1.9	-	-	-	0.7	4.7	4.2	4.4
		49	-	-	8	-	-	2.1	-	-	1.2	-	-	14.8
		50	-	-	8	-	-	3.4	-	-	1	-	-	29.1
		51	-	-	5	-	-	2.4	-	-	0.8	-	-	11.3
2	2	1-43	4.5*	2.2*	3.2*	4.2	2.2	2.9	1.1	0.4	0.6	21.9*	3.6*	8.8*
		44-60	7.1*	3.8*	5.1*	4.9	2.3	3.1	1.3	0.6	0.9	57.2*	9*	16.4*
		61-74	5.4*	3.1*	4.4*	5.5	4	4.4	1.2	0.6	0.9	32.6*	13.9*	19.8*
		75-79	6*	4.6*	5.2*	4.9	3.4	4	1.2	0.9	1.1	34.2*	17.5*	25.8*
		80-88	3.6*	2.1*	3.1*	2.2	1.7	2	0.6	0.3	0.5	4.9*	1.6*	3.3*
		89-90	2.6*	1.9*	2.3*	2.3	1.7	2	0.7	0.6	-	5.6*	3*	4.3*
		91-106	3.8*	1.8*	3.1*	4.3	2.7	3.4	1	0.5	0.8	15.6*	7.2*	10.5*
3	1	1-7	7.6	5.5	6.4	3	2.2	2.7	1.3	0.7	0.9	20.8	8.3	14.6
		8-15	4.8	3.4	3.9	3.6	2.1	2.7	0.8	0.6	0.7	14	5.1	7.8
		16	-	-	8.1	-	-	4.2	-	-	0.6	-	-	17.7
3	2	1-11	7.8*	2.8*	4.8*	4.7	3.3	4	1	0.5	0.8	23.1*	6.3*	15.8*
		12-21	3.8*	2*	3.3*	3.2	2.5	2.9	1	0.5	0.8	14.1*	5.2*	9.6*
		22-24	4.7*	4.1*	4.4*	3	2.7	2.8	0.9	0.7	0.8	14.8*	10.6*	13.3*
		25	-	-	3*	-	-	2.5	-	-	0.8	-	-	6.2*
		26-34	3.5*	1.2*	2.5*	4.7	2.2	3.3	1	0.5	0.8	10*	2.1*	6.8*
4	1	1-18	6.5	1.9	5.2	3.5	1.9	2.7	1.1	0.6	0.9	21.5	5.2	12.4
		19-22	3.9	3.2	3.5	2.9	2.6	2.8	0.6	0.4	0.5	5.2	3.1	4.8
		23-32	4.2	2.5	3.5	2.6	1.6	2	0.6	0.3	0.5	4.6	2	3.3
		33	-	-	4.7	-	-	3.1	-	-	0.5	-	-	9.1
		34	-	-	4.6	-	-	1.7	-	-	0.8	-	-	5.5
4	2	1-13	9.4	6.1	8.2	4.5	3.6	4.1	1	0.8	0.9	38.3	15.2	26.3
	3	1-16	8.7	4.5	6.7	5.8	3.2	3.9	1.2	0.9	1.1	78.1	13.8	30.1
5		1-27	7.8*	3.5	5.2	2.9	1.8	2.2	1.5	0.5	0.8	24.7	5.2	10
		28-36	7.6	4.6	5.5	2.6	1.7	2	1.3	0.7	1	23	5.8	11.5
		37-48	7.2	4.2	5.2	2.3	1.8	2	1.1	0.6	0.8	13.5	4.8	9.4
6		1-5	4.9	2.9	3.7	4.9	2.5	3.3	1.1	0.7	0.9	31.6	4.8	13.8
7		1	-	-	3.3	-	-	2	-	-	0.6	-	-	3.2
8		1-5	3.4*	1.8*	2.7*	2.6	1.1	1.9	0.8	0.2	0.5	3.8*	2.1*	2.9*
		6-7	4.8*	4.2	4.6	5	3.4	4.2	1.3	0.9	1.1	19.3	12.3	15.8
		8-9	4.1*	3.9*	4*	1.3	1.2	-	0.7	0.6	-	3.7*	3.5*	3.6*
		10	-	-	8	-	-	2.4	-	-	2	-	-	31.4
		11	-	-	3.6	-	-	1.8	-	-	0.8	-	-	5.3
		12	-	-	4*	-	-	2.3	-	-	0.8	-	-	6.8*

Thin Bifaces (continued)

Specimens 47-48: Blade edges are convex. Basal corners are angular. Bases are straight and thinned more than medial and distal portions. Both specimens are markedly smaller than Specimens 1-46. The general form of the specimens suggests the *Matamoros* type as defined by Suhm and Jelks (*ibid.*:215). Both are made of fine-grained chert.

Specimen 49: Long and slender, one blade edge is convex, the other recurved, apparently the result of retouch. The base has rounded corners and is straight. Segments of the blade edges are ground. Along the convex edge, grinding begins 2.8 cm from the base and extends to the point. Along the recurved blade edge, grinding begins 3.4 cm from the base and extends to the tip. Made of tan-brown, fine-grained chert.

Specimen 50: Blade edges are pronouncedly convex to the extent that this specimen appears more lanceolate than triangular. The basal corners are angular, and the base is straight. Made of gray, fine-grained chert.

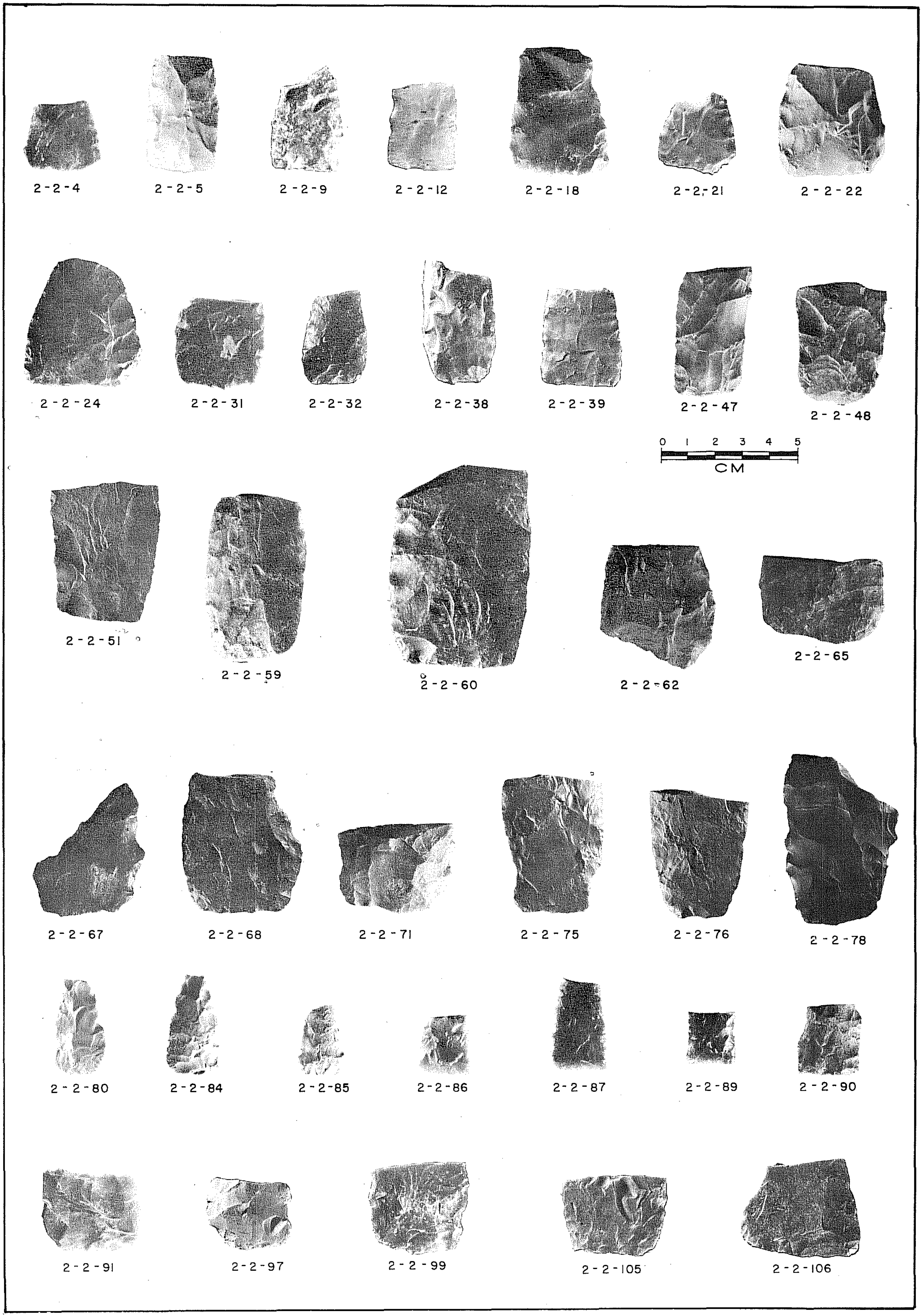
Specimen 51: Blade edges are convex to the extent that this specimen is more leaf shaped than triangular. The blade edges are heavily beveled, imparting a twist to the blade. The basal corners are slightly rounded. The base is straight. Made of brown, fine-grained chert, moderately patinated.

Among the Group 2, Form 1 specimens, the ones recovered from Late Prehistoric deposits (Specimens 22 and 23 from 41 LK 201 and Specimens 43, 45, and 46 from 41 MC 222 are good examples) are generally narrower in relation to length and are thinner and more finely flaked. The *Tortugas* specimens recovered from Archaic context are heavier, exhibit blade beveling more often, are thick and crudely flaked in the midsection, and are well thinned basally. Late Prehistoric specimens show much more pressure flaking, especially along the blade edges. The Late Prehistoric specimens lie flat on the table. Because of blade beveling and thick midsections, specimens recovered from Archaic horizons tend to have one or both blade edges raised from the table.

Form 2. Proximal Fragments (106 Specimens)

Specimens 1-43: Remnant blade edges are mostly convex, although some are straight or concave. Basal corners range from sharp and angular to slightly rounded. Bases are more-or-less straight. Although all lack distal tips, the original complete outline of these specimens appears to have been triangular. This inferred triangular outline, coupled with a comparable range of sizes, suggests that Specimens 1-43 are broken examples of complete triangular forms (Thin Biface Group 2, Form 1, Specimens 1-46) described on page 296. Specimens 20, 27, 32, and 39 have beveled blades. Specimen 11 is made of quartzite; Specimens 12 and 17 are of chalcedony. The remaining specimens are made of fine-grained chert. Specimen 27 is heavily patinated (Fig. 65).

Figure 65. *Thin Bifaces: Group 2, Form 2.* Numbers beneath each specimen indicate group, form, and specimen number.


2-2-4
2-2-5
2-2-9
2-2-12
2-2-18
2-2-21
2-2-22
2-2-24
2-2-31
2-2-32
2-2-38
2-2-39
2-2-47
2-2-48
0 1 2 3 4 5
CM
2-2-51
2-2-59
2-2-60
2-2-62
2-2-65
2-2-67
2-2-68
2-2-71
2-2-75
2-2-76
2-2-78
2-2-80
2-2-84
2-2-85
2-2-86
2-2-87
2-2-89
2-2-90
2-2-91
2-2-97
2-2-99
2-2-105
2-2-106

Thin Bifaces (continued)

Specimens 44-60: These specimens have slightly convex blade edge remnants. Basal corners are sharply angular to slightly rounded. As a whole, these specimens are larger in all dimensions than Specimens 1-43 above. Also, basal width and maximum width along the blades are the same. The blade edges thus run more-or-less perpendicular to the base. With the distal ends broken along straight to slightly diagonal snap lines, a rectangular outline is imparted to most of the specimens. All are made of fine-grained chert. Specimens 58-60 are lightly patinated.

Specimens 61-74: Broad, thin proximal fragments, generally with too little of the blade remaining to suggest outline. Basal corners are slightly rounded. These 14 specimens are distinguished chiefly because they are so broad, obviously derived from comparatively large thin bifaces. All are made of fine-grained chert.

Specimens 75-79: These five specimens have slightly convex blade edges and are distinguished by blade edges tapering to meet the straight base. All are among the largest specimens in Form 2. Made of fine-grained chert.

Specimens 80-88: Blade edge remnants are straight to slightly convex. Basal corners are angular to slightly rounded. Original complete outline was probably triangular. The small size and associational context of most of these specimens suggest that they are either triangular arrow points or arrow point preforms. All are probably Late Prehistoric artifacts. Specimen 83 is made of chalcedony; the rest are of fine-grained chert.

Specimens 89-90: These two specimens are distinguished by lateral edge grinding. Both could be basal fragments of stemmed bifaces, but not enough remains to be sure. Bases are very straight, blade edges are perpendicular to the base, and straight fractures impart a square outline to the specimens.

Specimens 91-106: These proximal fragments with straight bases are generally too fragmentary or nondescript for inclusion in the categories above. All are made of fine-grained chert. Specimens 93, 98, 99, 101, and 102 are lightly patinated.

Group 3. Unstemmed with Concave Bases (50 Specimens)

Form 1. Complete Triangular (16 Specimens)

Specimens 1-7: Blade edges are straight to slightly convex (Fig. 66). Basal corners vary from sharply angular to slightly rounded. Blades of Specimens 4 and 5 are beveled. Bases are thinned more than other portions by removal of thinning flakes running perpendicular to the base. Both edges of Specimen 2 are ground from the basal corners upward for a distance of 1.5-2.0 cm. The blade edges above this grinding appear to have been retouched, perhaps while the piece was still hafted. These specimens are all longer relative to width than Specimens 8-15 described below. Specimen 3 is made of chalcedony; the rest are made of fine-grained chert. Specimens 3 and 5 are heavily patinated. Any or all of these specimens could be included in the *Tortugas* type as defined

Thin Bifaces (continued)

by Suhm and Jelks (1962:249). Specimen 3 was recovered from a deposit at 41 LK 67 yielding corrected radiocarbon dates ranging from 800 B.C.-400 B.C.

Specimens 8-15: Blade edges are slightly convex. Basal corners are sharp to slightly rounded. Bases are thinned more than other portions of each piece. Specimens 8 and 15 each have one edge beveled. These eight specimens are distinguished from Specimens 1-7 in that they are not as long, but do have nearly equal widths. Specimen 14 is made of an unusual black, fine-grained chert. The others are made of fine-grained chert (Fig. 66).

Specimen 16: This thin, well-worked specimen has straight, lightly serrated blade edges and sharp, very angular basal corners. The basal concavity is pronounced. Surface collected immediately west of the main site area at 41 MC 222, the specimen may represent Late Prehistoric activities. However, as a direct association with the Late Prehistoric remains at 41 MC 222 was not established, a conclusive statement of temporal affiliation cannot be made. Made of gray, fine-grained chert (Fig. 66).

Form 2. Proximal Fragments (34 Specimens)

Specimens 1-11: Blade edge remnants on most of these specimens are slightly convex (Fig. 66). One specimen has straight edges, and another has a recurved edge. Basal corners are sharp in five cases and slightly rounded in the remainder. All are broader than Specimens 12-21, 22-24, 25, and 26-34. Specimens 4-7 are highly significant; all were recovered from the Middle Archaic component at 41 LK 31/32, dating between 3380 B.C. and 2340 B.C. The size, workmanship, and lightly serrated blade edges of Specimen 11 make it much like thin biface Group 3, Form 1, Specimen 16.

Specimens 12-21: Probably broken examples of thin biface Group 3, Form 1, Specimens 1-15, these specimens appear to have been more-or-less triangular prior to breakage. All have thinned bases. Specimen 17 is made of petrified wood.

Specimens 22-24: These three specimens are fragments of bifaces appearing to have been longer and narrow than the others

Specimen 25: This biface fragment is distinguished by lateral edge grinding on both sides, extending upward 1.8 cm from the base. The base is thinned more than the rest of the piece. Made of brown, fine-grained chert. May have been broken by impact fracture (Fig. 66).

Specimens 26-34: These proximal fragments with concave bases are generally too fragmentary for inclusion in the categories above. Specimens 30 and 33 are patinated. Specimen 34 is burned.

Thin Bifaces (continued)

Group 4. Unstemmed with Convex to Semicircular Bases (196 Specimens)

Form 1. Complete Triangular (34 Specimens)

Unless otherwise noted, all specimens in this group have convex blade edges and rounded intersections of base and blades. Distal ends are pointed (Fig. 67).

Specimens 1-18: These specimens--especially Specimens 3, 15, and 16--meet the specifications for the *Refugio* type as described by Suhm and Jelks (1962:241). Specimens 3, 15, and 16 have the "needlelike tip" characteristic of some *Refugio* examples. Specimens 4, 9, 11, and 18 have beveled blades. Specimens 8 and 10 are lightly patinated. Specimen 16 is moderately patinated.

Specimens 19-22: These four unusual bifaces have very straight, uniform blade edges and slightly convex bases. Blade length slightly exceeds basal width. Most distinctive, however, is the thinness of the pieces. Basal portions are thinned even further, almost fluted, by flakes struck perpendicular to the base. The extreme thinning, fine flaking, and uniform shape make these specimens stand out clearly.

Specimens 23-32: Because of their small size, thinness, and irregular edges, most or all of these specimens are believed to be arrow point preforms. Specimen 31 exhibits a fairly uniform shape and may be a small triangular arrow point. Specimens 25 and 32 are made of chalcedony.

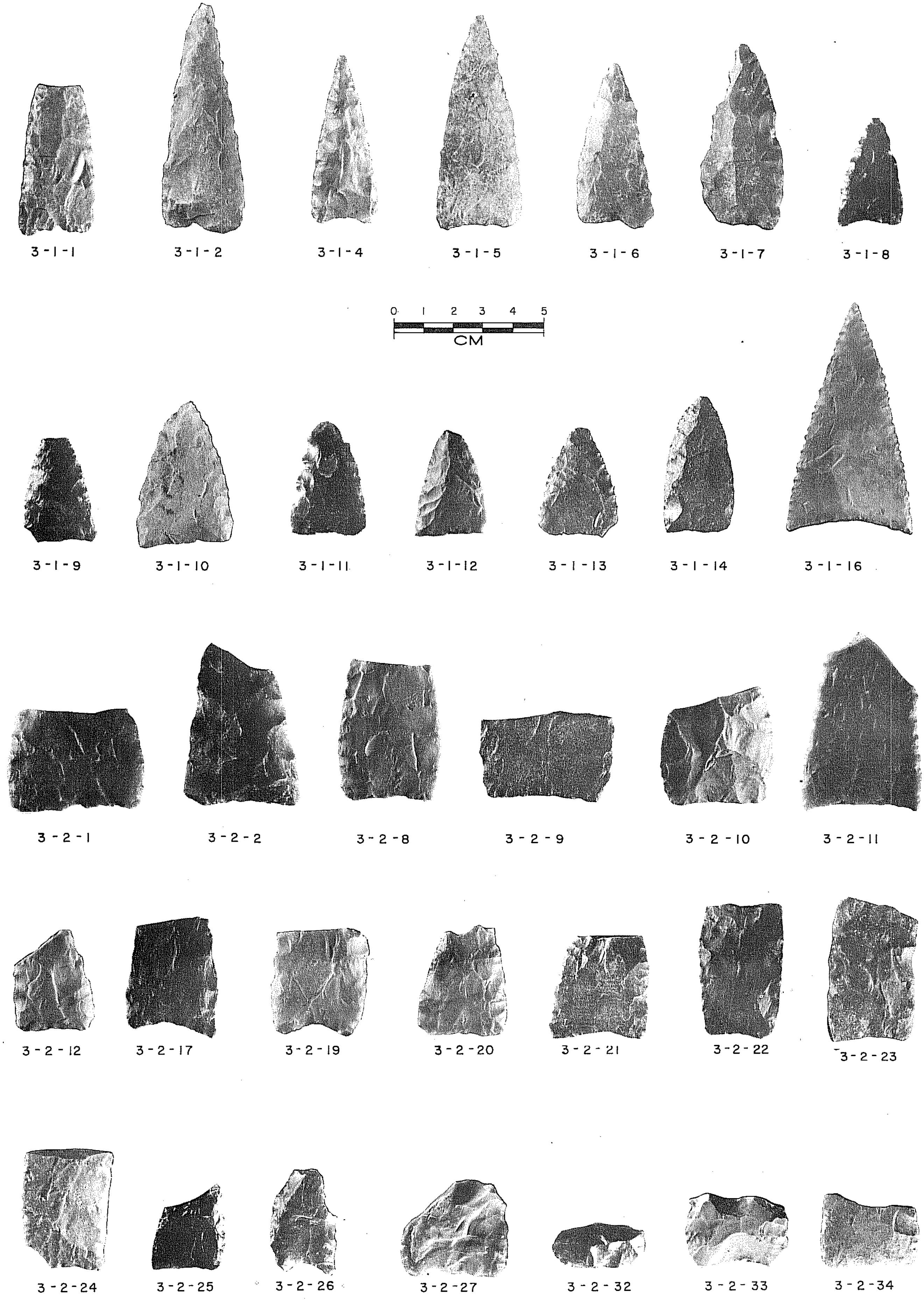
Specimen 33: Very thin and finely flaked, this specimen is unusual in that the distal end is rounded more than pointed. Also unusual is the ground 2-cm segment of the basal edge. One lateral edge has been sheared away, apparently by an impact fracture.

Specimen 34: Long and narrow with straight blade edges, the left edge is beveled on each face. Diamond shaped in cross section, the blade is unusually thick. The base is well thinned.

Form 2. Steeply Beveled Blades (13 Specimens)

This category arbitrarily includes complete and fragmentary specimens of an artifact form so distinctive that even broken examples may be recognized as belonging to this form. In the past, artifacts such as these have been referred to under the function-specific name of "beveled knives" (Sollberger 1971). The complete specimens have long blades (5.0-6.5 cm), with edges varying from pronouncedly convex to more-or-less straight, depending upon the degree to which the piece has been altered through retouch. In eight cases, blade retouch is so extensive that distinct shoulders have developed where the blade meets the basal portion. The specimens are widest at the shoulders and contract or round

Figure 66. *Thin Bifaces: Group 3, Forms 1 and 2.* Numbers beneath each specimen indicate group, form, and specimen number.


3-1-1
3-1-2
3-1-4
3-1-5
3-1-6
3-1-7
3-1-8
0 1 2 3 4 5
CM
3-1-9
3-1-10
3-1-11
3-1-12
3-1-13
3-1-14
3-1-16
3-2-1
3-2-2
3-2-8
3-2-9
3-2-10
3-2-11
3-2-12
3-2-17
3-2-19
3-2-20
3-2-21
3-2-22
3-2-23
3-2-24
3-2-25
3-2-26
3-2-27
3-2-32
3-2-33
3-2-34

Thin Bifaces (continued)

out to semicircular bases. On all specimens retaining blade portions, the beveling was done along the left-hand edge of each face. This form of artifact is diagnostic of the Late Prehistoric and is often found along with *Perdiz* arrow points and pottery (Fig. 68).

Specimen 1: This oval to elliptical specimen exhibits only very slight beveling. Blade retouch was not extensive enough to create a marked transition from blade to base.

Specimen 2: This specimen is fragmentary, consisting only of a rounded base and a short segment of the blade. The distinctive blade twist resulting from beveling is apparent in the remnant blade segment.

Specimen 3: This specimen is complete and exhibits the most extensive beveling of any in Group 4. The specimen was surface collected from the backdirt of Machine Strip 6 beside Area C at 41 LK 67.

Specimen 4: Almost diamond shaped in outline, Specimen 4 has a more pointed than rounded base. At 9.4 cm, this is the longest specimen in the group. The proximal portion from the contact of blade and base downward exhibits scattered patches of a black substance which may be vestiges of hafting cement. A small sample of the substance was tested and found <u>not</u> to be asphaltum. Otherwise, composition of this black substance is unknown.

Specimen 5: This specimen is fragmentary. The distal segment of the blade is missing.

Specimen 6: The blade edges of this leaf-shaped specimen are slightly beveled.

Specimen 7: Smallest of the complete specimens (length is 6.1 cm), the blade edges of this specimen are moderately beveled and straight.

Specimen 8: This specimen is fragmentary; the blade is missing.

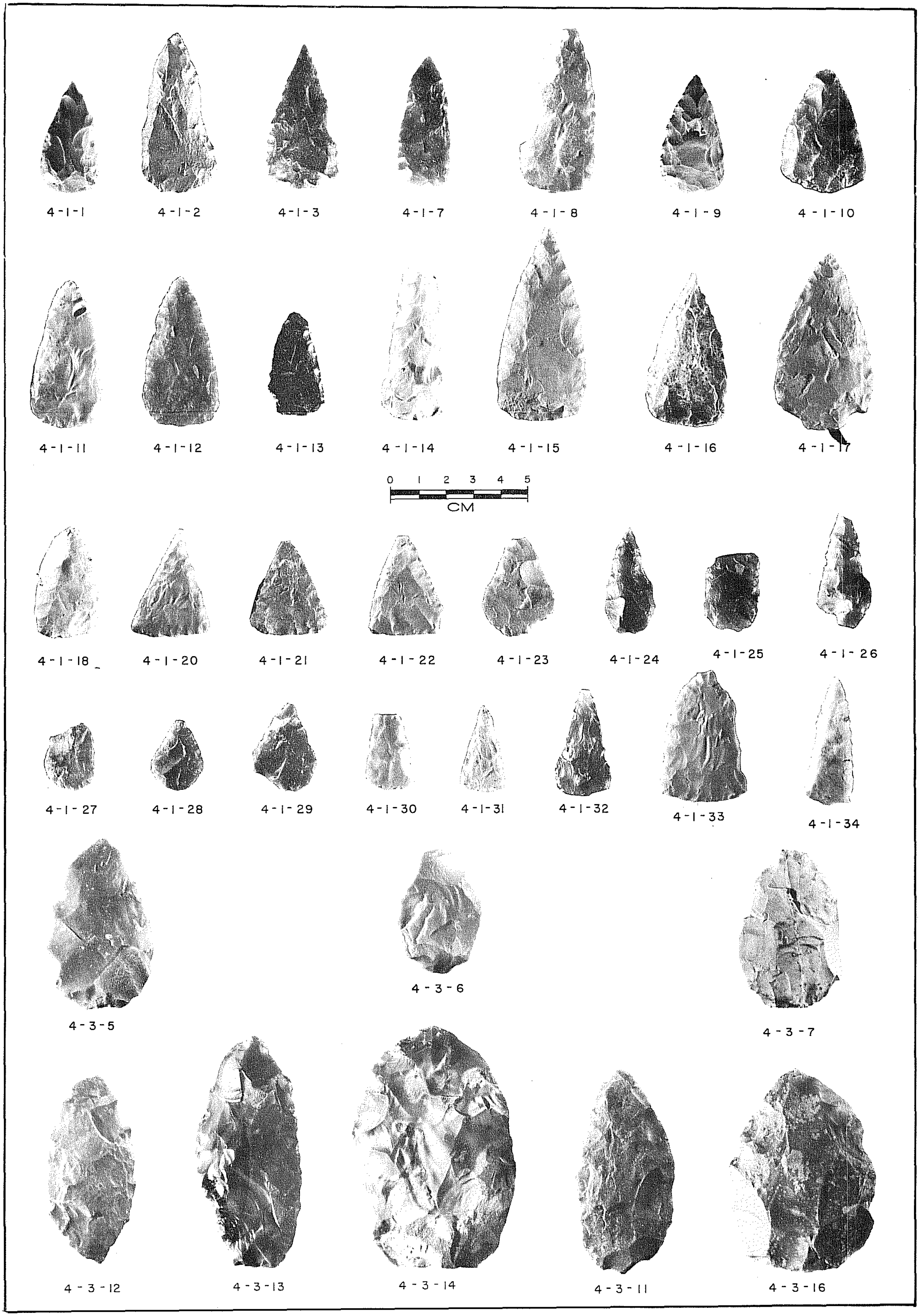
Specimen 9: Large and oval to elliptical in outline, the blade has been beveled only slightly. Specimen 9 is an excellent example of the artifact form in its finished, but lightly retouched, condition.

Specimen 10: The distal tip is missing, and the base is slightly convex, much straighter than all of the other specimens.

Specimen 11: The specimen is a beveled blade fragment; the base is missing.

Specimen 12: This specimen is unusually long (8.8 cm), considering the degree to which the blade has been beveled.

Figure 67. *Thin Bifaces: Group 4, Forms 1 and 3.* Numbers beneath each specimen indicate group, form, and specimen number.


4-1-1
4-1-2
4-1-3
4-1-7
4-1-8
4-1-9
4-1-10
4-1-11
4-1-12
4-1-13
4-1-14
4-1-15
4-1-16
4-1-17
0 1 2 3 4 5
CM
4-1-18
4-1-20
4-1-21
4-1-22
4-1-23
4-1-24
4-1-25
4-1-26
4-1-27
4-1-28
4-1-29
4-1-30
4-1-31
4-1-32
4-1-33
4-1-34
4-3-5
4-3-6
4-3-7
4-3-12
4-3-13
4-3-14
4-3-11
4-3-16

Thin Bifaces (continued)

Specimen 13: The specimen is fragmentary; the distal half of the blade is absent.

Form 3. Oval to Elliptical (16 Specimens)

These 16 specimens, all complete, are generally larger and more crudely flaked than any of the other thin bifaces. Most are comparatively thick and are oval to elliptical in outline. Specimen 1 is one of the very few thin bifaces retaining cortex, a small patch on one face. The specimens verge on being thick bifaces, but are a little too thin and well formed to fit any of the thick biface categories (Fig. 67).

Form 4. Fragments with Convex to Semicircular Ends (133 Specimens)

Sharing convex to semicircular ends as a common characteristic, this category of thin bifaces contains examples of workmanship ranging from thin and well finished to thick and crudely flaked. Many may be fragments of artifacts similar to the complete Group 4 specimens described above, broken either in the process of manufacture or in use. Another possibility, especially for surface-collected specimens, is that breakage occurred postdepositionally through exposure to weather and large animals (hoof damage). Although morphologically most similar to specimens in the other Group 4 categories, these Form 4 fragments could theoretically be preforms of any of the thin bifaces described herein. Sixteen specimens are 4.5-5.5 cm in width; 66 are 3.5-5.4 cm wide; and 51 are 2.0-3.4 cm wide. Unusual lithic materials include three pieces of chalcedony, three pieces of quartzite, and one piece each of quartz, jasper, palmwood, and sandstone. Fourteen pieces are patinated, four heavily, five moderaterly, and five lightly (Fig. 68).

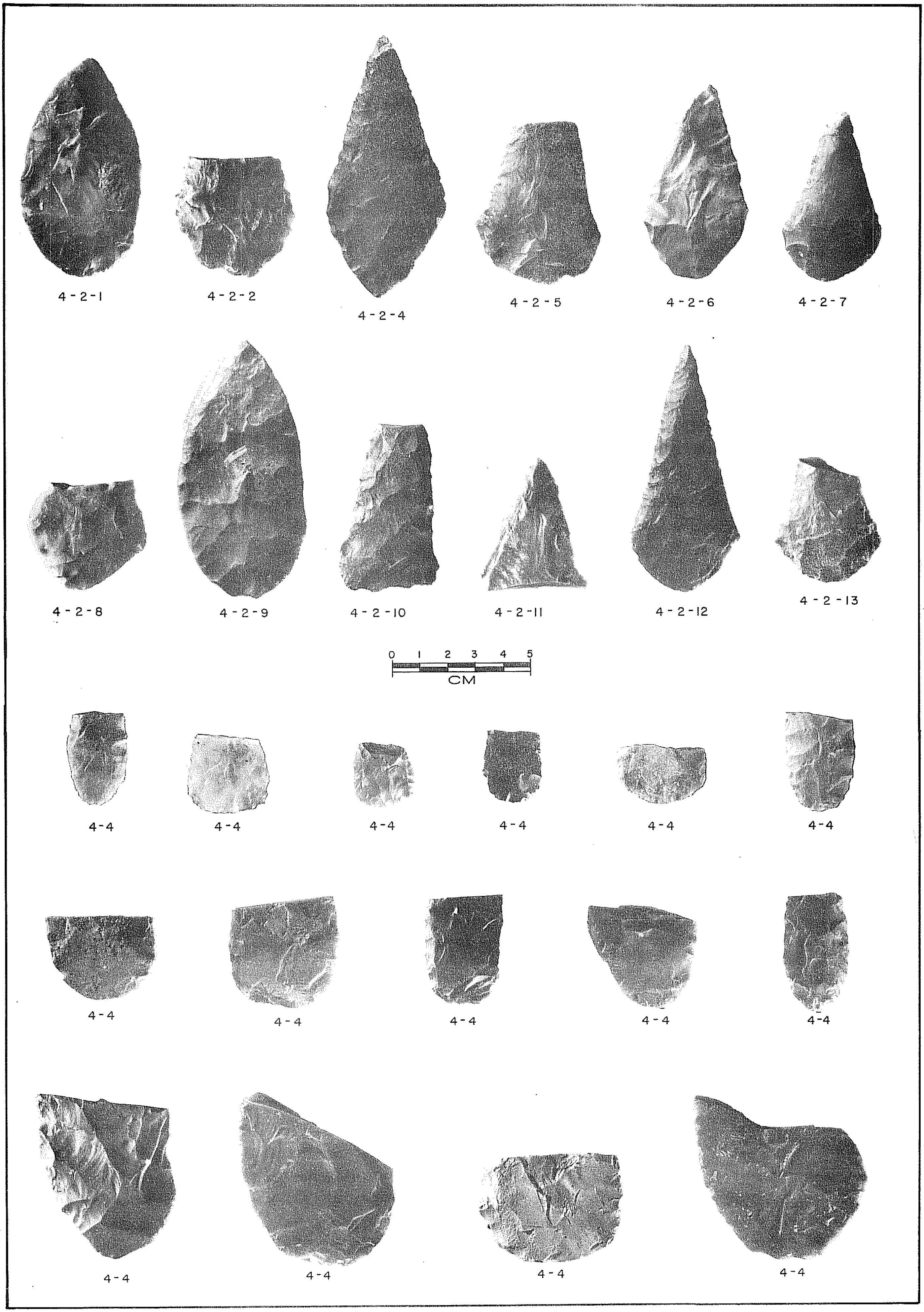
Group 5. Unstemmed Leaf Shaped (48 Specimens)

These specimens are characteristically long and slender with a point at one end. They are semicircular, convex, or slightly pointed at the other end. Most but not all reach their maximum width at the midsection. Unless otherwise noted, all blade edges are convex. The specimens are subdivided according to basal configurations, either rounded, pointed, or slightly convex to straight (Fig. 69).

Specimens 1-27: The proximal ends of these specimens are rounded or semicircular. Many have a centrally thick ridge running almost the length, thinning only near the proximal end. Their general leaf-shaped outline, steep edges, and symmetry

---

Figure 68. *Thin Bifaces: Group 4, Forms 2 and 4.* Numbers beneath each specimen indicate group, form, and specimen number.


4-2-1
4-2-2
4-2-4
4-2-5
4-2-6
4-2-7
4-2-8
4-2-9
4-2-10
4-2-11
4-2-12
4-2-13
0 1 2 3 4 5
CM
4-4
4-4
4-4
4-4
4-4
4-4
4-4
4-4
4-4
4-4
4-4
4-4
4-4
4-4
4-4

Thin Bifaces (continued)

place these specimens in the *Lerma* or *Refugio* type categories as defined by Suhm and Jelks (1962:207, 241). Specimen 4 was recovered from the Middle Archaic horizon at 41 LK 31/32, dating between 3380 B.C. and 2340 B.C. The form is generally attributed to the Archaic Stage, but tight chronologic control is not available. Specimen 4 is made of petrified wood.

Specimens 28-36: These nine specimens are all bipointed. The midsection is thick, and ends are somewhat thinner. All have the characteristics of the *Lerma* type as defined by Suhm and Jelks (*ibid.*:207). Specimen 31 is heavily patinated. Specimen 33 is made of gray, fine-grained quartzite. Specimen 35 is made of petrified wood.

Specimens 37-48: Specimens in this group share in common slightly convex to almost straight proximal ends. In every case, the proximal end contracts from maximal widths in the midsection area. These specimens do not have the pronounced central ridge running their lengths, as do Specimens 1-27. Most, if not all, of the specimens meet the *Refugio* type description (Suhm and Jelks 1962:241). Specimens 38, 42, 44, 45, and 47 have exceptionally straight bases. Specimens 39, 41, and 47 are patinated.

Group 6. Circular to Subcircular (5 Specimens)

These five specimens are roughly circular in outline, vary considerably in thickness, and are crudely flaked (Fig. 64).

Group 7. Diamond Shaped (1 Specimen)

This small specimen is widest at the midsection and tapers to a point at either end.

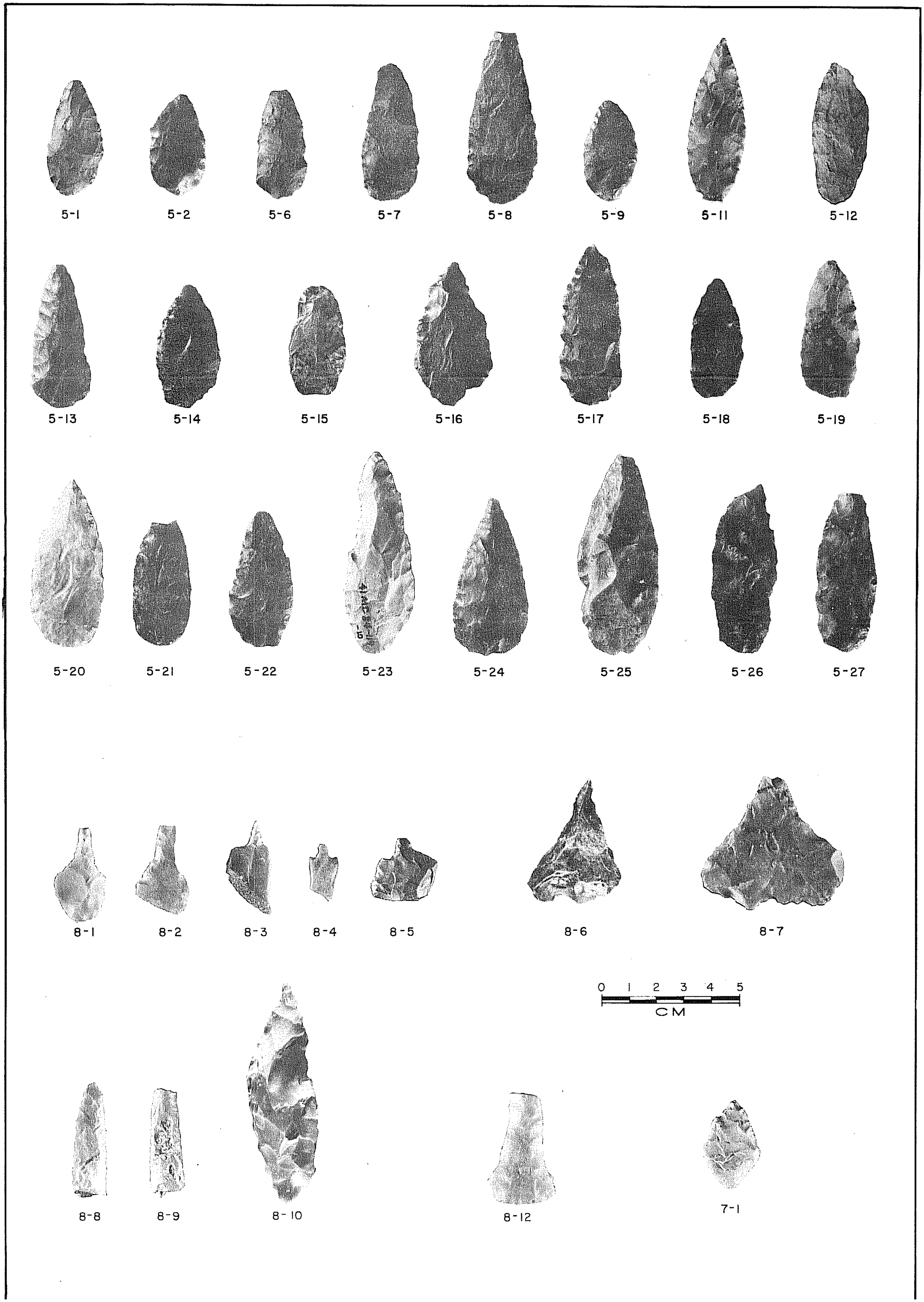
Group 8. Bifaces with Sharp, Slender Projections (12 Specimens)

Having a variety of outline forms, these specimens have slender, needlelike points and probably functioned as drills or perforators (Fig. 69).

Specimens 1-5: These pieces are made on flakes. One end is bifacially worked to a short, needlelike point. The other end is wider and modified only unifacially, if at all. This type of artifact is diagnostic of the Late Prehistoric Stage. The Choke Canyon specimens were found in association with *Perdiz* points and pottery.

Specimens 6-7: Generally triangular in outline, these two specimens are bigger and much thicker than Specimens 1-5. Bifacially worked overall, each has a thick, tapering point projecting from the wide proximal end.

Figure 69. *Thin Bifaces: Groups 5 and 8.* Numbers beneath each specimen indicate group, form, and specimen number.


5-1
5-2
5-6
5-7
5-8
5-9
5-11
5-12
5-13
5-14
5-15
5-16
5-17
5-18
5-19
5-20
5-21
5-22
5-23
5-24
5-25
5-26
5-27
8-1
8-2
8-3
8-4
8-5
8-6
8-7
0 1 2 3 4 5
CM
8-8
8-9
8-10
8-12
7-1

Thin Bifaces (continued)

Specimens 8-9: These two distal fragments are relatively long, very narrow, and pointed at one end. Both are bifacially worked overall. Specimen 9 is burned to a gray-white color.

Specimen 10: This leaf-shaped specimen has a thick ridge running its length and has steep sides as a result. One end is worked to a short, needlelike point.

Specimen 11: This specimen is essentially a short, leaf-shaped biface with a very sharp distal tip. The right blade edge of one face is beveled, the bevel contributing to the sharpness of the point.

Specimen 12: This fragmentary specimen has a very narrow blade which expands abruptly to a rounded base. A thick central ridge runs the length of the blade. The base is somewhat thinner.

Group 9. Fragments with Pointed Ends (178 Specimens)

Group 9 contains thin biface fragments with pointed ends. Workmanship varies from relatively thick and crudely flaked to thin and finely flaked. Depending upon whether breakage occurred during manufacture or use, these specimens could be fragments of preforms or of finished tools. Especially in the case of surface-collected specimens, breakage may also have occurred postdepositionally through exposure to weather and large animals (hoof damage from deer, horses, and cattle). The specimens are grouped by width: 4-5 cm, 18 specimens; 3-3.9 cm, 38 specimens; 2-2.9 cm, 91 specimens; 1-1.9 cm, 31 specimens. Unusual lithic materials include three pieces of chalcedony, two pieces of gray siliceous quartzite, two pieces of petrified palmwood, two pieces of fine-grained quartzite, and one piece of white and red quartz. Thirty-two specimens are patinated, eight heavily, 12 moderately, and 12 lightly.

Group 10. Lateral and Medial Fragments (199 Specimens)

Included in this group are otherwise unclassifiable lateral and medial fragments of thin bifaces. Workmanship ranges from relatively thick and crudely flaked to thin and finely worked. The fragments may be derived from finished tools broken during use or from preforms broken during manufacture. Some breakage may also be the result of postdepositional mechanical action. The specimens are grouped by width: 3-4.5 cm, 56 specimens; 2-2.9 cm, 87 specimens; and 1-1.9 cm, 56 specimens. Unusual lithic materials include four pieces of chalcedony, two pieces of quartzite, and one piece of quartz. Thirty-three specimens are patinated, 11 heavily, 15 moderately, and seven lightly.

Distally Beveled Bifaces and Unifaces (239 Specimens)

Included in this subclass are chipped stone specimens sharing beveled and/or extremely concave ("scooped out") ends (distal "bits") as a common trait. In

Distally Beveled Bifaces and Unifaces (continued)

the subclass are both unifacial and bifacial specimens with thicknesses ranging above and below the arbitrary thickness standard of 1.3 cm used to distinguish between thick and thin bifaces described above. The distinctive beveled end is considered to be the single most important descriptive attribute, rendering extent of facial chipping (unifacial vs. bifacial) and artifact thickness of secondary importance as classificatory criteria. The assemblage presented in this category includes specimens elsewhere referred to as *Clear Fork* gouges, *Guadalupe* adzes, *Olmos* bifaces, and *Nueces* scrapers. Typology, function, and chronological implications are also given further attention following the descriptions.

Specimens vary in outline from triangular/subtriangular to rectangular/subrectangular to oval and elliptical. The triangular and subtriangular forms are by far the most common. Length varies considerably, as do the length-width ratio, thickness, and weight. Maximum width is less variable throughout the assemblage than are the other metric attributes. Both biconvex and plano-convex cross sections are represented. Morphology of the beveled or "bit" end varies considerably. The bit edge may be concave, straight, or convex. The degree to which the bit is "scooped out" varies from none to extensive. Outline, bit morphology, and thickness are the principal attributes used to define the various groups described below. Other characteristics presumably related to use of these tools, such as lateral edge dulling, polish, striations, and step scarring, are considered in the discussion following these descriptions. The specimens are grouped into the following categories for descriptive purposes:

- Group 1. Large Triangular to Subtriangular (*Clear Fork* Gouge Type 1, after Ray 1941)
- Group 2. Large, Elongate, Rectangular to Subrectangular (*Clear Fork* Gouge Type 3, after Ray 1941)
  - Form 1. Long
  - Form 2. Short
- Group 3. Short, Broad, Triangular to Subrectangular
  - Form 1. Triangular, Proximal End Pointed
  - Form 2. Triangular, Proximal End Rounded
  - Form 3. Rectangular to Subrectangular (*Nueces* scrapers, after Hester, White, and White 1969)
- Group 4. Small Triangular to Subtriangular
- Group 5. Small, Narrow Distal Fragments
- Group 6. Long, Narrow, Elliptical (*Guadalupe* adzes, after Campbell 1976)
- Group 7. Various Forms with Broad, Rounded, Low-Angle Bevels
  - Form 1. Elongate, Elliptical to Subrectangular
  - Form 2. Short, Broad, Subrectangular to Oval
  - Form 3. Subtriangular
  - Form 4. Distal Fragments
- Group 8. Miscellaneous Forms
  - Form 1. Triangular to Subtriangular with Steep Bevels
  - Form 2. Steeply Beveled Sides
  - Form 3. Offset Bevels

Distally Beveled Bifaces and Unifaces (continued)

Form 4. Broad, Flat, Triangular
Form 5. Odd Shapes
Group 9. Distal Fragments

Provenience by site is presented in Table 12. Metric attributes and figure references are presented in Table 13. Site provenience by specimen number is provided in Table 14.

Group 1. Large Triangular to Subtriangular (Clear Fork Gouge Type 1, after Ray 1941) (12 Specimens)

Specimens in this group are triangular to subtriangular in outline with the bevel at the broad end of each piece (Fig. 70). All are bifacially worked. Except for a single plano-convex specimen, all are biconvex in lateral cross section. Five specimens have a pronounced ridge running the length of the face opposite the bevel (ventral). Even though both faces are convex, the strong ridge gives a prismatic appearance to these specimens. The bevels on the Group 1 specimens are generally broader, deeper, and more pronouncedly "scooped out" than specimens in most of the other groups. This bit morphology imparts a cusped appearance to the corners formed by the intersection of the bit and the lateral edges. The bit edges are slightly concave to unevenly straight, although the overall appearance is one of concavity, due to the cusping of the corners. Specimens 1 and 8 are made of gray siliceous quartzite. Specimen 10 is of petrified palmwood. The rest are made of chert. Specimen 8 was recovered from Level 5 of Test Pit 2 at 41 MC 19. All other specimens were surface collected. Specimen 2 retains a small patch of cortex on the ventral face.

Group 2. Large, Elongate, Rectangular to Subrectangular (Clear Fork Gouge Type 3, after Ray 1941) (29 Specimens)

These specimens are rectangular to subrectangular in outline (Fig. 71). The body contracts only slightly from the bit (distal) end to the proximal end. Group 2 specimens are generally narrower in relation to length than are the other specimens, with the exception of Group 6. All are bifacially worked. As with Group 1, all are biconvex in cross section. Nineteen specimens (nine Form 1 and ten Form 2) have pronounced ridges running the length of the face opposite the bevel. Although both faces are indeed convex, the exaggerated ridge on one face creates a prismatic cross section. The bevels on Group 2 specimens are as deep, but not as broad, as those of Group 1. This slight variation in bit morphology, coupled with the rectangular outline, eliminates the pronounced cusps at the bit end. Most of the bit edges are convex. Group 2 is further subdivided into two forms based on lentgh. Form 2 specimens are generally only 1/2 to 3/4 the length of Form 1 specimens. Since specimens of both forms are so similar in other respects, it is suggested that the Form 2 examples may simply be worn-down, resharpened versions of Form 1 artifacts.

TABLE 12

SITE PROVENIENCE - DISTALLY BEVELED BIFACES AND UNIFACES

SITE NO.	GROUP 1	GROUP 2		GROUP 3			GROUP 4	GROUP 5	GROUP 6	GROUP 7				GROUP 8					GROUP 9
		FORM 1	FORM 2	FORM 1	FORM 2	FORM 3				FORM 1	FORM 2	FORM 3	FORM 4	FORM 1	FORM 2	FORM 3	FORM 4	FORM 5	
41LK8			1															1	
41LK9																			
41LK10				1	1														1
41LK13						1													
41LK14	1		1	1		2	3		1	2	1			2	1				2
41LK15					3				1	1				1					1
41LK17							1		1										
41LK18										1									
41LK20																			
41LK27			1	1			1			1	1	1							
41LK31/32	1	1			2		2				1		2				1		
41LK34																			
41LK41												1							
41LK48																			
(Same as MC30)																			
41LK49																			
41LK50																			
41LK51					1		2			1									
41LK52	2			3				1		1		1							1
41LK53				1			2												1
41LK59																			1
41LK64		1	2	1						1	1								
41LK65																			
41LK67		1	2			1	1				1	1				1			3
41LK69		3	3	1			1		1	2	1				1		1		1
41LK73																			
41LK74				1			1		1		1	1		1					
41LK75				1		1								1				1	1
41LK77																			
41LK83																			
41LK85					1														
41LK86																			
41LK87	1												1	1		1			
41LK88																			
41LK91					1						1								1
41LK92																			
41LK93		1																	
41LK94							1												
41LK97																			
41LK197																			
41LK198																			
41LK201					1	1						1							1
41LK202																			
41LK203		1																	
41LK204	1	3									3		1			1			
41LK205						1				1									
41LK206							2			4		1							
41LK207										1			1	1					
41MC8																			
41MC9																			
41MC10																			
41MC11				1															
41MC13				1	1					1									1
41MC14				1															
41MC15				1		1													
41MC17																			
41MC18				1															
41MC19	1				1	2													
41MC22						1													

TABLE 12

SITE PROVENIENCE - DISTALLY BEVELED BIFACES AND UNIFACES (CONTINUED)

SITE NO.	GROUP 1	GROUP 2		GROUP 3			GROUP 4	GROUP 5	GROUP 6	GROUP 7				GROUP 8					GROUP 9
		FORM 1	FORM 2	FORM 1	FORM 2	FORM 3				FORM 1	FORM 2	FORM 3	FORM 4	FORM 1	FORM 2	FORM 3	FORM 4	FORM 5	
41MC24																			
41MC25					1		1												
41MC26																			
41MC28					1														
41MC29					2	1													
41MC30														1					
(Same as LK48)																			
41MC31																			
41MC33	1																		
41MC36																			
41MC39																			
41MC40																			
41MC41						1									1				1
41MC42																	1		
41MC43														1					
41MC44																			
41MC45																			
41MC48																			
41MC50							1												
41MC52		1					1			1									
41MC53																			
41MC54	1		1																
41MC55						1													
41MC56																1			
41MC57								1					1						
41MC58			1																
41MC59				1															
41MC64						2											1		
41MC65				1															
41MC67										1									
41MC68																			
41MC69																			
41MC72					1														
41MC74																			
41MC75				2															
41MC78		1																	
41MC79														1					
41MC80																		1	
41MC83																			
41MC84	1	2	1	1		2	1			1				1	2	1		2	4
41MC86														1					
41MC88																			
41MC90																			
41MC91																			
41MC92																			
41MC93																			
41MC94	1			1	1	1		1	1										2
41MC95					1	2						1						1	
41MC171																			
41MC174					1				1									1	1
41MC176																			
41MC177		1																	
41MC184																			
41MC189									1	1									
41MC219																			
41MC222																			
41MC223																			
41MC224																	1		

TABLE 13

METRIC DATA - DISTALLY BEVELED BIFACES AND UNIFACES

GROUP	FORM	LENGTH RANGE			WIDTH RANGE			THICKNESS RANGE			WEIGHT RANGE			BEVEL ANGLE RANGE			ILLUS.
		MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	
1		8.7	5.3	6.7	4.9	3.9	4.2	2.3	1.3	1.7	78.0	28.2	48.7	77-87	57-58	67-73	70
2	1	9.0	5.7	7.1	4.2	3.2	3.7	2.2	1.5	1.8	69.3	27.0	48.0	78-79	50-52	61-68	71
	2	6.1	5.0	5.5	4.2	3.1	3.5	2.0	1.3	1.7	42.5	23.0	33.8	72-82	55-57	64-72	71
3	1	5.4	3.7	4.4	5.6	3.3	4.3	1.7	0.7	1.3	33.8	10.0	23.6	89-91	52-56	62-68	72
	2	5.3	3.6	4.3	5.3	3.1	4.3	1.7	0.8	1.2	46.0	13.0	25.3	78-84	44-48	61-67	72
	3	6.5	3.0	4.3	5.2	3.0	4.1	1.6	0.9	1.1	44.8	8.0	26.0	71-76	46-54	58-65	73
4		7.6	2.8	4.9	4.2	2.5	3.4	1.5	0.7	1.0	42.2	4.7	19.1	84-89	30-34	59-66	74
5		4.1	3.2	3.6	2.8	2.5	2.6	1.1	1.0	1.0	-	-	-	61-62	51-58	57-63	
6		9.9	6.8	8.3	4.1	3.1	3.5	2.8	1.7	2.4	109.0	41.8	72.3	77-79	49-65	61-68	75-76
7	1	8.1	5.1	6.8	4.5	3.1	3.8	2.2	1.4	2.0	66.9	25.2	52.0	63-65	36-47	55-64	
	2	6.2	5.5	5.8	5.1	4.7	4.9	2.2	1.5	1.8	65.7	49.8	57.0	63-65	50-64	56-65	
	3	7.3	3.9	5.8	5.1	3.5	4.5	2.6	1.2	1.6	73.5	23.0	41.7	60-67	47-58	54-63	
	4	5.3*	4.4*	4.8*	4.4	3.1	3.7	2.9	1.3	2.0	62.3*	22.5*	38.6*	-	-	-	
8	1	6.5	4.7	5.5	5.3	3.2	4.0	2.0	1.3	1.6	51.0	24.0	32.6	78-80	49-53	63-72	78
	2	6.2	4.8	5.5	4.1	3.2	3.8	2.5	1.5	1.8	34.0	33.5	33.9	67-78	41-44	54-59	78
	3	7.0	4.8	5.8	4.2	3.6	3.9	2.1	1.3	1.6	48.0	21.0	31.3	68-76	48-55	55-61	78
	4	6.8	4.0	5.6	6.0	5.0	5.5	1.9	1.5	1.7	56.0	31.3	44.1	62-69	41-46	49-54	78
	5	9.4	4.0	5.9	4.7	3.3	4.2	3.1	1.2	1.8	148.0	17.6	49.9	71-76	45-57	59-66	78
9		4.4*	1.9*	3.1*	5.1	3.1	3.9	2.7	0.9	1.3	40.3*	9.0*	19.7*	90-96	45-48	63-70	78

TABLE 14. DISTALLY BEVELED TOOLS--SITE PROVENIENCE BY SPECIMEN NUMBER

GROUP 1

SPECIMEN NO.	SITE NO.
1	41 LK 14
2	41 LK 31/32
3	41 LK 52
4	41 LK 52
5	41 LK 87
6	41 LK 204
7	Live Oak Co.
8	41 MC 19
9	41 MC 33
10	41 MC 54
11	41 MC 84
12	41 MC 94

GROUP 2, FORM 1

SPECIMEN NO.	SITE NO.
1	41 LK 31/32
2	41 LK 64
3	41 LK 67
4	41 LK 69
5	41 LK 69
6	41 LK 69
7	41 LK 93
8	41 LK 203
9	41 LK 204
10	41 LK 204
11	41 LK 204
12	41 MC 52
13	41 MC 78
14	41 MC 84
15	41 MC 84
16	41 MC 177

GROUP 2, FORM 2

SPECIMEN NO.	SITE NO.
1	41 LK 8
2	41 LK 14
3	41 LK 27
4	41 LK 64
5	41 LK 64
6	41 LK 67
7	41 LK 67
8	41 LK 69
9	41 LK 69
10	41 LK 69
11	41 MC 54
12	41 MC 58
13	41 MC 84

GROUP 3, FORM 1

SPECIMEN NO.	SITE NO.
1	41 LK 10
2	41 LK 14
3	41 LK 27
4	41 LK 52
5	41 LK 52
6	41 LK 52
7	41 LK 53
8	41 LK 64
9	41 LK 69
10	41 LK 74
11	41 LK 75
12	41 MC 11
13	41 MC 13
14	41 MC 14
15	41 MC 15
16	41 MC 18
17	41 MC 59
18	41 MC 64
19	41 MC 75
20	41 MC 75
21	41 MC 84
22	41 MC 95

GROUP 3, FORM 2

SPECIMEN NO.	SITE NO.
1	41 LK 8
2	41 LK 10
3	41 LK 15
4	41 LK 15
5	41 LK 15
6	41 LK 31/32
7	41 LK 31/32
8	41 LK 51
9	41 LK 91
10	41 LK 201
11	41 MC 13
12	41 MC 19
13	41 MC 25
14	41 MC 28
15	41 MC 29
16	41 MC 29
17	41 MC 72
18	41 MC 94
19	41 MC 95
20	41 MC 174

GROUP 3, FORM 3

SPECIMEN NO.	SITE NO.
1	41 LK 13
2	41 LK 14
3	41 LK 14
4	41 LK 67
5	41 LK 75
6	41 LK 201
7	41 LK 205
8	41 MC 15
9	41 MC 19
10	41 MC 19
11	41 MC 22
12	41 MC 29
13	41 MC 41
14	41 MC 55
15	41 MC 64
16	41 MC 64
17	41 MC 84
18	41 MC 84
19	41 MC 94
20	41 MC 95
21	41 MC 95

GROUP 4

SPECIMEN NO.	SITE NO.
1	41 LK 14
2	41 LK 14
3	41 LK 14
4	41 LK 17
5	41 LK 27
6	41 LK 31/32
7	41 LK 31/32
8	41 LK 51
9	41 LK 51
10	41 LK 53
11	41 LK 53
12	41 LK 67
13	41 LK 69
14	41 LK 74
15	41 LK 94
16	41 LK 206
17	41 LK 206
18	41 MC 25
19	41 MC 50
20	41 MC 52
21	41 MC 84

TABLE 14. (continued)

SPECIMEN NO.	SITE NO.
GROUP 5	
1	41 LK 52
2	41 MC 57
3	41 MC 94
GROUP 6	
1	41 LK 14
2	41 LK 15
3	41 LK 17
4	41 LK 69
5	41 LK 74
6	41 MC 94
7	41 MC 174
8	41 MC 189
GROUP 7, FORM 1	
1	41 LK 14
2	41 LK 14
3	41 LK 15
4	41 LK 18
5	41 LK 27
6	41 LK 51
7	41 LK 52
8	41 LK 64
9	41 LK 69
10	41 LK 69
11	41 LK 205
12	41 LK 206
13	41 LK 206
14	41 LK 206
15	41 LK 206
16	41 LK 207
17	41 MC 13
18	41 MC 52
19	41 MC 67
20	41 MC 84
21	41 MC 189
GROUP 7, FORM 2	
1	41 LK 14
2	41 LK 27
3	41 LK 31/32
4	41 LK 64
5	41 LK 67
6	41 LK 69
7	41 LK 74
8	41 LK 91
GROUP 7, FORM 1 (cont.)	
9	41 LK 204
10	41 LK 204
11	41 LK 204
GROUP 7, FORM 3	
1	41 LK 27
2	41 LK 41
3	41 LK 52
4	41 LK 67
5	41 LK 74
6	41 LK 201
7	41 LK 206
8	41 MC 95
GROUP 7, FORM 4	
1	41 LK 31/32
2	41 LK 31/32
3	41 LK 87
4	41 LK 204
5	41 LK 207
6	41 MC 57
GROUP 8, FORM 1	
1	41 LK 14
2	41 LK 14
3	41 LK 15
4	41 LK 74
5	41 LK 75
6	41 LK 87
7	41 LK 207
8	41 MC 30
9	41 MC 43
10	41 MC 79
11	41 MC 84
12	41 MC 86
GROUP 8, FORM 2	
1	41 LK 14
2	41 LK 69
3	41 MC 41
4	41 MC 84
5	41 MC 84
GROUP 8, FORM 3	
1	41 LK 67
2	41 LK 87
3	41 LK 204
4	41 MC 56
5	41 MC 84
GROUP 8, FORM 4	
1	41 LK 31/32
2	41 LK 69
3	41 MC 42
4	41 MC 64
5	41 MC 224
GROUP 8, FORM 5	
1	41 LK 8
2	41 LK 75
3	41 MC 30
4	41 MC 84
5	41 MC 84
6	41 MC 95
7	41 MC 174
GROUP 9	
1	41 LK 10
2	41 LK 14
3	41 LK 14
4	41 LK 15
5	41 LK 52
6	41 LK 53
7	41 LK 59
8	41 LK 67
9	41 LK 67
10	41 LK 67
11	41 LK 69
12	41 LK 75
13	41 LK 91
14	41 LK 201
15	41 MC 13
16	41 MC 41
17	41 MC 84
18	41 MC 84
19	41 MC 84
20	41 MC 84
21	41 MC 94
22	41 MC 94
23	41 MC 174

Distally Beveled Bifaces and Unifaces (continued)

Form 1. Long (16 Specimens)

Specimen 4 is made of gray siliceous quartzite. Specimens 8 and 11 are of petrified wood. Specimens 6, 7, and 8 retain patches of cortex on their ventral surfaces. All specimens were surface collected.

Form 2. Short (13 Specimens)

Specimens 3 and 13 are made of gray siliceous quartzite. Specimen 6 is of petrified wood. Specimen 12 is made of a fine-grained, orange-brown quartzite. Specimens 6 and 7 were recovered in controlled excavations at 41 LK 67. Specimen 6 was found in Level 3 (98.75-98.70) of Unit N904 E999. Specimen 7 came from Level 1 (98.63-98.55) of Unit N846 E1059. In both cases, Late Archaic period affiliation is suggested.

Group 3. Short, Broad, Triangular to Subrectangular (63 Specimens)

Generally distinguished from Group 1 by their smaller size and more variable outline, there is nevertheless some overlap between Groups 1 and 3, especially with regard to Forms 1 and 2 described below (Fig. 72). Group 3 specimens are as wide as those in Group 1, but generally speaking, they are shorter, thinner, and more finely flaked. The width of Group 3 specimens approaches, and in some cases exceeds, the length. The group is further subdivided into three forms based on outline shape. Two of the forms are basically triangular in outline, one composed of specimens with pointed proximal ends and the other of specimens with slightly rounded proximal ends. The third form contains specimens with rectangular to subrectangular outlines. These are identical to the *Nueces* scrapers found at the Oulline site in La Salle County to the west of Choke Canyon. Of the 63 specimens in the group, 18 are unifacially worked. The rest are bifacial. The unifacial specimens are plano-convex in cross section. The bifacially worked specimens are all biconvex in cross section; however, the dorsal (beveled) faces tend to be more pronouncedly convex than the ventral. The bevels on the Group 3 specimens are relatively steep and straight. The beveled edges are mostly straight. Some are slightly convex. Only a small number of Group 3 specimens have the "scooped out" bit characteristic of Group 1.

Form 1. Triangular, Proximal End Pointed (22 Specimens)

Specimens 2, 3, 8, 10, 12, 13, 19, and 21 are unifacially worked. Specimens 1 and 9 have slightly concave bit edges, imparting a "scooped out" appearance to the bevel. The dorsal faces of Specimens 3, 8, 10, 14, 17, 19, and 21 are asymmetrically pyramidal in configuration. The apex of the pyramid on each specimen is off center toward the beveled edge. Three distinct facets are formed on the dorsal surface by the intersection of the bevel with a pronounced

---

Figure 70. *Distally Beveled Bifaces and Unifaces: Group 1.* Group and specimen numbers are shown by each artifact. Specimens are shown at actual size.

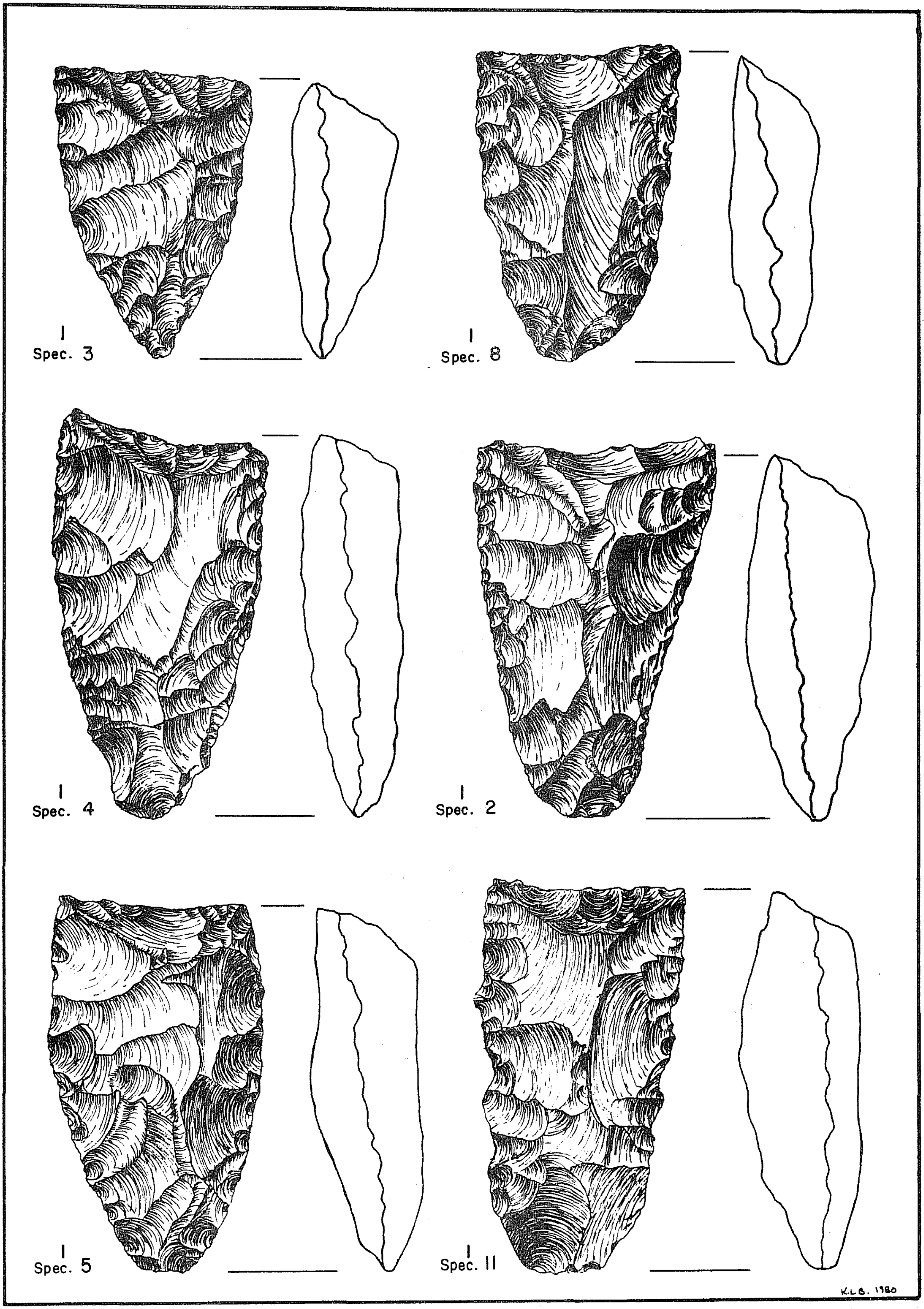


FIGURE 70

Distally Beveled Bifaces and Unifaces (continued)

ridge running back to the proximal end of each specimen. These particular specimens are generally thicker than the others in the group. Rock types other than chert include petrified wood (Specimen 1), gray siliceous quartzite (Specimen 2), and purple, coarse-grained quartzite (Specimen 11). Specimens 7, 13, and 19 retain patches of cortex on their dorsal faces. All Form 1 specimens were surface collected.

Form 2. Triangular, Proximal End Rounded (20 Specimens)

Specimens 6, 8, 10, 12, 13, 14, 16, and 19 are unifacially worked. Specimens 6, 7, and 18 have "scooped out" bevels. Specimens 8 and 13 have the dorsal pyramid configuration described for Form 1 above. All Form 2 specimens are made of chert. Specimens 8, 14, 16, and 19 retain patches of cortex on the dorsal surface. Three of the Form 2 specimens were recovered from radiocarbon-dated deposits as follows:

SPECIMEN NO.	SITE	UNIT	LEVEL	RADIOCARBON AGE
6	41 LK 31/32	N1059 E865	(97.85-97.75 cm)	2350 B.C.
7	41 LK 31/32	N1065 E875	(98.05-97.95 cm)	----
8	41 LK 201	Test Pit 3	Level 9 (90-80 cm)	1300 B.C.

Although tentative, these dates would suggest a Middle and Late Archaic affiliation for the Group 3 tool type.

Form 3. Rectangular to Subrectangular (Nueces scraper after Hester, White, and White 1969) (21 Specimens)

Specimens 11 and 13 are unifacially worked. Specimens 9, 12, and 21 have "scooped out" bits. Specimen 21 has pronounced cusps at the distal corners. All Form 3 specimens are made of chert. Specimen 11 retains a patch of cortex on the dorsal face. Specimen 9 was recovered from Level 2 (10-20 cm) of Test Pit 1 at 41 MC 55. Specimen 14 was found in Level 3 (20-30 cm) of Test Pit 1 at 41 MC 55. All other Form 3 specimens were surface collected (Fig. 73).

<u>*Group 4. Small Triangular to Subtriangular*</u> (21 Specimens)

Similar in general shape to the Group 1 specimens, the Group 4 specimens are distinguished by their diminutive size, straight to convex bit edges, thinness, and fine flaking (Fig. 74). There is some overlap in length between Group 1 and Group 4, the largest specimens in Group 4 approaching or equaling the length of the smallest specimens in Group 1. In the case of these overlapping specimens, where length permits no differentiation, bevel morphology and thickness provide the means for group determination. The bevel characteristic of

---

Figure 71. *Distally Beveled Bifaces and Unifaces: Group 2, Forms 1 and 2.* Group, form, and specimen numbers are shown by each artifact. Specimens are shown at actual size.

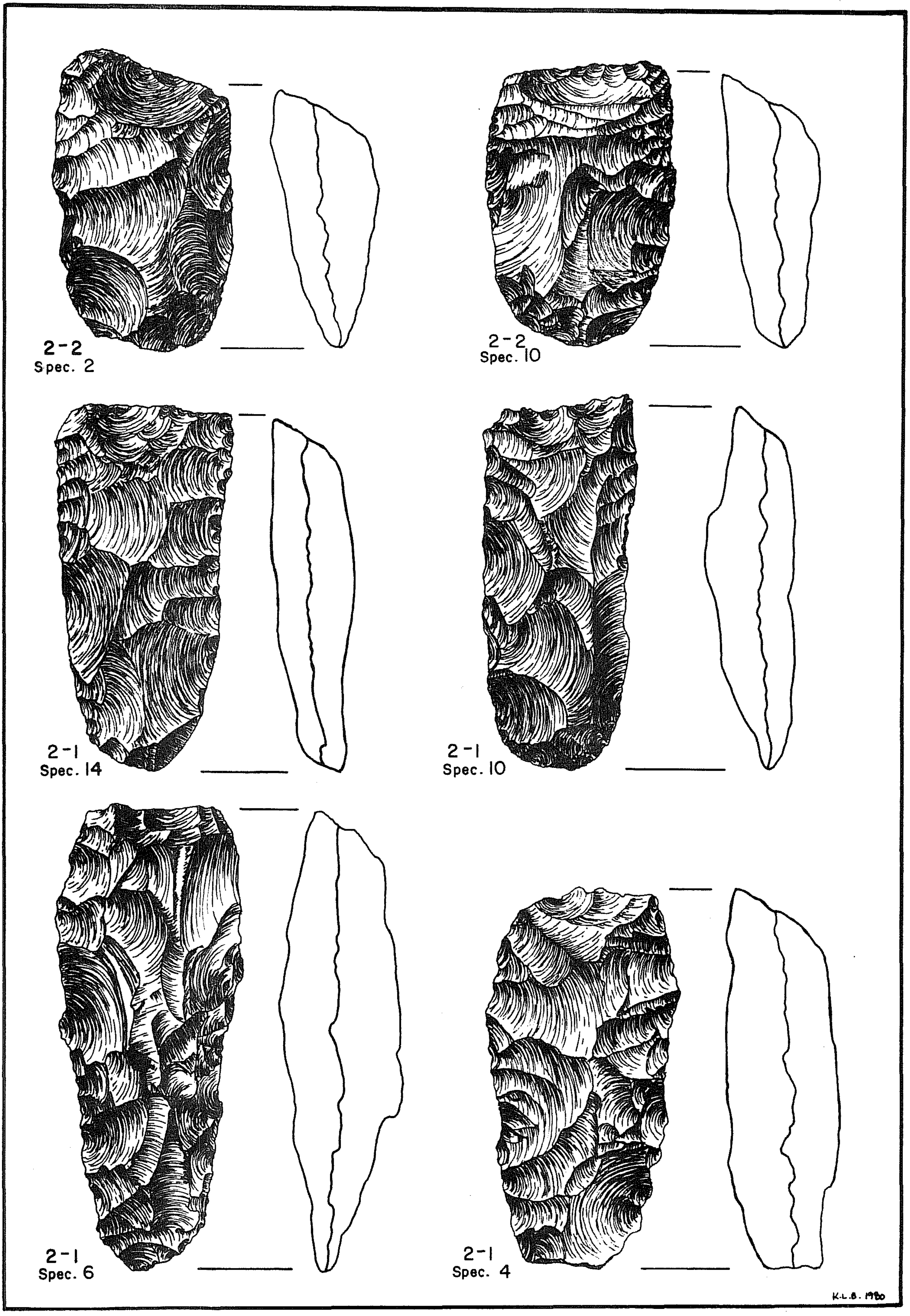

2-2
Spec. 2
2-2
Spec. 10
2-1
Spec. 14
2-1
Spec. 10
2-1
Spec. 6
2-1
Spec. 4
K.L.B. 1980

FIGURE 71

Distally Beveled Bifaces and Unifaces (continued)

Group 4 is more angular than the Group 1 bevel and tends to project outward to create a straight to slightly convex bit edge. Except for Specimens 13 and 16, the Group 4 specimens do not have the "scooped out" appearance distinctive of the Group 1 bits. Specimens 1, 3, and 6 are unifacially worked and plano-convex in cross section. Cross sections of all other specimens are biconvex. Group 4 specimens are uniformly thinner and more finely flaked than Group 1 specimens. Specimen 9 is much smaller than all other Group 4 specimens and is much like the *Olmos* biface as described by Hester (1969b) and Shafer and Hester (1971). With respect to these two attributes, Group 4 is much like Group 3. All Group 4 specimens are made of chert. Proveniences for specimens recovered in excavations are as follows:

SPECIMEN NO.	SITE	UNIT	LEVEL
4	41 LK 17	Test Pit 4	6 (60-50 cm)
6	41 LK 31/32	N950 E838	4 (99.70-99.50 cm)
7	41 LK 31/32	N1061 E873	6 (98.25-98.15 cm)
12	41 LK 67	N848 E1052	5 (98.40-98.35 cm)
18	41 MC 25	Test Pit 1	4 (40-30 cm)

Group 5. Small, Narrow Distal Fragments (3 Specimens)

The three Group 5 specimens, all fragmentary, are the narrowest artifacts (with the single exception of Group 4, Specimen 9) in this subclass. They are rectangular, having a chisellike appearance. All are bifacially worked. Perhaps significantly, each is broken into lengths ranging from 3.3 to 4.1 cm, and they are much the same size in their other dimensions as well. Cross sections are biconvex. The beveled ends of Specimens 1 and 3 are "scooped out" very shallowly and form a bit somewhat like those of the Group 2 specimens. The bevel on Specimen 2 is more angular, the bit edge slightly convex. The most distinctive feature of the Group 5 specimens is that they are so slender relative to their length. All three are made of chert and were surface collected.

Group 6. Long, Narrow, Elliptical (Guadalupe adzes) (8 Specimens)

Although exhibiting considerable variation in size, the longest Group 6 specimens are the largest in this subclass of artifacts (Fig. 75). Group 6 specimens have previously been referred to as *Guadalupe* adzes (Campbell 1976, Calhoun 1965). These specimens are long, narrow, and elliptical and are bifacially worked. Transverse cross sections are thickly plano-convex or trianguloid. The convex faces have pronounced medial ridges running the length of each specimen. A roughly prismatic or "keeled" appearance is imparted by the medial ridge. Unlike most other distally beveled bifaces and unifaces, the bevels of Group 6 specimens are located opposite this ridge-backed face. The dorsal face (defined by presence of the bevel face) is thus comparatively flat, whereas the ventral

---

Figure 72. *Distally Beveled Bifaces and Unifaces: Group 3, Forms 1 and 2.* Group, form, and specimen numbers are shown by each artifact. Specimens are shown at actual size.

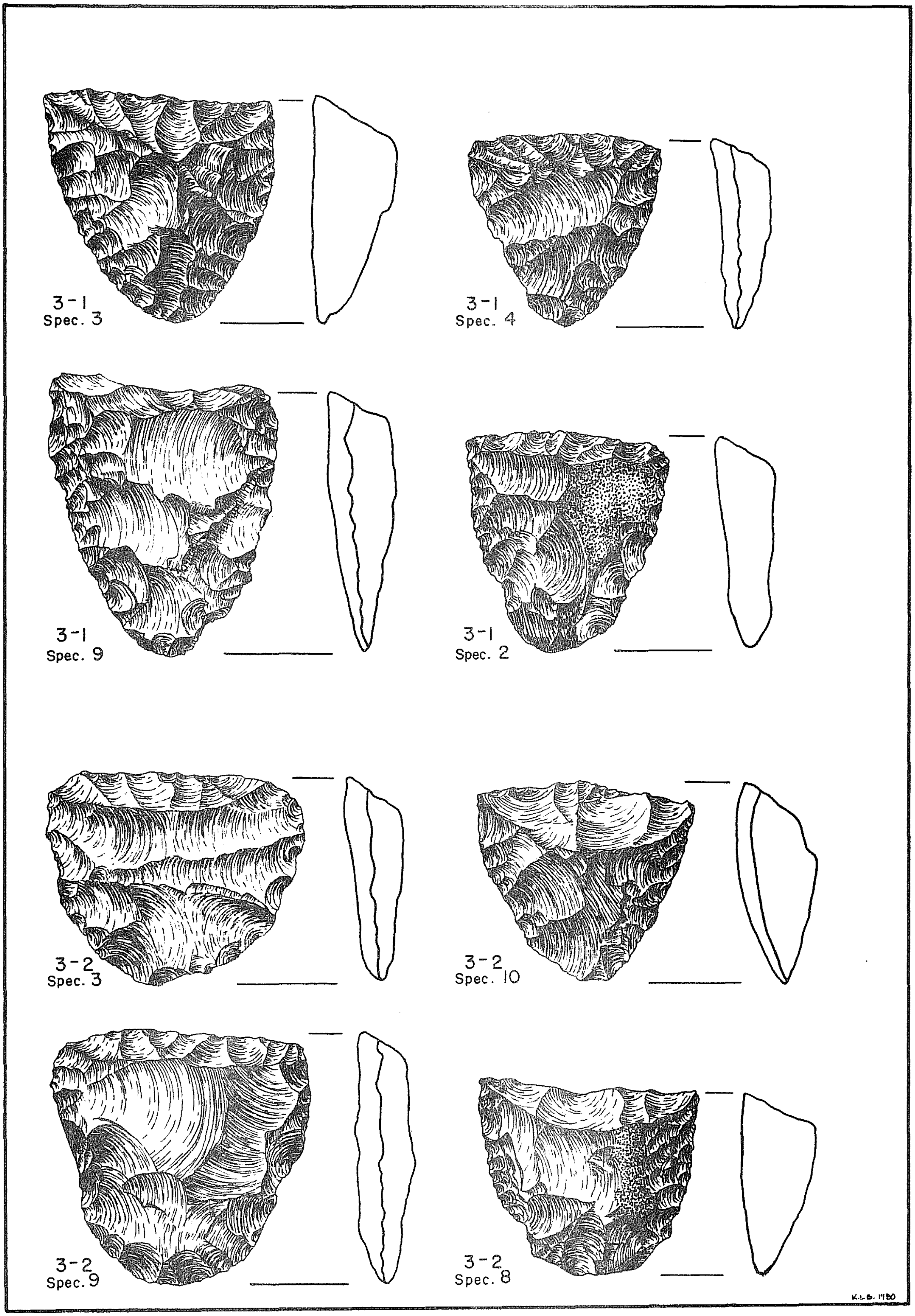

3-1
Spec. 3
3-1
Spec. 4
3-1
Spec. 9
3-1
Spec. 2
3-2
Spec. 3
3-2
Spec. 10
3-2
Spec. 9
3-2
Spec. 8
K.L.G. 1980

FIGURE 72

Distally Beveled Bifaces and Unifaces (continued)

face is steep sided. The Group 2, Form 1 specimens (*Clear Fork* gouge Type 3) share this ventral ridge in common with the Group 6 specimens, although the ridge is not quite as strong in Group 2. On six of the specimens, the bevels are formed by one to four flake scars and, relative to the planes of the dorsal and ventral faces, are much more angular than specimens of other groups of the subclass. Hester and Kohnitz (1975:22-23) describe the distinctive *Guadalupe* bevel as "oblique and single faceted." With respect to bevel faceting, several of the Choke Canyon specimens are atypical in that the bit is formed by more than one flake facet. All eight specimens in Group 6 are made of fine-grained chert. Except for Specimen 8 (Fig. 76), all specimens retain cortex on 10-50% of the ridged ventral surface. Specimen 5 (Fig. 75) was recovered from Level 4 of Test Pit 4 at 41 LK 74. All others were surface collected.

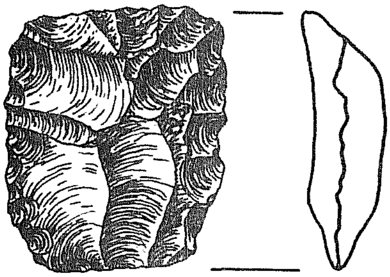
Group 7. Various Forms with Broad, Rounded, Low-Angle Bevels (46 Specimens)

Showing considerable variation in outline, Group 7 specimens are divided into four form categories representing different outline configurations. The specimens share a distal end morphology considerably different from those previously described. Distal ends might best be described as "shovel-shaped." The edge of the beveled end is pronouncedly convex or rounded, whereas other specimens in the subclass have straight to only slightly convex bevel edges. None have the more angular or cusped corners marking the intersection of the bevel edge with the lateral edges typical of previously described groups. The angle of beveling is generally so low that there is not a distinct bevel face on the specimens. All specimens in the group are bifacially worked. Most are biconvex in cross section, but there are some plano-convex and concave-convex cross sections represented. Eighteen of the 46 specimens lack proximal ends. A large proportion of the complete specimens are very thick and crudely flaked. It is possible that Group 7 contains preform examples of specimens in the groups described above. Breakage and/or inability to further thin the pieces may have resulted in their being discarded before reduction to finished forms. Many of the specimens would require only slight additional modifications to be made into Group 1 or Group 2 artifacts.

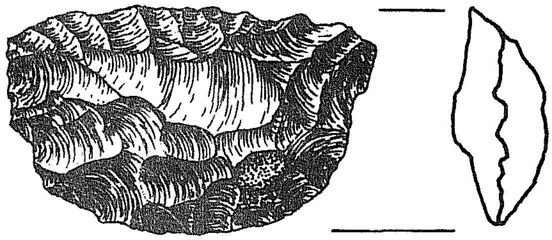
Form 1. Elongate, Elliptical to Subrectangular (21 Specimens)

Specimens in this subgrouping are long and relatively slender. Specimen 12 (Fig. 77) is made of gray silicified quartzite. Specimen 1 was recovered from Level 1 of Test Pit 2 at 41 LK 14. Speciman 17 came from Level 1 of Test Pit 1 at 41 MC 13. All others were surface collected. Specimen 2 retains cortex over 25% of one face.

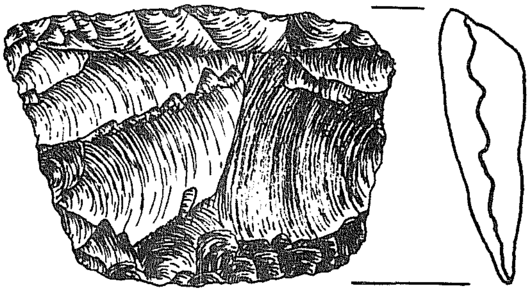
Figure 73. *Distally Beveled Bifaces and Unifaces: Group 3, Form 3.* Group, form, and specimen numbers are shown by each artifact. Specimens are shown at actual size.



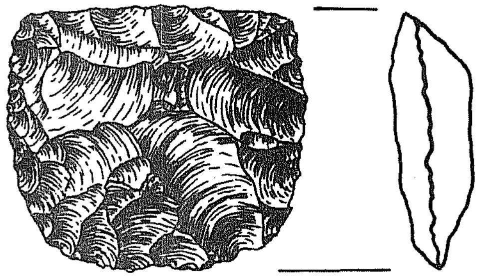
3-3
Spec. 7



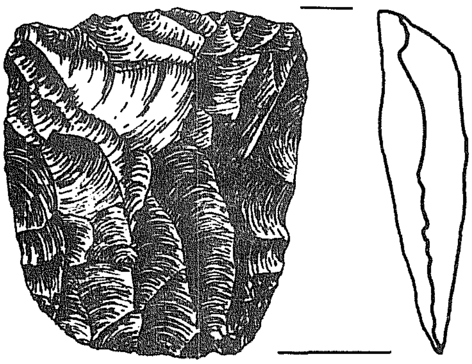
3-3
Spec. 4



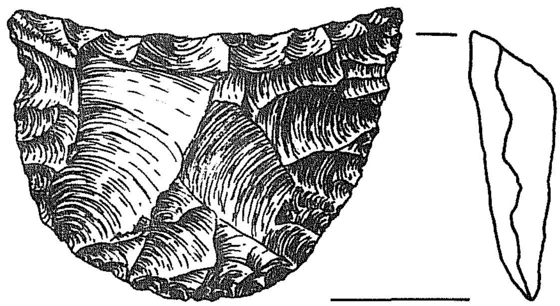
3-3
Spec. 18



3-3
Spec. 5

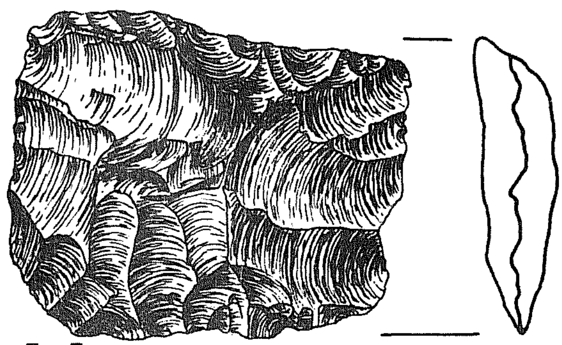


3-3
Spec. 2



3-3
Spec. 21

3-3
Spec. 19



3-3
Spec. 8

K.L.G. 1980

FIGURE 73

Distally Beveled Bifaces and Unifaces (continued)

Form 2. Short, Broad, Subrectangular to Oval (11 Specimens)

Form 2 specimens are generally shorter and wider than Form 1 specimens and are subrectangular to oval. Specimen 5 is made of petrified palmwood. The rest are of chert. Specimen 3 (Fig. 77) was found in Level 11 (97.75-97.65) of Unit N1059 E861 at 41 LK 31/32. Specimen 7 was found in Level 5 of Test Pit 1 at 41 LK 74. All others were surface collected. Specimen 5 retains cortex over 50% of one face.

Form 3. Subtriangular (8 Specimens)

Form 3 specimens are similar in overall shape to Group 1 specimens, distinguished only by the "shovel-shaped" bit. Specimen 5 is made of gray siliceous quartzite. The rest are chert. All specimens were surface collected (Fig. 77).

Form 4. Distal Fragments (6 Specimens)

Although fragmentary, the distinctive bits on these specimens permit their inclusion in Group 7. Specimen 1 was found in Level 6 (98.75-98.55) of Unit N1083 E1108 at 41 LK 31/32. The rest were surface collected.

Group 8. Miscellaneous Forms (34 Specimens)

Among these specimens are five form categories essentially distinct from one another, having only the distal bevel as a common trait (Fig. 78).

Form 1. Triangular to Subtriangular with Steep Bevels (12 Specimens)

These specimens are more-or-less triangular in outline. In size, they are generally smaller than Group 1 and larger than Group 4, two of the other triangular groups described above. Five of the 12 specimens are unifacial. Eight are plano-convex in cross section. The remainder are biconvex. The steepness of the bevels on these specimens distinguishes them from the other groups and forms. Bevel edges are straight to slightly convex. Corners formed by the intersection of the lateral edges with the bit are fairly angular. All specimens are made of chert. Specimen 6 was found in Level 1 of Test Pit 1 at 41 LK 87. The rest were surface collected.

Form 2. Steeply Beveled Sides (5 Specimens)

Form 2 specimens vary from subrectangular to subtriangular in outline. The specimens are distinguished by steep dorsal sides which, in conjunction with the beveled bit, impart an asymmetrically pyramidal configuration to the dorsal

---

Figure 74. *Distally Beveled Bifaces and Unifaces: Group 4.* Group and specimen numbers are shown by each artifact. Specimens are shown at actual size.

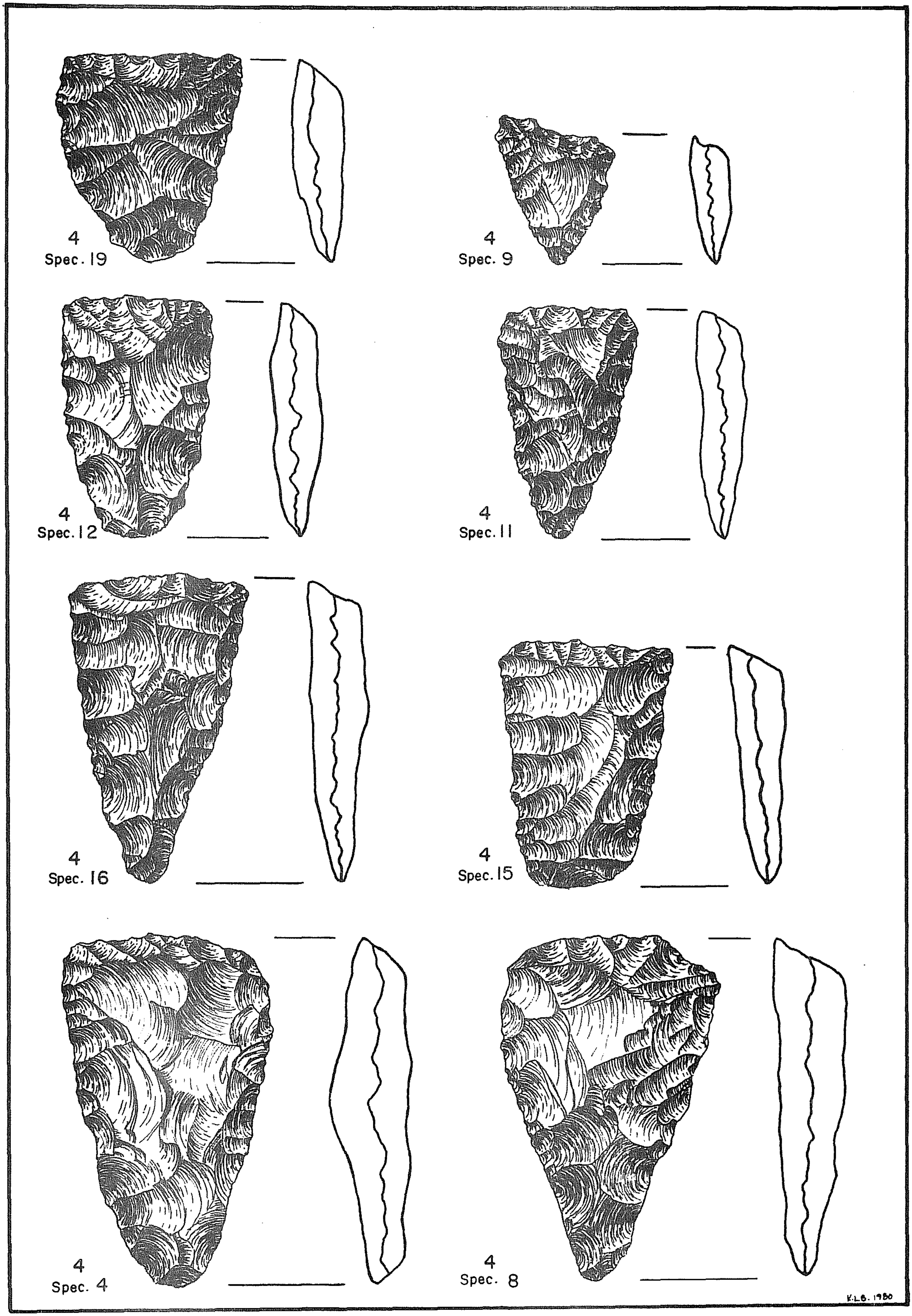

4
Spec. 19
4
Spec. 9
4
Spec. 12
4
Spec. 11
4
Spec. 16
4
Spec. 15
4
Spec. 4
4
Spec. 8
K.L.B. 1980

FIGURE 74

Distally Beveled Bifaces and Unifaces (continued)

face. In this respect, Form 2 specimens are not unlike some specimens of Group 3 described on page 324. However, this form is longer, thicker, and more crudely flaked than any of Group 3. Bevel edges are straight, and distal corners are angular. Specimen 2 (Fig. 78) is made of gray siliceous quartzite. All were surface collected.

Form 3. Offset Bevels (5 Specimens)

This form is characterized by specimens with offset bevels. Outlines vary from subtriangular to elliptical. All are bifacially worked. Two have plano-convex cross sections. The others are biconvex. Four of the bevels are offset to the left, one to the right. All were surface collected.

Form 4. Broad, Flat, Triangular (5 Specimens)

Triangular in outline, Form 4 specimens are wider at the bit end than almost all other specimens in this subclass. They are also comparatively flat and have low-angle bits. Three of the five are unifacially worked. In cross section, they are plano-convex. The bevels are low-angles and not at all pronounced. Four of the specimens retain cortex patches on the dorsal face. All specimens were surface collected.

Form 5. Odd Shapes (7 Specimens)

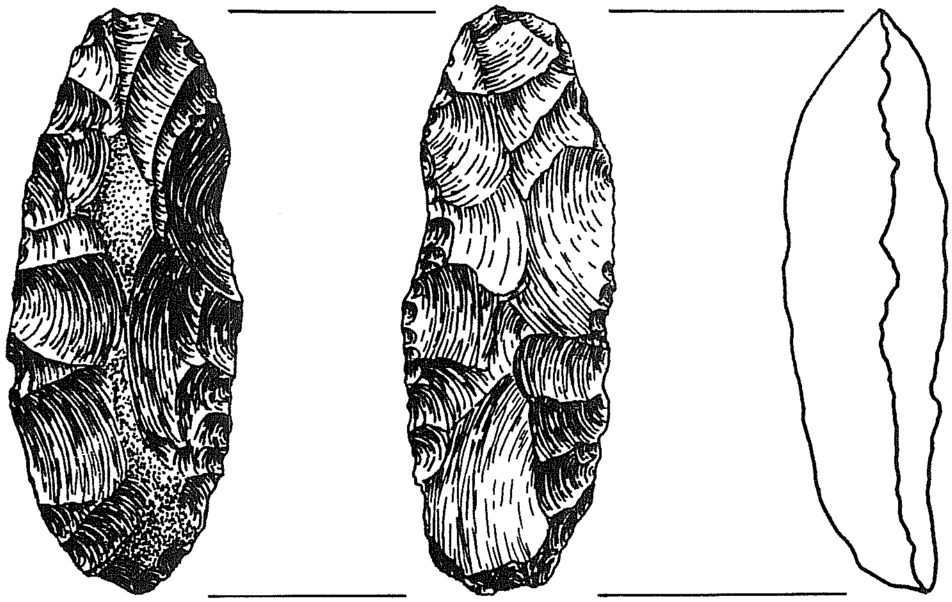
These specimens are characterized by eccentricities of outline, thickness, and dorsal face morphology. The medial portion of Specimen 1 is constricted so that the distal end is abnormally flared. Specimen 3 (Fig. 78) is a long, very thick uniface. The dorsal face has extremely steep sides and a cortex-covered ridge running the length of the specimen. The bevel face is deep and high angled. Specimen 6 is much like the Group 1 specimens. The bevel was obviously formed by a blow, resulting in a hinge fracture at the distal end of the piece. All of the specimens were surface collected.

Group 9. Distal Fragments (23 Specimens)

Group 9 specimens consist of distal (beveled end) fragments retaining too little of the proximal section for inclusion in the above groups and forms. Most, if not all, probably do belong in previously described categories, primarily Groups 2, 3, and 4. Specimens 8 and 14 are made of petrified wood. All others are chert. Four specimens were recovered from subsurface proveniences as follows:

Figure 75. *Distally Beveled Bifaces and Unifaces: Group 6.* Group and specimen numbers are shown by each artifact. Specimens are shown at actual size.

6
Spec. 5



6
Spec. 4

K.L.B. 1980

FIGURE 75

Distally Beveled Bifaces and Unifaces (continued)

SPECIMEN NO.	SITE	UNIT	LEVEL
7	41 LK 59	N955 E557	2 (99.00-98.90 cm)
8	41 LK 67	N903 E1001	4 (98.65-98.60 cm)
14	41 LK 201	Test Pit 1	11
15	41 MC 13	Test Pit 3	8

All other specimens in the group were surface collected.

Discussion

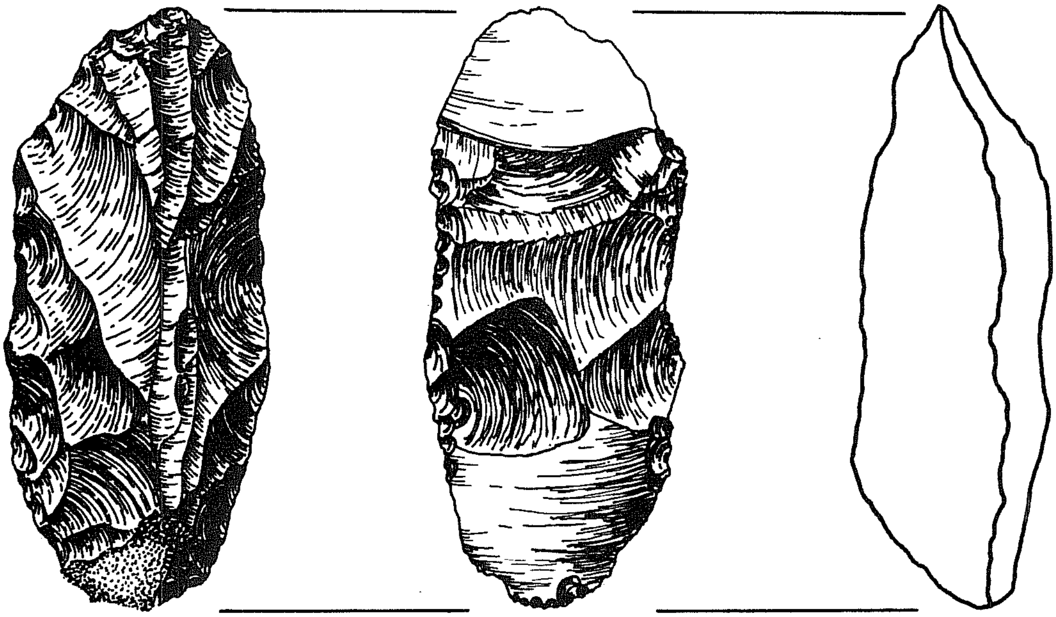
As early as 1928, Cyrus N. Ray recognized the distinctive form of artifact to which he later gave the name "*Clear Fork* gouge," an appellation derived both from the location of his earliest finds (the Clear Fork of the Brazos River) and certain of the stone tool's morphological characteristics suggesting use in a gouging or scraping capacity (Ray 1941). With the exception of the three other named types mentioned below, the term "*Clear Fork* gouge," or simply "gouge" is, in Texas, commonly applied to chipped stone tools exhibiting distal end beveling as a prominent characteristic.

Ray (*ibid.*) divided 441 *Clear Fork* gouges collected from the Abilene region of Texas into six type groupings, based on their extent of facial chipping (bifacial vs. unifacial), outline shape, and cutting edge morphology. Specimens collected at Choke Canyon and sorted into Groups 1-4, more especially Groups 1 and 2, are well within the range of attributes presented by Ray in describing his *Clear Fork* Types 1, 2, and 3. His other three types (4-6) represented by only 27 specimens, are not represented in the Choke Canyon assemblage.

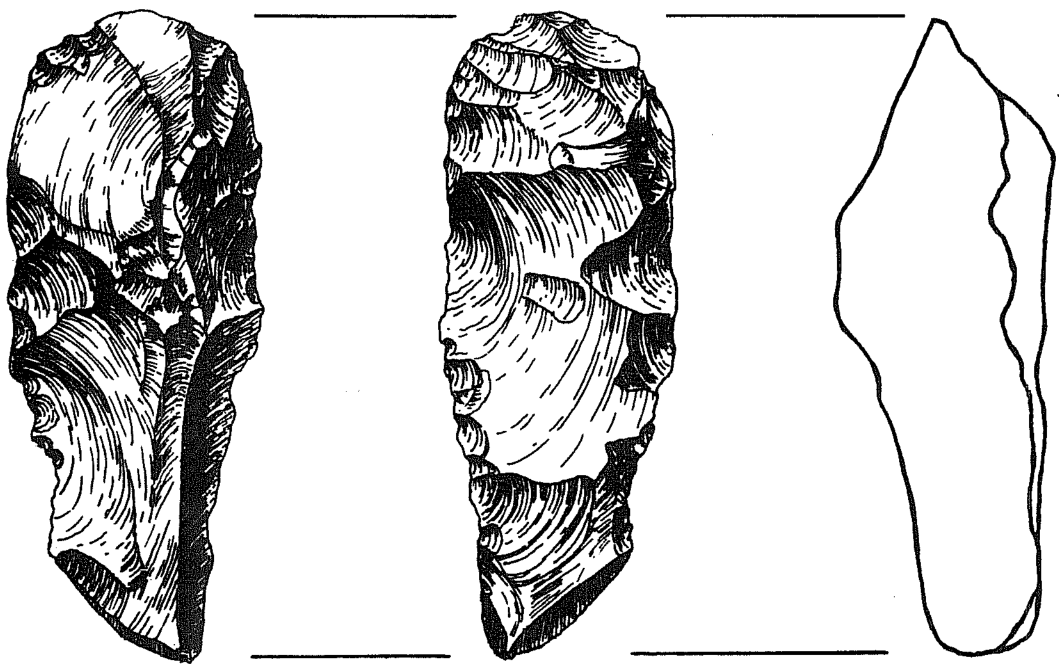
The *Guadalupe* adze (or gouge), *Olmos* biface, and *Nueces* scraper are artifact types finding limited expression in Choke Canyon collections. The *Guadalupe* adze (Group 6, page 328) is a distinctive tool type enjoying rather widespread recognition without benefit of formal definition (Campbell 1976; Calhoun 1965; Fox *et al.* 1974:40; Hester 1980a:113-114). The *Olmos* biface (Hester 1969b; Shafer and Hester 1971) is represented at Choke Canyon by a single specimen (Group 4, Spec. 9). These diminutive artifacts resemble "miniature gouges," being triangular in outline, bifacially worked, and having a bevel at the broad end. Also found at Choke Canyon were a number of specimens like the *Nueces* scraper as defined by Hester, White, and White (1969). In addition to examples of the *Clear Fork, Guadalupe, Olmos,* and *Nueces* tool types, there are at Choke Canyon several other groups of distally beveled implements for which no formal type designations have been set. These specimens in Groups 3, 4, 5, and 7 are by no means unique to Choke Canyon, but simply have not received the individual attention accorded to the above formally established tool types.

Figure 76. *Distally Beveled Bifaces and Unifaces: Group 6.* Group and specimen numbers are shown by each artifact. Specimens are shown at actual size.

6
Spec. 3



6
Spec. 8



K.L.B. 1980

FIGURE 76

Distally Beveled Bifaces and Unifaces (continued)

Distributions

Ray's (1941) *Clear Fork* type collection came from the area around Abilene, Texas. In the years subsequent to publication of Ray's article, *Clear Fork*-like artifacts have been reported from northern Mexico (Epstein 1969), the central and southern sections of the Texas coastal plain (Hester, Gilbow, and Albee 1973; Howard 1973; Fox *et al.* 1974; Chandler 1974; Shiner 1975), central Texas (Weir 1976), and northward into Missouri (Benfer 1971). In a recent study of northerly occurrences of *Clear Fork* tools, Hughes (1980:145) states "that gouges are virtually non-existent on the High Plains; that they occur rarely around the northern edges of the High Plains . . . and that they occur much more frequently around the southern borders of the High Plains . . . ."

The *Guadalupe* tool has a much more restricted known geographic distribution. This form occurs most commonly in the middle and lower reaches of the Guadalupe and San Antonio river drainages on the Texas coastal plain (Calhoun 1965; Hester 1980a:112-113) Fox *et al.* (1974) report *Guadalupe* tools from the Cuero Reservoir area in DeWitt and Gonzales Counties. Two sites in San Antonio, Granburg II (41 BX 271) and Panther Springs (41 BX 228), have yielded a number of *Guadalupe* specimens (Hester and Kohnitz 1975; Stephen L. Black, personal communication).

Olmos bifaces, according to Hester (1980a:114), "are found mainly along the drainage system of Los Olmos Creek, which runs from west of Laredo into Baffin Bay. The tools are especially common in the Baffin and Grullo Bays area near Kingsville, and also along the Los Olmos in Duval County." The single specimen found at Choke Canyon thus occurs farther north than would normally be expected. *Nueces* scrapers (as described by Hester, White, and White 1969) also occur more to the south and west of Choke Canyon. The Oulline site, yielding many of the *Nueces* scrapers studied by Hester, is located in La Salle County west of Choke Canyon.

Chronological Considerations

Of the temporal occurrence of *Clear Fork* tools, Ray (1941:161) stated:

> Their use probably extended back into the Pleistocene to a date comparable with that of the Folsom and Yuma cultures, and also up into the bottom of the lower Burnt Rock Mound Middens . . . It is probable that the long relatively narrow Clear Fork Gouge (Type 3) may be the earliest type, and the smaller specimens of Clear Fork Gouge (Type 1) the latest type. Types 1 and 2 however seem to have had a vogue throughout a tremendous lapse of time.

Later findings tend to support Ray's initial impressions concerning the chronological placement of the various types of *Clear Fork* tools he recognized. At

---

Figure 77. *Distally Beveled Bifaces and Unifaces: Group 7, Forms 1, 2, and 3.* Group, form, and specimen numbers are shown by each artifact. Specimens are shown at actual size.

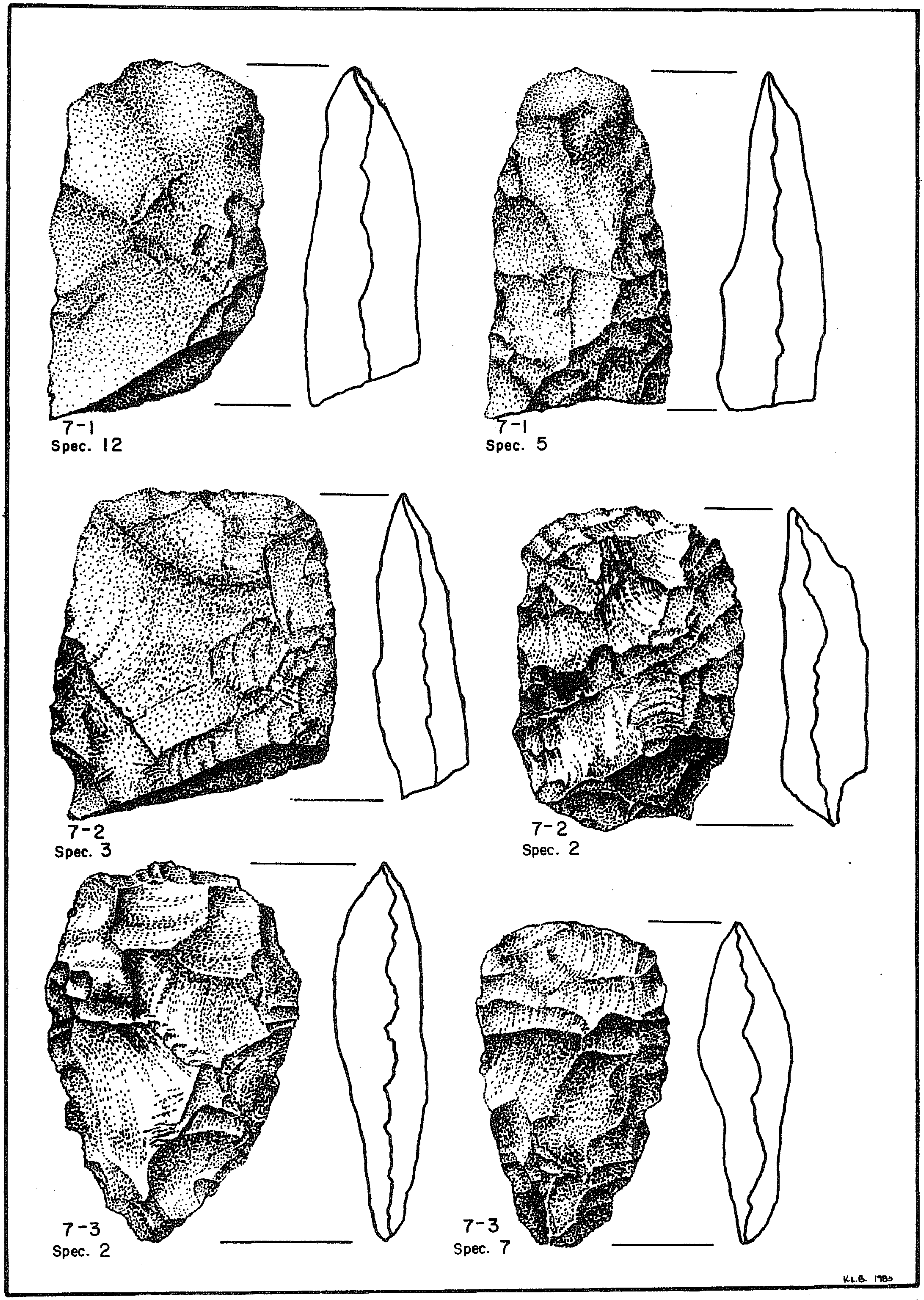

7-1
Spec. 12
7-1
Spec. 5
7-2
Spec. 3
7-2
Spec. 2
7-3
Spec. 2
7-3
Spec. 7
K.L.B. 1980

FIGURE 77

Distally Beveled Bifaces and Unifaces (continued)

the San Isidro site in northern Mexico, Epstein (1969) found *Clear Fork* tools in association with *Golondrina* projectile points, now dated around 7000 B.C. (Hester 1980a:137-138). From deposits representing the time period from 6000 B.C. to 3500 B.C., the Granburg II and Panther Springs sites have yielded *Clear Fork* specimens in association with *Bell, Early Corner-Notched,* and *Early Triangular* projectile point types (T. R. Hester and Stephen L. Black, personal communications). Hester (personal communication) believes that the unifacially worked *Clear Fork* tools are older than otherwise similar bifacial examples. In his discussion of *Clear Fork* tools, Hughes (1980:145) notes that "they are associated with *Angostura* or similar Paleo-Indian points; and that they . . . are characteristic of Early and Middle and possibly some Late Archaic complexes."

The *Guadalupe* tool was apparently in use throughout a much more limited period of time than the various forms of *Clear Fork* tool. *Guadalupe* tools have been found in substantial numbers at the Granburg II and Panther Springs sites along with the previously mentioned *Clear Fork* tools and *Bell, Early Corner-Notched, Early Triangular,* and *Gower*-like projectile points (Hester and Kohnitz 1975; Stephen L. Black, personal communication). This context indicates that the *Guadalupe* form was in use during the time period from 6000 B.C. to 3500 B.C. More specifically, the zone at Granburg II (in Bexar County) containing *Guadalupe* tools yielded a radiocarbon assay of 3600-3400 B.C. (Hester 1980a:147).

The temporal context of *Olmos* bifaces has not been well established. Shafer and Hester (1971:10) note occurrence of the *Olmos* forms on sites containing both Archaic and Late Prehistoric components. Significantly, the implement has been found on sites yielding <u>only</u> Archaic materials, but <u>not</u> on single component Late Prehistoric sites. "This suggests that the *Olmos* form of biface may have begun during Archaic times, and perhaps survived into the late prehistoric era" (*ibid.*). *Nueces* scrapers are likewise not well dated. At the Oulline site in La Salle County, Hester, White, and White (1969) note the predominance of Archaic materials over Paleo-Indian and Late Prehistoric remains found on the site. The numerous *Nueces* scrapers found at the Oulline site are suggested to be Archaic in age.

Of the 239 distally beveled bifaces and unifaces discussed above, 24 were recovered from subsurface excavations. Of these 24, ten specimens came from strata at three sites (41 LK 31/32, 41 LK 67, and 41 LK 201) which yielded carbon in quantities adequate for radiocarbon assays. Although the findings at 41 LK 31/32 and 41 LK 67 are discussed in detail by Scott and Fox (1982) and Brown *et al.* (1982), the radiocarbon assays from these sites having a bearing on the temporal occurrence of distally beveled tools will be briefly discussed. These findings are critical to chronological interpretation of the many other specimens found during the Phase I investigations at Choke Canyon. For the 215 specimens found in surface collections, comparisons with dated forms from both Choke Canyon and surrounding regions are possible, although for the time being, certainly less reliable than the temporal placement of specimens recovered from radiocarbon-dated contexts.

Figure 78. *Distally Beveled Bifaces and Unifaces: Group 8, Forms 1, 2, 3, 4, and 5.* Group, form, and specimen numbers are shown by each artifact. Specimens are shown at actual size.

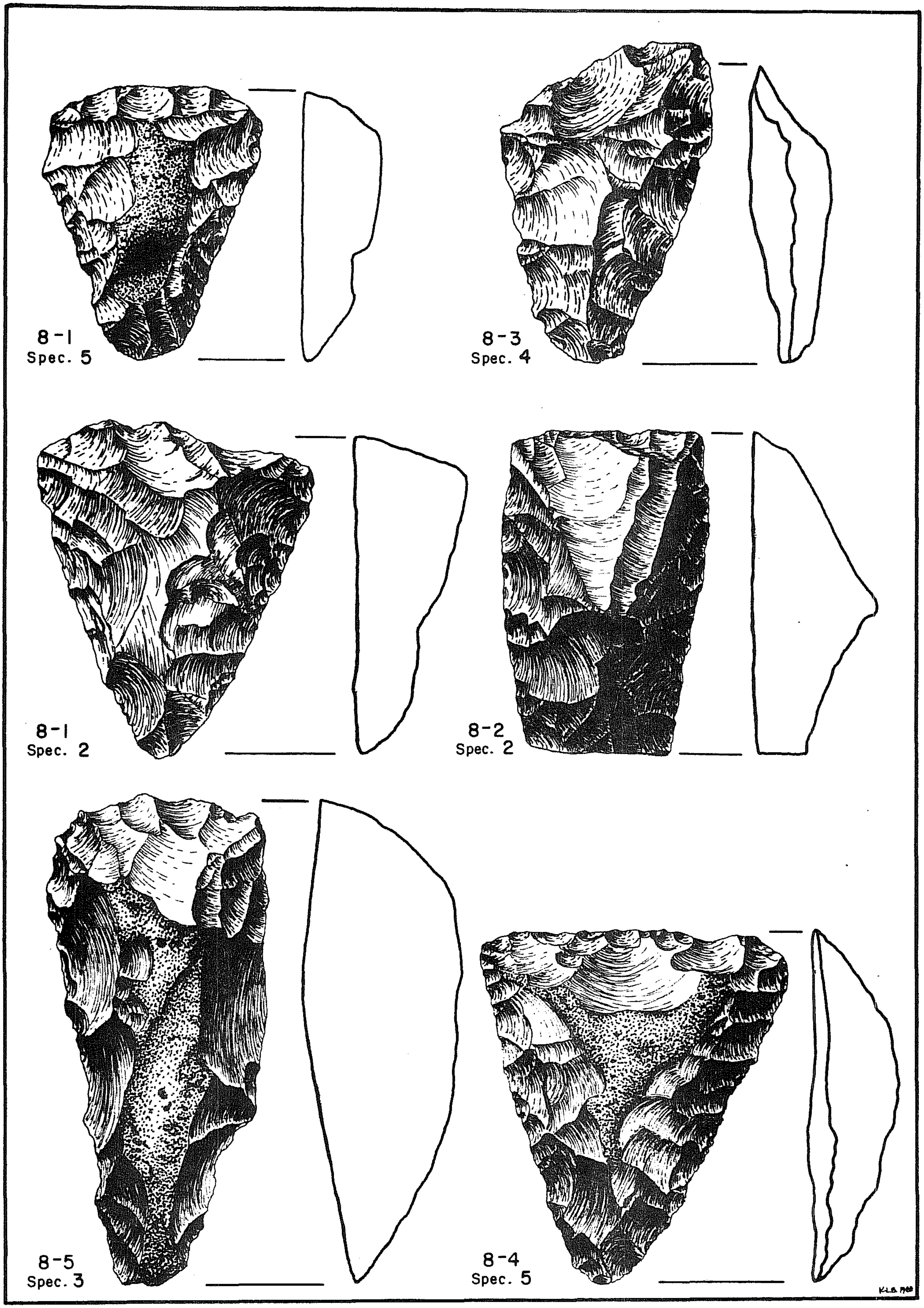


FIGURE 78

Distally Beveled Bifaces and Unifaces (continued)

Proveniences of the 10 specimens recovered from radiocarbon-dated horizons are as follows:

SITE	SPECIMEN NO.	UNIT	LEVEL
41 LK 31/32	6 (Group 3, Form 2)	N1059 E865	97.85-98.75
41 LK 31/32	7 (Group 3, Form 2)	N1065 E875	98.05-97.95
41 LK 31/32	7 (Group 4)	N1061 E873	98.25-98.15
41 LK 31/32	3 (Group 7, Form 2)	N1059 E861	97.75-97.65
41 LK 67	6 (Group 2, Form 2)	N904 E999	98.75-98.70
41 LK 67	7 (Group 2, Form 2)	N846 E1059	98.63-98.55
41 LK 67	12 (Group 4)	N848 E1052	98.40-98.35
41 LK 67	8 (Group 9)	N903 E1001	98.62
41 LK 201	10 (Group 3, Form 2)	Test Pit 3	90-80 cm
41 LK 201	14 (Group 9)	Test Pit 1	110-100 cm

Schematic drawings of all these specimens are presented in Figure 79. Detailed drawings of Group 3, Form 2, Specimen 10; Group 4, Specimen 12; and Group 7, Form 2, Specimen 3 are shown in Figures 72, 74, and 77 of this report. Detailed drawings of specimens from 41 LK 31/32 and 41 LK 67 are provided in separate report volumes for each site.

The four specimens recovered from 41 LK 31/32 were found in a horizon from which radiocarbon assays of 3400 to 2400 B.C. were obtained. At 41 LK 67, four distally beveled tools came from deposits yielding radiocarbon assays in the general range of 1600 to 600 B.C. The two specimens found at 41 LK 201 were in a horizon dated at 1300 B.C.

A comparison of the 10 distally beveled specimens recovered from dated context reveals certain subtle, but definite changes through time in the form of the tool. Division of the specimens into two groups--one composed of specimens from 41 LK 31/32 dating from 3400 to 2400 B.C. (Early Archaic) and the other of six specimens from 41 LK 67 and 41 LK 201 ranging in age from 1600 to 600 B.C. (Late Archaic)--permits a summary of the perceived distinctions. Two of the four Early Archaic specimens are believed to be "classic" examples of the *Clear Fork* tool as defined by Ray (1941). One (Group 3, Form 2, Specimen 6) is unifacial and corresponds to Ray's Type 2 *Clear Fork*. The other specimen (Group 3, Form 2, Specimen 7) is bifacial and much like Ray's Type 1. However, due to apparent intensive resharpening, these two specimens are shortened to a length range and outline consistent with Group 3, Form 2 specimens from a strictly descriptive standpoint. Group 4, Specimen 7 has an indistinctive outline; it is more-or-less subtriangular with a poorly developed bevel and does not appear to be useful as a diagnostic. Group 7, Form 2, Specimen 3 is one of the best examples of the "shovel-shaped" form characteristic of Group 7. Not previously noted in the literature, Group 7 specimens may either be distinct tool forms unto themselves or simply preforms of other varieties of distally beveled tools. Among the six Late Archaic specimens are two triangular forms

---

Figure 79. *Distally Beveled Bifaces and Unifaces Recovered from Radiocarbon-Dated Contexts*. Group, form, and specimen numbers are shown by each artifact.

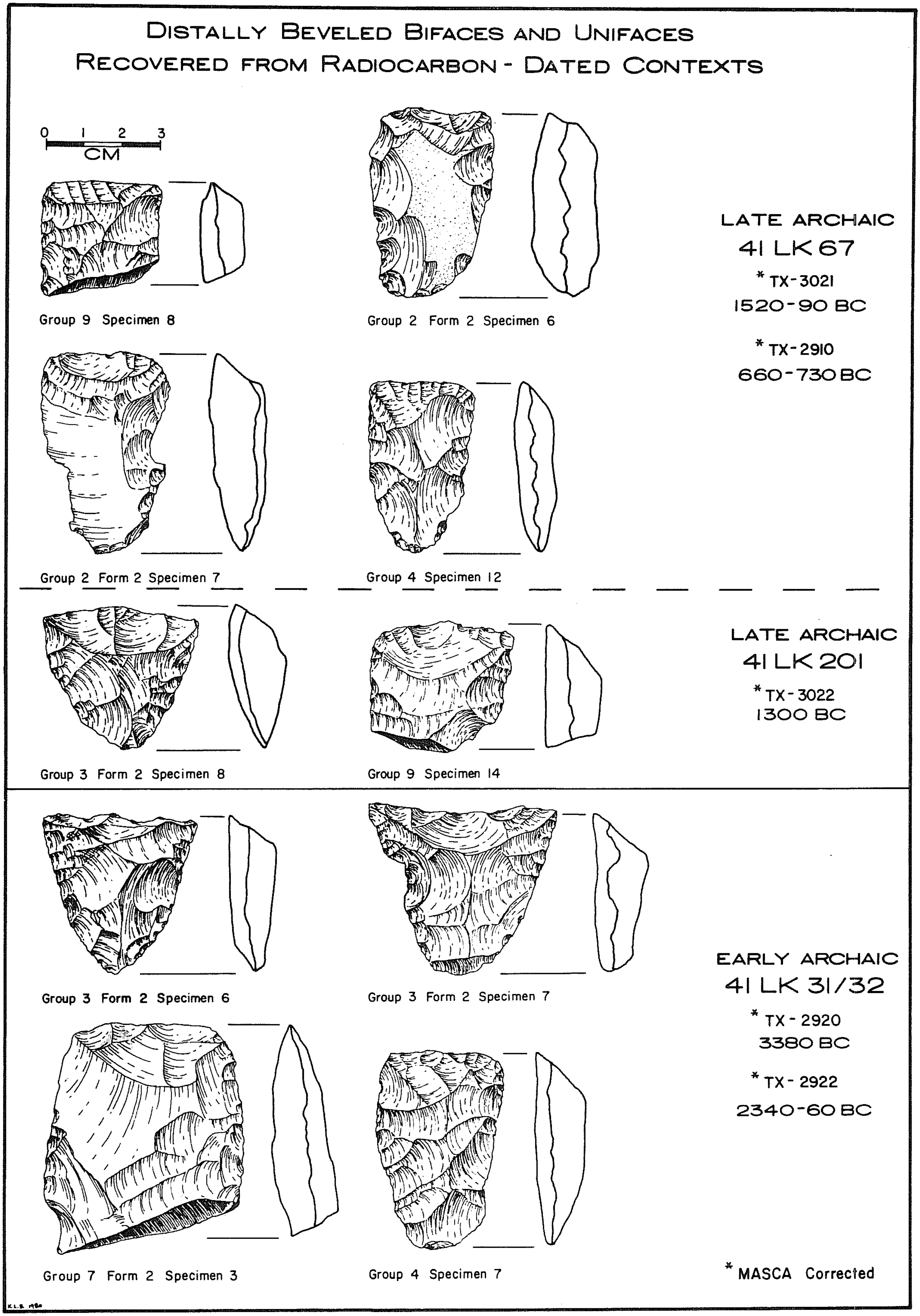

DISTALLY BEVELED BIFACES AND UNIFACES
RECOVERED FROM RADIOCARBON - DATED CONTEXTS
0 1 2 3
CM
Group 9 Specimen 8
Group 2 Form 2 Specimen 6
LATE ARCHAIC
41 LK 67
* TX-3021
1520-90 BC
* TX-2910
660-730 BC
Group 2 Form 2 Specimen 7
Group 4 Specimen 12
LATE ARCHAIC
41 LK 201
* TX-3022
1300 BC
Group 3 Form 2 Specimen 8
Group 9 Specimen 14
Group 3 Form 2 Specimen 6
Group 3 Form 2 Specimen 7
EARLY ARCHAIC
41 LK 31/32
* TX-2920
3380 BC
* TX-2922
2340-60 BC
Group 7 Form 2 Specimen 3
Group 4 Specimen 7
* MASCA Corrected

FIGURE 79

Distally Beveled Bifaces and Unifaces (continued)

(Group 3, Form 2, Specimen 10 and Group 4, Specimen 12), two subrectangular to subtriangular forms (Group 2, Form 2, Specimens 6 and 7) and two distal fragments (Group 9, Specimens 12 and 14) which probably were originally subrectangular to subtriangular or illiptical in outline. Late Archaic (Group 3, Form 2) Specimen 10 is triangular and unifacial and virtually indistinguishable from Early Archaic (Group 3, Form 2) Specimen 6. Group 4, Specimen 12 is triangular and bifacially worked and bears much in common with the Group 1 form, except that it is much smaller. The remaining four Late Archaic specimens are less distinctive. All are considerably different from the four specimens recovered from Early Archaic context. The occurrence of these specimens in Late Archaic contexts suggests that many, if not all, of the Group 2, Form 2 artifacts are also Late Archaic in age.

The major, although at present tentative, differences recognized between the Early and Late Archaic distally beveled tools are found in the size range of specimens representing each assemblage and in the apparent exclusive association of certain forms with each time period. Based upon the limited chronological evidence now available from Choke Canyon and relying upon comparisons of chronological occurrence to similar tool forms in adjacent regions, it is apparent that the largest distally beveled forms are found in Paleo-Indian and Early Archaic assemblages but are not expressed in Late Archaic assemblages. Likewise, the smallest distally beveled tools in the Late Archaic assemblage find no expression (dimension-wise) in the Early Archaic. From the standpoint of morphology, the basic triangular and subtriangular to elliptical forms occur from at least 7000 B.C. on through to 600 B.C. and perhaps even later. Tentatively assigned to the Late Paleo-Indian, Pre-Archaic, Early Archaic, and Late Archaic periods, respectively, the triangular Group 1 and Group 4 specimens are a good example, being similar in shape but quite different in length and thickness. Certain other forms--the best examples from Choke Canyon are the Group 6 (*Guadalupe* tools) and many (but not all) of the Group 3 specimens--appear to be restricted in time to either the Late Paleo-Indian/Early Archaic (in the case of the former) or the Late Archaic (the latter). Relative to *Guadalupe* tools, this suggestion is based strictly on findings made at sites to the north (Granburg II and Panther Springs), since there was no stratigraphic or radiocarbon data collected on this implement during Phase I work at Choke Canyon. While the largest and smallest of the distally beveled tools seem to fall within mutually exclusive time ranges, there remain an array of intermediate-sized tools for which chronological affiliations are still uncertain. The Group 3 tools fall within this category. These specimens are comparatively thin, carefully flaked, and usually almost as wide as they are long. The speculation is that, with the benefit of future stratigraphic, contextual, and radiocarbon data, many will prove to be affiliated with the Late Archaic. Considerable significance is attached to Ray's (1941:161) belief that his Type 3 *Clear Forks* are the oldest gouges to be found in the Abilene area. Attention is called to certain morphological similarities between Ray's *Clear Fork* Type 3 (comparable to Group 2, Form 1, page 325) and the *Guadalupe* tool (Group 6, page 328). Both are long, narrow, and have steep longitudinal ridges on the side opposite the bevel. There is a possibility that these two forms are coeval or that Group 2, Form 2 is a morphological outgrowth of Group 6. Significantly, however, there

Distally Beveled Bifaces and Unifaces (continued)

have been no specimens of Ray's Type 3 *Clear Fork* found along with *Guadalupe* and *Clear Fork* tools at the two Bexar County sites, Granburg II and Panther Springs.

Function: Speculations and Experiments

The function of distally beveled implements has been the subject of much conjecture, some purely speculative and some backed by examination and experimentation. Ray (*ibid.*:161-162) offered the first ideas and, in the process, covered almost the whole gamut of possible functions considered by researchers in later years. He suggested that such tools may have been used (1) for digging tubers, bulbs, or fleshy roots, (2) to make atlatls and dart shafts, (3) to gouge out wooden bowls or other utensils, (4) in hollowing burnt out logs for boats, (5) to remove tree bark for use as a food, and (6) for use in fleshing hides. Ray's (1941:162) final statement on the function of *Clear Fork* gouges was as follows:

> The idea that these tools, and especially those having one flat face-Type 2, were used somewhat like a modern carpenter's steel planer and pushed across a surface, is one I have long held.

For digging and hide fleshing, Ray suggested that the gouges were hafted onto wooden handles. His Type 3 specimens (Group 2, Form 1) he noted "are long enough and fit the hand well enough to have been used without handles" (*ibid.*: 161).

For almost 30 years, Ray's study was the only major work on *Clear Fork* tools. In 1971, Benfer conducted a use-wear study of 24 distally beveled tools found in Missouri. Sixteen of the specimens were called *Clear Fork*. The remaining eight specimens, Benfer felt, did not conform to Ray's definition of the *Clear Fork* type. After fairly extensive microscopic examination, Benfer (1971:27) concluded that wear patterns on *Clear Fork* tools could have resulted from "contact with soil in which grasses were growing (nondomesticated) and used as digging tools in extracting roots, tubers, or other vegetable substances . . . or the *Clear Fork* gouge could also have been used as a pulping tool, or for preparing plant foods in some other fashion."

An account of attempts at using the *Clear Fork* to perform various tasks was published by Howard in 1973. Operating on the basic assumption that *Clear Fork* gouges were used on wood, Howard hafted the tools onto four different types of wooden handles and also tried to use the gouges held in the hand. Howard (1973: 58-59) concluded the following:

> The study strongly suggests that the Clear Fork gouge was the cutting "bit" of an efficient woodworking tool. The experiments demonstrated that the tool was most probably a shaving or planing device. This indicates that the gouge is more closely related in function to the modern wood plane and drawing knife than it is to the adze. Because of its demonstrated efficiency it was probably used for numerous woodworking tasks.

Distally Beveled Bifaces and Unifaces (continued)

> The construction of many types of prehistoric structures may be assumed to have included the use of trees and saplings. Since the experiments demonstrated the efficiency of the gouge for felling trees, it appears reasonable to suspect that this was one of its applications. This possibility is supported by the absence of the stone axe from many of the prehistoric tool assemblages which do include the Clear Fork gouge.

Hester, Gilbow, and Albee (1973) conducted a study of 56 *Clear Fork* tools found in Dimmit and Zavala Counties, southern Texas. After microscopic inspection of the specimens, limited replicative experiments, comparisons with other microwear research, and consideration of available ethnographic evidence, the authors concluded "that these tools were used in the working of wood," but further qualified this statement by noting that they had not yet tried to use the tool form on bone or fibrous plants. In summary, "the data suggest that they were employed more in the manner of end scrapers, to dress and smooth wood surfaces" (Hester, Gilbow, and Albee 1973:95).

From examination of a collection of 22 *Clear Fork* tools from the Falcon Dam area of south Texas, Chandler (1974:18) concluded that the specimens he studied "were probably used in a pushing fashion (i.e., planer gouge) on a hard, unyielding surface, probably wood." He also suggested for the lateral edges of the tools "extensive usage as a scraper with the edge being held at basically right angles to the material being worked."

Unifaces (53 Specimens)

A uniface is a flake or flake fragment exhibiting flake scars over most or all of one face. The opposite face is the unmodified ventral side of the original flake. Unifaces are distinguished from trimmed flakes in that additional chipping has served to modify the overall shape of the pieces so that they no longer resemble the original flake, as do the trimmed flake specimens. Often, but not always, the unifacial shaping has obliterated the flake's striking platform, bulb of percussion, and ventral termination features.

The following six descriptive groups contain artifacts suggested to have served as "scrapers," "gouges," "adzes," or "knives." However, these specimens were not systematically examined for use-wear. The above function-specific terminology is strictly subjective. It is entirely possible that a number of these artifacts are simply preforms of chipped stone tools intended for the uses suggested above or for other uses altogether.

The distinction between unifaces described in the distally beveled bifaces and unifaces section and unifaces described below is somewhat arbitrary in a number of cases, especially among specimens in uniface Group 3. It is probable that some of the specimens included in this subclass were manufactured to serve in the same capacity as were the distally beveled tools. Such flakes, however, do not assume such distinctive forms, either in outline or distal bevel morphology, as do distally beveled specimens.

Unifaces (continued)

Unifaces are divided into the following categories based primarily on shape:

Group 1. Large Elliptical
Group 2. Subcircular to Oval
Group 3. Triangular to Subtriangular
  Form 1. Thick
  Form 2. Thin
Group 4. Truncated or Fragmentary with Rounded Ends
Group 5. Irregular Shapes
Group 6. Fragments with Pointed Ends

Provenience of all unifaces is provided in Tables 15 and 16. Specimens from each group are illustrated in Figure 80.

Group 1. Large Elliptical (10 Specimens)

Specimens in this group are elliptical in outline and plano-convex in cross section. The convex faces of seven specimens are pronouncedly humped. Patches of cortex commonly remain on the highest areas of the convex faces. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	8.8	6.8	7.2
Width Range:	5.5	4.3	4.8
Thickness Range:	2.7	2.0	2.3
Weight Range:	99.0	56.0	79.0
Edge Angle Range:	52-66°	40-48°	46-55°

All Group 1 specimens were surface collected. All are made of fine-grained chert.

Group 2. Subcircular to Oval (9 Specimens)

Group 2 specimens are subcircular to oval in outline, plano-convex in cross section, and uniformly smaller than specimens of Group 1. The convex faces of Specimens 1 and 4 are pronouncedly humped. Four of the specimens retain patches of cortex on the convex face. Metric attributes are:

	Maximum	Minimum	Average
Diameter Range:	5.6	3.8	4.8
Thickness Range:	2.1	1.4	1.6
Weight Range:	45.0	22.0	37.0
Edge Angle Range:	61-63°	34-40°	48-52°

UNIFACES - SITE PROVENIENCE TABLE 15 TRIMMED FLAKES - SITE PROVENIENCE

SITE NO.	GROUP 1	GROUP 2	GROUP 3		GROUP 4	GROUP 5	GROUP 6	GROUP 1	GROUP 2	GROUP 3					GROUP 4					
			FORM 1	FORM 2						FORM 1	FORM 2	FORM 3	FORM 4	FORM 5	FORM 1	FORM 2	FORM 3	FORM 4	FORM 5	FORM 6
41LK8									1					1						
41LK 9																				
41LK10																				
41LK13																				
41LK14	1	1	1							1			1	1						
41LK15					1					2	1									
41LK17										1										
41LK18																				
41LK20																				
41LK27		1						1				1								1
41LK31/32																				
41LK34																				
41LK41								3						1		1				1
41LK48																				
(same as MC30)																				
41LK49																				
41LK50																				
42LK51					1															
41LK52	1			1		1														
41LK53									1											
41LK59																				1
41LK64	1		1	1	2			1			1		1							
41LK65																				
41LK67					1			1											1	
41LK69								1	2						1	1				
41LK73																				
41LK74				1																
41LK75									2											
41LK77																				
41LK83																				
41LK85					1															
41LK86																				
41LK87																				
41LK88																				
41LK91					1	1														
41LK92																				
41LK93																				
41LK94																				
41LK97																				
41LK197																				
41LK198																				
41LK201										4	1	1	1	2			1		1	
41LK202																				
41LK203																				
41LK204	1					1							1						1	
41LK205				1																
41LK206	1																			
41LK207																	1			1
41MC8																				
41MC9																				
41MC10																				
41MC11																				
41MC13													1							
41MC14						1														
41MC15						1										1				
41MC17																				
41MC18																				
41MC19																				

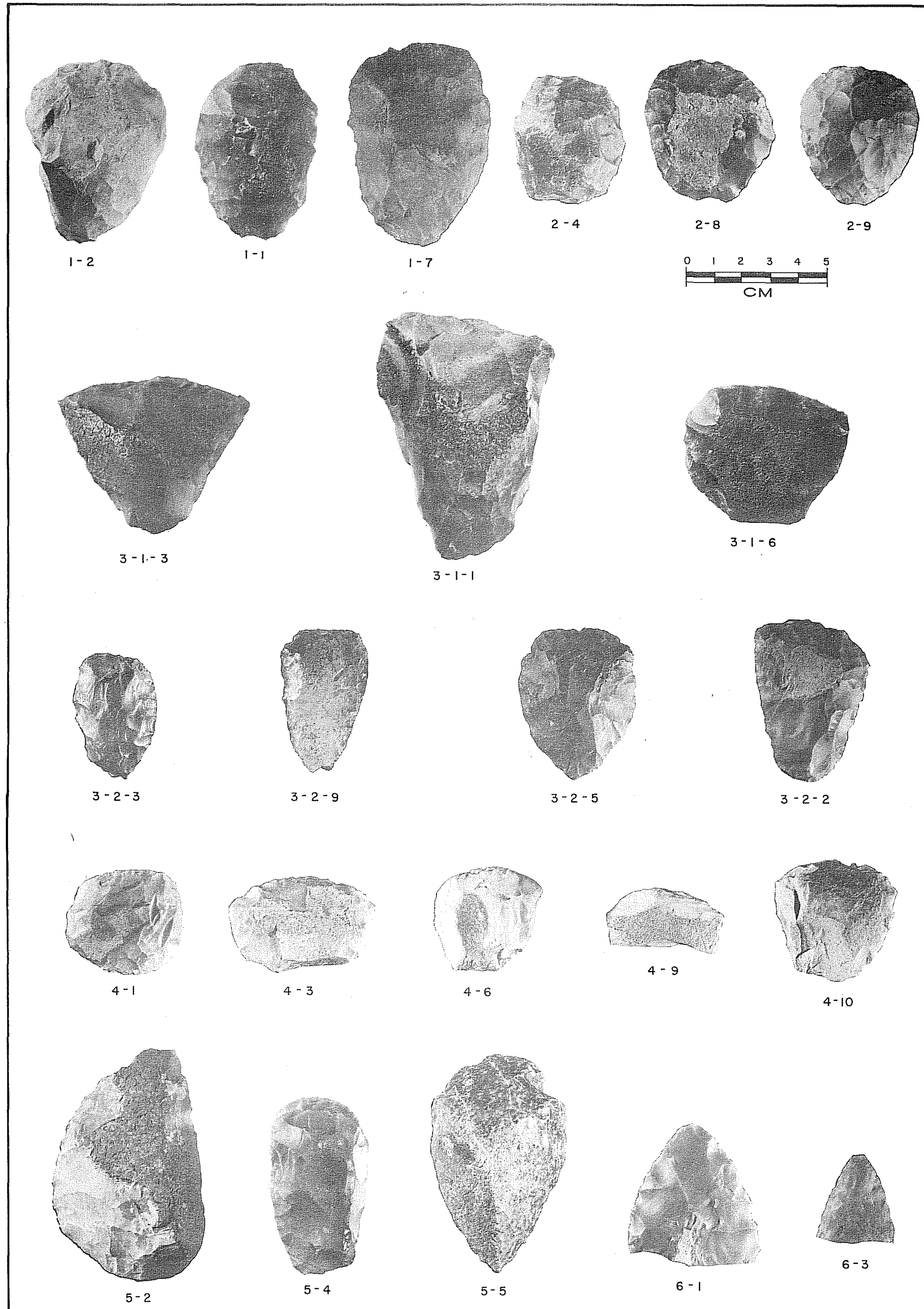
UNIFACES - SITE PROVENIENCE (continued) TABLE 15 TRIMMED FLAKES - SITE PROVENIENCE (continued)

SITE NO.	GROUP 1	GROUP 2	GROUP 3		GROUP 4	GROUP 5	GROUP 6	GROUP 1	GROUP 2	GROUP 3					GROUP 4					
			FORM 1	FORM 2						FORM 1	FORM 2	FORM 3	FORM 4	FORM 5	FORM 1	FORM 2	FORM 3	FORM 4	FORM 5	FORM 6
41MC22																				2
41MC24					1															
41MC25																				
41MC26																				
41MC28																				
41MC29																				
41MC30																				
(Same as LK48)																				
41MC31																				
41MC33									1											
41MC36																				
41MC39																				
41MC40																				
41MC41			2					1												
41MC42		1																		
41MC43																				
41MC44																				
41MC45																				
41MC48																				
41MC50																				
41MC52																				
41MC53																				
41MC54																				
41MC55					1							1	1							
41MC56													1		1					1
41MC57				1																
41MC58																				
41MC59																				
41MC64		1	1					1												
41MC65	1												1							
41MC67																				
41MC68																				
41MC69																				
41MC72								1		1										
41MC74	1																			
41MC75														1						
41MC78																				
41MC79																				
41MC80																				
41MC83																				
41MC84	1	1		1			3		1									1	1	2
41MC86																				
41MC88																				
41MC90																				
41MC91																				
41MC92																				
41MC93																				
41MC94		3	1	1	1			2	1						1					
41MC95	1	1		1		1		1												1
41MC171																				
41MC174	1																			
41MC176																				
41MC177																				
41MC184																				
41MC189																				
41MC219								1												
41MC222																				
41MC223																				
41MC224																				

TABLE 16. UNIFACES--SITE PROVENIENCE BY SPECIMEN NUMBER

SPECIMEN NO.	GROUP	FORM	SITE NO.
1	1	-	41 LK 14
2	1	-	41 LK 52
3	1	-	41 LK 64
4	1	-	41 LK 204
5	1	-	41 LK 206
6	1	-	41 MC 65
7	1	-	41 MC 74
8	1	-	41 MC 84
9	1	-	41 MC 95
10	1	-	41 MC 174
1	2	-	41 LK 14
2	2	-	41 LK 27
3	2	-	41 MC 42
4	2	-	41 MC 64
5	2	-	41 MC 84
6	2	-	41 MC 94
7	2	-	41 MC 94
8	2	-	41 MC 94
9	2	-	41 MC 95
1	3	1	41 LK 14
2	3	1	41 LK 64
3	3	1	41 MC 41
4	3	1	41 MC 41
5	3	1	41 MC 64
6	3	1	41 MC 94
1	3	2	41 LK 52
2	3	2	41 LK 64
3	3	2	41 LK 74
4	3	2	41 LK 205
5	3	2	41 MC 57
6	3	2	41 MC 84
7	3	2	41 MC 84
8	3	2	41 MC 95
9	3	2	41 MC 94
1	4	-	41 LK 15
2	4	-	41 LK 51
3	4	-	41 LK 64
4	4	-	41 LK 64
5	4	-	41 LK 67
6	4	-	41 LK 85
7	4	-	41 LK 91
8	4	-	41 MC 24
9	4	-	41 MC 55
10	4	-	41 MC 94
1	5	-	41 LK 52
2	5	-	41 LK 91
3	5	-	41 LK 204
4	5	-	41 MC 14
5	5	-	41 MC 15
6	5	-	41 MC 95
1	6	-	41 MC 84
2	6	-	41 MC 84
3	6	-	41 MC 84

Figure 80. *Unifaces: Groups 1, 2, 3 (Forms 1 and 2), 4, 5, and 6.* Group, form, and specimen numbers are shown below each artifact.


1-2
1-1
1-7
2-4
2-8
2-9
0 1 2 3 4 5
CM
3-1-3
3-1-1
3-1-6
3-2-3
3-2-9
3-2-5
3-2-2
4-1
4-3
4-6
4-9
4-10
5-2
5-4
5-5
6-1
6-3

Unifaces (continued)

Group 3. Triangular to Subtriangular (15 Specimens)

Group 3 unifaces are triangular to subtriangular in outline and plano-convex in cross section. The 15 specimens are divided into two form categories based upon artifact thickness.

Form 1. Thick (6 Specimens)

Form 1 specimens are beveled at the broad end and perhaps should have been grouped with the distally beveled forms. However, these specimens do not exhibit as distinctive a form either in outline or bevel morphology as do the distally beveled artifacts. Flaking is very crude, and specimens are generally much thicker overall than most of the distally beveled specimens. Metric attributes are as follows:

Specimen Number	Length	Width	Thickness	Weight	Bevel Angle
1	8.8	6.2	3.5	160.0	45-69°
2	5.8	5.3	2.7	81.0	84-89°
3	5.6	6.9	2.1	83.0	56-63°
4	5.2	5.8	2.1	66.0	76-81°
5	4.9	5.1	2.2	60.0	55-66°
6	4.9	5.7	1.8	65.0	61-66°

All six specimens retain cortex on the convex face. Amount of cortex coverage ranges from 20-80%. Specimens 1, 2, and 3 have an asymmetrically pyramidal configuration to their convex faces resulting from steeply flaked sides and ends. All Form 1 specimens were surface collected. All are made of fine-grained chert.

Form 2. Thin (9 Specimens)

Triangular to subtriangular in outline and plano-convex in cross section, these nine specimens are the thinnest and most finely flaked specimens in the uniface subclass. The specimens retain little or no cortex on the convex face. The exceptionally fine flaking around the edges of Specimens 2, 7, and 9 is suggestive of retouch and indicates that these tools may have been used in their present form. Metric attributes are as follows:

Specimen Number	Length	Width	Thickness	Weight	Bevel Angle
1	5.5	4.5	1.5	32.0	51-55°
2	5.8	4.0	1.6	36.0	42-55°
3	4.5	3.1	1.2	17.0	46-54°
4	5.6	3.3	1.8	39.0	56-59°
5	5.3	4.2	1.4	31.0	38-51°
6	4.6	3.9	1.5	29.0	48-53°
7	5.2	3.1	1.4	18.0	35-46°
8	6.0	4.5	1.6	43.0	47-79°
9	5.2	3.1	1.0	19.0	59-71°

Unifaces (continued)

All Form 2 specimens were surface collected. All are made of fine-grained chert.

Group 4. Truncated or Fragmentary with Rounded Ends (10 Specimens)

These specimens vary considerably in outline from irregularly subcircular, to oval to subrectangular. All are plano-convex in cross section. These specimens all have a "stubby" appearance, as well as one end worked to a rounded form. Five of the specimens are made on short, thick flakes retaining platforms, bulbs of percussion, and distal termination features. The remainder are made on flake fragments having sharply angled snap fractures opposite the rounded end. Eight specimens retain patches of cortex on the convex face. The cortex generally occurs on the thickest part of the specimen. Metric attributes are as follows:

	Maximum	Minimum	Average
Length Range:	4.7*	2.1*	3.8*
Width Range:	5.2	3.6	4.4
Thickness Range:	1.9	1.0	1.5
Weight Range:	49.0*	11.0*	30.0*
Edge Angle Range:	71-73°	37-44°	50-63°

Specimen 6 was recovered from Level 2 of Test Pit 2 at 41 LK 85. All others were surface collected. All are made of fine-grained chert.

Group 5. Irregular Shapes (6 Specimens)

Group 5 contains a variety of unusually shaped unifaces. Each one is individually described. Metric attributes of each specimen are as follows:

Specimen Number	Length	Width	Thickness	Weight	Bevel Angle
1	3.2*	3.2	0.9	12.0*	34-40°
2	8.0	5.2	2.7	114.0	46-54°
3	5.3*	6.0	1.7	61.0*	48-70°
4	6.0	3.5	1.8	51.0	60-67°
5	7.8	4.9	2.1	77.0	40-54°
6	5.5*	5.3	2.5	81.0*	51-63°

Specimen 1: Fragmentary, subrectangular to trapezoidal in outline, and slightly plano-convex in cross section, this specimen is much thinner than the rest. One end consists of a snap fracture. The other end is straight, and the lateral edges taper down to it. Retouch is especially apparent along one lateral edge.

Unifaces (continued)

Specimen 2: Made on a large, thick primary flake, this specimen is subcrescentic in outline. The piece is thickest at the cortex platform, with the main body of the flake laterally offset from the axis of the platform and bulb. The edge opposite the platform has been flaked on the convex face to form an ululike tool.

Specimen 3: This specimen is a large tertiary flake fragment with a very irregular outline and plano-convex cross section.

Specimen 4: This specimen is made on a long, very thick cortex platform flake. It is strongly plano-convex (almost prismatic) in cross section and elongate and subrectangular in outline. Such specimens have previously been referred to as "snub-nosed end scrapers."

Specimen 5: This specimen is teardrop shaped in outline and plano-convex in cross section. The convex face has a three-sided pyramidal configuration. One lateral side of the convex face is cortex covered. The specimen is heavily patinated.

Specimen 6: This specimen is generally oval in outline with very sinuous edges and strongly plano-convex in cross section. The flake on which the piece is made is snapped at one end and rounded at the other.

All Group 5 specimens were surface collected. All are made of fine-grained chert.

Group 6. Fragments with Pointed Ends (3 Specimens)

These specimens are triangular in outline and very thin. Each displays a point at one end and a snap fracture at the other. They are probably preform failures. All were surface collected from 41 MC 84.

Trimmed Flakes (75 Specimens)

Trimmed flakes are flakes or flake fragments exhibiting retouch to the extent that a working edge is formed. The flaking on these specimens has not substantially altered the original shape of the flake or flake fragment upon which the tool has been made. Like the unifaces, trimmed flakes are suggested to have served in the functional capacities of "end scrapers," "side scrapers," and "knives." Many may be preforms for other tools described elsewhere in this report. Trimmed flakes are divided into four groups, based primarily on outline:

- Group 1. Circular to Subcircular
- Group 2. Large, Oval to Elliptical
- Group 3. Thin Blade Flakes and Flake Fragments
    - Form 1. Rectangular
    - Form 2. Triangular

Trimmed Flakes (continued)

Form 3. Convergent
Form 4. Divergent
Form 5. Distal Fragments
Group 4. Miscellaneous Thick Flakes and Flake Fragments
Form 1. Divergent
Form 2. Rectangular
Form 3. Offset
Form 4. Split Cobble
Form 5. Fragments with Rounded Ends
Form 6. Unclassifiable Fragments

Site provenience for all trimmed flakes is provided in Tables 16 and 17. Specimens from each group are illustrated in Figure 81.

Group 1. Circular to Subcircular (14 Specimens)

Group 1 specimens are circular to subcircular in outline and plano-convex in cross section. All retain 20-80% cortex on the convex face. All specimens retain obvious striking platforms and bulbs of percussion on their plano faces and edges. The extent of peripheral edge chipping varies from one-third to three-quarters of the circumference. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Diameter Range:	8.2	4.3	5.2
Thickness Range:	3.0	1.3	1.9
Weight Range:	235.0	27.0	63.0
Edge Angle Range:	65-68°	41-58°	55-63°

All Group 1 specimens were surface collected. All are made of fine-grained chert.

Group 2. Large, Oval to Elliptical (9 Specimens)

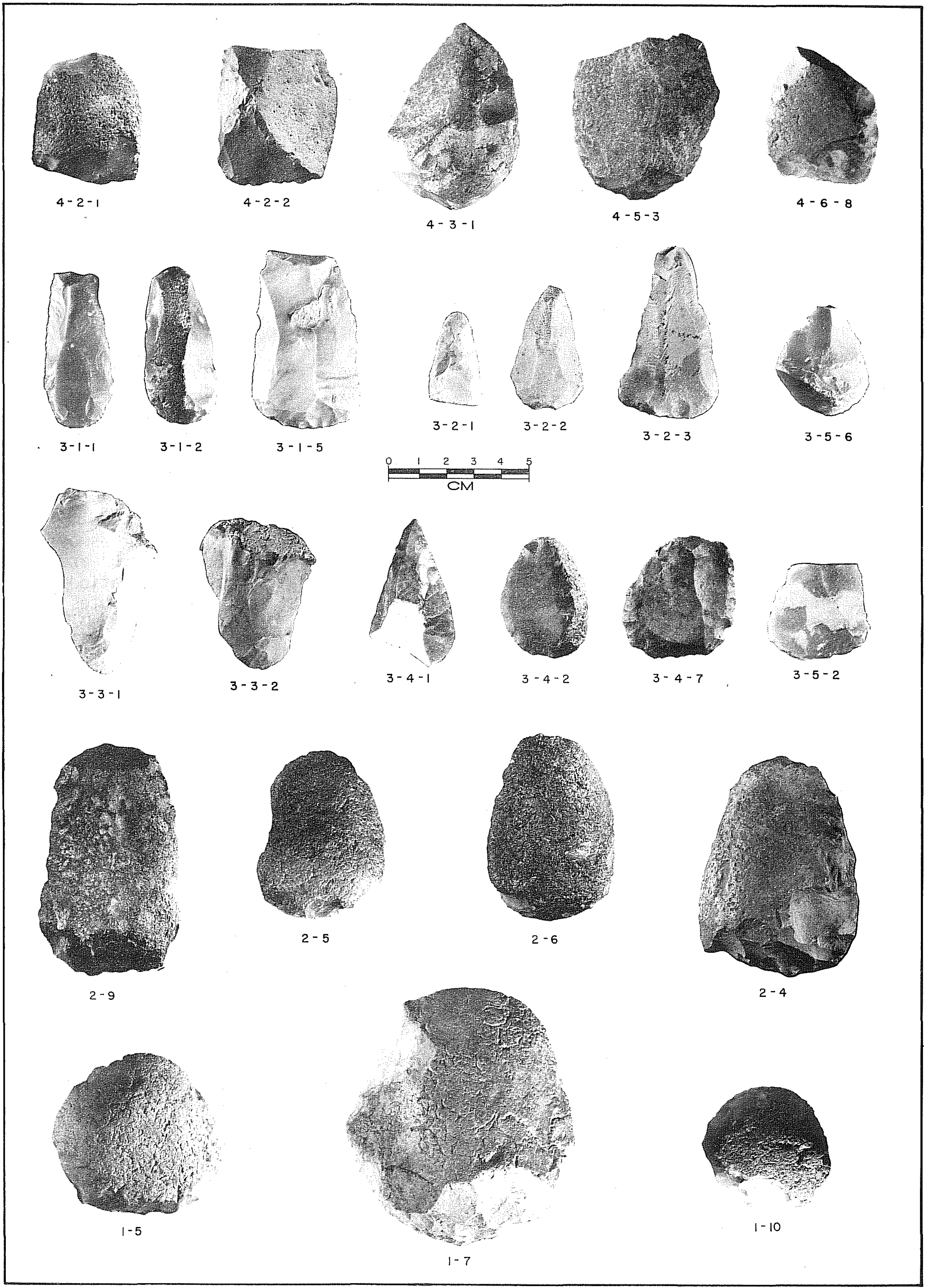
The specimens are the largest in the trimmed flake subclass. They are oval to elliptical in outline and plano-convex in cross section. The convex faces are largely covered with cortex. Chipping has been done on the ends only in five cases and on the side(s) and ends in four cases. Five specimens retain the striking platform and bulb of percussion on the plano face. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	9.3	6.2	7.8
Width Range:	5.9	4.6	5.1
Thickness Range:	2.4	1.3	1.9
Weight Range:	118.0	50.0	83.0
Edge Angle Range:	64-71°	46-47°	55-62°

TABLE 17. TRIMMED FLAKES--SITE PROVENIENCE BY SPECIMEN NUMBER

SPECIMEN NO.	SITE NO.
GROUP 1	
1	41 LK 27
2	41 LK 41
3	"
4	"
5	41 LK 64
6	41 LK 67
7	41 LK 69
8	41 MC 41
9	41 MC 64
10	41 MC 72
11	41 MC 94
12	"
13	41 MC 95
14	41 MC 219
GROUP 2	
1	41 LK 8
2	41 LK 53
3	41 LK 69
4	"
5	41 LK 75
6	"
7	41 MC 33
8	41 MC 84
9	41 MC 94
GROUP 3, FORM 1	
1	41 LK 14
2	41 LK 15
3	"
4	41 LK 17
5	41 LK 201
GROUP 3, FORM 1 (cont.)	
6	41 LK 201
7	"
8	"
9	41 MC 72
GROUP 3, FORM 2	
1	41 LK 15
2	41 LK 64
3	41 LK 201
GROUP 3, FORM 3	
1	41 LK 27
2	41 LK 201
3	41 MC 55
GROUP 3, FORM 4	
1	41 LK 14
2	41 LK 64
3	41 LK 201
4	41 LK 204
5	41 MC 13
6	41 MC 55
7	41 MC 56
8	41 MC 65
GROUP 3, FORM 5	
1	41 LK 8
2	41 LK 14
3	41 LK 41
4	41 LK 201
5	"
6	41 MC 75
GROUP 4, FORM 1	
1	41 LK 69
2	41 MC 56
3	41 MC 94
GROUP 4, FORM 2	
1	41 LK 41
2	41 LK 69
3	41 MC 15
GROUP 4, FORM 3	
1	41 LK 201
2	41 LK 207
GROUP 4, FORM 4	
1	41 MC 84
GROUP 4, FORM 5	
1	41 LK 67
2	41 LK 201
3	41 LK 204
4	41 MC 84
GROUP 4, FORM 6	
1	41 LK 27
2	41 LK 41
3	41 LK 59
4	41 LK 207
5	41 MC 22
6	"
7	41 MC 56
8	41 MC 84
9	"

Figure 81. *Trimmed Flakes: Group 1, Group 2, Group 3 (Forms 1, 2, 3, 4, and 5), and Group 4 (Forms 1, 2, 3, 5, and 6)*. Group, form, and specimen numbers are shown by each artifact.


4-2-1
4-2-2
4-3-1
4-5-3
4-6-8
3-1-1
3-1-2
3-1-5
3-2-1
3-2-2
3-2-3
3-5-6
0 1 2 3 4 5
CM
3-3-1
3-3-2
3-4-1
3-4-2
3-4-7
3-5-2
2-9
2-5
2-6
2-4
1-5
1-7
1-10

Trimmed Flakes (continued)

All Group 2 specimens were surface collected. All are made of fine-grained chert.

Group 3. Thin Blade Flakes and Flake Fragments (29 Specimens)

Form 1. Rectangular (9 Specimens)

These long flakes were apparently struck from prepared cores as evidenced by long, parallel flake scars and ridges running the length of the dorsal faces. The ridges impart a prismatic configuration to the flakes. Form 1 specimens are more-or-less rectangular in outline and prismatic in cross section, the plano surface being the ventral face of the flakes. Striking platforms are retained at one end of each specimen, this end tending to be slightly narrower than the other end. Cortex patches remain on the dorsal (convex) faces of four flakes. Striking platforms are crushed on three specimens. Four remnant platforms are single facet; one is multiple facet. One platform has been obliterated by retouch. Six specimens have been trimmed on the distal end only. The others are trimmed both distally and laterally. Trimmed flakes of this type are elsewhere referred to as "side scrapers" and "end scrapers" and are often found in Late Prehistoric context. A Late Prehistoric affiliation is strongly indicated for these Choke Canyon specimens also. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	7.2	3.8	5.6
Width Range:	4.4	2.4	3.4
Thickness Range:	1.7	0.6	1.1
Weight Range:	48.0	8.0	26.0
Edge Angle Range:	65-71°	45-67°	55-67°

Specimen 5 was recovered from Level 11 of Test Pit 2 at 41 LK 201. The rest were surface collected. The subsurface context of Specimen 5 suggests an affiliation other than Late Prehistoric. Deposits yielding the specimen produced radiocarbon assays of around 1300 B.C. (MASCA corrected). Other specimens, however, were commonly collected along with arrow points and pottery, both at 41 LK 201 and at several other sites. The one specimen recovered from subsurface at 41 LK 201 tentatively suggests that this tool form is not temporally restricted to the Late Prehistoric.

Form 2. Triangular (3 Specimens)

These specimens are much like those of Form 1 except that they are triangular. Single facet striking platforms are retained at the narrow end of each piece. They retain no cortex. Specimen 1 is trimmed both laterally and distally. Specimens 2 and 3 are trimmed only at the distal end. Specimen 1 is probably an arrow point preform, while Specimens 2 and 3 are "end scrapers."

Trimmed Flakes (continued)

Specimen 1 was recovered from Level 1 of Test Pit 4 at 41 LK 15. The others were surface collected. All are made of fine-grained chert. Metric attributes are:

Specimen Number	Length	Width	Thickness	Weight	Bevel Angle
1	3.4	2.0	0.2	3.0	35-37°
2	4.4	2.6	0.6	7.0	62-67°
3	6.3	3.6	0.9	21.0	50-61°

Form 3. Convergent (3 Specimens)

These specimens are described as trimmed convergent flakes. The flakes are broadest at the platform end and taper to a narrower, rounded end. The outline is irregularly subtriangular, and the cross section is plano-convex. Two specimens exhibit cortex platforms, the cortex covering the entire broad end of each specimen. The other specimen has a large multiple facet platform with one lateral facet retaining cortex. Each specimen is trimmed only at the narrow, rounded end. Metric attributes are:

Specimen Number	Length	Width	Thickness	Weight	Bevel Angle
1	6.8	4.3	1.9	36.0	37-43°
2	5.3	4.2	1.4	27.0	26°
3	4.8	4.2	1.3	18.0	66-69°

Specimen 2 was recovered from Level 2 of Test Pit 2 at 41 LK 201 (Late Prehistoric component). All specimens are made of fine-grained chert.

Form 4. Divergent (8 Specimens)

These trimmed flakes are irregularly shaped, but the lateral edges generally diverge from the striking platform. Four specimens are trimmed both distally and laterally. Two specimens exhibit only lateral trimming and two specimens only distal trimming. Metric attributes are:

	Maximum	Minimum	Average
Length Range:	5.3	3.0	4.6
Width Range:	5.2	3.0	4.1
Thickness Range:	1.5	0.7	1.2
Weight Range:	39.0	11.0	23.0
Edge Angle Range:	72-75°	36-39°	52-61°

Specimens 2, 3, and 5 have cortex "backs" opposite their trimmed edges. Specimen 3 was found in Level 11 of Test Pit 1 at 41 LK 201. Specimen 6 came from Level 2 of Test Pit 2 at 41 MC 55. The other specimens were surface collected. All are made of fine-grained chert.

Trimmed Flakes (continued)

Form 5. Distal Fragments (6 Specimens)

These six fragments are very similar in appearance to the distal ends of other specimens in Group 3, especially Forms 1-3. They are suggested to be fragments of such complete forms. They range in length from 2.5-3.6 cm, in width from 2.8-3.6 cm, and in thickness from 0.3-0.8 cm. Specimen 4 was recovered from Level 10 of Test Pit 1 at 41 LK 201. The rest were surface collected. All are made of fine-grained chert.

Group 4. Miscellaneous Thick Flakes and Flake Fragments (23 Specimens)

Form 1. Divergent (3 Specimens)

These specimens are subtriangular in outline. Lengths range from 4.3-5.5 cm, widths from 4.9-6.9 cm, and thicknesses from 1.2-2.2 cm. All are surface collected.

Form 2. Rectangular (3 Specimens)

These specimens are rectangular in outline. Lengths range from 4.0-4.9 cm, widths from 3.8-4.3 cm, and thicknesses from 1.7-2.0 cm. All retain cortex on the convex face. Specimen 1 is trimmed at the end opposite the platform and might be considered a distally beveled tool. Specimen 2 shows trimming on the distal end and one lateral edge. Specimen 3 has both edges and distal end trimmed. All were surface collected and are made of fine-grained chert. They retain platforms and bulbs of percussion on their ventral (plano) faces.

Form 3. Offset (2 Specimens)

These two trimmed pieces are teardrop shaped in outline and consist of flakes which, when struck from the core, trended sideways from the axis perpendicular to the striking platform. Each piece was then trimmed along the edge opposite the striking platform. Both retain cortex over most of the convex (dorsal) face. Specimen 1 is 6.5 cm long, 4.7 cm wide, and 2.3 cm thick. Specimen 2 is 5.6 cm long, 3.9 cm wide, and 1.6 cm thick. Both were surface collected.

Form 4. Split Cobble (1 Specimen)

This unique trimmed flake was made by splitting a chert cobble. It is irregularly subcircular in outline and extremely thick. The ventral (plano) face retains vestiges of a platform and a distinct bulb of percussion. One lateral edge has been trimmed to a steep, sharp edge. The remainder of the dorsal (convex) face is covered with cortex. Length is 9.6 cm, width 7.4 cm, and thickness 4.0 cm. Edge angle is 60°. This specimen was surface collected from 41 MC 84.

Trimmed Flakes (continued)

Form 5. Fragments with Rounded Ends (4 Specimens)

These specimens have sharp angular breaks at one end and are trimmed to a rounded shape at the other end. Lengths range from 2.6-6.2 cm, widths from 4.4-5.3 cm, and thicknesses from 1.4-2.5 cm. All were surface collected.

Form 6. Unclassifiable Fragments (10 Specimens)

These 10 specimens are fragments of trimmed flakes. Outlines are generally angular and range from subrectangular to subcircular to subtriangular. Metric attributes are summarized as follows:

	Maximum	Minimum	Average
Length Range:	6.0	3.0	4.3
Width Range:	4.7	2.8	3.7
Thickness Range:	1.7	0.7	1.2

All were surface collected.

Debitage

A total of 21,192 pieces of lithic debitage was recovered during the course of Phase I investigations at Choke Canyon. Debitage totals by site are presented in Table 18. This total does not include debitage recovered from 41 LK 31/32 (9246 pieces) and 41 LK 67 (8292 pieces). Debitage collections from these two sites are reported by Scott and Fox (1982) and Brown, Potter, Hall, and Black (1982).

All debitage recovered from Phase I controlled excavations was sorted by catalog lot (usually representing all debitage found in a 5-cm or 10-cm vertical level excavated in a 1-m^2 unit) into the following categories: primary flakes, secondary flakes, tertiary flakes, chips, and chunks. A total and percentage for each category was recorded and is given in Table 19. Pieces in each category were then classified according to flake platform characteristics (for flakes) and degree of cortex removal (for chips and chunks). Subtotals for these divisions were recorded within each category. The number of modified or trimmed pieces within each division was recorded. Debitage was broken down as follows:

I. Primary Flakes
    A. Cortex Platform
        1. Modified
        2. Trimmed
    B. Single Facet Platform
        1. Modified
        2. Trimmed
    C. Other Platform Types
        1. Modified
        2. Trimmed

Debitage (continued)

II. Secondary Flakes
- A. Cortex Platform
  1. Modified
  2. Trimmed
- B. Single Facet Platform
  1. Modified
  2. Trimmed
- C. Small Multiple Facet Platform
  1. Modified
  2. Trimmed
- D. Large Multiple Facet Platform
  1. Modified
  2. Trimmed
- E. Lipped
  1. Modified
  2. Trimmed

III. Tertiary Flakes
- A. Single Facet Platform
  1. Modified
  2. Trimmed
- B. Small Multiple Facet Platform
  1. Modified
  2. Trimmed
- C. Large Multiple Facet Platform
  1. Modified
  2. Trimmed
- D. Lipped
  1. Modified
  2. Trimmed

IV. Chips
- A. Cortex
  1. Modified
  2. Trimmed
- B. Partial Cortex
  1. Modified
  2. Trimmed
- C. No Cortex
  1. Modified
  2. Trimmed

V. Chunks
- A. Cortex
- B. Partial Cortex
- C. No Cortex

The following definitions of the classifications above were adapted from studies by Crabtree (1972), Shafer (1969) and Mallouf (1976).

A primary flake retains cortex over its entire external or dorsal surface and is the result of the initial testing and/or removal of cortex from a cobble core. A primary flake may have a striking platform devoid of cortex.

A secondary flake retains 1-99% cortex on its external or dorsal surface as a result of having been struck from a core partially free of cortex.

A tertiary flake, including its striking platform, is devoid of cortex.

A cortex platform flake possesses a platform of unmodified, weathered cortex.

A single facet platform flake possesses a platform consisting of a single removal scar (facet) produced by previous knapping.

A multiple facet platform flake possesses a platform consisting of two or more facets produced by previous knapping. It has been subdivided into <u>small</u> (< 1 cm) and <u>large</u> (> 1 cm) according to the width of combined facets.

Debitage (continued)

Lipped flakes "have multifaceted, lenticular-shaped striking platforms and a characteristic lip or ridge which is at right angles to the axis of removal on the ventral side. The striking platforms are bifacially prepared and multifaceted. The dorsal side of the flake is multifaceted and rarely exhibits cortex. Lipped flakes are characteristically thin and arched" (Shafer 1969:4)

A chip is a portion of a flake which has no platform because of breakage, crushing, or shattering. It has been subdivided into primary, secondary, and tertiary according to the amount of cortex remaining on the external surface.

A chunk is a fragment showing no striking platform and no force rings (bulbs of percussion) emanating from the direction of applied force. Thickness approaches maximum length and width. It is too small to be a core and too large and massive to qualify as a chip. It has been subdivided into primary, secondary, and tertiary according to the amount of cortex remaining on the external surface.

A modified flake or chip may have been used as a tool. Such use is evidenced by minute nicking, battering, or polish along the edge(s) of the flake or chip.

A trimmed flake or chip exhibits intentional edge preparation through removal of a uniform series of tiny flakes along an edge. It is distinguished from modified flakes and chips in that human alteration of the piece is unquestionable (Mallouf 1976).

For primary flakes, the "Other Platform Types" division was intended to include lipped and multiple facet platform flakes, both of which were very minor elements of the primary flake collection.

Among secondary and tertiary flakes, lipping was a characteristic given precedence over platform faceting. Lipped flakes had either single facet or multiple facet platforms, but were always counted as lipped flakes.

Modified flakes were recognized through unenhanced eye inspection of the debitage as it was being sorted. No microscopic inspection was attempted. It is therefore likely that some modified flakes were not seen and that some believed to be modified actually were not.

Chipped Stone Tool Rock Material Types

The nonchert rock types, especially petrified woods and chalcedonys, used in the manufacture of some of the chipped stone tools collected in Phase I investigations at Choke Canyon are an eye-catching element of the total chipped stone tool assemblage. Perhaps because of their aesthetic appeal or perhaps because they stand out so clearly against a background of plain tan, brown, and gray cherts, the nonchert specimens seem to comprise a substantial percentage of the total chipped stone tool inventory. The actual contribution of nonchert materials to the assemblage is negligible (Table 20), less than 5%.

TABLE 18. DEBITAGE TOTALS BY SITE

SITE	TOTAL PIECES	SITE	TOTAL PIECES
41 LK 8	1929	41 MC 9	137
41 LK 13	8	41 MC 13	313
41 LK 14	1983	41 MC 15	1081
41 LK 15	1003	41 MC 17	590
41 LK 17	305	41 MC 19	1142
41 LK 34	16	41 MC 24	99
41 LK 41	711	41 MC 25	6
41 LK 49	29	41 MC 26	85
41 LK 51	1595	41 MC 29	352
41 LK 53	995	41 MC 30	179
41 LK 59	1685	41 MC 31	56
41 LK 74	843	41 MC 39	712
41 LK 77	33	41 MC 55	535
41 LK 85	318	41 MC 75	334
41 LK 87	401	41 MC 84	463
41 LK 88	52	41 MC 86	222
41 LK 91	633	41 MC 177	104
41 LK 94	152	41 MC 222	966
41 LK 201	1125		

Site by site breakdowns of debitage into the 53 analytical/descriptive units discussed above are provided in Appendix IX.

TABLE 19. DEBITAGE COUNTS AND PERCENTAGES BY SITE

SITE	PRIMARY COUNT	PRIMARY PERCENTAGE	SECONDARY COUNT	SECONDARY PERCENTAGE	TERTIARY COUNT	TERTIARY PERCENTAGE	CHIPS COUNT	CHIPS PERCENTAGE	CHUNKS COUNT	CHUNKS PERCENTAGE
41 LK 8	40	2.07	448	23.23	741	38.41	599	31.05	101	5.24
41 LK 13	1	12.50	1	12.50	2	25.00	4	50.00	0	0
41 LK 14	34	1.72	338	17.05	450	22.69	1104	55.67	57	2.87
41 LK 15	24	2.39	141	14.06	227	22.63	605	60.32	6	0.60
41 LK 17	4	1.31	52	17.04	69	22.63	165	54.10	15	4.92
41 LK 34	0	0	1	6.25	2	12.50	11	68.75	2	12.50
41 LK 41	12	1.69	115	16.17	153	21.52	410	57.67	21	2.95
41 LK 49	2	6.90	8	27.58	8	27.59	11	37.93	0	0
41 LK 51	17	1.06	217	13.61	411	25.77	943	59.12	7	0.44
41 LK 53	10	1.00	107	10.95	212	21.31	651	65.43	13	1.31
41 LK 59	34	2.02	329	19.53	514	30.50	744	44.15	64	3.80
41 LK 74	12	1.42	191	22.66	230	27.28	409	48.52	1	0.12
41 LK 77	1	3.03	14	42.42	7	21.21	11	33.34	0	0
41 LK 85	2	0.63	51	16.04	63	19.81	198	62.26	4	1.26
41 LK 87	11	2.74	82	20.45	81	20.20	221	55.11	6	1.50
41 LK 88	1	1.91	12	23.08	12	23.08	27	51.92	0	0
41 LK 91	7	1.11	122	19.27	181	28.59	319	50.39	4	0.64
41 LK 94	0	0	35	23.03	40	26.31	75	49.34	2	1.32
41 LK 201	19	1.69	224	19.91	369	32.80	505	44.89	8	0.71
41 MC 9	0	0	23	16.79	37	27.01	76	55.47	1	0.73
41 MC 13	3	0.95	48	15.34	79	25.24	183	58.47	0	0
41 MC 15	6	0.56	176	16.28	321	29.69	571	52.82	7	0.65
41 MC 17	5	0.85	117	19.83	206	34.92	260	44.07	2	0.33
41 MC 19	10	0.88	193	16.90	385	33.71	548	47.99	6	0.52
41 MC 24	0	0	14	14.14	28	28.28	57	57.58	0	0
41 MC 25	0	0	4	66.67	2	33.33	0	0	0	0
41 MC 26	0	0	0	0	31	36.47	54	63.53	0	0
41 MC 29	1	0.29	40	11.36	139	39.49	169	48.01	3	0.85
41 MC 30	2	1.11	47	26.26	53	29.61	73	40.78	4	2.24
41 MC 31	0	0	5	8.93	19	33.93	31	55.36	1	1.78
41 MC 39	5	0.71	121	16.99	213	29.92	367	51.54	6	0.84
41 MC 55	3	0.56	75	14.02	140	26.17	315	58.88	2	0.37
41 MC 75	15	4.49	67	20.06	97	29.04	152	45.51	3	0.90
41 MC 84	9	1.94	101	21.81	128	27.65	225	48.60	0	0
41 MC 86	0	0	46	20.72	77	34.69	99	44.59	0	0
41 MC 177	3	2.88	16	15.39	31	29.81	54	51.92	0	0
41 MC 222	6	0.60	162	16.77	341	35.30	451	46.69	6	0.62

TABLE 20. ROCK MATERIAL TYPE SUMMARY--CHIPPED STONE TOOLS

Artifact	Total Specimens	Petrified Wood	Chalcedony	Siliceous Quartzite	Quartzite	Sandstone	Felsite	Percent Nonchert
Cores	1307	29	11	7	7	2	2	4.4
Thick Bifaces	626	17	9	7	6	3	0	6.7
Thin Bifaces	1029	7	22	3	11	1	0	4.3
Distally Beveled Bifaces & Unifaces	239	8	0	7	2	0	0	7.1
Unifaces	53	0	0	0	0	0	0	0
Trimmed Flakes	75	0	0	0	0	0	0	0

TOTAL ARTIFACTS = 3329

TOTAL NONCHERT ARTIFACTS = 161

PERCENT NONCHERT ARTIFACTS = 4.8

Chipped Stone Tool Rock Material Types (continued)

In Dimmit and Zavala Counties to the west of Choke Canyon, the more frequent use of gray siliceous quartzite in the manufacture of *Clear Fork* tools has been noted (Hester, Gilbow, and Albee 1973:95). In experiments conducted by these researchers, this rock type was found to be "extremely hard and durable." Based on these qualities, they suggest that gray siliceous quartzite may have been specifically selected by prehistoric people for making their *Clear Fork* tools. Although nonchert rock types were somewhat more prevalent in Groups 1 and 2 of the distally beveled bifaces and unifaces (page 318), they still did not occur in quantities suggesting a preference for such materials over chert.

More generally, the ratio of chert to nonchert chipped stone tools at Choke Canyon is felt to reflect a combination of the availability and workability of lithic raw materials used for knapping. Chert is much more common locally than are most of the other rock types represented. Chert is also an easier material to knap than are most of the nonchert rock types. Significantly, the two most commonly used nonchert rocks were petrified wood and chalcedony, both having fine-grained structures more akin to chert than are the other hard, coarse-grained materials.

Patination of Chipped Stone Tools

Of 3329 chipped stone artifacts recovered during Phase I investigations at Choke Canyon, 520 (about 16%) evidence varying degrees of patination. Patinated lithics were recovered from 41 (34%) of the 119 sites from which collections were made. In an effort to determine the correlation between patination and relative ages of chipped stone artifacts, the occurrence of patinated specimens within each chipped stone subclass (except debitage) was recorded. A distinction was made between surface and subsurface recoveries. Subjective determinations of degree of patination--light, medium, or heavy--were made on each specimen. Type names of reliable time-diagnostic artifacts were noted. Finally, the landform setting and soil type for each site yielding patinated lithics were noted.

Of 520 patinated specimens, only 70 (13%) were recovered from subsurface excavations. Significantly, 38 of these subsurface recoveries were made in excavation of Late Archaic and Late Prehistoric deposits at 41 LK 67. The other site given major subsurface attention during Phase I, 41 LK 31/32, yielded only one patinated artifact from subsurface context. The primary focus of the investigation at this site was on Early and Middle Archaic components.

Based on subjective observation, 222 specimens were lightly patinated, 164 moderately patinated, and 134 heavily patinated. There are no apparent inequities in the distribution of specimens in each of these three groups among sites yielding patinated materials. At sites with larger numbers of patinated artifacts, the materials often divide more-or-less equally among the three degrees. The numbers do show, however, that light and moderate degrees of patination are most common.

Patination of Chipped Stone Tools (continued)

Among the patinated thin bifaces, 12 specimens fall into reliable time-diagnostic typological groupings. Patinated dart points include four *Pedernales*, three *Tortugas*, two *Langtry*, and one *Ensor*. Two *Perdiz* arrow points were lightly patinated. These bifaces represent Middle Archaic, Late Archaic, and Late Prehistoric periods in the cultural sequence. Among the distally beveled bifaces and unifaces (including *Clear Fork* tools), there were 41 patinated specimens representing all of the morphological/descriptive groups except Group 6, the *Guadalupe* tools. Absence of patination from *Guadalupe* tools is significant in that they are among the earliest chipped stone tools found at Choke Canyon. The few other early chipped stone tools found during Phase I (i.e., *Scottsbluff*, *Angostura*, and *Bell* points) showed no signs of patination.

In comparing the distribution of patinated and nonpatinated chipped stone materials by landform setting, it was found that patinated artifacts occur most commonly at sites located in valley margin and Pleistocene terrace contexts. Otherwise, the occurrence of sites with and without patinated materials is more-or-less uniform throughout floodplain (channels, drainages, and sloughs) upland situations.

Other factors having a possible bearing on the patination question include soil type, soil chemistry, and the physical constitution of individual specimens. Cursory examination of USDA soil types and limited soil chemistry data yielded no immediate insights into the problem, but were by no means exhaustively probed. The elemental, chemical, and mineralogical constitution of a stone tool may also determine in some way whether or not the tool will patinate. Analysis aimed at determining what role such physical properties may play in the development of patina on stone tools is far beyond the scope of this work, but certainly merits further consideration. A tendency for light brown and tan cherts to patinate more frequently and to a greater degree has been noted in the Choke Canyon assemblage. This suggests that individual physical properties may indeed influence the formation of patina on chipped stone.

In summary, it appears that patination is not a direct function of age in the sense that an older chipped stone tool is more likely to have a patina. A site's landform situation seems to have some influence on whether or not patination occurs, although patinated materials have been found in all settings at Choke Canyon. Valley margins and Pleistocene terraces are relatively more ancient landform features where, either through erosion or nondeposition, surfaces are likely to be exposed over long periods of time. The patination evident in the Choke Canyon assemblage is most probably a result of the duration of surficial exposure, soil chemistry, physical properties of the lithic material, or a combination of all three.

HAMMERSTONES

Hammerstones in a variety of sizes and of several different rock types were found during the Phase I investigation at Choke Canyon. All consist of stream-rolled cobbles exhibiting varying intensities of pecking and battering on their

Hammerstones (continued)

ends and around their circumferences. Oval to elliptical outlines are most common, but other irregular, elongate forms are also present. The specimens are made commonly of quartzite. Chert and igneous rocks are also present. All rock types are found in the gravels of the Frio River. The 17 specimens are divided into two groups: probable hammerstones and possible hammerstones.

Group 1. Probable Hammerstones (10 Specimens)

Specimen Number	Site	Length	Width	Thickness	Weight
1	41 LK 41	5.8	3.9	3.2	106
2	41 LK 51	7.8	6.8	4.0	274
3	41 LK 52	8.9	6.5	6.1	475
4	41 LK 64	6.8	5.9	4.2	214
5	41 LK 201	16.5	9.6	6.9	1384
6	41 LK 201	10.5	7.4	6.3	784
7	41 LK 204	6.6	5.0	4.3	188
8	41 MC 19	6.3	4.9	2.9	126
9	41 MC 65	8.5	7.3	5.0	409
10	41 MC 94	8.2	5.4	4.2	268

The shapes of these 10 specimens and the clear evidence of battering on the ends and edges are the bases for the designation "probable hammerstones." Specimen 5 is made of an igneous material, probably felsite. Specimens 9 and 10 are made of chert. The remainder are made of quartzite. Specimen 8 was recovered as a component or association of Feature 3, a burned rock concentration encountered in Level 4 of Test Pit 4 at 41 MC 19 (Fig. 40). All other specimens were surface collected. Specimens 1, 3, 7, 8, and 10 are illustrated in Figure 60,a-e.

Group 2. Possible Hammerstones (7 Specimens)

Specimen Number	Site	Length	Width	Thickness	Weight
1	41 LK 14	10.8	9.0	7.7	885
2	41 LK 52	10.4	8.0	7.1	754
3	41 LK 64	7.7	5.1	4.2	216
4	41 LK 201	10.1	6.3	5.3	512
5	41 LK 201	8.6	7.1	6.3	507
6	41 MC 36	6.9*	6.1	5.4	408
7	41 MC 171	8.7	7.0	5.1	353

Specimens in this group are more irregularly shaped than those of Group 1, and although battering is evident, it is not as clearly patterned on ends and edges as in Group 1. For this reason, the specimens are grouped together and referred to as "possible hammerstones." Specimens 1 and 4 are made of an igneous material probably felsite. Specimen 6 is made of trachyte porphyry. The other specimens are quartzite. All specimens were surface collected. Group 2 specimens are not illustrated.

GROUND STONE

Slabs of sandstone, both whole and fragmentary, are overwhelmingly predominant in this class of artifacts and are believed to have been used in various grinding and abrading capacities. Mostly gray-white to tan-brown in color, the sandstone artifacts of Choke Canyon are made of rocks likely derived from the Jackson Group, the geologic formation across which the western reaches of Choke Canyon Lake will extend. Whether or not the sandstone used in the artifacts came from the immediate area or elsewhere cannot be definitely stated. Nevertheless, there is an ample supply of the raw material readily available in the reservoir area. Other ground stone artifacts are made of igneous and metasedimentary rocks such as rhyolite, felsite, and quartzite. It is not unusual to find these rock types in the Frio River Valley gravels. Gypsum, occurring in the Frio Formation trending across the midsection of the reservoir, has also been found on the prehistoric sites at Choke Canyon. It occurs in a very distinctive fibrous form called "satin spar." After being weathered and worked in the gravel bars of the Frio River, the gypsum assumes a rodlike form apparently collected and used in some unknown way by prehistoric people.

Modified Sandstone (278 Specimens)

The sandstone artifacts are divided into the following categories for descriptive purposes:

- Group 1. Smoothed Slabs and Slab Fragments with Flat and/or Concave Faces
  - Form 1. Large
  - Form 2. Medium
  - Form 3. Small
- Group 2. Subcircular to Angular Pieces with Flat and/or Convex Faces
  - Form 1. Wedge-Shaped Cross Section
  - Form 2. Lenticular Cross Section
- Group 3. Grooved Pieces

Specimens of each group are illustrated in Figures 82-27. Site provenience is provided in Table 21.

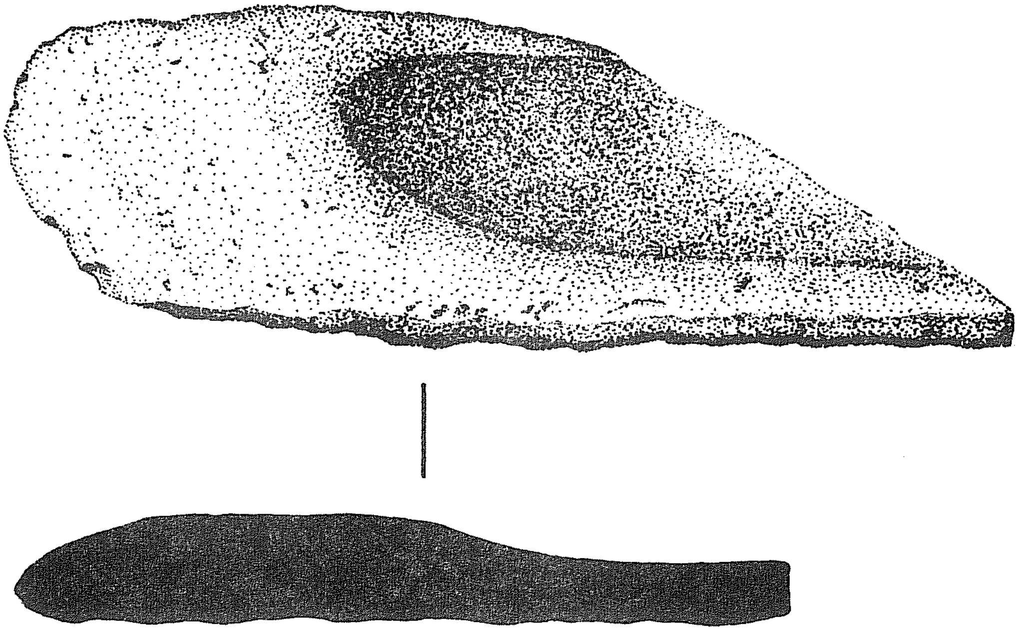
Group 1. Smoothed Slabs and Slab Fragments with Flat and/or Concave Faces (205 Specimens)

This group is divided into three forms based on maximum length of the pieces involved. Four essentially complete grinding slabs and numerous angular fragments are included which, by virtue of one or more smoothed faces, are thought to be portions of slabs similar to the complete specimens. Smoothed faces of all specimens in Group 1 are either flat or shallowly concave. On the several complete slabs, these smoothed surfaces are obviously grinding facets, usually assuming a long, oval shape. Smoothing and distinctive curvatures on the fragmentary specimens suggest that they were once part of whole grinding slabs. The assumed function of these slabs was to grind, pulp, or otherwise process

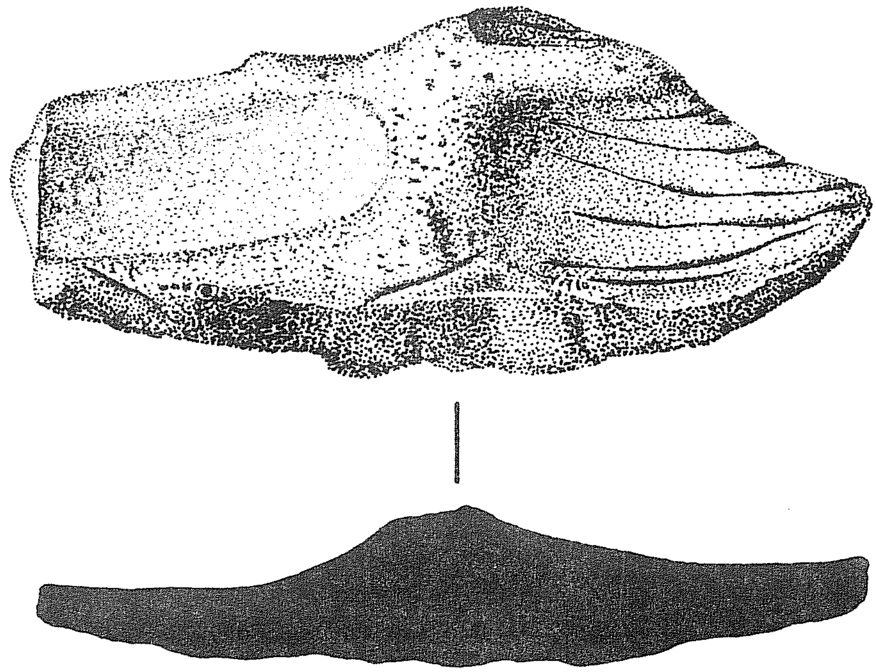
---

Figure 82. *Modified Sandstone: Group 1, Form 1.* Group, form, and specimen numbers are shown by each artifact. Specimens are shown at 25% of actual size.

I-1
Spec. 6



I-1
Spec. 19



K.L.B. 1980

FIGURE 8

Modified Sandstone (continued)

vegetal material such as seeds and fruits into edible form. The slabs likely served in other capacities as well. Fragments of broken slabs were used as manos (Group 2) and abraders (Group 3).

Form 1. Large (30 Specimens)

These specimens range in maximum length from 15-60 cm, in width from 15-40 cm, and in thickness from 5-10 cm. Individual descriptions of some of the complete and near complete slabs follow:

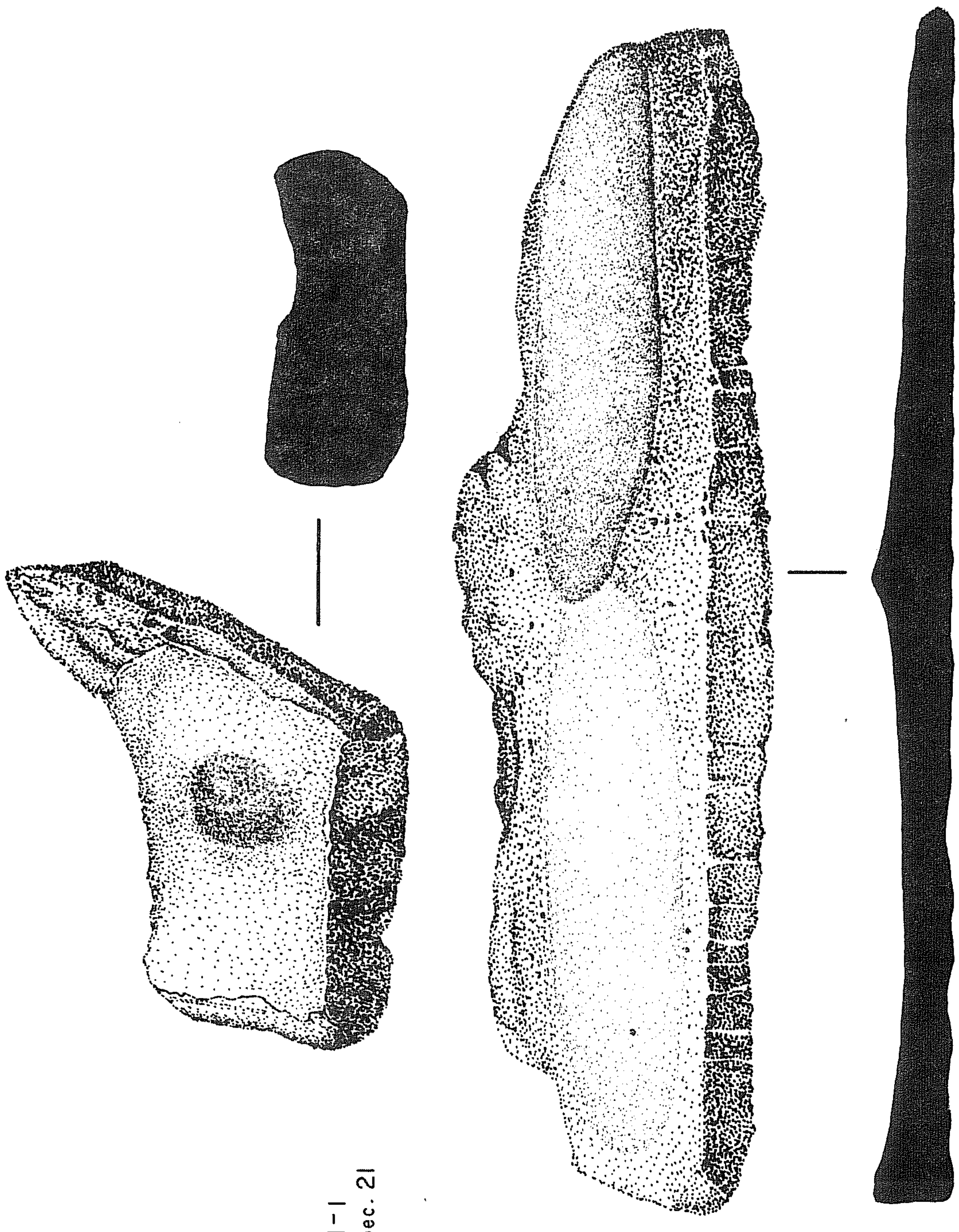
Specimen 6: This specimen was surface collected at 41 LK 14 and measures 40 x 28 x 6 cm. It has a single oblong grinding facet on one face. The truncated length of the facet is approximately 20 cm. This facet is about 17 cm wide and 1 cm deep (Fig. 82).

Specimen 19: This slab measures 44 x 26 x 9 cm and was surface collected at 41 MC 67. Used on one face only, the piece exhibits two oval-shaped grinding facets ranging in depth from 1.0-2.4 cm. These facets, or basins, are the deepest of any present in the collection. One facet contains a number of V-shaped and U-shaped grooves running the long axis of the facet. The grooves are from 9-15 cm long, 0.5-1.0 cm wide, and up to 0.5 cm deep. The other facet also displays longitudinal grooving down in its basin, but these striations are barely perceptible. Both basins are about 20 cm long and appear to be truncated. Both are about 13 cm wide (Fig. 82).

Specimen 21: This piece measures 23 x 15 x 6 cm and was surface collected at 41 MC 72. A circular depression has been pecked and ground into its face. Diameter of the depression is 5.5 cm, and it is 1.2 cm deep. Pecking is evident over the entire area of the depression. Outward from the depression to a diameter of about 9 cm is a 3.5-cm band of smoothing. This specimen is similar to the "nutting stones" found in northeast and east Texas.

During Phase I investigations at Choke Canyon, only two other specimens similar to Specimen 21 were found. Specimen 20 (Group 1, Form 1) was also surface collected from 41 MC 72. The depression of this specimen has a diameter of 6 cm and is entirely smooth. There is little or no pecking evident. Although both specimens have been modified by human hands, similar depressions have been known to occur naturally in sandstone of the Jackson Group. Specimen 48 (Group 1, Form 2; page 374) shows a depression thought to be natural rather than made by man. It is of similar depth and diameter, but does not exhibit the apparently intentional pecking and grinding seen on Specimens 20 and 21 (Form 2). It may well be that the sandstones with natural depressions were selected and further altered by prehistoric people. Specimen 21 is illustrated in Figure 83.

Figure 83. *Modified Sandstone: Group 1, Form 1.* Group, form, and specimen numbers are shown by each artifact. Specimens are shown at 25% of actual size.



1-1
Spec. 21

1-1
Spec. 27

K.L.B. 1960

Modified Sandstone (continued)

The remaining 26 specimens in Group 1, Form 1 are smaller than Specimens 6, 19, 20, and 21. All are more-or-less angular in outline, and most are 16-25 cm long and 4-10 cm thick. Only Specimens 8 and 30 were recovered from subsurface excavations. Specimen 8 was recovered from an elevation of 98.86 in Unit N910 E1009 at 41 LK 67. Specimen 30 came from Level 3 (98.90-98.80) of Unit N104 E89 at 41 MC 222. All others were surface collected.

Form 2. Medium (60 Specimens)

These specimens are 9-14 cm long and 1.5-1.7 cm thick. Outlines are irregular and angular. One, and sometimes two, face(s) of each piece has (have) been smoothed to either a flat or slightly concave shape. Only rarely are complete grinding facets evidenced on Form 2 specimens. Most specimens are fragments of larger slabs with grinding facets and basins similar to those of Form 1. The following three specimens are atypical.

Specimen 12: This slab fragment measures 11.2 x 6.2 x 1.6 cm and has an angular, irregular outline. The specimen was recovered from Level 2 (99.50-99.40) of Unit N1117 E1401 at 41 LK 41. One of its faces retains vestiges of two overlapping facets (Fig. 84). The fragment appears to have been burned.

Specimen 16: This specimen measures 13 x 8.2 x 1 cm and has an oblong, irregular outline. One face exhibits a shallow, smooth basin with a length and width dimension slightly less than those of the specimen overall. A biconical hole with a diameter of 0.25 cm was drilled through the piece near the midsection, about 4.5 cm from one end. The piece was recovered from Level 10 of Test Pit 3 at 41 LK 51. It was found broken into two pieces. The small size of the piece and the perforation suggest that it may have been a pendant (Fig. 85).

Specimen 24: This specimen measures 17 x 13 x 1.4 cm and is subtrapezoidal in outline. It is one of the thinnest specimens in the Form 2 category. The facet on one face is well smoothed, and although the facet is truncated (apparently by breakage), the corners of the piece are rounded. This suggests use and modification subsequent to breakage (Fig. 84). Specimen 24 was surface collected from 41 LK 64.

Specimen 48: Dimensions of this specimen are 11.5 x 8.0 x 4.5 cm. It exhibits a circular depression similar to those of Specimens 20 and 21 of Group 1, Form 1. However, the shaping of the depression on Specimen 48 is natural. This specimen was recovered from the surface collection at 41 MC 67.

Only three Form 2 specimens were recovered from subsurface excavations. Specimen 12 came from Level 2 (99.50-99.40) of Unit N1117 E1401 at 41 LK 41. Specimen 16 was found in Level 10 of Test Pit 3 at 41 LK 51. Specimen 28 came from Level 4 of Test Pit 2 at 41 LK 201. Specimen 58 (Fig. 84) was recovered from 41 MC 94. It is a good example of the pronounced basinlike facet.

Figure 84. *Modified Sandstone: Group 1, Form 2; Group 2, Form 1; and Group 3.* Group, form, and specimen numbers are shown by each artifact.

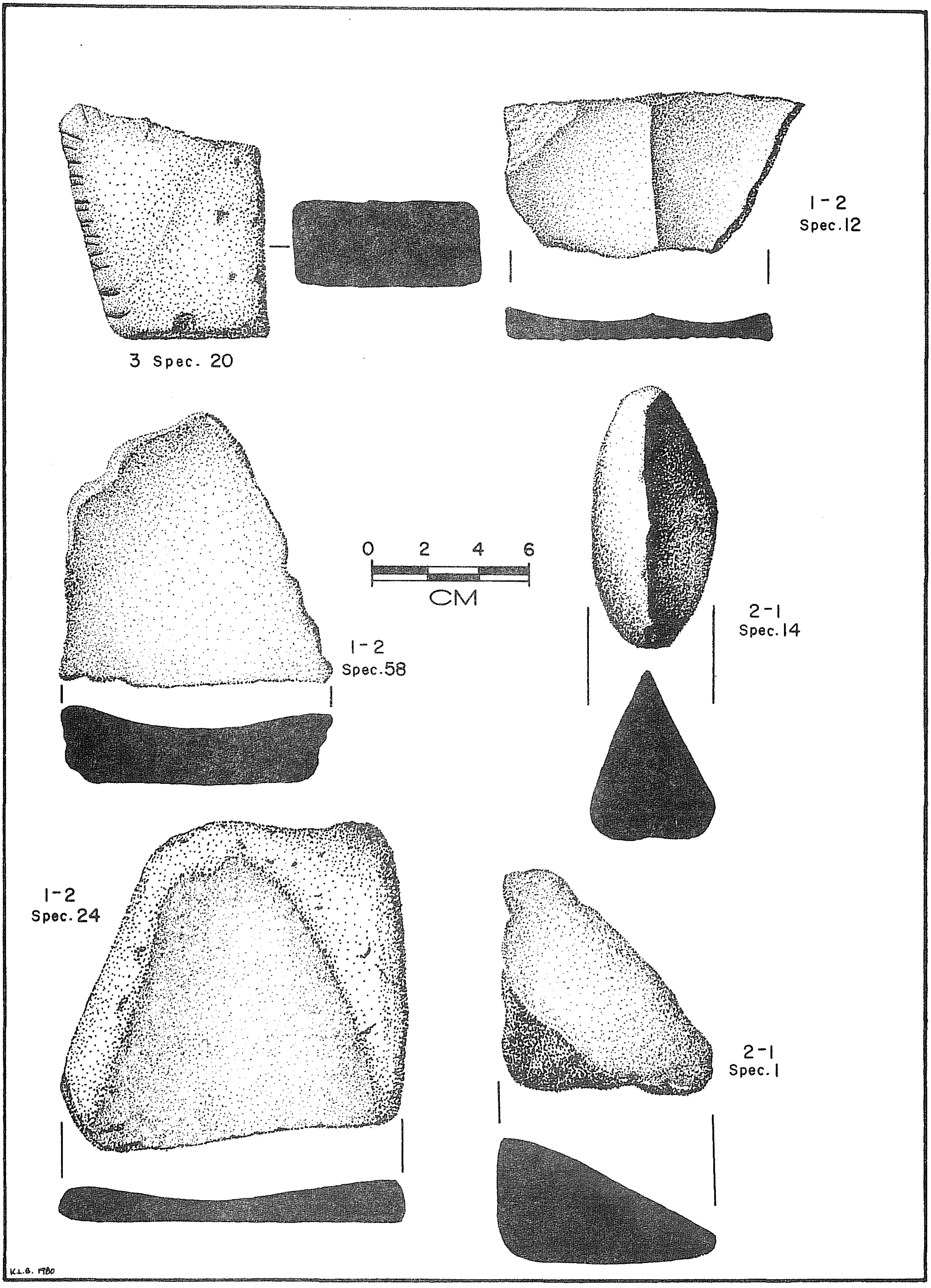

3 Spec. 20
1-2
Spec.12
0 2 4 6
CM
1-2
Spec.58
2-1
Spec.14
1-2
Spec. 24
2-1
Spec. 1
K.L.B. 1980

FIGURE 84

Modified Sandstone (continued)

Form 3. Small (115 Specimens)

Form 3 specimens are small fragments of smoothed slabs with both flat and basined facets on one or two faces. Length and width dimensions are 3-8 cm and thickness 1-4 cm. Proveniences for 31 out of 115 specimens recovered in subsurface excavations are as follows:

SITE	SPECIMEN NUMBER	LOT	UNIT	LEVEL
41 LK 31/32	8	21	N1056 E863	6 (98.23-98.15)
"	9	25	"	9 (97.73-97.60)
"	10	440	N1059 E865	9 (97.85-97.75)
"	11-14	491A (1-4)	N1061 E873	8 (98.00-97.75)
"	15	644	N1065 E875	11 (97.65-97.55)
"	16	740	N1116 E998	2 (100.10-99.90)
41 LK 41	18	24	N1114 E1400	5 (99.20-99.10)
41 LK 51	33	30	Test Pit 3	6
41 LK 59	36	100	N982 E823	3 (98.73-98.60)
41 LK 67	43	451	N842 E1054	
"	44	555	N844 E1059	(98.36)
"	45	634	N848 E1052	3 (98.50-98.45)
"	46	674	N901 E1005	3 (98.70-98.65)
41 LK 201	56	5	Test Pit 1	5
"	57	20	Test Pit 2	1
"	58	25	Test Pit 2	5
"	59	44	Test Pit 3	1
41 MC 15	63	36	Test Pit 6	6
41 MC 17	64	2	Test Pit 1	2
41 MC 66	66	11	Test Pit 3	2
"	67	15	Test Pit 2	6
41 MC 31	69	1	Test Pit 1	1
41 MC 39	74	21	Test Pit 3	4
41 MC 55	78	25	Test Pit 3	4
41 MC 222	110	21	N98 E89	3 (98.61-98.56)
"	111	38	N100 E87	surface
"	112	54	N104 E89	3 (98.90-98.80)
"	113	59	N105 E89	2 (99.00-98.90)

No examples of Group 1, Form 3 specimens are illustrated in this report.

<u>Group 2. Subcircular to Angular Pieces with Flat and/or Convex Faces</u> (48 Specimens)

Sandstone pieces in Group 2 are subcircular to angular in outline. Lengths are 5-16 cm, widths 4-14 cm, and thicknesses are 1.5-4 cm. Smoothed faces on these pieces are either flat or slightly convex. Smoothing laps up onto the edges of

---

Figure 85. *Modified Sandstone: Group 1, Form 2 and Group 3.* Group, form, and specimen numbers are shown by each artifact.

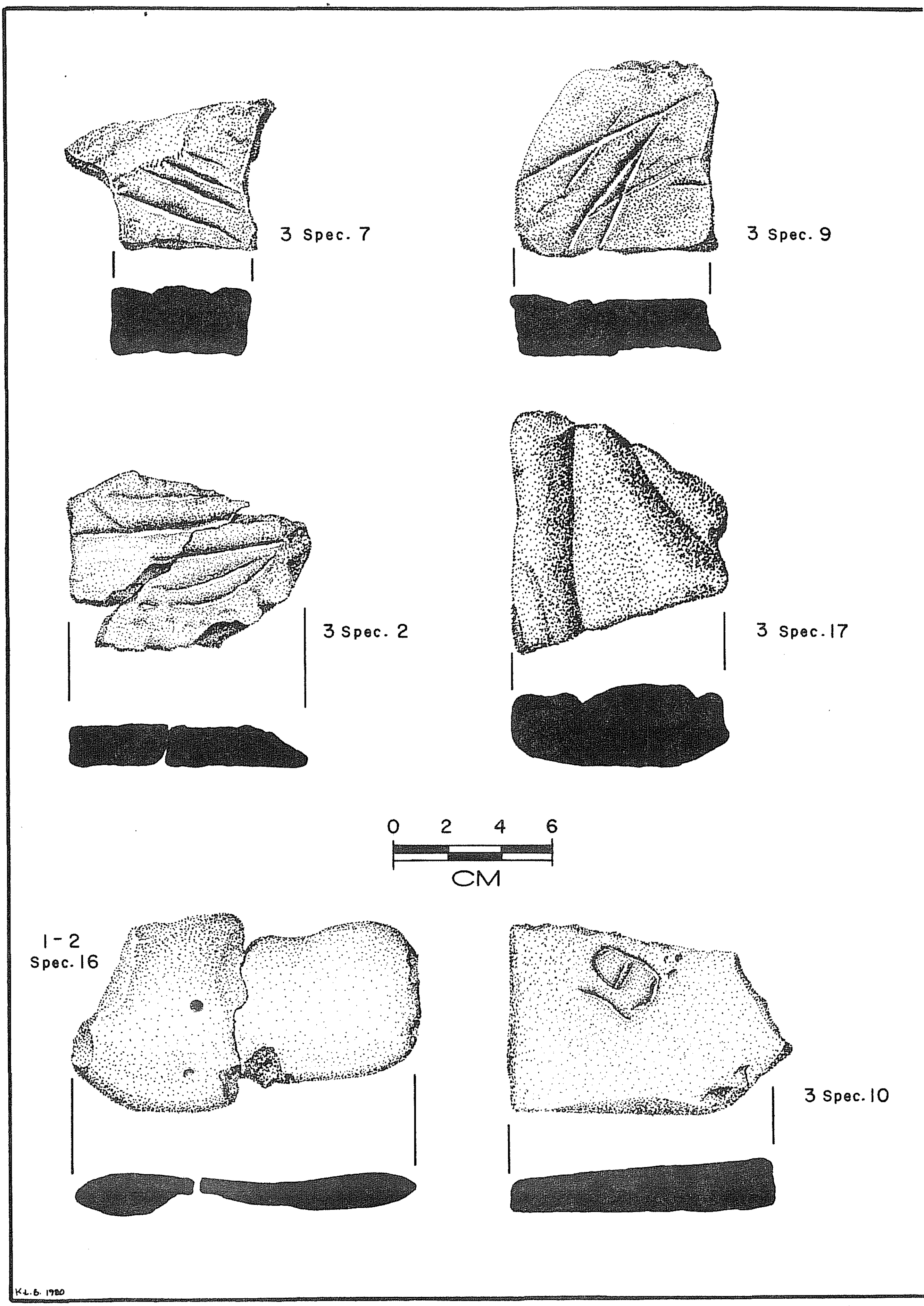

3 Spec. 7
3 Spec. 9
3 Spec. 2
3 Spec. 17
0 2 4 6
CM
1-2
Spec. 16
3 Spec. 10
K.L.B. 1980

FIGURE 8

Modified Sandstone (continued)

many pieces, and edges often appear to be intentionally rounded and shaped. Because of their size and the morphology of their faces and edges, Group 2 specimens are believed to be "manos," the sandstone piece which is held in the hand when food is ground. Group 2 is divided into two forms based on cross section shape.

Form 1. Wedge-Shaped Cross Section (17 Specimens)

Outlines of the Group 2, Form 1 specimens vary from subcircular to triangular to rectangular. All are wedge shaped in cross section. Most are smoothed only on one face; two are smoothed on two faces. Many exhibit breakage around their margins, where the artifact is thinnest. The breakage appears to be intentional and may be the result of use as choppers or percussors. Similar breakage has been observed on similar specimens recovered from 41 LK 28 (Charles Johnson II, personal communication). Specimen 1 was recovered from Level 3 of Test Pit 3 at 41 LK 14. All others were surface collected. Specimens 1 and 14 are illustrated in Figure 84; Specimen 5 is shown in Figure 86.

Form 2. Lenticular Cross Section (31 Specimens)

Most Group 2, Form 2 specimens are subcircular to oval in outline, but there are some rectangular and irregular in outline. Most Form 2 pieces are plano-convex in cross section; some are biconvex or rectangular in cross section. Faces are flat or convex, edges rounded and/or smoothed. Specimen 30 was found in Level 3 (98.63) of Unit N98 E88 at 41 MC 222. The rest were surface collected. Specimens 4, 9, 19, and 25 are illustrated in Figure 86.

Group 3. Grooved Pieces (25 Specimens)

These angular fragments of sandstone have from one to eight V-shaped or U-shaped grooves worked into their faces. Lengths are 5.5-17 cm, widths 3.1-11 cm, and thicknesses are 1.5-6 cm. In outline, most are irregularly angular. Nine specimens are fragments of grinding slabs or manos that were reused as abraders. The assemblage has been broken down according to the number of grooves on each specimen.

Four specimens have one groove; four specimens have two grooves; four specimens have three grooves; five specimens have five grooves; two specimens have seven grooves, and one specimen has eight grooves. On specimens with more than one groove, the grooves are parallel, but in some cases, criss cross or are independent of one another at different angles.

Figure 86. *Modified Sandstone: Group 2, Forms 1 and 2.* Group, form, and specimen numbers are shown by each artifact. Modified quartzitic and igneous rocks--Specimen 1 (lower left-hand corner of figure).

Modified Sandstone (continued)

Specimen 10 is unlike the rest. Depending upon how the specimen is held, the number "19" or "61" appears to have been etched or grooved into the smooth face of this grinding slab fragment. The "numbers" are 2.8 cm high (Fig. 85). Specimens 13, 17, and 21 have notably wider grooves than do the other specimens (Fig. 85). Specimens 2, 8, 9, and 13 were recovered from subsurface excavations:

SITE	SPECIMEN NUMBER	LOT	UNIT	LEVEL
41 LK 15	2	18	Test Pit 3	2
41 MC 15	8	36	Test Pit 6	6
41 MC 24	9	3	Test Pit 1	4
41 MC 55	13	24	Test Pit 3	2

Modified Quartzitic and Igneous Rocks (6 Specimens)

Specimen 1 (Fig. 86) was surface collected from 41 LK 69 and measures 5.6 x 7.6 x 3.1 cm. This fragmentary specimen is made of very dense, gray, medium-grained quartzite. It is biconvex in cross section, and one face is very smooth and convex, suggesting use as a mano.

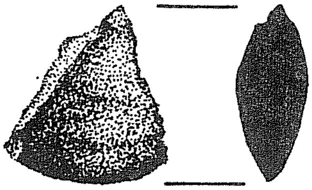
Specimen 2 (Fig. 87) was surface collected from 41 LK 201 and measures 5.5 x 4.7 x 1.8 cm. This fragmentary specimen is made of tan, fine-grained chert. It is biconvex in cross section and exhibits two parallel grooves extending the width of one face at the broken end. The specimen tapers slightly to the rounded end opposite the break. Both faces are smooth, but this does not appear to have been intentional. The grooves are about 0.2 cm wide and 4.1 cm in length.

Specimen 3 (Fig. 87) was surface collected at 41 LK 244, during the 1979 CAR-UTSA survey of Choke Canyon. It measures 9.5 x 6.3 x 3.9 cm and is made of a mottled pale red and tan felsite. The specimen is roughly oval in outline and biconvex in cross section. Both faces are smoothed. One face has two facets that rise from each end to an apex near the middle of the artifact. Portions of the circumference seem to be pecked or battered.

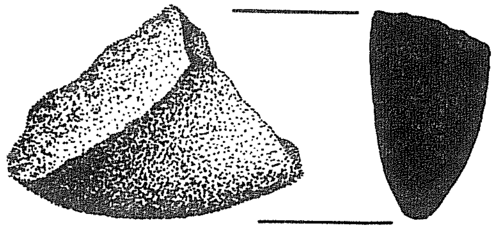
Specimen 4 (Fig. 87) was surface collected from 41 MC 22 and measures 2.4 x 2.1 x 0.9 cm. This fragmentary specimen is made of hematite-cemented sandstone and appears to have been burned. It is black on one face and a dark, dusky red on the other. One face is extremely smooth, the other rough. The piece is worked to a sharp convex edge. The shape suggests the working end of a celt or adze.

Specimen 5 (Fig. 87) was surface collected from 41 MC 171 and measures 3.9 x 2.8 x 1.7 cm. This fragment is made of gray, coarse-grained quartzite. Both faces are smoothed. It may be a mano fragment.

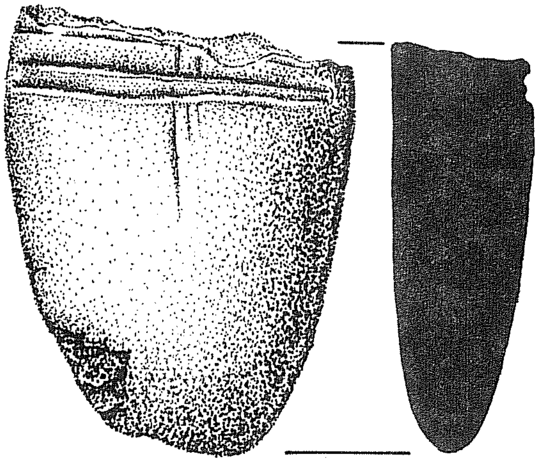
Figure 87. *Modified Quartzitic and Igneous Rocks.* Specimen numbers are shown beneath each artifact.



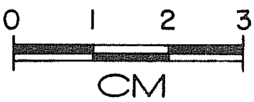
Spec. 4

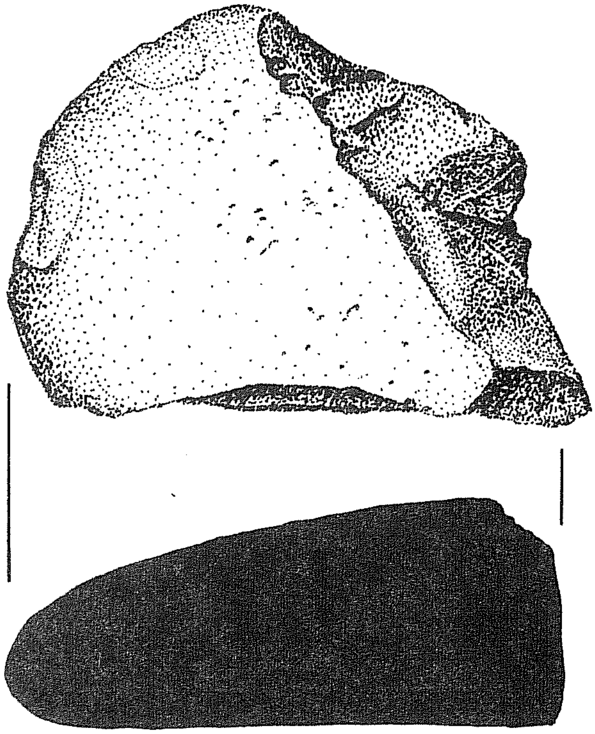


Spec. 5

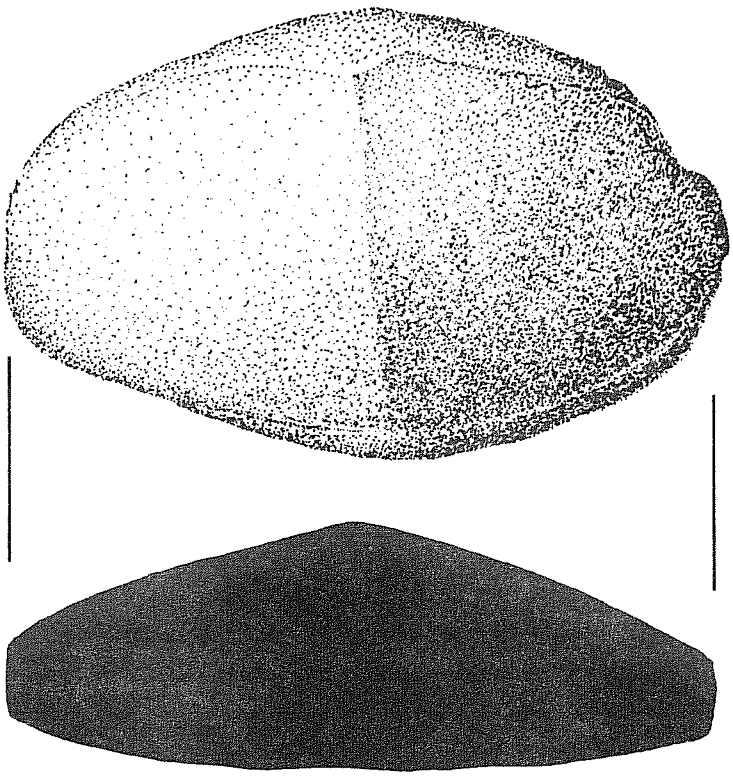


Spec. 2





Spec. 6



Spec. 3

K.L.G. 1980

TABLE 21

SITE PROVENIENCE - MODIFIED SANDSTONE, IGNEOUS ROCKS, AND GYPSUM

SITE NO.	GROUP 1			GROUP 2		GROUP 3	IGNEOUS ROCKS	GYPSUM
	FORM 1	FORM 2	FORM 3	FORM 1	FORM 2			
41LK8								
41LK9								
41LK10								
41LK13		1						
41LK14	6	9	3	1		1		7
41LK15						1		2
41LK17								
41LK18		1	4					
41LK20								
41LK27					1			
41LK31/32			10					
41LK34								
41LK41	1	4	14			1		1
41LK48								
(Same as MC30)								
41LK49								
41LK50								
41LK51		5	2					
41LK52								
41LK53			1	1	1			
41LK59			1					
41LK64		5	6	1	2	1		
41LK65						1		
41LK67	1		6		1			
41LK69		1	2			1	1	
41LK73								2
41LK74				1				
41LK75			2					
41LK77								
41LK83								
41LK85								
41LK86								
41LK87			2					
41LK88								
41LK91								
41LK92								
41LK93								
41LK94		1	1					
41LK97								
41LK197								
41LK198								
41LK201	1	2	6	1			1	1
41LK202								
41LK203								
41LK204								
41LK205								
41LK206								
41LK207								
41MC8								
41MC9	1							
41MC10								
41MC11	2	1						
41MC13			1			1		
41MC14								
41MC15	1		1			1		
41MC17			1					
41MC18								
41MC19								
41MC22		2			1		1	

SITE NO.	GROUP 1			GROUP 2		GROUP 3	IGNEOUS ROCKS	GYPSUM
	FORM 1	FORM 2	FORM 3	FORM 1	FORM 2			
41MC24	1		1		1	1		
41MC25								
41MC26	1							
41MC28								
41MC29		3	3	1	1	1		
41MC30				1	1			
(Same as LK48)								
41MC31		3	5	1	1	1		
41MC33								
41MC36								
41MC39			1					
41MC40								
41MC41			2	2	2	1		
41MC42								
41MC43		1	1					1
41MC44								
41MC45								
41MC48								
41MC50								
41MC52								
41MC53								
41MC54								
41MC55	1		2		2	3		
41MC56	2	1			1	3		
41MC57								
41MC58								
41MC59								
41MC64		2	4			1		
41MC65		4	12	1	2	3		
41MC67	1	2				1		
41MC68								
41MC69		2	1					
41MC72	2							
41MC74								
41MC75		3			1			
41MC78								
41MC79					1			
41MC80								
41MC83								
41MC84	3	3	3	1	2	1		
41MC86								
41MC88			1		1			
41MC90								
41MC91								
41MC92								
41MC93								
41MC94	3	3	5	4	6	1		
41MC95	2			1				
41MC171		1	3				1	
41MC174								
41MC176					1			
41MC177			1					
41MC184								
41MC189								
41MC219								
41MC222	1		6		1			
41MC223								
41MC224								
41MC294							1	

Modified Quartzitic and Igneous Rocks (continued)

Specimen 6 (Fig. 87) was surface collected from 41 MC 294 during the 1979 CAR-UTSA survey of Choke Canyon and measures 8.1 x 5.7 x 3.6 cm. Light gray in color, the specimen is made of a very fine-grained devitrified rhyolite. Both faces are extremely smooth and slightly convex, suggesting use as a mano.

Satin Spar Gypsum (14 Specimens)

These stream-rolled cobbles are 4-13 cm long, 1.0-5.5 cm wide, and 0.7-2.5 cm thick. Most have squared to slightly rounded ends. The ends are battered and smoothed, but whether these alterations are intentional or natural cannot be determined. Gypsum is a comparatively soft material. This quality would seem to limit its usefulness as a hammerstone or abrader. Gypsum, when ingested in a powdered form, is said to be an excellent purgative. Gypsum powder also makes a good base for other pigments. Pieces of gypsum may be used to mark on other rocks and hard objects--it leaves white streaks similar to chalk. Rounded gypsum cobbles were found in caches of grave inclusions at the Archaic cemetery site, 41 LK 28, located a short distance east of Choke Canyon. The gypsum was collected by prehistoric people, but its use remains a mystery. Site provenienced of gypsum specimens recovered during Phase I investigations are as follows: seven specimens from 41 LK 14, one from 41 LK 41, two from 41 LK 73, one from 41 LK 201, and one from 41 MC 43. Gypsum outcrops in the Frio Formation partially account for the higher incidence of gypsum specimens recovered from Live Oak County. The Frio Formation runs through the midsection of the project area. Gypsum cobbles are more common at the east end of the reservoir than at the west end. Examples of the spar gypsum are illustrated in Figure 59,a-d.

MISCELLANEOUS LITHIC ARTIFACTS AND MATERIALS

Pumice (2 Specimens)

Pumice, a constituent of the Catahoula Formation, was found at 41 LK 64 and 41 LK 204. In both cases, the pumice was probably cropping out either on-site or nearby. The specimen from 41 LK 64 is reddened, as if burned. Other than this single observation, there is no evidence to suggest that the pumice was used by prehistoric people. At 41 LK 204, this material was found in chunks 30 cm or more in diameter. The two specimens collected had maximum lengths of 7.2 and 10.3 cm. These specimens are not illustrated.

Ocher (8 Samples)

At the following six sites, ocher was found in small amounts.

Miscellaneous Lithic Artifacts and Materials (continued).

SITE	UNIT	LEVEL	COUNT	WEIGHT
41 LK 15	Test Pit 1	3	powder	< 1
41 LK 41	N1117 E1400	1	3	2.3
41 LK 51	Test Pit 3	9	2+	< 1
"	Test Pit 3	11	12	64
41 LK 67	N905 E1005	4	2	< 1
"	N909 E1005	1	1	< 1
41 LK 74	Test Pit 3	7	1	3.9*
41 MC 15	Test Pit 2	4	1	1.0

The ocher sample from 41 LK 41 is yellow; the rest are varying shades of red. The 65-gram sample from 41 LK 51 is actually a ferruginous sandstone, but is nevertheless pale red and has a chalky consistency unlike the other sandstones recovered. The best sample (Fig. 59,e) is a single piece from Test Pit 3, Level 3, from 41 LK 74. This small, square piece of ocher measures 2 x 2 x 1 cm and is biconcave in cross section. Circular depressions are developed into both faces, apparently by intentional scratching. The surfaces of both faces are marked by both linear and rotary scratch marks.

Bituminous Coal (1 Sample)

One piece of bituminous coal was recovered from Level 7 of Test Pit 2 at 41 MC 177. It measures 5.5 x 4.7 x 2.9 cm and weighs 58 grams. This chunk of material exhibits a lustrous black sheen and distinct cleavage planes. The closest source of bituminous coal is the Piedras Negras, Mexico, area across from Eagle Pass at the Texas-Mexico border. Since this source is approximately 150 miles northwest of the recovery site, it is assumed that this material was brought to 41 MC 177 by prehistoric people. Its use is unknown.

Asphaltum (1 Sample)

Approximately 11 grams of asphaltum were recovered from Levels 8 and 9 of Test Pit 2 at 41 MC 55. Two small chunks from Level 8 weighed 9 grams. The largest piece from Level 9 measured 1.8 x 2.3 cm. Along with marine shells and asphaltum-coated ceramics from 41 MC 55, this asphaltum suggests that the people who deposited the materials had direct contact with a coastal supply source.

Fired Mud Dauber Nest (1 Specimen)

The fired remains of a mud dauber's nest were found around Feature 2, Levels 16 and 17, of Test Pit 3 at 41 LK 201. The mud dauber, a type of wasp, constructs a nest of mud in which to lay its eggs. In modern times, these nests are usually built in the protected parts of structures, such as under eaves of houses or under highway bridges. The nests are rarely seen in the wild. The nest at 41 LK 201 may be indirect evidence of an aboriginal structure at the site. Such evidence, however, is inconclusive.

Miscellaneous Lithic Artifacts and Materials (continued)

Gastrolith (?) (1 Specimen)

An extremely shiny, flat pebble measuring 2.2 x 2 x 0.6 cm was recovered from Level 6 of Unit N954 E557 (Area C) at 41 LK 59. The abnormal shininess, rounding, and smoothing of the edges suggest that it may have been a gastrolith from an alligator or large fish.

SHELL ARTIFACTS

During the Phase I investigation of Choke Canyon, artifacts of both marine shell and freshwater mussel shell were found in small numbers. Artifacts of marine shell were generally easy to recognize. Because mussel shell is a very fragile material, it become difficult to distinguish intentional modification from natural postmortem and postdepositional alterations.

MARINE SHELL (7 Specimens)

Conch Columellas (3 Specimens)

Specimen 1: This specimen (Fig. 88,e) was surface collected from 41 LK 8 and measures 2.9 cm long and 0.6 cm in diameter. It is a smoothed, shaped segment from the columella of a left-handed whelk, possibly *Busycon contrarium*. It may have been intended for eventual manufacture into a tubular bead, but there are no perforations.

Specimen 2: This specimen (Fig. 88,g) was surface collected from 41 LK 67 and measures 5.1 cm long and 2.1 cm in diameter. This artifact is made on a segment of columella from a left-handed whelk, possibly *Busycon contrarium*. One end has been beveled by abrasion to form a "columella gouge." The angle of the bevel is approximately 50°. The proximal end has been broken.

Specimen 3: This columella segment (Fig. 88,d) is not obviously an artifact. It measures 8.5 cm long and 2.8 cm in diameter. The deep, pronounced spiral is right-handed. The columella probably represents a horse conch, *Pleuroploca gigantea*. Both ends of the piece are battered. One end may have been rounded slightly by abrasion. It was surface collected from 41 LK 75.

Conch Whorl Fragment (1 Specimen)

A fragment of the outer whorl of a conch shell was recovered from Level 2 of Test Pit 3 at 41 MC 55. The piece (Fig. 88,f) is subtriangular in outline and measures 5.1 x 2.4 x 0.3 cm. Evidence of a groove-and-snap shaping technique is retained along one edge. The other edges appear to have been broken by percussion.

Shell Artifacts (continued)

Gastropod Shell Beads (3 Specimens)

Three small, complete gastropod shells (Fig. 88,a-c), perforated and perhaps used as beads, were recovered from the following proveniences:

SITE	LOT	UNIT	LEVEL
41 LK 31/32	25	N1056 E863	9 (97.93-97.60)
41 LK 87	8	Test Pit 2	1 (10-0 cm)
41 MC 55	21	Test Pit 2	9 (90-80 cm)

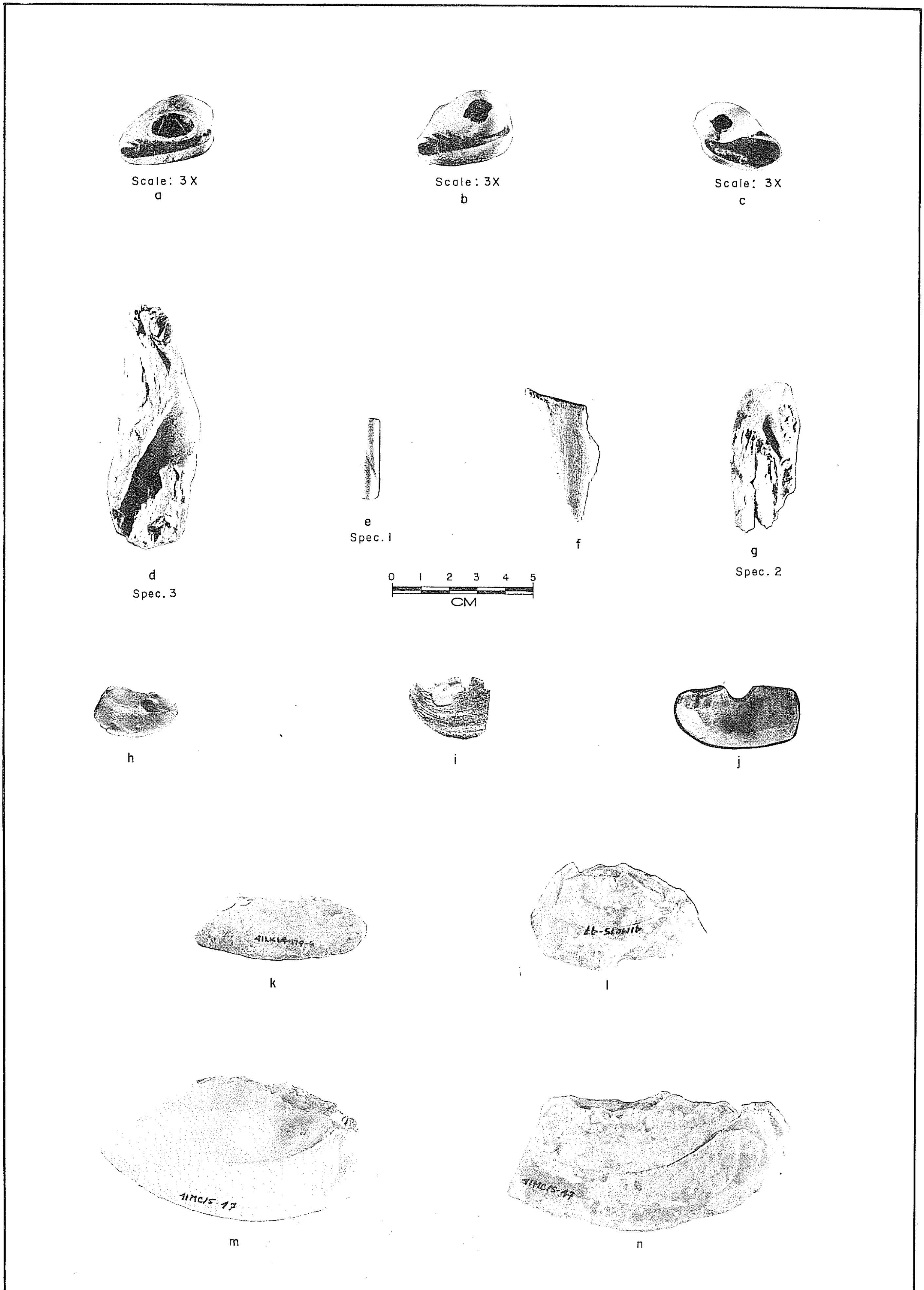
The specimens from 41 LK 87 and 41 MC 55 are common Atlantic marginellas, *Prunuum (leptegouana) apicina*. Each has a perforation, either ground or broken through the outer whorl near the aperture, perhaps to facilitate stringing. The specimen from 41 MC 55 is partially filled with what is believed to be asphaltum. The third shell, recovered from 41 LK 31/32, has not been identified as to species. It is the same size--about 1.2 cm long--as the marginellas, but is not as heavy, and the aperture opens to the left rather than to the right.

MUSSEL SHELL (153 Specimens)

Because the shell is generally very fragile, recognition of mussel shells that have been intentionally altered by prehistoric people is difficult. Three types of alteration are recognized: perforation, notching, and cutting or shaping. All of these alterations can, and most likely did, occur during archaeological recovery. Shells can be punctured, notched, and cut by digging tools while still in the ground. The shells may also be altered in the matrix screening process, especially when the matrix is hard and when dry screens are being used. Even the physical properties of the mussel shell make recognition of intentional alteration difficult. The shell is constructed of thin laminae which tend to obscure signs of abrasion and/or wear. Thus, the shells listed as intentionally modified may not be artifacts. The following sites contained possible mussel shell artifacts:

	MODIFICATION		
SITE	PERFORATED	NOTCHED	CUT AND/OR SHAPED
41 LK 14			1
41 LK 41			1
41 LK 59	7	3	2
41 LK 67	7		
41 LK 74	1		
41 LK 201	1		
41 MC 15			94
41 MC 31			32
41 MC 75	1		
41 MC 86	1		
41 MC 222	1		
41 MC 224			1

Figure 88. *Modified Mussel and Marine Shell.* a-c, gastropod shell beads; d,e,g, conch columellas; f, conch whorl fragment; h-n, mussel shell fragments.


Scale: 3X
a
Scale: 3X
b
Scale: 3X
c
d
Spec. 3
e
Spec. 1
f
g
Spec. 2
0 1 2 3 4 5
CM
h
i
j
k
l
m
n

Shell Artifacts (continued)

These modified mussel shells are fragmentary. Pieces are as short as 1.5 cm and as long as 11 cm. Perforations are usually near the shell umbo (or hinge) and are 0.2-0.4 cm in diameter. All identifiable perforated shells were of the species *Cyrtonaias tampicoensis*. The shells of this species are particularly thin and fragile. These physical characteristics increase the possibility that alteration occurred unintentionally. Notches were found along the edges of three specimens, ranging in width and depth from 0.4 to 1.0 cm.

Cutting and/or shaping was the most common form of alteration. At two sites in particular--41 MC 15 and 41 MC 31--there were enough modified shell fragments to suggest that manufacture of mussel shell artifacts was a major activity at these two locations.

One area of 41 MC 15, in particular, was unique in the numbers of *Megalonaias gigantea* found on its surface. This species, the giant washboard mussel, is the largest to be found in Texas rivers. Its shell is large, thick, and heavy. Fragments of *Megalonaias gigantea* were found in a number of clusters on the surface of Area A. The pattern of breakage of these fragments suggests the manufacture of some type of tool or ornament. There were, however, no complete shell artifacts at 41 MC 15, only large fragments.

A plan map of Area A (showing the shell clusters) is presented in Figure 45. Examples of each type of modification are shown in Figure 88, h-n.

PREHISTORIC CERAMIC ARTIFACTS

A total of 576 prehistoric ceramic fragments was recovered from 16 of the sites investigated during Phase I investigations conducted at Choke Canyon by the CAR crew.

Prehistoric ceramics from southern Texas have received little analytical attention in comparison to that accorded to south Texas lithic artifacts or to ceramic materials from other areas of the state. During the laboratory processing stage of the Phase I investigations it was recognized that the comparatively large ceramic sample from the project area sites offered a chance for a detailed analysis of a specific artifact type known to be restricted in time to a relatively brief interval.

The main purposes or goals of the ceramic analysis were (1) to describe in detail the Choke Canyon Phase-I ceramic collection, (2) to determine the most effective analytical methods for the future study of ceramics from the project area, and (3) to answer research design problems and questions. The research design, discussed in a following section, was formulated after an examination of the regional literature. Limitations discussed below necessitated a number of revisions in the original research design (Black 1979).

At the outset of the ceramic analysis several limitations to the study were recognized. A major limitation was that the analyst (Stephen Black) began as a novice ceramicist. Knowledgeable persons offered advice on many aspects of the analysis; however, no "south Texas ceramic expert" existed, hence months were spent learning the basics of ceramic analysis. A second major limitation of the analysis was that funding or access to specialized equipment was not available to apply many of the current analytical techniques used in ceramic analysis. The third and most serious major limitation of the analysis was not fully realized until well into the project. The majority of the ceramic fragments were very small, weathered plainware body sherds on which surface characteristics were frequently not preserved. Most ceramic typologies or classification systems are based in large part on surface finish or decoration and vessel form, information unavailable for many of the Nueces River Project ceramics. These major limitations and a number of minor considerations discussed later necessitated changes in research methodology during the analysis.

CERAMIC BACKGROUND

The archaeology of the interior portion of southern Texas was largely unknown and uninvestigated until the last 20 years (as discussed in the Archaeological Background section). Prior to the late 1960s, the presence of ceramics at prehistoric sites in southern Texas was undocumented (cf. Suhm, Krieger, and Jelks 1954:142). Hester (1968b) and Hester and Hill (1969, 1971) published the first articles calling attention to the presence of ceramics in southern Texas. From 1971 to 1980, a relatively large number of archaeological investigations have been undertaken in south Texas resulting in a tremendous increase in the number of reported and recorded sites, many which contain Late Prehistoric ceramic-bearing components.

The "initial" study of south Texas ceramics (Hester and Hill 1971) contains a descriptive classification of the south Texas ceramics based largely on macroscopic examination of "large ceramic samples" from three sites in Dimmit County. The authors (*ibid.*) define seven groups of ceramics and state that ". . . sherds from southern Texas sites can usually be sorted into one or more of them." Hester and Hill (1971) published their study to synthesize what information was then available, rather than to exhaustively define or describe the ceramics. The importance of their paper is three-fold: (1) it calls attention to the presence of ceramics at a number of southern Texas sites which appear to be "remarkably similar" in appearance; (2) the paper discusses the distribution of the known ceramic bearing sites, acknowledging the limited samples of sites; and (3) the paper summarized the known ceramic types from areas adjacent to south Texas as possible antecedents of the south Texas bone-tempered tradition. Hester and Hill (*ibid.*) review known types such as *Leon Plain* (central Texas), and *Rockport* (central Texas coast) wares, and the *Goliad* (interior south-central coastal plains) wares. They also discuss the miscellaneous reports of unnamed bone-tempered pottery noted at many coastal sites and a few sites in the Pecos area. Hester and Hill (1971:199-200) suggest that "it seems most probable that the bone-tempered pottery of southern Texas was introduced by Late Prehistoric peoples from central Texas (i.e., the Toyah Focus described by Jelks 1962)."

A number of small scale descriptions of ceramics from specific sites or areas of south Texas have been published in the last decade. These studies have been limited to relatively brief descriptions of varying degrees of detail. The most detailed of these studies (Hester and Parker 1970) divided several hundred bone-tempered sherds from the Berclair site in Goliad County into ten groups based primarily on exterior surface color. In addition, they described several *Rockport* ware sherds; some sherds with various incised, punctated and brushed finishes; some asphaltum-decorated sherds, and a partially restorable bone-tempered jar. Hester and Parker (*ibid.*) used a consistent format for describing each group. The remaining ceramic descriptions from south Texas are much less detailed and offer little interpretive information. These include Creel *et al.* 1979 (Live Oak County), Hester *et al.* 1977 (Jim Wells County), and Lynn, Fox, and O'Malley 1977 (Live Oak and McMullen Counties). Hester (1980a) provides a brief, updated summary of south Texas ceramics.

The limitations of the ceramic descriptions from south Texas have also been noted for many of the plainwares described in Texas. Dulaney (1977:201) discusses the problem of "blurred distinctions" in Texas plainwares. He points out that this problem has most often been overcome, or perhaps ignored, by the use of "non-typological" approaches utilized by Story (1968), Hester and Parker (1970), Hester (1972), Fawcett (1976), Lynn, Fox, and O'Malley (1977), and Dulaney (1977). "Non-typological" descriptions are based on qualitative attributes determined by macroscopic and microscopic sherd examination. These attributes are used to define a number of categories of attribute groups. Once established, these groups can then be utilized for intersite and intrasite comparison. A major limitation with "non-typological" studies is that the categories are, as Dulaney (*ibid.*:201) points out, "devoid of areal, temporal and spatial implications." That is to say, the sherds are sorted simply on the basis of appearance without regard to when or where a vessel was produced. In short, while "non-typological" studies have enabled some comparative studies, they serve only to describe the range or the variations of physical appearance. They tell us nothing (with the exception such as Story 1968) about where the ceramics were produced, about how they were produced, about when they were produced or why they were produced. The categories based on subjective appraisal cannot be quantitatively demonstrated.

South Texas ceramics have not been subjected to the types of analysis which have long been utilized in other areas and are often considered basic (cf. Shepard 1976). These include petrographic examination, refiring tests, and a variety of recently developed or recently applied techniques termed "scientific analysis" by Peacock (1970). The value of such studies is not simply that it can be done--but rather that much more can be learned from the ceramics than is presently known. Among the techniques which have been successfully applied to ceramics are Differential Thermal Analysis (DTA), Atomic Absorbtion Spectrography (AAS), emission spectrography, X-ray diffraction, neutron activation, and X-ray fluorescence. These methods, properly applied, can identify clay minerals, mineral inclusions, and minor and trace elements included in the sherds, thus providing clues to manufacturing localities and techniques.

Summarizing the available background information on south Texas ceramics, bone-tempered pottery is known to occur across much of south Texas. Bone-tempered pottery is associated with Late Prehistoric occupations and dates after A.D. 1200 at over 100 sites in south Texas according to Hester (1980a:124). At many sites only a few sherds have been found, although sites yielding hundreds of sherds have been reported from several areas. South Texas bone-tempered pottery is usually undecorated, but incising, punctates, brushing, and asphaltum decoration have been occasionally reported. Vessel forms are restricted to simple functional forms (e.g., ollas, jars, and bowls). The method of manufacture is coil construction and presumably open firing at relatively low temperatures. The south Texas bone-tempered pottery tradition is believed to be linked to a similar central Texas tradition commonly referred to as *Leon*

Plain (Hester and Hill 1971). Bone-tempered pottery also occurs in east Texas in the Caddoan area as well as adjacent areas of Louisiana and Arkansas. It is possible that bone-tempered pottery making was introduced to south Texas from the east rather than from central Texas.

Along the south Texas Gulf coast, sandy paste ceramics known as *Rockport* wares (Campbell 1962) are common. *Rockport* sherds have been found at several inland sites such as the Berclair site (Hester and Parker 1970) and are usually cited as examples of coastal contact. Trade wares from distant regions have occasionally been found in south Texas. Huastecan ceramics have been found in extreme south Texas (MacNeish 1958). Mogollon ceramics have been found in Dimmit County (Hester and Hill 1969). Southwestern ceramics have been found in Bexar County (Orchard and Campbell 1959). These finds, although rare, clearly indicate some trade or indirect contact with cultures producing more sophisticated ceramics during the Late Prehistoric period.

FINAL RESEARCH DESIGN

Prior to ceramic analysis, the author reviewed regional literature pertinent to prehistoric ceramics. A preliminary research design (Black 1979) was formulated and distributed to interested colleagues for criticisms in January 1979. The research design provided the author with an analytical framework to guide the study. A seven phase study was conceived to answer a series of research problems or questions posed concerning various aspects of the Nueces River Project ceramics. In May 1979, the research design was revised based on the experience gained during the first five months of the analysis. The final research design presented here is a further revision which reflects several years of experience and the cold hard realities of limited time and money. As will be noted, the research design was only partially completed. Perhaps future analysts will be able to accomplish more of the goals ambitiously set forth during the present analysis.

Previous ceramic studies in southern Texas have been of a very limited nature for the following reasons: (1) small sample sizes, (2) lack of time and money, (3) disinterest, and often (4) lack of adequate research facilities. The ongoing Nueces River Project has contributed a great deal toward overcoming these deficiencies. The comparatively large ceramic sample collected from 16 sites within a geographically restricted area (the proposed reservoir) enabled a more comprehensive ceramic study to be undertaken. In order to best accomplish this study, a number of research goals or problems to be answered were formulated. These questions are basic and often overlap.

1. What variations are present in the sample?
2. Can the variations be demonstrated quantitatively?
3. How can the variations be explained? From different sources, manufacturing technologies, time periods, cultures, materials, etc.?
4. How do the varieties compare?
    a. intersite
    b. intrasite
    c. interregion
5. How were the ceramics manufactured? What techniques and materials were utilized?

6. Where were the ceramics manufactured? Locally, or imported, one source or many?

and perhaps most importantly,

7. What analytical techniques would be most useful in future ceramic studies of the area?

Some of the questions can never be completely and accurately answered; nonetheless, it has been attempted to answer as many of them as fully as possible. To accomplish the stated goals or rather to answer the stated questions, a multiphase analysis was envisioned. Initially, seven steps or phases were planned; an eighth phase was later added. The eight phases are outlined below.

1. Final Research Design: ". . . to be formulated after review and criticism of the preliminary research design" (Black 1979). In reality, the final research design was never formally prepared as modifications were continually made.

2. Isolate Sample: The preparation of the ceramic sample by inventory, labeling, and organization. Each ceramic fragment was given a sequential specimen or sherd number to facilitate the analysis. The ceramics were organized by site. This initial examination provided a feel for the variations and limitations of the sample and an inkling of problems yet to be encountered.

3. Sherd Examination and Attribute Definition: Initially, this phase was intended to be a routine, consistent examination of each sherd "requiring no more than 5-10 minutes per sherd" (*ibid.*). It was hoped to record sherd attribute data for a variety of possible attributes which could be quantitatively coded. A lengthy attribute list was compiled based on general ceramic literature, Bennett (1974), and a study then underway on ceramics from a Bexar County site (never completed). It was initially planned to examine a random 10% sample of the total available sample (576 sherds) using the attribute list. This population termed the First Run would be used for statistical analysis. Those attributes found to be useful would be the basis for a Second Run using a second 10% random sample. This process would continue until all sherds had been examined and a final set of essential attributes were compiled. This phase was very naively conceived, severely revised, and ultimately scrapped.

4. Attribute Analysis: Two types of attribute analysis were planned--quantitative (objective) and qualitative (subjective). A quantitative analysis was attempted on a 50% random sample of the total sample using computer-produced statistics of numerically coded attributes. A qualitative analysis following the accepted practice of visually dividing the sherds into groups sharing common subjectively chosen attributes was planned for the remaining 50% sample. Both of these methods were expected to provide attribute groups which could then be compared. The quantitative analysis was unsuccessful for several important reasons. Ultimately, the entire 576 sherds were divided into subjective attribute groups.

5. Technological Analysis: To be based on the attribute groups as a test of the validity and to explain the variation of the attribute groups. The technological methods which were expected to be used included thin-section (petrographic) examination, refiring tests, and Differential Thermal Alteration (DTA). These studies were expected to provide information on clay mineral

identification, paste inclusion identification, degree of homogeneity of each attribute group, firing temperatures utilized, etc. This phase was not conducted due to lack of time, money, and access to facilities.

6. Comparative Analysis: The author planned to compare attribute groups at three levels: intersite (larger samples), intrasite, and interregional. It was expected that certain attribute groups from certain sites would more closely resemble ceramics from specific areas or sites, allowing some inferences to be made regarding cultural influences or interaction. This phase was partially completed. Lack of easily accessible comparative samples somewhat hindered the interregional comparisons.

7. Experimental Replication: This phase was added during the course of the analysis. To understand and accurately describe the pottery making methods represented by the project sherds, it was necessary to conduct a series of open firings under partially controlled conditions. Shepard (1976) and Matson (1963) have suggested that such replication be a prerequisite for serious ceramic analyses.

8. Data Synthesis: This report is the final phase of the analysis incorporating and summarizing all research design phases and making recommendations for the direction of future research.

CERAMIC TERMINOLOGY

Ceramic analysis requires the understanding and use of a number of specialized terms and concepts which have been borrowed from other fields and used with specific meanings. One problem is that ceramic terminology has not been standardized; two researchers may use a single term to represent two different concepts (see Shepard 1976:365-368 for an excellent discussion of this problem). In an effort to clarify the meanings of many of the terms repeatedly used in this analysis the following definitions are provided. More detailed discussions of many of these terms or concepts can be found in Shepard (*ibid*).

Burnishing — The use of a hard tool such as a smooth pebble or a worn sherd to compact and polish a vessel surface. Burnishing is done when a vessel is in a leather-hard state of drying. A fine clay and water solution may be used during the burnishing.

The fine clay may be the same clay in the paste or a different clay which is referred to as a *burnishing slip*. A burnished surface is smooth to the touch and has a luster or gloss. Functionally, a burnished surface strengthens the vessel and decreases the permeability (holds water longer).

Core — The layer of unoxidized carbon usually visible in the cross section of a freshly broken sherd, also called the *carbon streak*. The core is often in the central portion of the cross section appearing as a noticeably darker color than the surface or near surface areas of the paste. The core may cover part or almost all of a cross section. Figure 89 shows the variations of core thickness common at Choke Canyon. Cores are usually centered one in which the constituents are evenly distributed as opposed to a *poorly mixed* paste. In a *convoluted* paste, the constituents are aligned in folded irregular patterns. A *patchy* paste is one with distinct patches of untempered clay. The term *fine-grained* paste herein refers to the texture of the matrix to which the bone temper has been added. Since virtually all the Nueces River Project ceramics were bone tempered, bone was not considered in paste texture. See Shepard (1976:117-121) for an excellent discussion of paste texture.

<u>Paste Inclusion</u> A nonclay constituent of a paste. A *nonplastic inclusion* is one that retains its structure when fired (e.g., bone or sand). A *natural inclusion* is one naturally present in the clay. Intentionally added inclusions are called *temper*.

<u>Rim</u> The lip or top edge of a vessel. A rim may be *direct* (Fig. 90,b), *tapered* (Fig. 90,c), *tapered from the exterior* (Fig. 90,f), *tapered from the interior* (Fig. 90,c), *thickened* (Fig. 90,l), or *beveled* (Fig. 90,d).

<u>Slip</u> A thin layer of fine clay particles applied to a vessel surface. Floating produces a self-slipped effect. A true slip is made from a different clay than used in the paste. A *burnishing slip* is a clay layer applied while polishing a surface.

<u>Smoothing</u> The use of fingers or tools to make a vessel surface even. A well-smoothed surface has very even contours. A poorly smoothed surface has uneven, irregular contours.

<u>Sooting</u> Application of a thin layer of carbonaceous material on a vessel surface. Sooting can be intentional during firing or a by-product of cooking over an open fire. Sooting results in a black color which can be easily confused with fire clouding or asphaltum.

<u>Wet Brushing</u> Use a brushlike tool (possibly a frayed stick) to smooth the surface of a wet, freshly made vessel. This technique was frequently applied to the interior surfaces of Nueces River vessels leaving a characteristic surface finish. The brush marks are usually parallel, but can be irregular.

ATTRIBUTE CODING VALUES

A major emphasis of the earlier phases of this analysis was numeric coding of attributes. All attribute value codes were set up in a consistent manner from least to most or best to worst. The values chosen were purposefully limited to a maximum of five categories, since it has been demonstrated that with any systematic observation, the larger the number of categories the greater the variation between operators (Griffiths and Rosenfeld 1954:75). Most of the attributes initially chosen were eliminated due to inconsistency of coder, covariance of attributes, poor attribute value selection, and inability to code attributes due to poor preservation. Bennett (1974) provides coding attribute but may be closer to the exterior or interior of a vessel wall. A *zoned core* is one with distinct zonation in color.

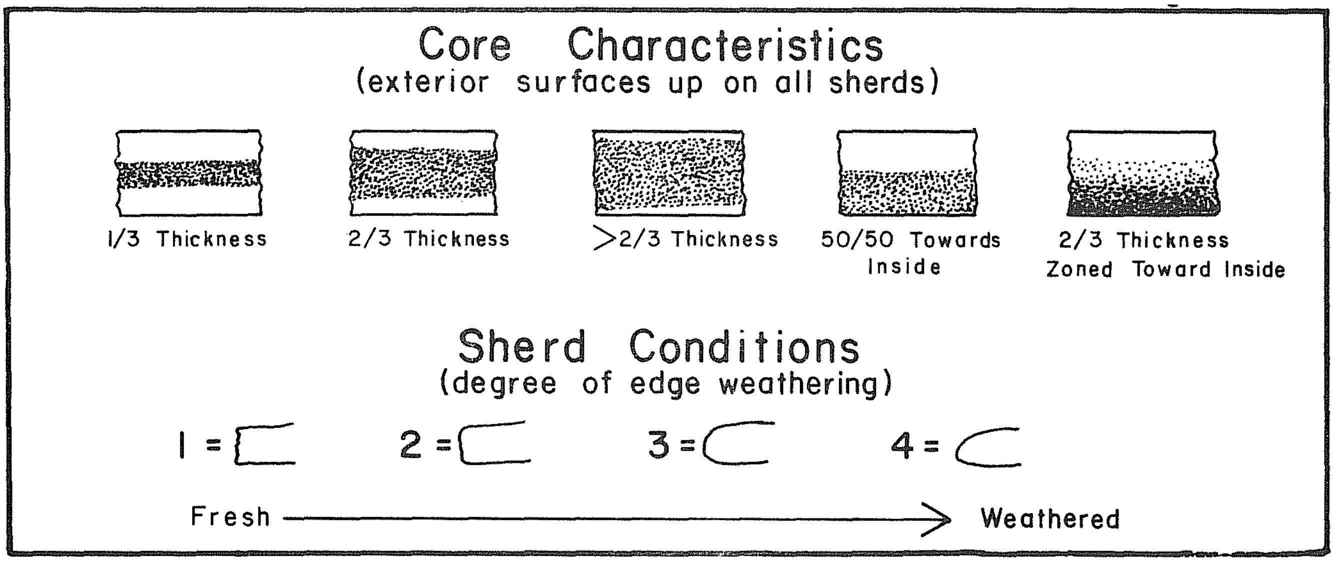


FIGURE 89

<u>Floating</u> The use of water or a paste slurry to bring the finer clay particles to the surface of a vessel. A floated surface has a thin layer of fine clay which often masks the temper particles just under the surface. This process is analogous to the final step of finishing concrete. A vessel surface is floated after the vessel has been formed, shaped, and smoothed just before it is set aside to dry.

<u>Fire Cloud</u> An unoxidized patch or cloud on a vessel surface caused during firing. The fire cloud results from lack of oxygen and can be caused by direct contact of fuel against vessel. Fire-clouded surfaces have gray splotches or mottling on them. Fire clouding can be difficult to distinguish from soot on small sherds.

<u>Oxidation</u> To combine with oxygen. The carbonaceous matter in a ceramic paste needs oxygen in order to burn. An *oxidized* vessel has absorbed the maximum amount of oxygen possible and contains no unburned carbonaceous material. Iron compounds oxidize as well, and are very important in determining colors. Well-oxidized vessels will have light clear colors such as red, tan, and orange.

<u>Paste</u> The mixture of clay and temper used to form a vessel. A paste may include a variety of constituents such as sand, clay, and silt. A *compact* paste has few visible pores. A *porous* paste has many visible pores. These terms are subjective as porosity is difficult to measure (Arnold 1975). A *homogeneous* paste is

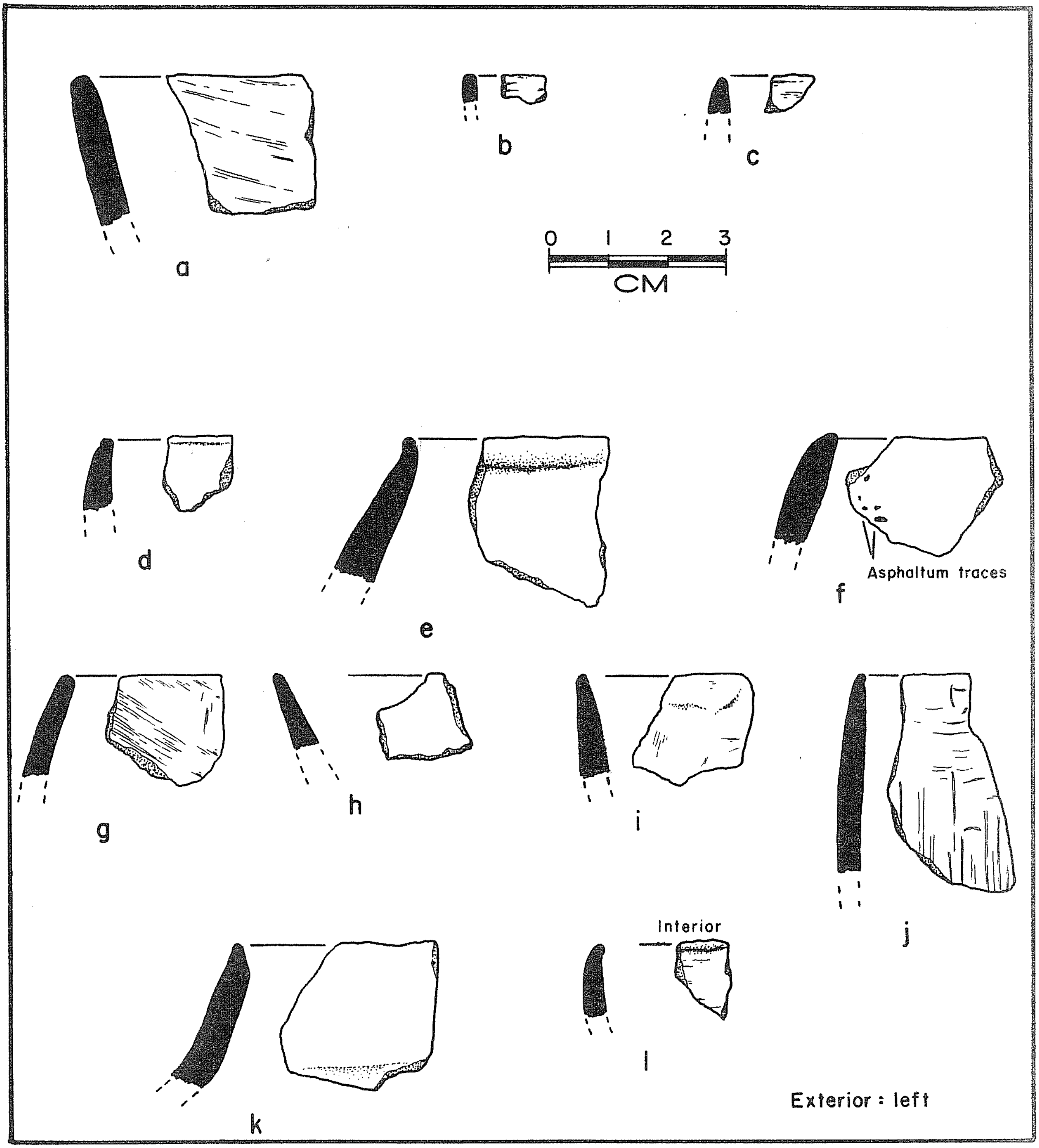


Figure 90. *Rim Sherds*. a, 41 LK 15, Group 2; b,c, 41 LK 41, Group 1C; d, 41 LK 41, Group 5; e, 41 LK 51, Group 2C; f, 41 LK 67, Group 2; g, 41 LK 201, Group 1B; h, 41 LK 201, Group 3A; i,j, 41 LK 201, Group 1A; k, 41 MC 84, Group 3; l, 41 MC 222, Group 1A.

definitions and format for a very large scale ceramic project in the southwest. Borrowing freely from Bennett's (*ibid.*) work, the following attributes were found to be most appropriate for the Nueces River Project ceramics.

Nonplastic Paste Inclusion Quantities or Density

The Choke Canyon ceramics were quite varied in the density of nonplastic paste inclusions. This attribute was felt to be significant in distinguishing between paste or vessel groups. The density or relative frequency of paste inclusions in ceramics is a difficult attribute to quantify. The problems are analogous to those faced by sedimentologists and mineralogists trying to quantify particle or mineral composition frequencies. Most of the accurate methods are prohibitively time consuming and require special equipment. An alternative method which is less accurate, but much quicker is a visual comparison chart. Several methods of constructing visual comparison charts have been used, including the checkerboard method employed by Bennett (1974:105) and a more sophisticated method using irregular angular fragments (Terry and Chilingar 1955). The latter method is more realistic and contains both black fragments on a white background and white fragments on a black background. The comparison charts Terry and Chilingar illustrated were actually developed by a Russian sedimentologist, M. S. Shvetsov, and have been reproduced in readily accessible publications such as the American Geological Institute (A.G.I.) Sheets (No. 6).

There are several problems inherent in estimating paste inclusion density which should be emphasized. Griffiths and Rosenfeld (1954) have clearly demonstrated that operator error is a significant concern in comparing this type of data. Different operators will estimate values differently and may consistently overestimate or underestimate. To verify the accuracy of the paste inclusion quantity estimate, it would be necessary to measure an operator's estimates against known values. This was not done with the Nueces River Project ceramics. A further problem is that many sherd cross sections have a variety of color inclusions against a variety of background colors. Sand appears to be much harder to estimate than bone, perhaps because sand is often translucent or highly reflective. The paste inclusion quantity values should be regarded as relative estimates. Below are the percentage density ranges and Nueces River Project values used to code this attribute. To reduce error, comparatively broad categories were selected.

COMPOSITION DENSITY PERCENTAGE RANGE	DESCRIPTIVE TERM	NUECES RIVER PROJECT CODING VALUE
< 5	Very Sparse	1
5-15	Sparse	2
15-25	Moderate	3
25-50	Profuse	4
> 50	Very Profuse	5

Particle Shape or Degree of Roundness

Considerable variation in sand grain shape was observed in the Choke Canyon ceramic collection. Sedimentologists have long been concerned with measuring sedimentary particle shape or rather sphericity or roundness. In general, given particles of similar hardness and minerology (quartz grains, for example) the greater the degree of roundness, the longer the distance the particle has been transported. The actual factors which determine particle shape are more complex (A.G.I. Data Sheet 7), however, the size and degree of roundness in sand grains can indicate general depositional modes. A visual comparison chart (A.G.I. Data Sheet 7) was used to estimate particle shape or sphericity. Table 22 shows the correlation of terms with the Nueces River Project shape values.

Particle Sizes

Particle sizes of nonplastic paste inclusions such as sand, bone, and hematite were determined by use of a micrometer installed in one of the 10X eyepieces in the Olympus variable power binocular microscope. The micrometer was calibrated for 30X. All measurements were taken at this magnification. Wentworth's size classification system (Shepard 1976:118) was used for a particle size scale as shown in Table 23. Most visible particles observed in the ceramic cross sections ranged from very fine to very coarse and were coded numerically for convenience.

QUANTITATIVE ANALYSIS

A major emphasis of the early phases of this analysis was an objective analysis of the ceramic sample using numerically coded attributes. It was hoped that a statistical analysis of attribute observations would avoid the inherent limitations of the "non-typological" studies commonly applied to plainware ceramics. An attempt to produce meaningful attribute clusters or groups was unsuccessful for a variety of reasons. Beware, plainware ceramics are much less amenable to statistical analysis than painted or decorated ceramics. This is particularly true when the analyst is inexperienced and the sample consists mostly of differentially preserved sherds.

The quantitative analysis began with a compilation of a lengthy attribute list (Appendix VI, Fig. 109). The list was compiled from a number of sources including Bennett (1974), a ceramic analysis then being undertaken at the CAR-UTSA on sherds from 41 BX 300 by Carolyn Furman (never completed), and various ceramic references. A decision was made to initially use the shotgun approach and to later discard those attributes which proved unnecessary. This proved to be hopelessly naive and resulted in the familiar problem common to many attempts to use statistical analysis in archaeology: "garbage in, garbage out."

TABLE 22. ROUNDNESS OF SEDIMENTARY PARTICLES (Nueces River Project)

DESCRIPTIVE TERM	NUECES RIVER PROJECT SHAPE VALUES
Very Angular	-
Angular	1
Subangular	2
Subrounded	3
Rounded	4
Well Rounded	5

TABLE 23. WENTWORTH'S SIZE CLASSIFICATION

DESCRIPTIVE TERM	DIAMETER LIMITS	NUECES RIVER PROJECT SIZE CLASSES
Pebble	64-4 mm	-
Granular	4-2 mm	-
Very Coarse	2-1 mm	5
Coarse	1-0.5 mm	4
Medium	0.5-0.25 mm	3
Fine	0.25-0.125 mm	2
Very Fine	0.125-0.062 mm	1
Silt	0.062-0.0039 mm	-

Initially, a 50% random sample was drawn from the parent population of 576 ceramic fragments using random numbers generated by a TI 58 programmable calculator. After 105 sherds were coded onto Form 1A, it became obvious that the procedure was too time consuming. Completing Form 1A (Appendix VI, Fig. 109) took from fifteen minutes to one hour per sherd. At this point in the analysis, the author did not realize how inconsistent his attribute recording had been, but after slight modifications of the data, the first 105 cases (sherds) were keypunched and examined using SPSS and BMDP packaged statistical programs. A series of data frequencies and factor analyses revealed a substantial number of attributes which either did not vary (i.e., were constants) or covaried (redundant variables or attributes). These obviously useless attributes were eliminated and a revised form (Appendix VI, Fig. 110) devised.

Completing Form 1B took from five to fifteen minutes per sherd. The remaining 183 sherds of the original 50% random sample were recorded on Form 1B. With completion of these 183 sherds and conversion of Form 1A data to Form 1B, there were 288 numerically coded data cases.

Unfortunately, many attributes had not been consistently recorded. In double checking the 288 coded forms, many inconsistencies were observed. Two principle reasons were responsible: inexperience and sampling. One can read exhaustively about a particular technique, but it takes considerable practice to identify the techniques in the flesh, so to speak. It was also impossible to record many of the attributes because the sherd surfaces were either not preserved or masked by lot number application. This meant that the number of missing cases for many attributes exceeded the number of valid cases. Rather than complete an unreliable, poorly conceived analysis, the quantitative analysis was abandoned.

In retrospect, statistical analysis is ill-suited for the analysis of the Choke Canyon ceramics. This sort of analysis could prove useful with a well-preserved sample and sufficient experience to consistently recognize and record important attributes, but it is equally possible that quantitative analysis cannot be successfully employed with plainware sherd samples. If an analysis is to provide cultural inferences, then one must choose attributes which result from cultural behavior; however, many of the attributes which varied the most among Choke Canyon ceramics (i.e., "sherd condition," "surface luster," and "filler particle protrusion") reflected nonbehavioral factors such as length of exposure.

QUALITATIVE ANALYSIS

The qualitative or subjective ceramic analysis proved to be the most useful method of defining attribute groups. Qualitative analysis involves the division of ceramics into similar groups on the basis of one or more subjectively chosen attribute. Shepard (1976:97-100) discusses "pottery sense," the ability to recognize important likenesses and differences between pottery samples. Shepard suggests that this sense is a developed ability based on experience, keen perception, and an understanding of the materials and techniques employed, but the inherent weaknesses in this type of analysis are many. The researcher must choose among the almost infinite number of possible observations or attributes which are significant. Many of the reasons a particular sherd is grouped with another may be beyond verbal description--hence, others are forced to accept on "faith" the "pottery sense" of an expert. Shepard accepts "pottery sense" as a valid indispensable ability, however, she points out the need for more adequate ceramic description. Shepard presents an effective argument for the use of pottery standards and of standardized descriptive systems. She notes inherent limitations in objective and subjective methods, but clearly recognizes that an objective analysis can provide data otherwise unobtainable.

As previously discussed, meaningful attribute groupings using quantitative methods were unobtainable. With approximately six months of examining and handling the Choke Canyon ceramics, experimental replications of certain ceramics techniques, considerable literature research, and a renewed confidence in his own "pottery sense," the analyst reexamined the entire ceramic sample. With each site, the analyst attempted to group sherds together which were most similar in observable attributes, but the small differentially preserved plainware sherds had few attributes which could be consistently observed. The nature of the sample from each site varied considerably. Some sites had large samples from horizontally distinct areas of the site and good preservation. Other sites had only a few poorly preserved sherds. These varying conditions forced a choice between using the few attributes common to all sherds (i.e., past inclusions, core characteristics, and thickness) or using as many attributes as possible to distinguish all site groups. The latter method was chosen.

The sherd sample from each site was examined three or four times. Obviously, similar sherds were grouped together with brief notes describing shared and unshared attributes. Eventually a series of site groups were defined for each site. Ideally each site group would contain sherds from a single vessel. In some sites, this proved possible, but in others, a group consisted of similar sherds from several vessels. A standardized site group form (Appendix VI, Fig. 111) was used to record each group. A similar range of observations were made on each group although specific attributes for a given group were often missing due to poor preservation or small size. In general, the larger sherds were better preserved and allowed more detailed descriptions. Smaller poorly preserved sherds provided only minimal detail. As should be apparent, the site groups are a form of the "non-typological" descriptive studies used in virtually all analyses of plainware from Texas.

The examination routine was standardized for consistency. During the first examination of each site sample, the sherds were grouped based on observations made during numerical coding and on macroscopic details. In sites with small sample sizes and relatively dissimilar groups, the first sorting was refined less on subsequent sorting than in larger sites with similar groups. The second examination of each site sample involved microscopic examination of sherd cross sections and surfaces. Each sherd was examined under 7X magnification and then "zoomed up" (higher magnification) to examine specific attributes. Paste inclusions were felt to be an important category of attributes because they could be observed on virtually every sherd and because these attributes varied considerably, especially between recognized groups. Paste inclusion attributes included identification of inclusions, estimates of relative densities, and measurements of inclusion particle size and shape. These observations were made at 30X with the aid of a calibrated micrometer (installed in the left eye piece) and comparative density and shape charts. Once a given sherd had been examined, brief notes were made on small slips of paper which were attached to the sherd bag. Subsequent sherds from the same pile were examined microscopically. If the details were the same or very similar to the first sherd then the second sherd was placed with the first without notes. On the other hand, if several details differed, then notes were made, and either a new group was started or several subgroups defined.

The process of reviewing each group macroscopically and microscopically was repeated until as fine a distinction as possible was made. This process is tedious and time consuming but essential. With experience, the process becomes faster, but even the most experienced analysts can expect to spend hundreds of hours examining a similar sample. There are no short cuts when dealing with small differentially preserved plainware sherds unless one chooses to ignore the many differences apparent upon close inspection. With practice, one is able to see subtle differences which clearly indicate seemingly similar sherds made with different paste compositions, firing conditions, and surface treatments. The closer one looks, the greater the variability one finds.

The resulting site groups are subjective groups described in a consistent format using as many objective measurements or descriptive standards as possible. The replicability of these groups varies with the site, but the author is confident that if he began anew, 70-90 percent of the groups would be unchanged. The 10-30% which would change are mostly those problematic groups with poor preservation. A number of catchall or miscellaneous groups were used at various sites where necessary. The analyst attempted to make note of these ambiguous groups, but believes that an experienced analyst could identify most groups using the site group descriptions. It is clearly recognized that no two analysts would divide the groups identically.

SITE GROUPS

The following section contains a breakdown by site of the identifiable site groups. Table 24 provides provenience data for all sherds recovered during Phase I investigations. A site group is a cluster of ceramic fragments which share similar attributes. Ideally each group contains sherds from a single vessel or with identical paste descriptions. Subgroups (1A, 1B, etc.,) were used to distinguish minor variations within an otherwise homogeneous group. Miscellaneous groups were used where necessary as catchall groups. Each group has been given a descriptive name. Please note that the descriptive name is NOT intended to be a type name but merely serves as a convenient label. The groups are numbered consecutively within each site; Group 1 at 41 LK 67 is not the same as Group 1 at 41 MC 222. Terminology and attribute codes were standardized and are defined in previous or following sections.

41 LK 14

Total No. of sherds: 7.
Number coded: 2.
Provenience: 1 uncontrolled surface, 3 controlled, 3 controlled subsurface.
General discussion: At least two vessels were present in the 41 LK 14 collection. Two groups were defined; both are bone tempered and have burnished

TABLE 24. PROVENIENCE OF PREHISTORIC CERAMICS RECOVERED IN EXCAVATIONS

Site	Group	Surface Uncontrolled	Surface Controlled	Subsurface Uncontrolled	Subsurface Controlled	Unit	Level	Count	Group Total	Site Total
41 LK 14	1		2		3	Test Pit 3	1	3	5	
	2	1	1						2	7
41 LK 15	1				2	Test Pit 4	2	2	2	
	2				16	Test Pit 4	1	13		
						Test Pit 4	2	3	16	18
41 LK 41	1		29		35	N1115 E1401 (1A)	2	1		
						N1135 E1441 (1A)	1	5		
							2	4		
						N1135 E1442 (1A)	1	2		
						N1136 E1441 (1A)	1	2		
							2	3		
						N1136 E1442 (1A)	1	4		
							2	4		
						N1144 E1474 (1A)	1	1		
						N1153 E1469 (1A)	1	1		
						N1135 E1441 (1B)	2	1		
						N1115 E1402 (1C)	1	1		
						N1135 E1441 (1C)	2	1		
						N1154 E1469 (1C)	1	1		
						N1154 E1470 (1C)	1	1		
						N1154 E1470 (1D)	1	1		
						N1135 E1442 (1E)	1	1		
						N1136 E1442 (1E)	1	1	64	
	2		11		11	N1114 E1400 (2A)	1	2		
						N1115 E1400 (2A)	1	3		
						N1115 E1402 (2A)	1	1		
						N1116 E1400 (2A)	1	1		
						N1116 E1402 (2A)	1	1		
						N1117 E1402 (2A)	1	1		
							3	1		
						N1153 E1470 (2A)	1	1	22	
	3		8		9	N1135 E1441 (3A)	2	1		
						N1144 E1474 (3A)	1	1		
						N1145 E1475 (3A)	1	2		
						N1117 E1401 (3B)	1	1		
						N1117 E1402 (3B)	1	1		
						N1115 E1400 (3C)	1	2		
						N1117 E1402 (3C)	1	1	17	
	4		7		1	N1145 E1475	1	1	8	
	5		6		3	N1117 E1400	1	1		
						N1135 E1441	1	1		
						N1136 E1442	1	1	9	
	6		4		2	N1114 E1402	1	1		
						N1115 E1400	1	1	6	126
41 LK 51	1	11							11	
	2	40							40	51

TABLE 24. (continued)

Site	Group	Surface Uncontrolled	Surface Controlled	Subsurface Uncontrolled	Subsurface Controlled	Unit	Level	Count	Group Total	Site Total
41 LK 67	1				146	N841 E1058	1	42		
							2	2		
							3	1		
						N841 E1059	1	13		
							2	10		
							5	1		
						N841 E1054	1	1		
						N841 E1057	2	3		
							3	6		
						N842 E1058	1	32		
							2	2		
							3	4		
						N842 E1059	1	7		
							2	12		
						N843 E1058	1	5		
							2	1		
						N844 E1052	4	1		
						N844 E1056	1	1		
						N845 E1058	4	1		
						N847 E1057	1	1	146	
	2		69		1	N990 E1006	2	1	70	
	3		1		9	N841 E1056	5	1		
						N841 E1058	1	1		
						N842 E1057	1	2		
						N842 E1058	1	1		
						N842 E1059	2	1		
						N843 E1048	1	1		
						N843 E1058	1	1		
						N845 E1059	1	1	10	
	4	10							10	
	5				2	N841 E1059	2	1		
						N847 E1058	2	1	2	238
41 LK 201	1	2	8						10	
	2		5		4	Test Pit 2	1	3		
							2	1	9	
	3	6	18		2	Test Pit 2 (3E)	2	2	26	
	4		2						2	
	5	1							1	
	6			1					1	
	7	2							2	51
41 MC 15	1		1						1	
	2				1	Test Pit 2	1	1	1	2
41 MC 17	1	1							1	1
41 MC 19	1	1							1	1
41 MC 41	1		1						1	1

TABLE 24. (continued)

Site	Group	Surface: Uncontrolled	Surface: Controlled	Subsurface: Uncontrolled	Subsurface: Controlled	Unit	Level	Count	Group Total	Site Total
41 MC 55	1				4	Test Pit 2	1	1		
							2	3	4	
	2				3	Test Pit 2	1	1		
							2	1		
							3	1	3	
	3	1							1	
	4	1	2						3	
	5				1	Test Pit 2	3	1	1	
	6	2							2	
	7				2	Test Pit 3	2	2	2	16
41 MC 64	1		1						1	1
41 MC 84	1	11							11	
	2	1							1	
	3	1							1	13
41 MC 94	1		2						2	2
41 MC 222	1		2		26	N98 E87 (1A)	1	1		
						N98 E88 (1A)	1	15		
						N98 E89 (1A)	4	3		
						N99 E87 (1A)	1	1		
						N99 E88 (1A)	1	3		
						N98 E88 (1B)	1	2		
						N98 E89 (1B)	4	1	28	
	2		11		2	N99 E87	1	1		
							2	1	13	
	3	1	2		1	N104 E88	1	1	4	
	4				2	N99 E87	1	2	2	47
41 MC 223	1	1							1	1
Totals	94	193		1	288			288	576	576

exterior surfaces. Paste inclusions vary considerably between groups indicating at least two clay sources.

41 LK 14 Group 1 (burnished bone tempered)

Total No. of sherds: 5 (1 coded).
Provenience: 2 controlled surface, 3 controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.6-0.9 cm.
Sherd length: 2-3 cm.
Sherd condition: 1-3. Varies.
Paste: Porous, poorly mixed, and somewhat convoluted. Some natural inclusions (sand and hematite).
Core: > 2/3 thickness.
Exterior surface: Highly burnished with burnishing slip. Very even and smooth, compact, temper free, highly polished surface. Some clouding. Some poorly preserved. Light brown to brown gray (clouded).
Interior surface: Slightly burnished and floated. Slightly uneven. Reddish light brown.
Paste inclusions: Bone: Quantity = 3-4; particle size = 1-5. On most cross sections, the bone is moderate.
Sand: Quantity = 2; particle size = 2-3; shape = 2-4. Opaque to clear to multicolored.
Other: One quartzite chunk (size 5). Several hematite chunks (size 4). Resin bubbles.
Estimated No. of vessels: 1 or 2.
Comments: Probably one vessel with uneven mixing and differential preservation on the surface.

41 LK 14 Group 2 (thin, burnished, profusely bone tempered)

Total No. of sherds: 2 (1 coded).
Provenience: 1 uncontrolled surface, 1 controlled surface.
Vessel fragments: Body.
Sherd thickness: 0.5 cm.
Sherd length: 1.5-2.0 cm.
Sherd condition: 3. Weathered.
Paste: Very fine; slightly porous. Homogeneous and profusely tempered.
Core: 2/3 thickness. Offset toward interior.
Exterior surface: Highly burnished. Floated; well smoothed. Some weathering beginning to expose temper. Light tan.
Interior surface: Poorly preserved. Light tan.
Paste inclusions: Bone: Quantity = 4-5; particle size = 1-5. Very profuse.
Other: Resin bubbles.
Estimated No. of vessels: 1.

41 LK 15

Total No. of sherds: 18.
Number coded: 5.
Provenience: Controlled subsurface.
General discussion: Two sherd groups are present at 41 LK 15. Both groups have profuse quantities of generally well-rounded sands. This suggests an alluvial clay source although the sand may have been added as temper. Sand varies in size and composition between the two groups suggesting differing clay or temper sources. Bone in sparse amounts has been added to both groups. Typically, all exteriors are highly burnished. Group 1 sherds appear more weathered than Group 2. All sherds are from Test Pit 4, Levels 1 and 2. Group 1 sherds are both from Level 2, while Group 2 sherds are from both levels. Red film on Group 2 is definitely a form of decoration.

41 LK 15 Group 1 (weathered, profuse sand with sparse bone temper)

Total No. of sherds: 2 (1 coded).
Provenience: Controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.6 cm.
Sherd length: 2.0 cm.
Sherd condition: 3. Weathered. Surface largely destroyed. Some calcareous coating or film on exposed sherd surfaces.
Paste: Light tan sandy paste. Slightly porous. Homogeneous. Larger sand possibly added along with some bone as temper.
Core: None, totally oxidized.
Exterior surface: Traces of a floated and burnished surface, mostly weathered away. Light tan.
Interior surface: Smoothed. Poorly preserved. Light tan.
Paste inclusions: Bone: Quantity = 2; particle size = 1-5.
Sand: Quantity = 4-5; particle size = 1-5; shape = 3-5; opaque to multicolored. Very fine sand may be inclusion. Larger sand may be temper.
Other: Occasional hematite chunks. One small well-worn pebble.
Estimated No. of vessels: 1.

41 LK 15 Group 2 (fugitive red filmed, burnished, profuse sand)

Total No. of sherds: 16 (4 coded).
Provenience: Controlled subsurface.
Vessel fragments: 1 rim, 15 body.
Sherd thickness: 0.5-0.7 cm.
Sherd length: 1.0-4.5 cm.
Sherd conditions: 2-3. Surface condition varies but generally good.
Paste: Homogeneous, gritty paste. Slightly porous. Sand is probably a natural inclusion. Strongly suggesting an alluvial clay source.
Core: > 2/3 thickness.

Exterior surface: Smoothed. Floated. Highly burnished. Coated with thin fugitive red. The fugitive red is actually a dark maroon color; gray tan to gray with some maroon. Some clouding.

Interior surface: Smoothed (not as well as exterior). Floated. Wet brushed and burnished but not as well finished as exterior. No fugitive red except just inside rim. Grayish light tan. Some clouding.

Paste inclusions: Bone: Quantity = 1-2; particle size = 1-2; shape = 5. Mostly finely pulverized. Occasional very coarse chunk.

Sand: Quantity = 5; particle size = 1-3; shape = 3-5. Opaque to clear to multicolored. Homogeneous source.

Estimated No. of vessels: 1.

Comments: Probably represents a single vessel although it could be several vessels with identical pastes and surface finishes. One rim sherd (Fig. 90,a) is a straight rim with a slight taper from the interior. Vessel is a fairly large bowl. Fugitive red film is applied to top of rim, along edge of rim interior and on exterior surface. Brush strokes are visible in coating. Dark maroon color of fugitive red suggests postapplication firing (see general discussion of fugitive red film).

<u>41 LK 41</u>

Total No. of sherds: 126 (including ceramic fragments).
Number coded: 59.
Provenience: 65 controlled surface, 61 controlled subsurface.
General Discussion: The ceramic sample from 41 LK 41 is the second largest collection from the Phase I investigation. The 126 sherds represent a relatively diverse assemblage in comparison to the other sites sampled. Six sherd groups were defined for 41 LK 41 based on morphology. These six groups were further divided into 18 subgroups. The six groups represent major clusters of similar sherds which are reasonably distinct. The preservation and sherd size varied considerably at 41 LK 41. The smaller, poorly preserved sherds were impossible to sort into individual vessel groups. The overall large sample size and degree of variation in attributes necessitated use of several miscellaneous groups.

Paste composition varied considerably among the 126 sherds from 41 LK 41. It is apparent that a number of clay sources and a number of combinations of clay and temper were used. Sand and bone are present as nonplastic paste inclusions in almost all sherds. The bone is an intentional additive or temper that is present in amounts ranging from sparse (Groups 4 and 5) to profuse (Groups 1 and 2). Sand could be a natural inclusion or it could have been added as a temper. Some sherd groups (especially Group 4) have so much sand and so little bone that it suggests the sand was intentionally added. Group 1 had a unique paste which is compact, fine grained, a distinctive gray, and contained numerous, very coarse to granular patches of untempered clay. The sand present in this paste lacks the evidence of long distance transport (i.e., it is not well rounded) that one would expect from alluvial clays. It is suggested that the clay source for Group 1 is an upland clay which was collected dry and pulverized. The large clay particles are uncrushed or incompletely crushed clay fragments. Pastes in other groups have larger quantities of rounded sand grains and may represent use of alluvial clay sources.

Surface treatment techniques also vary considerably at 41 LK 41. Of particular interest is the use of distinct slips applied to the exterior surfaces of Groups 1E and 2B. Group 1E sherds have a very fine slip on the exterior which appears to have functioned as a burnishing slip. Most sherds from all groups with preserved exterior surfaces showed evidence of floating, smoothing, and burnishing to varying degrees. Interior surfaces in most groups are poorly smoothed, frequently show brush marks, and are either not burnished or poorly burnished. No evidence of fugitive red filming was observed on any 41 LK 41 sherd.

Vessel forms represented by the 41 LK 41 collection are limited to bowls and ollas. Most sherds are small body sherds which are undiagnostic of any vessel form. The three rim sherds present appear to be from fairly small bowls. The one ceramic handle fragment probably comes from a handled olla. Another indication of ollas or constricted neck vessels are noticeably poorer interior finishing techniques noted on many sherds.

The irregular ceramic fragments in Group 6 (6B-6E) were not recovered from most Nueces River Project ceramic bearing sites. These may represent ceramic manufacturing debris. As will be discussed, irregular fired clay fragments would be expected in a manufacturing locality.

41 LK 41 Group 1 (thin, bone tempered, with compact fine gray paste)

Total No. of sherds:	64 (29 coded).
Provenience:	29 controlled surface, 35 controlled subsurface.
Vessel fragments:	2 rim, 62 body.
Sherd thickness:	0.4-0.6 cm.
Sherd condition:	2-3. Generally well preserved but some small and eroded. No severe leading observed. Some calcareous film.
Paste:	Compact fine-grained gray paste. Frequently convoluted. Well-fired resistant ware. Sparse sand is natural inclusion. Bone tempered; clay particles in paste.
Core:	Usually > 2/3 thickness.
Exterior surface:	Well finished. Smoothed. Floated and burnished, often very highly. Light tan to flesh tan.
Interior surface:	Generally poorly finished. Uneven parallel smoothing marks (finger and wet brush) common. Occasionally lightly burnished. Light tan, usually lighter than exterior.
Paste inclusions:	Bone: Quantity = 3-5; particle size = 1-5; most bone is coarse.
	Sand: Quantity = 1-2; particle size = 1-2; shape = 2-3, 5. Most sand is very fine to fine and clear to opaque

with occasional medium-sized, clear, well-rounded grains.

Clay: Occasional very coarse to granular patches of light gray untempered clay.

Other: Resin bubbles present in some sherds.

Estimated No. of vessels: The number of vessels represented by Group 1 is very difficult to estimate. A minimum number is 8-10, possibly more.

Comments: Group 1 is a very large group. The following variations were observed within this group with the noted exceptions. Group 1 (1A-1E) sherds are all thin walled, bone tempered, and well fired, with a similar fine compact paste. Vessel forms are unknown. Some (Group 1C) are small bowls.

Group 1A (40 sherds)

Fits Group 1 description.

Group 1B-with asphaltum (2 sherds)

Traces of asphaltum present along exterior edge. This obviously results from edge mending.

Group 1C (13 sherds)

Little or no sand. Clay patches rare. Exterior is well smoothed but possibly not burnished. The exterior surface color is reddish light tan. Some sherds have a thin core and may have been fired at higher temperatures or in a well-oxidized atmosphere. Two tiny rim sherds (Fig. 90,b,c) are present. One is a direct rim while the other is tapered from interior and exterior. Considering thinness, several small bowls are probably represented by Group 1C.

Group 1D (3 sherds)

Similar to Group 1A except gray, clouded exterior.

Group 1E (6 sherds)

Same as Group 1A except exterior surfaces have a very thin burnishing slip applied over a smoothed surface. Definitely distinct (gray or flesh) from paste and interior colors.

41 LK 41 Group 2 (miscellaneous bone tempered)

Total No. of sherds: 22 (12 coded).
Provenience: 11 controlled surface, 11 controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.4-0.8 cm.
Sherd condition: Varied, most are 3-4. Most surfaces eroded. Many sherds highly oxidized from long surface exposure.

Paste: Varied. Some with very fine sandy paste. Others with very fine-grained, porous paste. Often crumbly with excessive bone. All have bone temper added.
Core: Varied.
Exterior surface: Varied; when preserved usually well smoothed with burnishing.
Interior surface: Varied; when preserved, usually poorly smoothed or wet brush.
Paste inclusions: Bone: Quantity = 4-5; particle size = 1-5. Most bone coarse to very coarse.
Sand: Quantity = 1-2; particle size = 1-2. Occasional sherds have medium to coarse, well-rounded grains.
Other: Clay particles similar to Group 1. Quartzite chunk. Hematite. Resin bubbles.
Estimated No. of vessels: 6-10.
Comments: This group is a miscellaneous group of bone-tempered sherds. Poor preservation makes distinguishing groups difficult. All have bone tempering and weathered surfaces. Some similar in paste to Group 1. At least six vessels contributed to this group.

Group 2A (20 sherds)

Fits Group 2 description.

Group 2B (1 sherd)

A distinct brown slip has been added to the exterior. The color of the slip is markedly different from paste or interior surface.

Group 2C (1 sherd)

The unique paste of this sherd has a slightly porous sandy (very fine sand) texture with added bone and clay particle inclusions. Very coarse rounded clay particles occur in the paste. These particles have no bone within them but some sand. This may represent uncrushed clay. The paste is convoluted, probably poorly mixed. Parallel burnishing marks cover exterior surface.

41 LK 41 Group 3 (bone tempered with sandy paste and thick dark core)

Total No. of sherds: 17 (8 coded).
Provenience: 8 controlled surface, 9 controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.5-0.8 cm.
Sherd condition: Varied; 2-4. Many are weathered.
Paste: Fine sandy porous paste which varies somewhat. Probably several clay sources.
Core: Dark core; generally > 2/3 thickness.
Exterior surface: Where preserved, well smoothed to highly burnished. #106 has parallel burnishing marks.
Interior surface: Where preserved, poorly smoothed with some brushing. Interiors frequently sooted, especially Group 3B.

Paste inclusions: Bone: Quantity = 3-4; particle size = 2-5.
Sand: Quantity = 3-4; particle size = 1-4; shape = 2-5. Most are clear to opaque.
Other: Hematite occasionally present. Resin bubbles.
Estimated No. of vessels: 3.
Comments: Group 3 sherds share the following characteristics: moderate to profuse amounts of both sand and bone with sandy paste. Variants 3B and 3C are based on core characteristics and reflect firing conditions and postdepositional weathering.

Group 3A (6 sherds)

Fits Group 3 description.

Group 3B (3 sherds)

50/50 core toward interior. Sooted interior.

Group 3C (8 sherds)

Oxidized. Little or no core. Probably sun bleached.

41 LK 41 Group 4 (light brown sandy paste)

Total No. of sherds: 8 (5 coded).
Provenience: 7 controlled surface, 1 controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.7-0.8 cm.
Sherd condition: 1-3. Generally good condition. Some weathering.
Paste: Slightly porous. Homogeneous. Sandy paste with some bone. Angularity of sand suggests clay source is not alluvial.
Core: 1/3-2/3 thickness. Dark gray.
Exterior surface: Well smoothed--could have been burnished. Distinctive light brown color.
Interior surface: Same as exterior.
Paste inclusions: Bone: Quantity = 2; particle size = 2-4. Most of bone, noticeably larger than the sand.
Sand: Quantity = 4-5; particle size = 1-2, 3; shape = 2-3. Most are clear to opaque. Occasional medium, well rounded.
Other: Occasional hematite. Resin bubbles.
Estimated No. of vessels: 1.
Comments: One or more vessels have a distinctive clay source.

41 LK 41 Group 5 (miscellaneous sandy wares)

Total No. of sherds: 9 (4 coded).
Provenience: 6 controlled surface, 3 controlled subsurface.
Vessel fragments: 1 rim, 8 body.

Sherd thickness: 0.6-0.8 cm.
Sherd condition: 2-4. Varied. Generally slightly weathered.
Paste: Sandy. Porous paste. Often very friable due to high sand content.
Core: > 2/3 thickness. Very dark gray.
Exterior surface: Brushed smooth to well smoothed. Frequently burnished. Occasionally clouded. Gray-tan to gray to red-brown.
Interior surface: Same as exterior. Some interior surfaces appear pitted.
Paste inclusions: Bone: Quantity = 1-3; particle size = 1-5.
Sand: Quantity = 4-5; particle size = 1-5; shape = 2-5. Varied. Most sand is clear to opaque and subangular to subrounded.
Other: Rounded clay particles present in several sherds. Hematite. Resin bubbles.
Estimated No. of vessels: $\geq$ 3.
Comments: Group 5 included miscellaneous sandy paste sherds. The group shares profuse sand, friable paste, smoothed surface finishes, and some bone temper. Preservation and sherd size varies as does firing conditions, particularly the presence of clouding. Some sherds have a black burnished surface which may result from cooking. One rim sherd (Fig. 90,d) is slightly tapered from the exterior and slightly thickened (wall tapers then thickens at rim). The rim, although small, suggests the vessel was some type of bowl.

41 LK 41 Group 6 (irregular ceramic pieces)

Total No. of sherds: 6 (1 coded).
Provenience: 4 controlled surface, 2 controlled subsurface.
Vessel fragments: Unknown.
Comments: Group 6 consists of several irregular ceramic fragments that do not fit with previously defined sherd groups. Group 6A is a ceramic handle fragment; the others are irregular lumps, which may be sherd fragments, or more likely manufacturing debris.

Group 6A Ceramic Handle Fragment (Fig. 91,g)

Oval cross section (0.9 x 1.1 cm). Porous, very fine sandy paste. Poorly smoothed surface (lumps present). Tan to red to gray (clouded). Very dark, almost black core, > 2/3 thickness. Fine sand matrix with occasional medium-sized, well-rounded grains. Round clay particles. No bone visible.

Group 6B Fired Clay Lumps (2 Specimens)

Thickness is 1.3 and 0.6 mm (incomplete). Sandy dark gray to black paste. Each lump has one smoothed, burnished surface. No core present. Paste inclusion is one whole juvenile land snail.

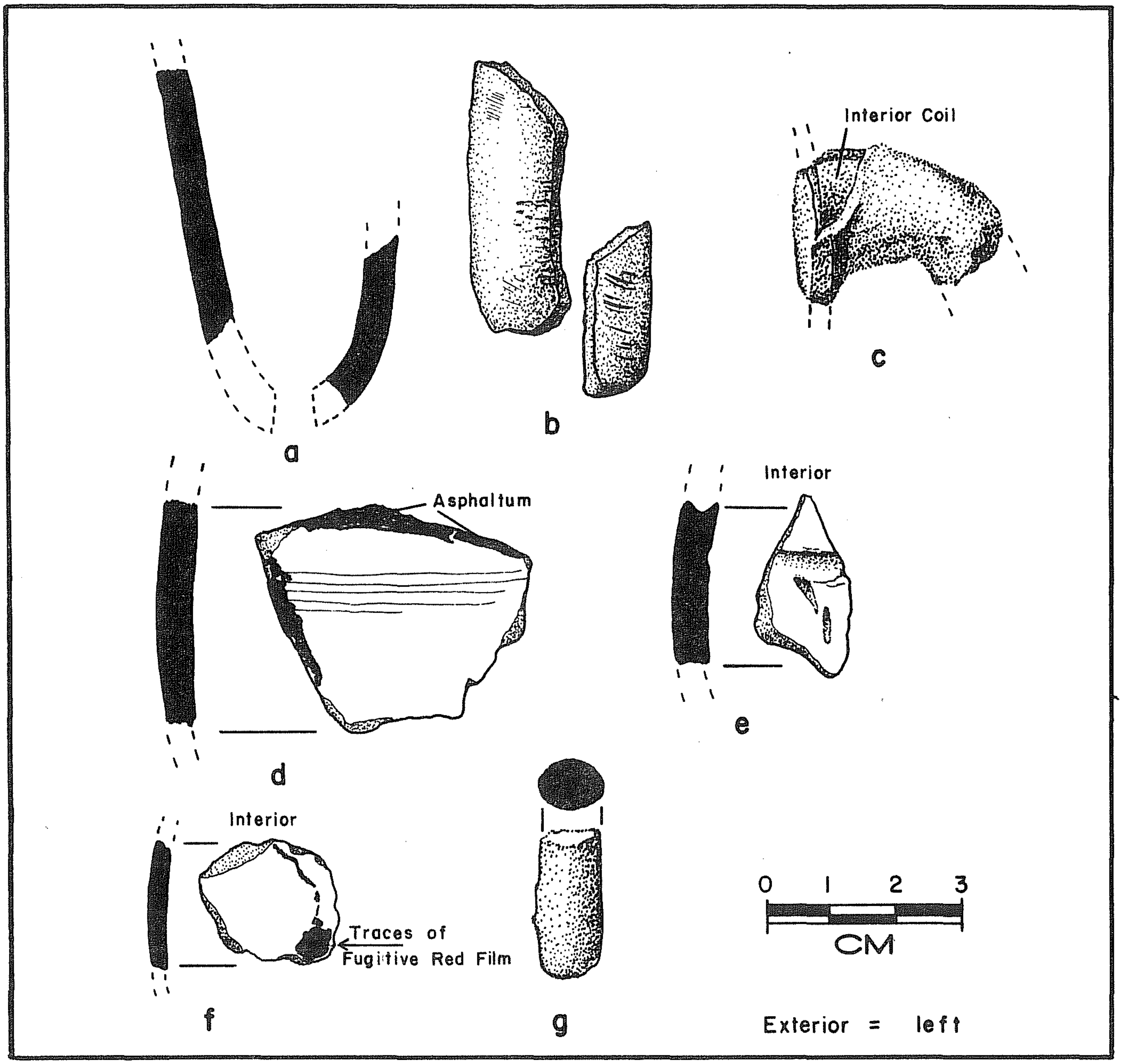


Figure 91. *Miscellaneous Ceramic Fragments.* a,b, 41 LK 201, Group 7 (pipe bowl fragments); c, 41 MC 223, Group 1 (handle fragment); d, 41 LK 201, Group 3B, asphaltum edge mending; e, 41 LK 67, Group 2, tool or stick impressions; f, 41 MC 222, Group 1B, fugitive red film design (?); g, 41 LK 41, Group 6A, handle fragment.

Group 6C Fired Lump

This specimen is a rounded lump with no identifiable surface. The paste contains fine to medium-sized sand and an occasional bone fragment. The lump is oxidized (tan to gray) and friable. This fragment appears to be manufacturing debris rather than a sherd or vessel fragment.

Group 6D Fired Chunk

Possibly a weathered sherd fragment. Reddish tan color. No surface visible. Sparse coarse bone particles in a very fine sandy paste.

Group 6E Fired Chunk

Extremely weathered but could be a sherd fragment. Very fine to fine sandy paste. No bone. Well oxidized. Paste is homogeneous.

<u>41 LK 51</u>

Total No. of sherds: 51.
Number coded: 21.
Provenience: All sherds are from uncontrolled surface collections from three general areas of the site: Area A (11 sherds), Area B (26 sherds), and Area C (14 sherds).
General discussion: Two sherd groups were defined at 41 LK 51. Group 2 was further divided into three subgroups. The two groups both have sandy pastes, sparse to moderate bone content, and comparatively well-finished surfaces. The pastes from the groups are quite different in porosity, color, and sand size which suggests they were made from different clay sources. Both groups have some sherds with traces of the elusive fugitive red film.

The sherd groups and subgroups are strongly correlated with the collection area proveniences. Group 1 sherds are from Area A. Groups 2A and 2B are from Area B. Group 2C sherds are from Area C. This suggests that at 41 LK 51 the distinct surface concentrations represent different vessels, an unsurprising conclusion.

<u>*41 LK 51 Group 1*</u> (sandy paste with burnished exterior and fugitive red film)

Total No. of sherds:	11 (4 coded).
Provenience:	Uncontrolled surface.
Vessel fragments:	Body.
Sherd thickness:	0.6-0.7 cm.
Sherd length:	1.6-2.4 cm.
Sherd condition:	2-4. Generally good condition. Some sherds are eroded and appear sun bleached.
Paste:	Porous and sandy paste. Somewhat poorly mixed.
Core:	Varies. 1/3-2/3 thickness. Very light color.
Exterior surface:	Even, well smoothed, floated, and burnished. A very compact surface. On one of the best preserved sherds (#155) traces of a fugitive red film were observed. The

	absence of similar traces on the remaining sherds suggests that the fugitive red film was only partially or lightly applied to the exterior surface. The other sherds have had this film removed by weathering.
Interior surface:	Even, smoothed with parallel brushmarks (wet brushing). Some fire clouding. Sherd #155 has traces of an oily, black residue which is not asphaltum. This residue may be postdepositional in origin.
Paste inclusions:	Bone: Quantity = 2-3; particle size = 1-5. Sand: Quantity = 3-4; particle size = 1-4; shape = 3-4. Multicolored grains. Other: Occasional hematite particles and shell fragments which may be land snails.
Estimated No. of vessels:	1.
Comments:	Differential weathering could account for the variation observed in this group.

41 LK 51 Group 2 (porous, profusely sandy paste with fugitive red film)

Total No. of sherds:	40.
Provenience:	Uncontrolled surface.
Vessel fragments:	1 rim, 39 body.
Sherd thickness:	0.6-0.8 cm.
Sherd length:	0.8-3.3 cm.
Sherd condition:	3.
Paste:	Very sandy. Porous paste. Fine to medium grain with occasional coarse bone, sand, or hematite particles.
Core:	Varies. 1/3-2/3 thickness. Often very faint.
Exterior surface:	The exterior surface, where preserved, is unusual with a yellow-gray, very fine slip that has been burnished (may well be burnishing slip) and coated lightly with a fugitive red film. The fugitive red coating appears to be an iron-oxided mineral pigment. The surface is frequently eroded or flaked away and is very fragile. Red fugitive film is difficult to detect except under magnification.
Interior surface:	Smoothed. Occasional traces of fire clouding.
Paste inclusions:	Bone: Quantity = 1-2; particle size = 1-5 (most 1-2). Generally very sparse. Occasional sherds contain more bone probably mixed into paste. Sand: Quantity = 5; particle size = 1-4 (most 2-3); shape = 2-5 (most 3-4). Most are clear to opaque quartz. Some multicolored grains. Other: Hematite (quantity = 1; particle size = 3-5). Hard spherical balls of iron oxide occasionally in paste up to 3 mm in diameter.
Comments:	Group 2 is composed of three subgroups of sandy paste sherds with sparse to very sparse bone content and variable surface treatment. Group 2 probably represents several (at least three) vessels made from a single clay source, but finished and fired under different conditions.

Group 2A (25 sherds)

This group represents one vessel. Exterior extremely well finished with a fine slip. Burnishing. Fugitive red film.

Group 2B (1 sherd)

Similar to Group 2A except that exterior surface finish is not preserved. Core is 50/50 interior. Interior is brush marked. Bone quantity is somewhat greater with generally larger fragments. Group 2B represents one vessel with a paste similar to Groups 2A and 2C.

Group 2C (14 sherds)

Similar to Group 2A except the paste is slightly more porous, and bone is more numerous. The core is irregular (1/3-> 2/3 thickness). Both surfaces are lightly burnished. No fugitive red film was observed. One rim sherd (Fig. 90,e) flares inward, is tapered from the interior, and is slightly thickened on the exterior. The rim profile suggests the vessel was a bowl with a slightly constricted rim. The top of the rim is actually rough and lacks floating and burnishing. Exterior color varies from light brown to gray around the rim. Interior frequently heavily clouded. Group 2C represents at least one vessel with highly variable surface clouding or several vessels fired under different conditions.

41 LK 67

Total No. of sherds: 238.
Number coded: 125.
Provenience: 158 controlled subsurface, 70 controlled surface, 10 uncontrolled surface.
General discussion: The 238 sherds recovered from 41 LK 67 represent the largest sherd sample collected during Phase I of the Nueces River Project. Five vessel groups were identified and found clustered in specific areas of the site. All groups are bone tempered with well-smoothed, burnished exteriors. Varied paste composition clearly indicates several distinct clay sources were used to construct the 41 LK 67 ceramics. Sherd condition and absence of rim sherds (only one) precluded vessel reconstruction; however, it appears likely that both olla and bowl forms were present in the collection. Asphaltum edge mending was observed on one rim sherd. Fire clouding was frequent on interior surfaces in several groups.

One of the more striking aspects of the 41 LK 67 ceramic collection is the degree of differential preservation between groups. Group 1 sherds were extremely corroded by chemical leaching of the bone. All exposed bone on the surfaces or on broken edges was destroyed, leaving pitted surfaces and rounded edges. Even, unexposed bone seemed affected, and appeared chemically stained brown. Sherd size in Group 1 was extremely small (averaging 1 cm or less in length) in contrast to Groups 2 and 3, which averaged more than 2.5 cm in length. Groups 2 and 3 were also much better preserved, exhibiting little or no chemical leaching. The nature of the chemical leaching which so adversely affected Group 1 sherds is unknown. Groups 3 and 5 were recovered from the same excavation area (Area C) and levels as Group 1, yet they were comparatively unaffected by chemical leaching. The fact that all three groups occur in the same deposits suggests that soil chemistry alone is not responsible for the chemical leaching. It is possible that the Group 1 vessel(s) was used as a container for some unknown type of corrosive liquid. It is also possible that Group 1 sherds were constructed of more porous materials and fired at lower temperatures, and thus were more friable and susceptible to weathering by acidic soil conditions. A similar degree of corrosion was not observed at any other sites.

41 LK 67 Group 1 (corroded, bone tempered)

Total No. of sherds:	146 (85 coded).
Provenience:	Controlled subsurface, Area C.
Vessel fragments:	Body.
Sherd thickness:	0.4-0.6 cm.
Sherd length:	0.5-2.0 cm.
Sherd condition:	3-4. Most sherds are extremely pitted. Virtually all exposed bone has been chemically leached. All sherds are very small.
Paste:	Slightly porous. Slightly silty paste with hematite. Generally friable.
Core:	1/3-2/3 thickness. Occurs centered and toward interior.
Exterior surface:	> 90% are severely pitted. On preserved surface fragments, the surface appears to have been smoothed, burnished, and occasionally clouded.
Interior surface:	Again most are leached (pitted). On preserved surfaces, interior is a burnished black (clouded). Most sherds appear clouded on interior.
Paste inclusions:	Bone: Quantity = 4; particle size = 1-5. Most bone particles are brown; perhaps a result of chemical weathering.
	Sand: Quantity = 1-2; particle size = 1-2; shape = 1-3. Most grains are clear (pure quartz) and appear transported very little.
	Hematite: Quantity = 1-2; particle size = 2-5. Orange to red. Frequently rounded.
	Other: Resin bubble clusters are common. Occasional shell fragments are probably land snails. One sherd (#352) contains rounded chunks of tempered clay (dried clay/temper fragments?).
Estimated No. of vessels:	(?).
Comments:	Very poor condition of sherds makes estimation of number of vessels and vessel form impossible. Two or more vessels are probably represented. Paste and inclusions vary little from sherd to sherd. Heavily clouded interiors suggest one vessel was fired upside-down. The nature of the chemical corrosion which literally ate the sherds away is unknown. Acidic soil at the site could be responsible. No bone was found during the excavations at 41 LK 67.

41 LK 67 Group 2 (burnished, sparsely bone-tempered olla)

Total No. of sherds:	70 (28 coded).
Provenience:	69 controlled surface, 1 controlled subsurface, Area B.
Vessel fragments:	1 rim, 3 neck, 66 body.
Sherd thickness:	0.6-0.8 cm.
Sherd length:	> 1-5.3 cm.
Sherd condition:	2-3. Sherd size much larger than Group 1. There is little evidence of chemical leaching.
Paste:	Slightly porous sandy paste of very even consistency. Paste oxidizes light tan.
Core:	Typically even. Approximately 1/2 thickness. Centered. Light gray core.
Exterior surface:	Well smoothed and highly burnished. Light tan to reddish light tan.
Interior surface:	Poorly smoothed. Wet brushed with a stick and fingers in generally paralleled patterns. Stick impressions were observed on one sherd (Fig. 91,e). Some lumps of clay protrude on surface. These probably fell from neck area as neck was constricted.
Paste inclusions:	Bone: Quantity = 1-3; particle size = 1-5. Most bone particles are 2-3 in size, with occasional 4-5 chunks. Most bone is carbonized (black).
	Sand: Quantity = 1-2; particle size = 1-3; shape = 2-4. Grains are opaque to multicolored. Olivine and amethyst may be present.
	Other: Hematite. Occasional fine particles. Resin bubbles occasionally occur as small clusters. Two sherds have apparent quartzite fragments in paste, probably a result of using a quartzite tool to pulverize paste.
Estimated No. of vessels:	1.
Comments:	Well-fired vessel; difficult to break sherds. The presence of one rim sherd (#403; Fig. 90,f) is very significant. The rim and several double curved sherds (curved in two directions) indicate the vessel was a constricted neck olla. The rim is tapered slightly from the interior and markedly from the exterior. Large numbers of sizable sherds with slight curvatures suggest the vessel was rather large. An equally significant aspect of sherd #403 is the presence of asphaltum along a small segment of an exterior edge. Minute amounts of asphaltum occur along an 8 mm section of an edge approximately 2 cm below the rim. Asphaltum is present on the exterior surface near the edge and along the interior margin of the edge. Presence of asphaltum was noticed only during microscopic examination; similar traces could easily have been missed on other sherds in this group. Location of asphaltum indicates use as a mending glue for a cracked vessel.

41 LK 67 Group 3 (profusely bone tempered)

Total No. of sherds: 10.
Provenience: 1 controlled surface, 9 controlled subsurface, Area C.
Vessel fragments: Body.
Sherd thickness: 0.5-0.7 cm.
Sherd length: 1.1-4.3 cm.
Sherd condition: 2-3. Most sherds are in good condition, but condition varies. Some are weathered and slightly pitted.
Paste: Very fine compact paste. Oxidizes to a grayish light tan. Very little sand or hematite in paste.
Core: Generally thick. > 2/3 thickness from interior outward. Medium gray.
Exterior surface: Well smoothed and highly burnished. Light grayish tan. Often appears worn with core color showing through thin spots. The exterior almost appears slipped on a few sherds. This is probably a burnishing slip from the same clay. Very fine-grained, even surface.
Interior surface: Poorly smoothed uneven surface. Dark gray to grayish tan. Fire clouded. Some sherds have a calcareous coating.
Paste inclusions: Bone: Quantity = 4-5; particle size = 1-5. Most bone is oxidized (white).
Sand: Quantity = 1; particle size = 1-2.
Other: Hematite (quantity = 1; particle size = 2).
Estimated No. of vessels: 1.
Comments: Group 3 is a distinct small cluster of sherds within Area C and among Group 1 sherds. Chemical leaching occurs to a much lesser extent than in Group 1. Vessel form is unknown.

41 LK 67 Group 4 (weathered, sparsely tempered)

Total No. of sherds: 10 (8 coded).
Provenience: Uncontrolled surface.
Vessel fragments: Body.
Sherd thickness: 0.5-0.6 cm.
Sherd length: 2.0-2.8 cm.
Sherd conditon: 2-3. Group 4 sherds have weathered surfaces. They were probably exposed on the surface for a relatively long time.
Paste: Very fine grained. Porous. Somewhat convoluted. Poorly mixed with a few lighter colored patches of untempered clay (containing small amounts of very fine sand). Seam lines (coils?) visible on several sherds (on fresh break) as a thin white calcareous coating.
Core: Very distinct. Roughly 2/3 thickness. Extends from interior outward. Some sherds have a light band between interior surface and core. Medium to light gray.
Exterior surface: Well smoothed and probably burnished. Very weathered with some chemical leaching. Light sooting or clouding present on most sherds. Grayish light tan.
Interior surface: Well smoothed and probably burnished. Heavily clouded. Severe chemical leaching or pitting, noticeably more than exterior, may be due to use (?). Gray to grayish light tan.

Paste inclusions: Bone: Quantity = 1-2; particle size = 2-5.
Sand: Quantity = 1-2; particle size = 1-4; shape = 4-5. Sand and bone occur in approximately equal proportions.

Estimated No. of vessels: 1.

Comments: Vessel form unknown. Heavily clouded. Well-smoothed interior suggests a bowl form fired upside-down.

41 LK 67 Group 5 (burnished bone tempered)

Total No. of sherds: 2 (1 coded).
Provenience: Controlled subsurface, Area C.
Vessel fragments: Body.
Sherd thickness: 0.5 cm.
Sherd length: 1.4-1.6 cm.
Sherd conditon: 3.
Paste: Very fine grained. Slightly porous. Appears clean. Slightly sandy.
Core: > 2/3 width. Slightly closer to interior. Medium gray.
Exterior surface: Well smoothed and highly burnished. Even reddish light brown.
Interior surface: Uneven surface. Light tan with gray calcareous coating.
Paste inclusions: Bone: Quantity = 3; particle size = 1-4.
Sand: Quantity = 1; particle size = 1-2; shape = 2. Appears similar to Group 1 except less numerous.
Estimated No. of vessels: 1.
Comments: Group 5 is distinct from other groups at 41 LK 67. Clay source appears related to Group 1 except paste appears purer, with little sand and no hematite. This may be due to small sample size. Little chemical leaching of bone. Both sherds are from Area C, but are 6 m apart.

41 LK 201

Total No. of sherds: 51.
Number coded: 27.
Provenience: 11 uncontrolled surface, 33 controlled surface, 1 uncontrolled subsurface, 6 controlled subsurface.
General discussion: The ceramic collection from 41 LK 201 evidences a diversity found only at one other site in the project area, 41 LK 41. In general,

condition of most 41 LK 201 sherds is excellent, with little or no chemical leaching of the bone. Group 1 has a compact paste and was well fired, forming resilient durable vessels with very thin walls. At least 12 vessels contributed to the 41 LK 201 collection.

41 LK 201 Group 1 (thin walled, profusely bone tempered)

Total No. of sherds:	10 (6 coded).
Provenience:	2 uncontrolled surface, 8 controlled surface.
Vessel fragments:	3 rim, 7 body.
Sherd thickness:	0.5 cm.
Sherd length:	2.0-4.4 cm.
Sherd condition:	2-3. Generally well preserved.
Paste:	Compact. Very fine-grained paste. Homogeneous with few inclusions except profuse quantities of bone.
Core:	> 2/3 thickness. Dark gray.
Exterior surface:	Floated, smoothed, and wet brushed in irregular directions. Flesh colored to gray (fire clouded).
Interior surface:	Poorly smoothed, but floated and wet brushed. Colors similar to exterior.
Paste inclusions:	Bone: Quantity = 4; particle size = 1-5.
Estimated No. of vessels:	3.
Comments:	Group 1 has two subgroups. Three rim sherds are present and represent different vessels. Figure 90,i illustrates a slightly everted (flared) bowl rim with tapering from the interior. Figure 90,j illustrates a slightly tapered (from interior) rim sherd from a straight-sided vessel (cylindrical jar?). A minimum of three vessels with similar pastes contributed sherds to Group 1.

Group 1A (7 sherds)

Described above.

Group 1B (2 sherds)

Similar to Group 1A, but slightly thicker (0.6-0.8 cm) with occasional fine sand grains. Figure 90,g illustrates a direct rim sherd from a bowl which has an inverted rim.

41 LK 201 Group 2 (fugitive red filmed, bone tempered)

Total No. of sherds:	9 (6 coded).
Provenience:	5 controlled surface, 4 controlled subsurface.
Vessel fragments:	Body.
Sherd thickness:	0.4-0.5 cm.
Sherd length:	1.0-2.5 cm.
Sherd condition:	2-3. Generally good. Exterior surfaces scratched on some.
Paste:	Slightly porous paste. Fine grained with little sand. Some sherds show evidence of a poorly mixed paste.

Core:	> 2/3 width. Dark gray.
Exterior surface:	Floated, smoothed, and highly burnished. A very thin fugitive red film was applied after burnishing which is very ephemeral and not present on several sherds that otherwise appear identical. Color is tan to grayish tan.
Interior surface:	The interior has a consistent matte gray coating which resembles a slip, but is probably a floated and lightly brushed surface that has been clouded to an even color or incompletely oxidized.
Paste inclusions:	Bone: Quantity = 3-4; particle size = 1-5. Sand: Quantity = 1; particle size = 1-2; shape = 2-3.
Estimated No. of vessels:	1.
Comments:	Group 2 is probably one vessel with varying exterior color due to fire clouding and variable application or preservation of the fugitive red film. Paste and core are consistent.

41 LK 201 Group 3 (moderately bone tempered with sandy paste)

Total No. of sherds:	26 (12 coded).
Provenience:	6 uncontrolled surface; 18 controlled surface, 2 controlled subsurface.
Vessel fragments:	1 rim, 23 body, 2 basal.
Sherd thickness:	0.5-0.6 cm.
Sherd length:	1.5-4.3 cm.
Sherd condition:	2-3. Sherds are weathered little.
Paste:	Somewhat porous. Homogeneous; sandy paste. Well fired; hard to break.
Core:	Varies from very light (oxidized) to 2/3 width.
Exterior surface:	Floated and smoothed. Most are highly burnished. Colors are light tan to flesh colored with occasional light sooting.
Interior surface:	Poorly smoothed. Some wet brushing and some coil lines exposed on surface. Colors are usually grayish tan.
Paste inclusions:	Bone: Quantity = 2-3; particle size = 1-5. Sand: Quantity = 1-2; particle size = 1-4; shape = 2-4. Most are opaque. Other: Occasional shell (land snail) fragments.
Comments:	Group 3 has four subgroups which probably represent different vessels with a similar paste. Some subgroups may stem from differing preservation or isolated occurrence of specific attributes (e.g., asphaltum). A minimum of four vessels contributed sherds to Group 3.

Group 3A (13 sherds)

One rim sherd (Fig. 90,h) is slightly tapered from both surfaces and suggests a shallow bowl, although the sherd is too small to be certain.

Group 3B (3 sherds)

Similar to Group 3A, but with asphaltum edge mending on exterior and along edge (Fig. 91,d). There are parallel burnishing tool marks visible on exterior.

Group 3C (6 sherds)

Similar to Group 3A, but burnishing is absent or not preserved. Several sherds have irregular lumpy interior surfaces with some larger bone chunks present. Surface color light tan. Dark distinct core > 2/3 thickness.

Group 3D (2 sherds)

Similar to Group 3A, but these sherds are large basal fragments with an unknown black substance visible as a thin film on portions of both surfaces. The substance is not asphaltum and does not appear to be sooting. It could be of postdepositional origin.

Group 3E (2 sherds)

Similar to Group 3A paste. The exterior is smoothed, burnished, and fire clouded. The interior surface is uneven and coated with a dark crust which appears to be a burned organic residue. The composition is unknown, but may be a charred food residue. Thickness is 0.8 cm. The core is very dark and extends throughout the cross section.

41 LK 201 Group 4 (fugitive red filmed with burnished surfaces)

Total No. of sherds:	2 (2 coded).
Provenience:	Controlled surface.
Vessel fragments:	Body.
Sherd thickness:	0.7 cm.
Sherd length:	1.5-2.5 cm.
Sherd condition:	3. Surfaces are somewhat weathered.
Paste:	Slightly porous, sandy paste with a variety of inclusions.
Core:	Indistinct, 2/3 width. Light gray.
Exterior surface:	Smoothed, floated, and highly burnished. Fugitive red film traces remain on burnished areas. Gray to grayish tan. Fire clouded.
Interior surface:	Uneven surface, apparently burnished. Gray; fire clouded.
Paste inclusions:	Bone: Quantity = 2; particle size = 1-5.
	Sand: Quantity = 2; particle size = 2-4; shape = 2-3.
	Other: Some pebbles (> 2 mm) and a very fine-grained sandstone fragment 4-6 mm across.
Estimated No. of vessels:	1.

41 LK 201 Group 5 (fine bone temper with sandy paste)

Total No. of sherds:	1.
Provenience:	Uncontrolled surface.

Vessel fragments: Body.
Sherd thickness: 0.7 cm.
Sherd length: 3.0 cm.
Sherd condition: 3. May be sun bleached.
Paste: Slightly porous, homogeneous sandy paste.
Core: 50/50 toward interior. Very light color.
Exterior surface: Smooth, even surface; could have been burnished. Light tan.
Interior surface: Even surfaces with slight wet brush marks. Light tan.
Paste inclusions: Bone: Quantity = 2-3; particle size = 1-4. Most of the bone is finely crushed.
Sand: Quantity = 3-4; particle size = 1-4; shape = 2-3. Most are opaque or multicolored.
Estimated No. of vessels: 1.

41 LK 201 Group 6 (profuse sand and no bone)

Total No. of sherds: 1.
Provenience: Uncontrolled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.5 cm.
Sherd length: 2.2 cm.
Sherd condition: 3.
Paste: Slightly porous sandy paste.
Core: 2/3 thickness toward interior.
Exterior surface: Smoothed and very slightly burnished. Grayish light tan.
Interior surface: Uneven, irregular surface. Gray.
Paste inclusions: Sand: Quantity = 4; particle size = 1-2 and 4; shape = 2-3 and 5. Profuse very fine to fine clear grains with occasional larger well-rounded grains.
Comments: This sherd has a curvature suggesting a vessel with a very small diameter. The sherd resembles Group 7 sherds in curvature and interior finish, and may be a pipe fragment. The complete absence of bone is very unusual in the Choke Canyon area.

41 LK 201 Group 7 (pipebowl fragments)

Total No. of sherds: 2.
Provenience: Uncontrolled surface.
Vessel fragments: Pipebowl.
Sherd thickness: 0.5-0.8 cm.
Sherd length: 3.0-4.0 cm.
Sherd condition: 2.
Paste: It is compact and appears patchy with clay grit chunks. Sand is very sparse and very fine grained, obviously an incidental inclusion. Clay grit chunks may have been intentionally added.
Core: > 2/3 thickness. Gray.
Exterior surface: Floated, smoothed, and highly burnished. Color varies from a gray flesh tan to grayish tan to almost black. Fire clouded.

Interior surface: Poorly smoothed, floated, and wet brushed. Color is gray flesh, and it appears lightly sooted. Lower section of pipe has tiny cracks on surface.
Paste inclusions: Bone: Quantity = 3-4; particle size = 1-4.
Sand: Quantity = 1; particle size = 1; shape = 2.
Other: Clay grit (quantity = 2; particle size = 4-5). Light gray patches or chunks of what appears to be pure clay (untempered).
Estimated No. of vessels: 1.
Comments: These sherds appear to be fragments of a pipebowl (Fig. 91,a,b). This group is unique in the Nueces River Project collection. The pipe must have been rather large; it had a maximum diameter of just over 5 cm.

41 MC 15

Total No. of sherds: 2.
Number coded: 1.
Provenience: 1 controlled surface, 1 controlled subsurface.
General discussion: The two sherds from 41 MC 15 are from distinctly different vessels. Small sherd size and general poor condition of surfaces prohibit discussion of surface treatment techniques. Some pitting or leaching of exposed bone was observed.

41 MC 15 Group 1 (bone tempered)

Total No. of sherds: 1 (1 coded).
Provenience: Controlled surface.
Vessel fragments: Body.
Sherd thickness: 0.6-0.7 cm.
Sherd length: 2.8 cm.
Sherd conditon: 2. Slightly weathered edges. Surfaces pitted by leaching of bone.
Paste: Silty, slightly porous.
Core: > 2/3 thickness.
Exterior surface: Smoothed, even, and weathered. Light tan.
Interior surface: Same as exterior except clay lump on surface.
Paste inclusions: Bone: Quantity = 3; particle size = 1-4.
Sand: Quantity = 1; particle size = 1-2; shape = 3-4.
Other: Hematite (quantity = 1; particle size = 2-4).
Estimated No. of vessels: 1.
Comments: Bone-tempered pottery made from silty clay with comparatively little sand and occasional hematite particles. Surface finish is not preserved.

41 MC 15 Group 2 (sandy paste)

Total No. of sherds: 1.
Provenience: Controlled subsurface.

Vessel fragments: Body.
Sherd thickness: 0.6 cm.
Sherd length: 2.0 cm.
Sherd condition: 4. Very weathered. Surface pitted by leaching of bone.
Paste: Sandy, slightly porous; crumbles easily (friable).
Core: > 2/3 thickness.
Exterior surface: Reddish light brown. Pitted by leaching bone. Surface finish not preserved.
Interior surface: Same.
Paste inclusions: Bone: Quantity = 2; particle size = 1-5.
Sand: Quantity = 4-5; particle size = 1=4; shape = 2-5. Clear quartz with some red grains.
Other: Hematite (quantity = 1; particle size = 2-5). Occasional well rounded.
Estimated No. of vessels. 1.

<u>41 MC 17</u>

Total No. of sherds: 1.
Number coded: 0.
Provenience: Uncontrolled surface.

<u>*41 MC 17 Group 1*</u> (thick walled, bone tempered with sandy paste)

Total No. of sherds: 1.
Provenience: Uncontrolled surface.
Vessel fragments: Neck.
Sherd thickness: 0.9 cm.
Sherd length: 5.0 cm.
Sherd condition: 2. Some minor pitting.
Paste: Slightly porous. Sandy. Homogeneous.
Core: 50/50 toward interior.
Exterior surface: Smooth, burnished with possible burnishing slip (?). Light brown to reddish light brown.
Interior surface: Well smoothed, highly burnished with a thin, fine gray burnishing slip.
Paste inclusions: Bone: Quantity = 2-3; particle size = 1-5. Most bone is size 2-3.
Sand: Quantity = 3-4; particle size = 1-3; shape = 1-3.
Other: A few resin bubbles present.
Estimated No. of vessels: 1.
Comments: This large, thick sherd has a recurved profile which suggests that it is a neck sherd from a large constricted neck vessel (olla). Exterior is well oxidized; interior is unoxidized. Paste, core, and surface finishes are very even suggesting well-made pottery. Difficult to break. Both surfaces appear to have a very fine burnishing slip. Some parallel burnishing tool marks visible on interior.

<u>41 MC 19</u>

Total No. of sherds: 1.
Number coded: 1.
Provenience: Uncontrolled surface.

<u>*41 MC 19 Group 1*</u> (bone-tempered sandy paste)

Total No. of sherds:	1 (1 coded).
Provenience:	Uncontrolled surface.
Vessel fragments:	Body.
Sherd thickness:	0.7-0.8 cm.
Sherd length:	3.8 cm.
Sherd condition:	4. Very weathered surfaces; extremely pitted and/or leached.
Paste:	Sandy. Obscured by carbon.
Core:	Greasy, carbon coated throughout.
Exterior surface:	Even.
Interior surface:	Even.
Paste inclusions:	Bone: Quantity = 4; particle size = 1-5. Sand: Quantity = 4; particle size = 1-3; shape = 2-3.
Estimated No. of vessels:	1.
Comments:	This very weathered sherd has no preserved surface finish. The vessel was either fired in a reduction atmosphere or used to cook an oily substance which has completely penetrated the paste.

<u>41 MC 41</u>

Total No. of sherds: 1.
Number coded: 1.
Provenience: Controlled surface.

<u>*41 MC 41 Group 1*</u> (sandy paste)

Total No. of sherds:	1 (1 coded).
Provenience:	Controlled surface.
Vessel fragments:	Neck.
Sherd thickness:	0.6-0.7 cm.
Sherd length:	2.8 cm.
Sherd condition:	Slightly weathered. Some lichen and calcareous coating.
Paste:	Fine sandy paste. Even consistency with occasional light patches.
Core:	> 2/3 thickness from interior.
Exterior surface:	Even, well smoothed. Finer particles on surface. Some minor flaking. Light tan.
Interior surface:	Uneven, irregular stick marks. Gray, clouded (?).
Paste inclusions:	Bone: Quantity = 1; particle size = 1-3. Very sparse. Sand: Quantity = 4-5; particle size = 1-3, most 1-2; shape = 2-3, with occasional 5. Pure clear quartz grains.

Estimated No. of vessels: 1.
Comments: This sherd has a recurved profile. A well-smoothed, oxidized exterior, and a poorly smoothed unoxidized interior which suggests a neck sherd from a constricted neck vessel (olla).

41 MC 55

Total No. of sherds: 16.
Number coded: 7.
Provenience: 4 uncontrolled surface, 2 controlled surface, 10 controlled subsurface.
General discussion: The small collection from 41 MC 55 contains a few sherds from at least eight vessels. Seven groups were defined based primarily on inclusion content and surface finish. All groups were bone tempered. Most groups contained small quantities of sand. Temper or inclusion content in most groups was moderate. Exterior surfaces are always even and smoothed and usually floated and burnished. Fugitive red film occurs in one group and an asphaltum band occurs on one sherd. In general, 41 MC 55 sherds are small and in relatively fair condition. No severe leaching was noted. Calcareous film, undoubtably postdepositional in nature, was observed on many sherds.

41 MC 55 Group 1 (bone tempered)

Total No. of sherds: 4 (1 coded).
Provenience: Controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.6 cm.
Sherd length: 0.7-2.0 cm.
Sherd condition: 2-3. Somewhat weathered and pitted surfaces.
Paste: Slightly porous, silty paste.
Core: > 2/3 thickness. Dark.
Exterior surface: Even smoothed surface, probably burnished but weathered. Grayish tan.
Interior surface: Wet brushed and even. Grayish tan.
Paste inclusions: Bone: Quantity = 3; particle size = 1-5.
Sand: Quantity = 1; particle size = 1. Very little sand.
Estimated No. of vessels: 1.

41 MC 55 Group 2 (bone tempered, with fugitive red film)

Total No. of sherds: 3 (1 coded).
Provenience: Controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.5-0.6 cm.
Sherd length: 0.3-2.0 cm.
Sherd condition: 2-3. Some weathering but generally in good condition.
Paste: Slightly porous, with sparse amounts of sand and bone.
Core: 2/3 thickness, even. Dark core.

Exterior surface: Even, smoothed, well burnished. Fugitive red filmed. Reddish brown on tan-gray.
Interior surface: Slightly uneven, and smoothed. Wet brush marks visible. Tan-gray.
Paste inclusions: Bone: Quantity = 2; particle size = 1-5.
Sand: Quantity = 2; particle size = 1-3; shape = 2-3. Multicolored.
Estimated No. of vessels: 1.

41 MC 55 Group 3 (thick walled with sparse bone and sand)

Total No. of sherds: 1 (1 coded).
Provenience: Uncontrolled surface.
Vessel fragments: Body.
Sherd thickness: 0.9 cm.
Sherd length: 2.6 cm.
Sherd condition: 3. Weathered, some lichen on surface.
Paste: Silty, porous paste with comparatively little temper.
Core: Extends throughout cross section. Dark black.
Exterior surface: Even, smoothed, no evidence of burnishing, although weathered. Tan to tan-brown.
Interior surface: Uneven, clouded or sooted, possibly weathered or worn away. No surface treatment techniques distinguishable. Gray.
Paste inclusions: Bone: Quantity = 2; particle size = 1-5.
Sand: Quantity = 2; particle size = 1-2; shape = 1-2. Clear to opaque.
Other: Occasional hematite, and resin bubbles.
Estimated No. of vessels: 1.

41 MC 55 Group 4 (miscellaneous bone tempered)

Total No. of sherds: 3 (2 coded).
Provenience: 1 uncontrolled surface, 2 controlled surface.
Vessel fragments: Body.
Sherd thickness: 0.5-0.6 cm.
Sherd length: 2.2-2.7 cm.
Sherd condition: 2-3. Generally well preserved with little weathering.
Paste: Varied, compact to slightly porous. Little sand and varying bone content.
Core: $>$ 2/3 thickness.
Exterior surface: Even, smoothed to varying degrees. Light burnishing. Light brown to reddish brown. One sherd fire clouded.
Interior surface: Uneven, wet brushed, with distinct ridges and/or lumps. Gray to brown. Some fire clouded.
Paste inclusions: Bone: Quantity = 3-5; particle size = 1-5.
Sand: Quantity = 1; particle size = 1-2; shape = 1-3. Clear to opaque grains.
Other: Occasional hematite and resin.
Estimated No. of vessels: $\geq$ 2.

41 MC 55 Group 5 (burnished, bone tempered with sand)

Total No. of sherds: 1.
Provenience: Controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.6 cm.
Sherd length: 1.3 cm.
Sherd condition: 2. Calcareous coating on most surfaces.
Paste: Porous, sandy and homogeneous. Well fired.
Core: None.
Exterior surface: Even, smoothed, and highly burnished with parallel burnishing marks. Dark gray.
Interior surface: Even, smoothed, but not floated. Gray.
Paste inclusions: Bone: Quantity = 3; particle size = 1-5.
Sand: Quantity = 2; particle size = 1-3; shape = 1-3. Mostly clear to opaque grains.
Estimated No. of vessels: 1.

41 MC 55 Group 6 (bone-tempered, sandy paste with asphaltum)

Total No. of sherds: 2 (1 coded).
Provenience: Uncontrolled surface.
Vessel fragments: Body.
Sherd thickness: 0.8 cm.
Sherd length: 1.6-1.8 cm.
Sherd condition: 3. Somewhat weathered, especially interior surface.
Paste: Porous, sandy paste.
Core: 2/3 thickness.
Exterior surface: Even, smoothed, floated, and lightly burnished. One sherd has an irregular band of asphaltum (approximately 0.8 cm wide) across the exterior. It is not connected with the edge, so it may be decoration. Light tan.
Interior surface: Poorly preserved, perhaps worn by use.
Paste inclusions: Bone: Quantity = 3; particle size = 1-5. Most bone is finely crushed with a few very large chunks.
Sand: Quantity = 3; particle size = 1-3; shape = 2-3. Most sand is clear.
Estimated No. of vessels: 1.

41 MC 55 Group 7 (sandy paste with oily black core)

Total No. of sherds: 2 (1 coded).
Provenience: Controlled subsurface.
Sherd fragments: Body.
Sherd thickness: 0.7 cm.
Sherd length: 2.8 cm.
Sherd condition: 2. Calcareous film on exposed surfaces.
Paste: Porous, friable, sandy paste with a variety of inclusions.
Core: Extends thoughout cross section. Dense black and oily.
Exterior surface: Even, smoothed, and well burnished.

Interior surface: Pitted, wet brushed.
Paste inclusions: Bone: Quantity = 1-2; particle size = 1-5.
Sand: Quantity = 2-3; particle size = 3-4. Multicolored grains.
Other: Occasional land snail, resin bubbles, and sandstone fragments.
Estimated No. of vessels: 1.
Comments: A dense black oily film coats all cross sections. This may be unburned carbon, or perhaps it is the result of cooking animal fats. Inclusion content estimates are very difficult to make with the black oily coating.

41 MC 64

Total No. of sherds: 1.
Number coded: 0.
Provenience: Controlled surface.

41 MC 64 Group 1 (burnished, bone tempered with sandy paste)

Total No. of sherds: 1.
Provenience: Controlled surface.
Vessel fragments: Body.
Sherd thickness: 0.7 cm.
Sherd length: 1.5 cm.
Sherd condition: 3.
Paste: Porous, sandy, and crumbly (easily friable).
Core: > 2/3 thickness.
Exterior surface: Even, smoothed, floated, and burnished. Grayish brown.
Interior surface: Smoothed only. Light tan.
Paste inclusions: Bone: Quantity = 2-3; particle size = 1-5.
Sand: Quantity = 3-4; particle size = 1-4; shape = 2-4. Mostly clear to opaque.
Estimated No. of vessels: 1.

41 MC 84

Total No. of sherds: 13.
Number coded: 7.
Provenience: Uncontrolled surface from two general areas.
General discussion: The collection from 41 MC 84 represents moderately bone-tempered ceramics with different sand contents, vessel forms, and vessel sizes. All sherds show considerable weathering from long-term surface exposure. Group 1 sherds were found in a small area (approximately 2 x 4 m) and probably represent a single vessel. Hematite is present in most sherds.

41 MC 84 Group 1 (thick-walled, sandy paste with bone temper)

Total No. of sherds: 11 (5 coded).
Provenience: Uncontrolled surface.
Vessel fragments: Body.
Sherd thickness: 0.7-1.1 cm.
Sherd length: 1.0-2.2 cm.
Sherd condition: 2-3. Surfaces eroded.
Paste: Porous sandy paste. Friable.
Core: > 2/3 thickness.
Exterior surface: Smoothed, no finish preserved. Reddish light brown.
Interior surface: Same as exterior except fire clouded. Grayish brown to light brown.
Paste inclusions: Bone: Quantity = 2; particle size = 1-5.
Sand: Quantity = 3; particle size = 1-3; shape = 2-3. Clear to opaque.
Other: Occasional hematite particles in all sherds.
Estimated No. of vessels: 1.
Comments: Group 1 probably represents a single fairly large vessel or two similar vessels.

41 MC 84 Group 2 (thin walled, bone tempered)

Total No. of sherds: 1 (coded).
Provenience: Uncontrolled surface.
Vessel fragments: Body.
Sherd thickness: 0.5 cm.
Sherd length: 2.3 cm.
Sherd condition: 3. Surface is weathered.
Paste: Slightly porous, silty paste.
Core: > 2/3 thickness toward interior.
Exterior surface: Even surface. Weathered, no finish preserved. Grayish tan.
Interior surface: Similar to exterior except clouded. Dark gray.
Paste inclusions: Bone: Quantity = 2-3; particle size = 1-5.
Sand: Quantity = 1; particle size = 1-3; shape = 2-3. Multicolored grains. Mostly exposed on surfaces.
Other: Hematite occurs occasionally as medium, rounded particles.
Estimated No. of vessels: 1.

41 MC 84 Group 3 (weathered bone tempered)

Total No. of sherds: 1 (coded).
Provenience: Uncontrolled surface.
Vessel fragments: Rim.
Sherd thickness: 0.6 cm.
Sherd length: 3.3 cm.
Sherd condition: 3. Weathered and probably sun bleached.
Paste: Slightly porous, somewhat poorly mixed.
Core: Indistinct, possibly sun bleached.

Exterior surface: Even. Weathered with little preserved finish, probably burnished and smoothed. Light tan.
Interior surface: Slightly uneven. No finish preserved. Light tan.
Paste inclusions: Bone: Quantity = 3.
Sand: Quantity = 1; particle size = 1-3; shape = 2-4. Multicolored grains.
Estimated No. of vessels: 1.
Comments: The rim is abruptly tapered from the interior (almost beveled, Fig. 90,k). The rim appears to be from some type of inverted rim (closed) vessel.

<u>41 MC 94</u>

Total No. of sherds: 2.
Number coded: 1.
Provenience: Controlled surface.

41 MC 94 Group 1 (thick, sandy paste)

Total No. of sherds: 2 (1 coded).
Provenience: Controlled surface.
Vessel fragments: Body.
Sherd thickness: 0.9-1.2 cm.
Sherd length: 2.7-4.9 cm.
Sherd condition: 2. Good condition. Slightly eroded.
Paste: Porous, sandy paste. Light tan.
Core: Distinct, 1/2 thickness.
Exterior surface: One is light tan, slightly mottled. Smoothed and lightly burnished. Parallel burnishing strokes readily visible. The other is smoothed.
Interior surface: The first is same as exterior. The second is uneven and pitted.
Paste inclusions: Bone: Quantity = 1; particle size = 1-5. Very little bone.
Sand: Quantity = 2; particle size = 1-3; shape = 2-3. Multicolored grains.
Other: Hematite (quantity = > 1; particle size = 2). Resin - a few bubbles.
Estimated No. of vessels: 2.
Comments: These sherds represent two vessels with slightly different surface treatment and similar paste.

<u>41 MC 222</u>

Total No. of sherds: 47.
Number coded: 11.
Provenience: 1 uncontrolled surface, 15 controlled surface, 31 controlled subsurface.
General discussion: The ceramic collection from 41 MC 222 represents a relatively small number of vessels. A minimum of four and no more than six vessels

contributed sherds to the collection. Basically two types of ceramics are present: profusely bone tempered and profusely sandy paste. Group 3 sherds are representative of additional bone-tempered vessels. Groups 1 and 3 appear to have a similar clay source with low densities of fine-grained sand and a myriad of inclusions (e.g., hematite, clay, and silicified wood) which are well rounded and granular (1-4 mm). Group 2 came from a different clay source. The sand may be a natural inclusion or purposefully added. Group 4 consists of two fired clay lumps which may not represent sherds. Group 1B is perhaps the most interesting group, containing traces of fugitive red film on the interior. The possible painted designs on several sherds are unique among the Phase I collection. Most groups are from distinct proveniences. Hopefully future excavations will reveal distinct vessel clusters.

41 MC 222 Group 1 (thin-walled bowl with fugitive red film, profusely tempered with bone)

Total No. of sherds: 28 (11 coded).
Proveniences: 2 controlled surface, 26 controlled subsurface.
Vessel fragments: 1 rim, 27 body.
Sherd thickness: 0.4-0.5 cm.
Sherd length; 0.75-2.4 cm.
Sherd condition: 1-2. Generally well preserved with little evidence of erosion or chemical weathering.
Paste: Convoluted. Frequently poorly mixed. Compact silty paste. Contains frequent inclusions, in addition to profuse quantities of crushed bone.
Core: Irregular. Generally > 2/3 thickness.
Exterior surface: Varies from poorly to well smoothed. Some sherds have light, uneven burnishing patches. Some have light wet brush marks generally parallel. Light brown.
Interior surface: Same as exterior, but usually wet brushed and occasionally faint fire clouds.
Paste inclusions: Bone: Quantity = 4-5; particle size = 1-5. Unevenly mixed into paste.
Sand: Quantity = 1-2; particle size = 1-2; shape = 1-3. Pure clear quartz. Looks fresh (i.e., transported comparatively little).
Other: Hematite (quantity = 1; particle size = 3-5) occurs in all sherds as rounded nodules up to 4 mm. Caliche and clay occur occasionally in small nodules. Caliche to 2.5 mm, clay to 4 mm. Clay nodules are hard and well rounded. Several sandstone fragments in paste (2-3 mm).
Estimated No. of vessels: 1.
Comments: These sherds appear to come from a small bowl with a thickened rim tapered from exterior and forming a slight overhanging lip on interior (Fig. 90,i). Due to frequent large inclusions (i.e., clay, hematite, sandstone, and caliche), these sherds break easily along inclusions, but

crumble very little. All sherds are from Level 1 of a 2-m^2 unit, except two sherds from Level 4. They probably represent a single vessel and are confined to a limited area of the site.

Group 1A (23 sherds)

As described above.

Group 1B (5 sherds)

Identical to Group 1A except for the exterior which has some fire clouding and the interior which is smooth with very light wet brush marks. Fugitive red film occurs on the interior as very ephemeral traces. Two sherds which fit together (Fig. 91,f) have what could be a tiny painted design. The apparent design appears to have a circular patch of fugitive red film with emerging spiraling lines. Several thin gray lines (not pictured) of unknown composition appear to connect with the design. These gray lines seem to be a very thin organic stain or paint which was observed on other Group 1A sherds but so faint that it could not be confidently identified. Several Group 1B sherds have small bright purple spots of unknown origin.

Groups 1A and 1B sherds are quite likely from the same vessel. The fugitive red film is so ephemeral that it could easily be destroyed. It is also possible that Groups 1A and 1B are from several very similar vessels made of the same paste and fired under the same conditions.

All sherds are from the 2-m^2 unit; a few from the surface, most from Level 1, and a few from Level 4. The Level 4 sherds represent either a small disturbance (animal burrow) or quite likely an unobserved wall collapsed from the top edge of the unit. Paste, surface colors, thickness, and condition of all Group 1 (A and B) are nearly identical.

41 MC 222 Group 2 (thick walled, sandy paste)

Total No. of sherds:	13 (6 coded).
Provenience:	11 controlled surface, 2 controlled subsurface.
Vessel fragments:	Body.
Sherd thickness:	0.7-0.9 cm.
Sherd length:	1.8-4.5 cm.
Sherd condition:	2-3. Some weathering of surfaces.
Paste:	Somewhat porous, very grainy sandy paste. A very fine dust of silt coats most particles. Very friable, crumbles easily.
Core:	> 2/3 thickness.
Exterior surface:	Smoothed. Occasional sherds (e.g., #539) have a floated fine-grained finish which is very easily eroded. Reddish light brown to grayish light brown colors with fire clouds.
Interior surface:	Smoothed. Rarely clouded. Reddish light brown.
Paste inclusions:	Bone: Quantity = 1; particle size = 1-5. Sand: Quantity = 4-5; particle size = 3-5; shape = 2-3. Opaque quartz grains.

Other: Hematite (quantity = 1; particle size = 4-5, up to 2 mm). Occasional small (up to 4 mm) granules and pebbles of subrounded silicified wood fragments.

Estimated No. of vessels: 1.

Comments: Vessel size is large as suggested by the curvature of the large sherds.

41 MC 222 Group 3 (miscellaneous bone tempered)

Total No. of sherds: 4 (2 coded).
Provenience: 1 uncontrolled surface, 2 controlled surface, 1 controlled subsurface.
Vessel fragments: Body.
Sherd thickness: 0.5-0.7 cm.
Sherd length: Unknown.
Sherd condition: 3.
Paste: Varies. Slightly porous with a lot of bone and occasional light patches.
Core: Varies.
Exterior surfaces: All are floated. Smoothed and burnished to varying degrees.
Interior surfaces: Poorly smoothed. Uneven. Brush strokes visible on some.
Paste inclusions: Bone: Quantity = 3-5; particle size = 1-5. Most contain very profuse quantities.
Sand: Quantity = < 1; particle size = 1. Very small quantities.
Other: Occasional hematite, resin, and clay intrusions.
Estimated No. of vessels: 2.
Comments: This group represents odd sherds which could be from three vessels. Surface finish varies. Group 3 contains several small sherds which do not fit the other bone-tempered groups (Groups 1A and 1B) from the site. All sherds have burnished exteriors, poorly smoothed interiors, and contain very little sand. The clay source is different in this group from any other group in 41 MC 222 because it contains less hematite.

41 MC 222 Group 4 (fired clay lumps ?)

Total No. of sherds: 2 (1 coded).
Provenience: 2 controlled subsurface.
Vessel fragments: These two small fragments are not recognizable as sherds. They contain very profuse fine-grained sandy paste with shell and hematite fragments. No regular surfaces visible, perhaps they are a fired clay coating or waddle.

41 MC 223

Total No. of sherds: 1.
Number coded: 0.
Provenience: Uncontrolled surface.

41 MC 223 Group 1 (bone-tempered handle)

Total No. of sherds: 1.
Provenience: Uncontrolled surface.
Vessel fragments: Handle fragment.
Handle diameter: 1.4-1.6 cm.
Sherd length: 3.3 cm.
Sherd condition: 3. Slightly weathered.
Paste: Porous, sandy paste.
Core: > 2/3 thickness. Dark gray.
Exterior surface: Grayish light tan. Slightly mottled. Smoothing marks visible. Some cracking and flaking of surface over hematite inclusions.
Interior surface: Grayish. Light orange. Pitted.
Paste inclusions: Bone: Quantity = 3-4; particle size = 1-5.
Sand: Quantity = 2-3; particle size = 1-3; shape = 1-3. Clear to opaque.
Other: Hematite (quantity = 1; particle size = 4-5; shape = 4). Occasionally exposed on surface.
Estimated No. of vessels: 1.
Comments: This sherd is a handle fragment, probably a handled olla. The sherd break reveals an interior cylinder stuck into the wall of the vessel and built up on the exterior (Fig. 91,c).

CHOKE CANYON CERAMIC TECHNOLOGY

The Choke Canyon ceramic collection offers a look at technological aspects of pottery making along the lower Frio River drainage during the Late Prehistoric period. These observations may be applicable to much of south and central Texas. Viewed as a group, the collection exemplifies the widespread bone-tempered pottery tradition defined by Hester and Hill (1971). Crushed bone in varying amounts was added to virtually every vessel represented in the collection. The majority of the sherds collected during the project represent vessels made by coil construction techniques. Vessel forms are restricted to olla, bowl, jar, and pipebowl forms. Surface treatment techniques were varied; but, in general, exterior surfaces were well smoothed and burnished while the interior surfaces were predictably less smooth, usually brushed. Thus, in general terms, the ceramics are very similar. However, when one considers the specific combinations of attributes, the homogeneous picture gives way to a more complex view. The variety of combinations of paste, paste inclusions, surface finish, and firing conditions strongly suggests a widespread local ceramic tradition in which bone tempering seems to be the only mandatory ingredient in an otherwise flexible recipe. Specific aspects of the local pottery making tradition merits individual discussion.

Paste Composition and Inclusions

Microscopic examination of fresh sherd breaks (cross sections) revealed considerable variation in paste characteristics. Paste in the collection ranges from highly compact homogeneous mixtures which were well fired (light clear colors) to very friable porous heterogeneous mixtures which were incompletely fired resulting in thick dark cores and dark, cloudy colors. This range in paste characteristics can be attributed to different clay sources, amounts of added temper, degrees of paste constituent admixture, and firing.

Paste inclusions can be divided into unintentional or natural inclusions and intentionally added inclusions or temper. Unintentional inclusions are those nonplastic (and a few plastic) paste constituents which naturally occur in the clay (e.g., sand) or those accidentally mixed into the paste (e.g., fragments of crushing tools). The only intentional inclusions added as temper are bone, possibly clay particles, and, in some cases, sand. Each paste inclusion observed in the Choke Canyon ceramics will be discussed.

Bone

Crushed bone was added to all 576 ceramic fragments with only two or three exceptions. The amount of bone ranges from very sparse to very profuse. Particle size ranges from minute, very fine particles to granular particles measuring up to 4 or 5 mm in diameter. Bone comes in a variety of colors and shapes, a fact that has probably caused inexperienced archaeologists to misidentify bone. Bone may be black, gray, blue, brown, and white with many variations in hue. All of these colors may appear within a single sherd cross section.

Bone also comes in a myriad of shapes. Some fragments are long, layered splinters, and some are amorphous chunks. Thin layers of bone and tiny holes are the most common bone structures visible. The thin parallel layers are known as "circumferential lamellar bone" which forms in the cortex of long bone. The tiny holes are osteoclasts which are filled in during the growth process except for a tiny hole in the center by concentric layers of bone known as osteoblasts (Ubelaker 1978:64). The whole structure--the tiny hole and surrounding osteoblasts is known as an osteon. In addition to these shapes, spongy cell-like structures are sometimes visible which appear to be cancellous bone tissue fragments. The faunal species utilized as bone temper are unknown, but most of the bone appears to be from large mammals such as deer or bison. This is based on a hunch rather than any real scientific basis.

In attempting to reproduce bone-tempered pottery, it was discovered that fresh or partially weathered bone crushed more easily; however, it also disintegrates into a useless powder. The answer to the problem is to burn the fresh or partially weathered bone over an open fire for a few minutes. The burned bone crushes easily into the shapes and sizes observed in sherd cross sections.

If the bone is being burned and fire blackened to facilitate crushing, then why does the exposed bone appear white or unburned? The color of the bone is a result of oxidation. The more oxygen each particle receives during firing, the whiter the bone appears. Blackened (carbon-rich) bone will reoxidize during firing as long as sufficient oxygen penetrates the vessel. In general, the exposed bone on the vessel surface is always white while bone within the paste may or may not be, depending upon localized oxidation conditions.

Sand

Siliceous detrital particles composed principally of quartz were observed in all but two site groups as a paste inclusion in varying amounts. Most of the sand can be attributed to natural inclusions present in the clay used to form the paste. In addition to varying amounts of sand, the composition of the sand varies in grain size and particle shape or degree of roundness. These attributes varied markedly between certain site groups. Some site groups such as Group 1 at 41 LK 67 contained very fine sand grains which were angular to subrounded in shape and made up of pure quartz. In contrast, Group 4 at 41 LK 67 contained very fine to coarse grains which were rounded to well rounded in shape and made of opaque and multicolored grains (abraded quartz and other minerals). The contrast in sand compositions implies that the two groups were made from distinctly different clay sources. Group 1 was probably made from an upland clay as evidenced by the angular, clear quartz grains. On the other hand, Group 4 was probably made from an alluvial clay source as evidenced by its rounded, abraded, and stream-rolled sand grains. These interpretations need to be tested by a comparison of locally collected clay samples from a variety of sources. Most site groups were composed of rounded grains rather than angular grains, hence alluvial clay sources were probably used more often than upland clay sources.

Most sand can be attributed to natural inclusions present in the clay sources. A few site groups contained very large amounts of sand and bimodal size-shaped compositions. These may reflect intentionally added sand used as temper, but it is difficult if not impossible to determine whether the sand was actually ever added as a temper unless the specific clay source can be determined.

Hematite

Iron oxide particles herein referred to as hematite were a common paste inclusion. These particles are usually recognizable by their bright red to rusty red appearance. Hematite typically occurred as rounded to well rounded, medium to granular (up to 6 mm) particles. Differences in hardness, color, and particle shape probably reflect different compositions of iron oxide minerals such as hematite, goethite, limonite, and magnetite. In most site groups, hematite particles occurred only occasionally, although some groups such as Group 1A at 41 MC 222 contained numerous particles which were large enough to weaken the vessel walls. Hematite particles are considered natural inclusions as they occur in some local clay sources.

Clay

Irregular to rounded patches or chunks (up to 4 mm) which appear to be untempered clay were observed in some sherds. These clay patches are usually lighter in color than the surrounding paste and are finer in texture because they do not contain bone particles. These clay inclusions were most common in upland clays (little sand or angular sand). It is suggested that the clay patches represent incompletely pulverized clay which was collected dry from an upland source. Some of the lighter colored patches may actually be a caliche.

Resin Bubbles

Clusters of tiny amber to orange bubbles were observed in many sherd cross sections. The composition of these resin bubbles is unknown. Resin bubbles seem to fill void or large pores in bone-tempered pottery. Resin bubbles possibly formed during firing by molten residue (which may be derived from animal bone) that flows and fills adjacent open spaces. Occasionally, similar material occurs as spongy accumulations. No resin bubbles were ever observed on sherd surfaces or anywhere except obvious voids. The bubbles themselves are tiny round spheres less than 1 mm in diameter. The resin bubble clusters are shaped to fit the available space and may be 5 mm or more.

Shell

Rare, small, thin, bright white shell fragments were observed. These appear to be land snail fragments. One whole juvenile land snail was observed in one sherd. Shell fragments are unintentional inclusions.

Quartzite and Sandstone

Occasionally, chunks up to 6 mm were observed which appeared to be quartzite and sandstone fragments. These are possibly fragments of quartzite and sandstone grinding implements used to crush the bone and/or the clay.

Surface Finish Techniques and Surface Coatings

A variety of surface finish techniques were observed on the Nueces River Project ceramics. A consistent pattern of even, smooth, and burnished exteriors was noted on many of the sherds. Sherd surfaces were frequently destroyed by postdepositional weathering, calcareous coating, and lichen. Decoration was observed on a surprisingly large percentage of the site groups (18%). Decorative techniques included fugitive red filming and possibly alphaltum banding. Fire clouding and sooting were common. Several examples of slip clays were applied to exterior surfaces.

Burnishing

Most exterior surfaces and interior bowl surfaces were first smoothed and floated and then burnished. The degree of burnishing ranged from very slight patchy burnishing with a very low luster to extensive well-developed burnishing which left a high glossy surface. Burnishing frequently was accomplished in parallel strokes as evidenced by the tool marks. In some cases, a thin slip or fine clay slurry was apparently used during the burnishing. This burnishing slip was usually made from a clay identical to the pastes; however, distinct burnishing slips of different clays were occasionally observed.

Slipping

A few sherds have coatings of fine-grained clay on the exterior or rarely the interior surface. These coatings are distinct in color and texture from the paste. Most of these were termed burnishing slips; however, this may be misleading. Burnishing (polishing) compacts the surface and may form a fine layer of lustrous clay that appears distinct from the paste, thus resembling a slipped surface (Shepard 1976:192). One sherd from 41 LK 41 (Group 2B) has a brown coating that is definitely a true slip. This slip may have functioned to improve the surface appearance, to decrease permeability, or both (*ibid.*: 191).

Wet Brushing

Term coined by author to describe the method of surface smoothing most often used on interior surfaces. Wet brushing involves the use of some type of organic brush (a frayed stick?) while the vessel was still wet leaving tiny (sometimes microscopic) raised ridges. Parallel and irregular patterns were observed.

this is correct spelling!

Fugitive Red Filming

Traces of a thin film of red mineral pigment were observed on approximately 16% of the site groups. Fugitive red filming is a decorative technique that apparently only occurs on bowl forms. Fugitive red film occurs on burnished exterior surface and occasionally on interior surface. A possible fugitive red film design was observed on the interior of a small bowl at 41 MC 222 (Group 1B). A larger bowl from 41 LK 15 (Group 2) has fugitive red film along the edge of the interior, on the rim, and on the exterior. A freshly decorated fugitive red-filmed bowl would have had a brilliant red color and must have been very striking in appearance.

Fugitive red film is extremely ephemeral; it is easily washed or rubbed off surfaces and usually remains only as traces. Most traces are only recognizable under careful microscopic examination. The composition of the red mineral is unknown, but appears to be an iron oxide such as earthy hematite (also called red ochre). Intact patches are bright red and have a metallic luster. Some examples of fugitive red film were a darker maroon color. Interestingly, one of the properties of hematite is that the red streak turns dark when heated (Hurlbut and Klein 1977: 269). It is suggested that the dark maroon color indicates a fugitive red-filmed vessel was used for cooking (exposed to heat). Given the ephemeral nature of fugitive red film, one suspects that a large percentage of the ceramics originally were filmed, and the substance has been weathered away or was not observed during examination. Similar decoration has been described on *Goose Creek Red-filmed* pottery along the upper Gulf Coast (Aten 1967) and on *Goliad Red-on-buff* at Mission Espíritu Santo (Mounger 1959).

Asphaltum

The use of asphaltum for edge mending and possibly decoration was documented at a number of sites. Most traces of asphaltum were observed on the exterior surface and along the edge of sherds. This indicates the use of asphaltum as a mending or waterproofing glue or coating on cracked vessels to prolong the vessel life. One sherd from 41 MC 55 Group 6 had a band of asphaltum across the exterior surface which is not connected with an edge. This may represent asphaltum decoration.

A serious problem arose during the early stages of this analysis when the distinction between asphaltum and heavy black sooting became impossible. Story (1968:17-18) encountered this same problem with ceramics from the Ingleside Cove site and was unable to solve it. Dr. Donald R. Lewis, director of the newly formed Center for Archaeological Research Chemical Laboratory, came up with an easy, inexpensive, and rapid method (referred to as the "Lewis method") for positively identifying asphaltum. The "Lewis method" involves a two-step process outlined below (courtesy of D. R. Lewis).

Test for Asphalt-Bitumen

1) Place small flake of material in one cup of a white porcelain spot plate.
2) Place one drop of isopentane (2-methyl Butane) on sample. Stir gently with fine clean point. If liquid turns yellow or brown, the sample is probably from heavy crude oil. If liquid stays clear, allow to evaporate completely and go to step 3.
3) Place one drop of Toluene on sample. Stir gently with fine clean point. If liquid turns yellow or brown, the sample probably contains asphaltic material. If liquid stays clear, the sample is probably coal, charcoal, soot, graphite, or pyrobitumen.

Using the "Lewis method," it was determined that many of the black coats on sherd surfaces were not asphaltum. The site groups identified in the text as having asphaltum were positively identified using the "Lewis method."

Asphaltum presumably was obtained along the Texas Gulf Coast where it is commonly found along the beaches. The beach asphaltum is derived from offshore oil or tar seeps (D. R. Lewis, personal communication). The presence of asphaltum on the ceramics probably indicates coastal contact either direct or indirect through trade, although surface tar seeps are known in the Uvalde area (G. L. Hammon, Department of Earth Science, The University of Texas at San Antonio, personal communication).

Foreign Coatings

Several sherds with a dried black coat or film on one or more surfaces were found. The material is not asphaltum. The nature of this material is unknown; it may be postdepositional or be an organic waterproofing agent such as mesquite sap. It may also be heavy carbon sooting, but it seems to have been a liquid at one time.

Burned/Organic Residue

Two sherds were excavated from 41 LK 201 (Group 3E); both have a layer of dark, cracked organic material which is several millimeters thick and appears to be burned on the interior surface. The composition of this residue is unknown, but it may be a burned food residue that was preserved through carbonization. In comparison to most project sites, 41 LK 201 exhibited excellent preservation.

Postdepositional Effects

A variety of postdepositional conditions have adversely affected the ceramics: calcareous coating, lichen, sun bleaching, weathering, and chemical corrosion. These effects are difficult to detect and often mask the original surface treatment techniques so effectively that one is left wondering what the original vessel surface was like.

Calcareous Coating

A light gray or white coating was observed on many sherds. The coating covers all surfaces including old broken edges. This coating is apparently a calcareous (calcium carbonate) stain derived from alkaline soils. The calcareous coat is postdepositional and frequently masks surface characteristics.

Lichen

Tiny black patches which appear to be lichen were seen on some sherds (particularly surface-collected sherds). Similar coats were often observed on lithic artifacts. Lichen are postdepositional and, like calcareous coatings, tend to obscure surface characteristics.

Weathering

Most sherds, especially surface-collected sherds, were adversely affected to varying degrees by the ravages of time. The combined effects of sun, rain, freezing, plowing, and animal and plant activity will eventually break down even the most resistant ceramics. The edges of the sherds go first. A fresh break weathers to a rounded edge as the condition attribute (Fig. 89) illustrates. A number of sherds were lighter in color on exposed edges than in the center of a fresh break. These sherds may have been sun bleached or oxidized by exposure to the bright Texas sun for tens or hundreds of years. Eventually, this process may entirely oxidize the sherd leaving no carbon core.

Chemical Corrosion

In some groups, particularly Group 1 at 41 LK 67, all exposed bone appears to be eaten away or chemically dissolved. This process is not understood and may be attributed to soil chemistry or to biological action (see discussion of Group 1 at 41 LK 67 for further details and speculation).

VESSEL FUNCTION

The ceramics collected from the Phase I investigations, while highly fragmented, offer some indications of vessel function. No reconstructable vessels were recovered; however, some diagnostic sherd types such as rim and neck sherds suggest specific forms. Four vessel forms are recognized: ollas, bowls, jars, and pipebowls. Olla and bowl forms are common; jar and pipebowl forms are rare. Vessel sizes could not be determined except in relative terms based on sherd curvature.

Ollas are relatively large in comparison with all other forms. An olla is a globular vessel with a constricted neck and an outward flaring rim. Single coil handles or lugs were attached to some ollas. The olla form is suggested to have functioned as a water container. The constricted neck minimizes water spillage during transportation. The handles provided a better grip for handling and carrying a wet, slippery water container.

Bowl forms show considerable variation in size and shape. Small rim sherds hint at three bowl shapes: closed or inverted rim bowls (Fig. 90,g), open rim bowls (Fig. 90,a), and flaring rim bowls (Fig. 90,i). Fugitive red filming occurs only on bowl forms. Bowls are suggested to have functioned as cooking or serving containers. Evidence of cooking includes sooted exteriors and the apparent occurrence of burned food residues on two sherds from 41 LK 201 (Group 2E).

Jar forms are suggested by one large rim sherd from 41 LK 201 (Fig. 90,j). This straight-sided cylindrical jar may have functioned as a storage or serving container. The final form is functionally obvious--the pipebowl (Fig. 91,a,b). Wooden or bone stems may have been used in conjunction with ceramic pipebowls. A bone stem was discovered *in situ* with a stone pipebowl at the Loma Sandia site (41 LK 28) in Archaic burial contexts (Hester 1980a: Fig. 5.16).

The above discussion is presented as a tentative assessment of vessel function. All forms represent utilitarian ceramics. Reconstructable vessels were recovered at several project sites during succeeding investigation phases. Reconstruction of these vessels will provide better evidence for vessel form.

SUMMARY

Seven research problems or questions were defined in the Final Research Design section. Below is a discussion of how effectively each question has been addressed by the present study.

1. What variations are present in the sample?

As the site group descriptions demonstrate, considerable variation is present in the sample within relatively narrow limits. Bone temper is present in 574 out of 576 ceramic fragments, but the amount varied from very sparse (< 5%) to very profuse (> 50%). Sand was present in all but 20 of the 576 sherds. In general, sherds with profuse quantities of sand had little bone and sherds with profuse bone had little sand; sand and bone appear to have performed the same function. Sherds with more bone than sand were predominant (71%). Sherds with more sand than bone constituted 21% of the sample, 6% of the sample had equal amounts of sand and bone, and 2% of the sample was indeterminate. In general, sandy paste ceramics were thicker than profusely bone-tempered ceramics. The thinnest and the strongest pottery was predominately bone tempered. The thickest and most friable pottery was the sandy paste groups. Additional variation is discussed elsewhere in the text.

2. Can the variations be demonstrated quantitatively?

Most of the variation could not be demonstrated using coded attribute values. The two principle reasons for this failure were (1) inexperience of the analyst and (2) the nature of the sample. Small weathered plainware ceramic fragments appear to be ill-suited for quantitative analysis.

3. How can the variations be explained? From different sources, manufacturing technologies, time periods, cultures, materials, etc.?

Sand composition was the best indicator of clay source variation along with the presence or absence of other natural inclusions such as hematite. A number of clay sources were obviously used by the Late Prehistoric peoples in the lower Frio River drainage. Most of these appear to be alluvial clay sources as they contain stream-rolled sand grains. Upland clay sources were also utilized as evidenced by angular unweathered quartz grains in some paste groups. While the number of clay sources remains unknown, clearly many different sources were used; four distinct potential clay sources were observed within the project area. Oxbow lake bottoms contain black clays with hematite inclusions. Upland clay deposits were observed on the south side of the project area in road cuts along State Highway 72. These deposits could have been exposed in arroyo walls. Along the active Frio River, two clay sources were observed. Partially eroded clay banks were accessible in some areas, particularly in the upper half of the project area. Thin drapes of fine-grained clays and silts were observed following floods along the river. These drapes provide very clean clay/silt under some conditions. Undoubtedly, other types of clay sources exist within the project area. Additionally, one can expect the clays along the various tributary drainages such as San Miguel Creek to differ according to upstream pedologic conditions.

Manufacturing technologies were similar across the project area. Most of the larger site samples contained examples of virtually all the techniques observed within the reservoir area. All or most of the ceramics were manufactured by the coil construction technique. The possible exception is the pipebowl fragment from 41 LK 201, which may have been molded by hand using a "pinch pot" technique.

Chronological control was unavailable for most sites; it is difficult to determine whether the ceramics changed through time. All the ceramics can be linked to Late Prehistoric occupations within the area. *Perdiz, Scallorn*, and *Edwards* arrow points were found in association with ceramics at various sites. Late Prehistoric components were firmly dated at only one site, 41 MC 222, during the Phase I investigations. Two radiocarbon assays ranging from 1260-1290 A.D. (MASCA calibration) were associated with *Edwards* and *Scallorn* arrow points and bone-tempered ceramics.

4. How do the varieties compare? (a) intersite, (b) intrasite, and (c) interregion.

On an intersite basis, the author was unable to define distinct project-wide "types" which could be compared. The ceramic collection could best be described as a spectrum of variation with very few clear clusters. In general, the larger site samples exhibited most of the various characteristics found within the project area. The very small size of the sherd samples from many sites provides an unreliable basis for intersite comparison.

Intrasite comparisons are limited to the few sites which contain the larger samples: 41 LK 41, 41 LK 51, 41 LK 67, 41 LK 201, 41 MC 55, and 41 MC 222. In most cases, the collections from the more intact sites such as 41 LK 67 clearly indicate most site groups occur in distinct clusters on a horizontal rather than vertical basis. No site evidences any clear horizontal stratification of ceramic groups or components. The repeated observation at several sites that the site groups occur in distinct vertical clusters strongly suggests that most site groups reflect single vessel distributions and are valid distinctions. A large site, 41 LK 41, which has been severely disturbed by plowing and clearing has evidenced considerable variation but little distinct clustering. The larger scaled excavations recently conducted at 41 LK 201 and 41 MC 222 provided better samples for intrasite comparisons.

An interregional comparison was hampered by the lack of readily accessible site samples. While site collections from many ceramic bearing sites are housed in Austin at the Texas Archeological Research Laboratory and in San Antonio at the Center for Archaeological Research most sites do not contain sorted ceramic types or groups. The researcher is forced to sort each site himself--a very time consuming process. Pulling representative samples from each site group may solve this problem. The Nueces River Project comparative collection is housed at UTSA in the archaeological laboratory and is available for examination by qualified researchers. Samples from additional sites will be added to the collection as time permits.

In general, the ceramics from Choke Canyon could be slipped unnoticed into most site collections from south and south central Texas. Fugitive red filming has not been previously documented from the area, but this is undoubtedly due to the ephemeral nature of this decorative technique.

5. How were the ceramics manufactured? What techniques and materials were used?

This has been discussed in several sections of this analysis.

6. Where were the ceramics manufactured? Locally, or imported, one source or many?

The ceramics are made within or near the project area. Numerous clay sources and presumably manufacturing localities were utilized. Manufacturing debris which could be expected at a ceramic firing location includes fired test lumps, exploded or failed vessels, and possibly burnishing tools (smooth pebbles or sherds). Fired lumps or irregular fragments found at 41 LK 41 are the only possible indication of a manufacturing site within the reservoir. It should be noted that open firings would leave little but ashes and charcoal in most areas.

7. What analytical techniques would be most useful in future ceramic studies of the area?

Based on the experience gained during analysis, a number of specific recommendations for future ceramic studies in the Choke Canyon area, as well as south Texas in general are offered. These are discussed below.

Laboratory Processing: Sherds should NOT be washed or labeled until examined. Instead, sherds should be bagged individually or by provenience. The ceramic analyst should look for fugitive red filming or organic residue on each sherd which could be damaged by washing. Labeling the sherds, particularly the smaller sherds, totally or mostly obscures the surface finish. Small sturdy bags with a zip lock (minigrip bags) are ideal for ceramic samples because they facilitate examination (easy removal). Asphaltum and sooting should be distinguished by the "Lewis Method."

Examination Routines: Each sherd should be broken on one edge or corner to expose a fresh cross section. Two pairs of slip joint pliers with padded (felt covered) jaws used with a quick snapping motion generally provides clean breaks with minimal damage. Examinations should include a macroscopic "eyeballing" for obvious details and a careful microscopic examination, using both low power (7-10X) and higher power (30X), of the cross sections and both surfaces. A micrometer installed in the microscope facilitates particle size determination.

Type of Analysis: A subjective or "non-typological" approach was far more useful than a quantitative analysis. Attribute groups should be defined for each site. A well-developed "pottery sense" is essential for ceramic analysis. A novice ceramicist should expect to spend hundreds of hours "learning the ropes." Experimental reproduction using open firing or coiled construction of various clays, tempers, and surface treatment techniques were found to be extremely educational.

Clay Source Identification: Natural inclusions such as sand and hematite offer the best potential for identifying clay sources, short of trace element or petrographic analyses. Sand composition could be quantified with respect to grain size, shape (degree of rounding), and color by ultrasonic disaggregation (cf. Gains and Handy 1977) of sherd fragments. These sherd sand composition values could then be compared to composition values of clay samples collected within a project or site area. Similar compositions should enable identification of clay sources.

Comparative Collections: All ceramic analysts should set up an example collection from all groups and sites defined during his or her analysis. If more of these collections were accessible, then interregional comparisons would be much easier.

Collection Techniques: Most sites in the Nueces River Project had very shallow Late Prehistoric components. At sites with comparatively large ceramic samples, block area excavations opened to 30 cm or so in depth could provide greater horizontal control and samples large enough to allow vessel reconstruction as has recently been demonstrated at 41 LK 201 (1981 UTSA Field School). Surface collections of grab bag sampling from distinct collection areas, such as that used at 41 LK 51, is a valid technique which can demonstrate horizontal clustering of attribute groups.

THE BONE-TEMPERED CERAMIC TRADITION OF SOUTH AND CENTRAL TEXAS

The present study of prehistoric ceramics from 16 sites in the Choke Canyon Reservoir area offers a detailed look at many aspects of the south Texas Late Prehistoric bone-tempered ceramic tradition defined by Hester and Hill (1971). This tradition is suggested to represent the widespread practice of making bone-tempered utilitarian ceramics during the Late Prehistoric ca. A.D. 1200-1600. Vessel forms appear to be limited to olla, bowl, jar, and pipebowl forms, although larger less fragmented collections may evidence additional forms. All vessel forms were made using coil construction techniques except pipebowls which were made using the "pinch pot" technique. Crushed bone was added to virtually all vessels in inverse proportion to the amount of sand occurring naturally in the clay. Clay sources appear to vary widely as evidenced by paste, color, and texture as well as sand grain morphology. Exterior surfaces were always smoothed and usually burnished. Interior surfaces were usually wet brushed except on bowls which were smoothed and often burnished. Decoration occurs more frequently than had been previously observed; 18% of the vessels represented by the project collection were decorated. The major form of decoration is fugitive red film which occurs as a thin ephemeral coating on the exterior and occasionally interior of bowls. Asphaltum was used as a mending glue to repair cracked vessels and occasionally as a decorative paint. Other forms of decoration such as incising, punctating, and brushing are rare but have been documented at some south Texas sites (Hester and Parker 1970).

The origins of the south Texas ceramic tradition have been tentatively linked to central Texas by previous researchers (Hester and Hill 1971:199-200). *Leon Plain* is the type name applied to most central Texas bone-tempered pottery (Suhm, Krieger, and Jelks 1954). Hester and Hill (1971:198-199) suggest that

Leon Plain "has never been fully studied and seems to be an amalgamation of various plain ceramics found in Late Prehistoric central Texas." One unpublished study of *Leon Plain* (Heartfield 1966) documented considerable variation in central Texas ceramics but concluded that *Leon Plain* should be considered a provisional type based on attribute consistency and geographical isolation. In the same paper Heartfield suggested that the origin of *Leon Plain* lies to the east in the fringe area between central Texas and the Caddoan area.

Leon Plain and the south Texas bone-tempered ceramic tradition have been previously dated to after A.D. 1200 (Jelks 1962:88; Hester 1980a:124). Recent excavations at the Panther Springs Creek site in Bexar County (south central Texas) challenges this dating (Black and McGraw 1982). At the Panther Springs Creek site, a poorly made bone-tempered cylindrical jar was found in association with *Scallorn* and possibly *Edwards* arrow points and a rock and charcoal feature radiocarbon dated to A.D. 980 ± 60 (TX-3856, MASCA calibrated). The occurrence of rather crudely made bone-tempered ceramics in south central Texas several hundred years before the widespread occurrence of thinner better made bone-tempered ceramics across much of central and southern Texas is significant. It is suggested that *Leon Plain* and the south Texas bone-tempered ceramic tradition are indistinguishable and should be considered a single tradition. Bone-tempered pottery appears to have been introduced into the area by A.D. 1000 probably from agricultural groups to the east. Widespread ceramic making apparently did not occur in the region until after A.D. 1200.

It is argued that the bone-tempered ceramic tradition that is evidenced at many Late Prehistoric sites over much of south and central Texas survived until early historic times. Clark (1978:76-77) has observed that bone-tempered ceramics very similar to *Leon Plain* have been found at many Spanish sites including Mission San José, Mission San Antonio de Valero, Presidio San Luis de Amarillas, Mission Santa Cruz de San Saba, Mission Concepción, Mission Espíritu Santo, Mission Rosario, and Mission San Juan. These Spanish colonial missions dealt mostly with Indian groups from southern and central Texas. It is suggested that bone-tempered ceramics were not found at the Lipan Apache mission, San Lorenzo de la Santa Cruz (Tunnell and Newcomb 1969). Mounger (1959: 179-181) defined three variants of bone-tempered ceramics at Mission Espíritu Santo--*Goliad Plain, Goliad Red-on-buff*, and *Goliad Black-on-buff*. A comparison was made with the ceramics from Mission Espíritu Santo to the *Rockport* wares of the central Gulf Coast and to *Leon Plain* of central Texas. She found that, while the mission ceramic decoration was more similar to the *Rockport* wares, the color, porosity, and tempering were most similar to *Leon Plain*. Mounger (*ibid.*:181) apparently decided that *Goliad* wares were distinctive from *Leon Plain* solely on the basis of decoration: "No *Leon Plain* has ever been reported in red or black, it may be concluded, *Goliad* ware is a local product and represents the ceramic tradition of the Aranama." The recognition of fugitive red filming and asphaltum painting on Late Prehistoric bone-tempered ceramics challenges the validity of the Goliad types.

In conclusion, it is argued that a single ceramic tradition is represented by the Late Prehistoric and mission bone-tempered pottery in south and central Texas. Between A.D. 1000-1500, the tradition of making bone-tempered utilitarian ceramics was adopted by many inland hunting and gathering groups living in south and central Texas. Spanish expansion from the south and Apache raiding from the north rapidly decimated and displaced the native groups in the region during the 17th and 18th centuries (Campbell and Campbell 1981:64). The surviving remnants, while sheltered in the Spanish missions, maintained their tradition of making bone-tempered pottery for a few decades longer. The bone-tempered ceramic tradition would include the following previously defined types: *Leon Plain*, "Doss Red Ware" (Kelley 1947), *Goliad Plain, Goliad Red-on-buff*, and *Goliad Black-on-buff*, as well as the untyped bone-tempered ceramics from south Texas and from the Spanish missions. It is suggested that the defined types serve little value and, in fact, are often misleading in that they imply that significant differences occur between types. Considerable differences do occur within the bone-tempered tradition of south and central Texas. Most differences may be more a product of clay source variation, small sample size, and poor preservation rather than cultural practices. It is suggested that the above type names be discarded in favor of simple descriptive labels until adequate distributional and descriptive data are available to define culturally meaningful types.

HISTORIC ARTIFACTS

Historic artifacts were collected at the following sites by the CAR-UTSA crews during the course of Phase I investigations at Choke Canyon:

41 LK 8	41 LK 51	41 LK 74	41 LK 202	41 MC 222
41 LK 14	41 LK 53	41 LK 91	41 MC 17	41 MC 223
41 LK 27	41 LK 65	41 LK 94	41 MC 55	41 MC 224
41 LK 31/32	41 LK 67	41 LK 198	41 MC 67	
41 LK 41	41 LK 73	41 LK 201	41 MC 171	

Three of these sites (41 LK 41, 41 LK 73, and 41 MC 17) were reported as a result of the initial survey by the Texas Historical Commission (Lynn, Fox, and O'Malley 1977). Site 41 LK 202 was recorded during the 1978 archaeological survey conducted by a crew from the Cultural Resources Institute, Texas Tech University. Previously unreported historic components were found on the following seven prehistoric sites by crews from the CAR-UTSA during Phase I investigaions: 41 LK 27, 41 LK 31/32, 41 LK 53, 41 LK 74, 41 LK 201, 41 MC 55, and 41 MC 67. Artifacts and information recovered by the CAR-UTSA in final excavations on historic components at 41 LK 31/32 and 41 LK 202 are reported by Brown *et al.* (1982). The remaining 12 sites listed above evidenced either modern historic components or early historic remains in such low quantities that no historic component could be defined. Such low density occurrence of early historic materials are also characterized by the absence of sandstone or tuff building materials normally found at the more permanent historic sites.

The historic artifacts are divided into the categories of ceramics, glass, metal, and miscellaneous artifacts for purposes of description. For more detailed discussions of historical research, historic sites archaeology, and historic artifacts, see Lynn, Fox, and O'Malley (1977), Everett (1981), Bandy (1981), and Scott and Fox (1981). The materials described below are not illustrated in this report.

CERAMICS

Decorated Earthenware (38 Specimens)

Blue Stenciled Design on Pearlware (2 Specimens)

One rim sherd, one body sherd. Both from 41 LK 65.

Blue Transfer Decoration (2 Specimens)

One ring foot, one body sherd. One from 41 LK 73, one from 41 MC 67.

Blue Shell-Edged Pearlware (6 Specimens)

All are rim sherds from 41 MC 67.

Blue Painted Pearlware (3 Specimens)

All are body sherds from 41 MC 67.

Cut Sponge Decorated Pearlware (2 Specimens)

Both are rim sherds from 41 LK 51.

Flown Blue (2 Specimens)

Both are body sherds from 41 LK 27.

Hand-Painted Pearlware (10 Specimens)

Eight body sherds, two rim sherds. Nine have green, red, black, and blue floral patterns. One has broad blue and narrow red bands. All are from 41 MC 67.

Banded Pearlware (8 Specimens)

Two rim sherds, six body sherds. Seven have alternating blue and white bands. One has blue, black, and white bands. One sherd is from 41 LK 73, and seven are from 41 MC 67.

Blue Sponge Decoration on Whiteware (3 Specimens)

All body sherds. Light blue floral pattern. All from 41 MC 67.

Undecorated Earthenware (53 Specimens)

Whiteware (52 Specimens)

Twenty-nine body sherds, 12 rim sherds, nine ring feet, one handle, and one base. Fragment of impressed seal on one body sherd reads ". . . ORE & FORS . . . GOTHIC." Provenience: one sherd from 41 LK 51, five sherds from 41 LK 53, one sherd from 41 LK 65, 30 sherds from 41 LK 73, four sherds from 41 LK 74, one sherd from 41 LK 91, one sherd from 41 LK 201, one sherd from 41 MC 67, and one sherd from 41 MC 223.

Brown Lead-Glazed Interior (1 Specimen)

One body sherd found at 41 LK 65.

Stoneware (22 Specimens)

Salt Glazed (8 Specimens)

All body sherds. Interiors: five with Albany slip, one unglazed, and two salt glazed. Provenience: one sherd from 41 LK 53, one sherd from 41 LK 65, four sherds from 41 LK 73, one sherd from 41 MC 55, and one sherd from 41 MC 224.

Alkaline Glazed (7 Specimens)

Seven body sherds, one handle. Provenience: four sherds from 41 LK 73, one sherd from 41 LK 198, one sherd from 41 MC 67, and one sherd from 41 MC 223.

Yellow Utility Ware (4 Specimens)

Two body sherds, two rim sherds. One specimen, yellow on both sides, was collected from 41 MC 67. Three specimens with white glaze lining were collected from 41 LK 73.

Ginger Beer Bottle With Bristol Glaze (1 Specimen)

One body sherd was collected from 41 LK 53.

Copper Luster on Red Stoneware Body (1 Specimen)

One body sherd was found at 41 LK 53.

Rockingham Glaze (1 Specimen)

One rim sherd was found at 41 LK 73.

Blue Glaze Salt Box Hanger (1 Specimen)

Semicircular fragment with remnant of suspension hole. Surface collected at 41 LK 27.

Porcelain (1 Specimen)

Roughly one-third of a porcelain mortar, including both rim and base, was found at 41 LK 201. Overall height of the mortar is 4.8 cm. Interior depth from rim to base is 3.7 cm.

GLASS

Bottle Bases (10 Specimens)

Nine are round. One is the base of a rectangular panel bottle. Two are fragments of hand-blown, dark green wine bottles from 41 LK 65. One is machine-made brown glass from 41 MC 223. One rectangular and two rounded bases of lavender glass were found at 41 LK 201. A clear glass round base was found at 41 MC 222. Bases of round, aqua-colored bottles were collected at 41 LK 27 and 41 LK 53. The specimen from 41 LK 27 bears the mark of a "B" on the bottom and represents "Anheuser-Busch." The base of an emerald green bottle came from 41 LK 53.

Bottle Necks (9 Specimens)

Hand Blown (1 Specimen)

Made of aqua-colored glass, this small neck (2.2 cm long and 1.6 cm in diameter) was found at 41 LK 73.

Mold Blown with Applied Necks (3 Specimens)

All were recovered from 41 LK 201. Glass colors are aqua, light green, and lavender. Lengths range from 4.4 to 5.5 cm and diameters from 2.0 to 2.2 cm.

Mold Blown Neck and Rims (4 Specimens)

Three specimens are from 41 LK 201. Two are clear, and one is lavender. Two are probably liquor bottle fragments. One specimen of clear glass came from 41 LK 65.

Neck Fragment with Mold Marks (1 Specimen)

An aqua-colored fragment lacking the rim was recovered at 41 LK 201.

Bottle Body Sherds (169 Specimens)

Bottle body sherds were recovered from various sites in the following colors and quantities: 102 clear sherds from 41 LK 8; three clear sherds from 41 LK 14; six clear sherds from 41 LK 41; six brown and two lavender sherds from 41 LK 53; one cobalt sherd from 41 LK 65; 17 clear, eight aqua, nine dark green, and seven light green sherds from 41 LK 73; two aqua and three lavender sherds from 41 LK 201; two aqua sherds from 41 MC 67; and one clear sherd from 41 MC 171.

From 41 LK 53, a fragment from the side panel of a "HOFSTETTERS BITTERS" bottle was collected. An embossed fragment of "M. GOLDEN'S LEATHER BALM" was found at 41 LK 201.

Complete Bottles (4 Specimens)

Specimen 1: Surface collected at 41 LK 201, this clear glass bottle measures 16 cm in height and 6.1 cm in diameter. It is a machine-made bottle of very recent manufacture and most likely contained medicine for treating cattle.

Specimen 2: From 41 MC 223, this aqua-colored bottle measures 16.2 cm in height, 7.4 cm in width, and 4.6 cm in thickness. It is of recent manufacture.

Specimen 3: Of clear glass, this specimen measures 11.4 cm in height, 4.6 cm in width, and 3.5 cm in thickness. Its basic shape is rectangular. The two side panels bear raised letters and a shield. Also written on each side is the phrase "FOR THE SERVICE OF MANKIND." Inside the shield is the word "FIDELITY." On the base is written "SAN ANTONIO DRUG CO." The bottle is of recent machine manufacture.

Specimen 4: This bottle is circular and made of clear glass. Height is 9.6 cm, and diameter is 5.3 cm. On the base is written "BARTON'S DYNASHINE." Specimen was surface collected at 41 MC 223. This bottle is of recent manufacture.

METAL

Metal artifacts were recovered at 16 sites as follows:

41 LK 8

Two wire nails and two small metal fragments. Recovered from Level 1 of Test Pit 2.

41 LK 9

Wire staple. Recovered from Level 2 of Test Pit 2.

<u>41 LK 14</u>

Base of small light bulb with filaments attached, from Level 1 of Test Pit 4.

<u>41 LK 27</u>

Back cover plate to a pocket watch. Diameter is 4.9 cm. Surface collected from historic dump.

<u>41 LK 51</u>

Wire staple. Recovered from Test Pit 1, Level 1.

<u>41 LK 53</u>

Piece of strap iron, 28 cm long, 1.9 cm wide, and 0.3 cm thick. Cast iron fragment, possibly from stove or skillet. Both surface collected from historic component.

<u>41 LK 65</u>

One small brass buckle. Square nail. Toy parts: cylinder of cap pistol and leg of cast iron horse. Buttons: one U.S.A. military (World War I vintage), brass with spread eagle; one with "POOLS SPECIAL INTERURBAN," brass, 1.6 cm in diameter. All surface collected in area of modern home.

<u>41 LK 67</u>

Buckshot, 0.7 cm in diameter. Lead. Recovered from Level 1 of Unit N990 E1007.

<u>41 LK 73</u>

Recovered in excavation units as follows:

Trench 1.
- Unit 1--nine square nails, five tin fragments.
- Unit 2--21 square nails, two wire fragments, two loops (buckle fragments?), two flat metal fragments.
- Unit 3--22 square nails, one chain link, one percussion cap (fired), one bridle bit fragment, one conical brass object with perforation at small end, one small piece of metal strap.
- Unit 4--23 square nails, one cinch ring with diameter of 10.6 cm.
- Unit 5--12 square nails, two fragments of tin, one crank handle fragment, one wire fragment, one ring with projecting fragment.
- Unit 6--13 square nails, four tin fragments, one flat strip bent into a loop.

Trench 2. 21 square nails, four pieces of metal strap, two miscellaneous metal fragments.

41 LK 74

Test Pit 4, surface, one centerfire cartridge case (probably for a .44 calibre pistol); Level 1, 13 square nails, one small metal strap fragment; Level 2, six square nails; Level 3, five square nails.

41 LK 94

One square nail, one metal fragment.

41 LK 201

One Spanish-style spur, one lantern frame part, one scissors handle, one lead container cap, one pipe fragment, one short piece of barbed wire, one long eye bolt, one metal strap with rounded ends. All surface collected from historic component at southeast end of site.

41 MC 17

One square nail, Test Pit 1, Level 1.

41 MC 67

Two square nails.

41 MC 222

One small metal button, Level 1 of Unit N104 E89.

41 MC 223

One horseshoe, one plate metal fragment.

MISCELLANEOUS

Marble

A fragment of a marble slab, perhaps a tabletop, was recovered from 41 LK 65.

Buttons

Small ceramic buttons, each with four holes, were recovered at 41 LK 73 and 41 LK 74. An attempt at making a bone button was evidenced on a bone fragment found at 41 LK 73. The fragment shows a circular cut with a diameter of 2 cm going into the face of the bone. There is a central perforation through the circle which goes entirely through the bone. The work was apparently done with a brace and bit.

Mortar

Samples of mortar used in construction were collected at 41 LK 73.

CONCLUSIONS

The Phase I archaeological investigations at Choke Canyon Reservoir have produced information pertinent to all of the major research problems recognized in the study of southern Texas prehistory. As stated in the introductory section of this report, these major research problems include clarification and elaboration of the prehistoric cultural/chronological sequence for the region; reconstruction of past environments; definition of prehistoric subsistence pursuits; elucidation of local prehistoric settlement patterns; and definition of lithic technological processes, tool forms, and patterns of tool utilization. Findings made during the Phase I effort at Choke Canyon make direct contributions in each of these areas of research. These same Phase I findings also permit formulation of plans for a final period of archaeological research at Choke Canyon during which attention will be focused on sites found, by virtue of their character and contents, to offer the greatest potential for recovery of useful, problem-oriented data.

SETTLEMENT PATTERNS, CULTURAL CHRONOLOGY, AND TIME DIAGNOSTIC ARTIFACTS

Phase I research at Choke Canyon has done little to alter the current understanding of the Paleo-Indian period in south Texas. Chipped stone tools recognized as diagnostic of this period were recovered at only four of the sites dealt with in this report. The stone tool forms upon which the presence of Paleo-Indian components are inferred include dart points of the *Scottsbluff* (41 LK 204), *Angostura* (41 LK 14 and 41 MC 84), and *Plainview* (41 MC 10) types. In the report of research carried out by the THC, Paleo-Indian components were recognized at three other sites--41 MC 7, 41 MC 14, and 41 MC 172--again on the basis of *Plainview* (two sites) and *Angostura* points found at each (Lynn, Fox, and O'Malley 1977:44, 72). At present these seven sites constitute the known Paleo-Indian localities at Choke Canyon. 41 MC

A number of other chipped stone tool forms in the Phase I assemblage and in private collections viewed by CAR workers may further attest to the activities of Paleo-Indian people in the vicinity of Choke Canyon. As mentioned in the discussion following distally beveled chipped stone tools, forms such as the *Clear Fork* and *Guadalupe* tools (Distally Beveled Bifaces and Unifaces Group 1; Group 2, Form 1; and Group 6) have been found in Paleo-Indian and Pre-Archaic contexts elsewhere in the southern half of Texas (Hester 1980a:112-114). However, these forms apparently do not occur strictly in Paleo-Indian context, but rather seem to cross-cut Paleo-Indian, Pre-Archaic, and Early Archaic assemblages. Such specimens were found at 20 other prehistoric sites during the Phase I field work in addition to the seven listed above (for site numbers, see Table 12). There is a possibility that additional Paleo-Indian components are represented among these sites. In several artifact collections belonging to local residents, CAR analysts recognized *Folsom, Plainview, Golondrina,* and *Angostura* points. Provenience data available for most of these materials are not good, but all are believed to have come from the McMullen-Atascosa-Live Oak county area. *Folsom* points occur rarely, but *Plainview, Golondrina,* and *Angostura* types are relatively common. Hester (1980a:137-138) indicates that these forms are diagnostic of the time period from 8200 B.C.-6000 B.C.

Based solely upon the relatively common occurrence of such forms in the Choke Canyon vicinity, there appears to have been considerable human activity in the area during this era.

Thus far, all recognized Paleo-Indian artifacts have been collected from site surfaces at Choke Canyon. No Paleo-Indian components have been isolated in subsurface probes. Knowledge of Paleo-Indian activities is limited essentially to inferences concerning settlement patterns for the time period based upon perceived geographic distribution of time-diagnostic chipped stone tools. The seven sites at Choke Canyon which have yielded Paleo-Indian materials are situated along the upland edge of the valley margin (41 LK 204), on ancient terrace surfaces in the Frio River valley (41 LK 14, 41 MC 7, 41 MC 10, 41 MC 14, and 41 MC 84), and on higher terrace surfaces paralleling San Miguel Creek (41 MC 172). No recognized Paleo-Indian remains have been found on post-Pleistocene land surfaces down in the Frio River valley at Choke Canyon, either on the surface or in the subsurface. There are two possible explanations for the absence of such remains from the lower reaches of the valley. One is that Paleo-Indian people were camping only at sites on the valley margin and on old, high terrace surfaces down in the valley. The second and more plausible explanation for the observed pattern is that evidence of Paleo-Indian activity in the lower reaches of the valley has been obscured or destroyed by later processes of erosion and alluviation related to the Holocene evolution of the Frio River system. Other factors that may influence a modern conception of the Paleo-Indian settlement pattern include the assumption that Paleo-Indian populations were relatively small in comparison with later prehistoric populations, and they inhabited the region over a shorter period of time (about 2000 years as compared with 6000 to 7000 years of Archaic activity). Fewer sites and lighter debris deposition would be consequences having a bearing on later perceptions of the settlement system practices during the period.

As for the Paleo-Indian period, recognizable evidence of Pre-Archaic activity at Choke Canyon is limited. The time period is estimated to range from 6000 B.C.-3500 B.C. At the recent end of this time range is the earliest component at 41 LK 31/32 (Site Group 1) for which two radiocarbon dates in the 3380 B.C.-3350 B.C. time range were obtained. This deepest component at 41 LK 31/32 has been termed Early Archaic. By central Texas or Trans-Pecos chronological standards, however, the dates available for the 41 LK 31/32 manifestation would place it at the recent end of the Early Archaic period, verging on the Middle Archaic. In the brief discussion of findings made at 41 LK 31/32 in this report (see Volume 8, Scott and Fox 1982, of the research series for further details), eight chipped stone tools are cited as having particularly good potential as diagnostics of the time period between 3380 B.C. and 2340 B.C. A group of three broad, unstemmed thin bifaces having concave bases (Group 3, Form 2, Specs. 4-6) are specimens very clearly affiliated with the earliest component at 41 LK 31/32. For the other five tools (two stemmed thin bifaces, an unstemmed thin biface with rounded base, and two distally beveled bifaces), Early Archaic affiliation cannot be confidently claimed, but they do unquestionably occur within the 1000 year span defined by the radiocarbon dates noted above.

Strictly on the basis of form comparisons between Choke Canyon and central Texas, there may be some additional evidence of Early Archaic activity at Choke Canyon provided by the appearance of dart point types such as *Bell*

(Thin Biface Group 1, Form 1, Spec. 7) and the generic "Early Triangular" forms, examples of which are very likely represented among the unstemmed thin biface forms (Groups 2-4). The problem with the use of triangular thin biface forms as time diagnostics in south Texas is that, unlike central Texas, the triangular form becomes extremely common in Middle and Late Archaic times (the best example is the *Tortugas* type). As a result, the "Early Triangular" form, assuming that it does occur in south Texas, does not have the background of predominately stemmed dart points making it stand out as distinctively as it does in central Texas. Again, the same group of distally beveled tool forms listed above as potential Paleo-Indian diagnostics (i.e., *Clear Fork* and *Guadalupe* tools) may be viewed with more confidence as Early Archaic diagnostics. The two distally beveled specimens recovered from the 3380 B.C.-2340 B.C. horizon at 41 LK 31/32 (see Fig. 79) attest to the relatively early occurrence of the tool form in the area, but again, similar forms are also known to occur in later Archaic contexts.

Although component recognition is definitely a problem in considering the Early Archaic at Choke Canyon, available data suggests that a settlement pattern similar to the one for the Paleo-Indian was being practiced. The apparent preference for Pleistocene terrace and upland margin sites is again probably more a function of geologic processes than of actual settlement.

The appearance of cultural remains dating from 3500 B.C.-2340 B.C. buried beneath over two meters of alluvium at 41 LK 31/32 provides the earliest evidence of a shift in settlement from higher areas of the valley down to terrace surfaces bordering the Frio River and the channels of its major tributaries. This deeply buried horizon is dated only at 41 LK 31/32, but it has appeared at three other sites in Choke Canyon. Excavation of the dam foundation trench through 41 LK 10 (Site Group 2) revealed a deeply buried deposit of cultural debris and a stratigraphic sequence very similar to that recognized at 41 LK 31/32. Although not previously mentioned in this report, borrow excavations during the relocation of State Highway 99 in the west central area of the reservoir (Fig. 1), did expose deeply buried cultural components where the new highway crosses the Frio River (on the southwest bank--no site number yet assigned) and on the right bank of Opossum Creek (41 MC 203). Based only on the similarity of their stratigraphic sequences, it is suggested that all of these incidentally discovered remains date to about the same time period as do the early cultural remains at 41 LK 31/32.

The deeply buried cultural deposits found at these four sites are extremely significant for several reasons. First, they were all discovered as a result of modern earth-moving efforts related to reservoir construction. Natural processes of erosion have not, as far as is now known, been severe enough anywhere in the project area to expose remains buried beneath two meters or more of deposit in the Frio River floodplain. At three of the locations, prehistoric sites were previously recorded on the basis of surface debris visible to the surveyors. In each case, the cultural debris evidencing the site was likely the result of later prehistoric activity temporally unrelated to the deeply buried remains. At the fourth site--the one revealed at the relocated State Highway 99 crossing of the Frio River--no prehistoric debris was evident on the surface prior to excavation of the borrow pit by road builders. This site could not be (and, in fact, was not) recognized during the course of a surface archaeological survey. Its discovery gives reason to carefully re-evaluate the accuracy of a settlement pattern analysis based primarily on surface data and limited subsurface testing.

Most of the major earth-moving activities related to reservoir construction took place at the east end of Choke Canyon in the vicinity of the dam. In addition to the dam foundation trench, numerous geologic test pits were excavated in the area. The deep components at 41 LK 31/32 were initially recognized in two of these pits. Out of six previously recorded prehistoric sites affected by massive earth-moving activities, deeply buried cultural deposits were found in two (41 LK 10 and 41 LK 31/32). Toward the central and western reaches of the reservoir basin, several old gravel pits and the two borrow pits beside relocated State Highway 99 are the only large-scale modern excavations that have occurred. It is considered extremely significant that deeply buried cultural deposits were exposed in both of the borrow pits excavated along State Highway 99. The frequency of discovery coincident with massive excavations suggests that such deeply buried components are quite common in the area.

On the basis of findings made at 41 LK 31/32 and at the three additional sites where deeply buried remains were isolated, it will be suggested that low terraces along the Frio River, its relict channels, and its larger tributaries became major zones of intensive aboriginal settlement after 3500 B.C. During the remainder of the Archaic and into the Late Prehistoric period, the distribution of time-diagnostic artifact forms indicate a primary emphasis on sites beside stream channels. Such a primary focus did not, however, act to the exclusion of locations on old, high terraces along the valley margin and on the upland edge of the valley. Sites in these landform settings also show evidence of habitation during the Middle Archaic, Late Archaic, and Late Prehistoric periods.

Middle and Late Archaic components are recognized at Choke Canyon partly on the basis of radiocarbon assays and partly through comparison of distinctive chipped stone tool forms with corresponding, dated types in central Texas and the Trans-Pecos. Unfortunately, charcoal samples in quantities adequate for radiocarbon assay were rarely found in association with distinctive chipped stone tool forms during the course of Phase I investigations at Choke Canyon. It is thus difficult to judge the reliability of cultural/chronological assignments based upon cross-correlation of artifact types.

Sites at Choke Canyon have yielded dart point forms similar to the *Pedernales*, *Bulverde*, *Travis*, and *Langtry* types, all of which are considered to be diagnostic of the Middle Archaic in central Texas and the Trans-Pecos. In addition to specimens belonging to these recognized Middle Archaic types, a number of other untyped dart points from Choke Canyon generally characterized by broad, straight stems are tentatively advanced as diagnostic of the Middle Archaic (various forms are illustrated in Fig. 61). From the Morhiss Complex of southeast Texas, recent excavations have yielded dart points of the *Morhiss* type from deposits radiocarbon dated between 1250 and 500 B.C. (Fox 1979:62). Several specimens provisionally typed as *Morhiss* were found at Choke Canyon.

A variety of small side- and corner-notched dart points with expanding stems are believed to be diagnostic of the Choke Canyon Late Archaic. Relatively numerous examples of types dated to the Late Archaic in central Texas and the Trans-Pecos are present. The most commonly represented are specimens of the *Ensor* and *Fairland* types; less frequent are *Edgewood*, *Darl*, *Marcos*, and *Frio* types. A variety of other small, untyped stem dart points found at Choke Canyon may also date to the Late Archaic (various forms are illustrated in Fig. 62).

As in the Paleo-Indian and Early Archaic periods, there are a number of unstemmed thin biface forms which, with benefit of additional stratigraphic and radiocarbon control, will prove to be diagnostic of Middle and Late Archaic activities. Phase I investigations at Choke Canyon have simply not provided enough data to confidently assign most of the unstemmed forms to any particular cultural period.

Among the distally beveled tools, there does appear to be a perceptible change in tool morphology from Paleo-Indian and Early Archaic times into the Middle and Late Archaic periods. Available data suggest that the largest distally beveled tool forms represent the Paleo-Indian and Early Archaic periods while the smallest forms are found only in Late Archaic context. Between the largest and smallest distally beveled tool forms, however, there is a large group of temporally ill-defined specimens, many of which are probably Middle Archaic, but may yet prove to be either earlier or later in period affiliation. Tentatively, distally beveled tools classified into Groups 3 and 4 (see Figs. 72-74) are suggested to be Late Archaic diagnostics.

Radiocarbon assays on components at 41 LK 31/32 (TX-2922: 2360-2340 B.C.), 41 LK 67 (TX-3021: 1590-1520 B.C.), and at 41 LK 201 (TX-3022: 1300 B.C.) comprise the range of absolute dates for the Middle Archaic. The Late Archaic is represented by dates of 780 B.C. (TX-2909) and 730-660 B.C. (TX-2910) at 41 LK 67 and 390-270 B.C. (TX-2873) at 41 MC 29. The terminal part of the Late Archaic is not yet recognized except that Late Prehistoric components have been dated around A.D. 1300.

The Late Prehistoric period at Choke Canyon is evidenced by a variety of arrow point forms, a group of "beveled knives" (Thin Biface Group 4, Form 2), certain of the unifaces and trimmed flakes, and a substantial collection of aboriginal pottery. Previously defined arrow point types such as *Scallorn*, *Edwards*, *Perdiz*, and *Cliffton* are present in the Choke Canyon assemblage as well as a number of untyped forms (various forms are illustrated in Fig. 63). The only radiocarbon assays available for the Late Prehistoric at Choke Canyon are from 41 MC 222 where two dates in the A.D. 1260 to 1290 range were obtained (TX-2875 and TX-2876). In central Texas, the *Scallorn* and *Edwards* forms have been dated considerably earlier. The Choke Canyon dates are, however, consistent with absolute dates available for a limited number of other Late Prehistoric components in south Texas sites (Creel *et al.* 1979:35; Hester 1980a:61). The available data thus suggest that the Late Prehistoric period begins later in south Texas by some 300 to 400 years than it does in central Texas.

SETTLEMENT PATTERNS COMPARED

The settlement patterns recognized for the various periods in Choke Canyon's prehistory are much like those described for nearby areas where relatively large tracts have been surveyed and studied. At the Chaparrosa Ranch, located in Zavala County approximately 160 km northwest of Choke Canyon, Hester (1978a:7) has noted the tendency for Paleo-Indian and other early period cultural remains to be located in valley margin or upland contexts. Sites described as "base camps" for Archaic and Late Prehistoric peoples occur on terraces paralleling channels down in the stream valleys. "Short-term camps and/or chipping stations" representing these periods are found on gravel-paved valley margins (Hester 1978a:7). One major difference between Chaparrosa Ranch and Choke Canyon is that lithic raw material sources are confined to eroded ancient terrace surfaces rimming the stream valleys in the Chaparrosa area (Hester 1981:123). There is a stronger distinction between quarry and nonquarry sites at Chaparrosa than at Choke Canyon, where lithic raw materials are more equitably distributed between upland and floodplain environments.

Shafer and Baxter (1975:68-74) have studied the settlement patterns over a large, primarily upland area of northern McMullen and southern Atascosa Counties, just 30 km northwest of Choke Canyon and encompassing two major drainages--San Miguel Creek and La Jarita Creek. As at Choke Canyon, locally higher densities of prehistoric sites were recognized along terraces beside these drainages. However, the area surveyed also includes much larger tracts of upland environment than were inspected either at Chaparrosa Ranch or at Choke Canyon. Based upon distribution of recognized sites, postulated site function, and types of chipped stone tools and manufacturing residues present in upland contexts, Shafer and Baxter (1975:68-74) offer a settlement model that allows for movement of encampments away from perennial water sources in major stream channels during periods of increased rainfall. Their model postulates the presence of temporary water supplies in minor upland drainages that precluded the need, during wet spells, to "tether" activities to the perennial streams, thus permitting short-term primary reliance on exploitation of upland resources.

As a result of survey emphasis placed primarily upon valley floor zones at Choke Canyon and Chaparrosa Ranch, there is not enough available data for comparison with the Shafer-Baxter settlement model. The model provides an attractive explanation for upland sites (such as 41 LK 204, 41 LK 207, and 41 MC 50 at Choke Canyon), containing hearth features and greater cultural debris concentrations than would normally be expected if a site served only as a day camp or resource procurement locality. Just as most of the "base camps" beside perennial streams are within a one-day pedestrian round-trip of many upland resource areas, so may floodplain environments often be easily reached in a day's time from upland encampments. Mussel shells found on valley margin and upland sites around Choke Canyon's periphery may be the result of such floodplain procurement trips centered out of upland encampments.

SITE CONFIGURATIONS

Prehistoric encampment in "generalized resource areas" during the Archaic and Late Prehistoric accounts for the long, narrow sites defined in the Frio River valley. The surface debris scatters evidencing prehistoric camps beside sloughs and channels on the valley floor are rarely more than 50 m in width, but may parallel the banks of drainages for lengths of 2000 m or more. These long, narrow channel sites developed primarily as a result of repeated camping events which occurred over an estimated period of 5000 years during the Archaic (ca. 3500 B.C.-A.D. 1300). Because of the scarcity of time-diagnostics, it is impossible on most of these sites to identify camp debris resulting from discrete periods of Archaic habitational activity within the recognized limits of each.

Late Prehistoric sites in the Choke Canyon valley often occur within the limits of larger Archaic settlement areas. Rather than a linear distribution, however, Late Prehistoric sites or components, more often pattern into subcircular and oval configurations. When comparing the configurations of Late Prehistoric and Archaic sites and/or components at Choke Canyon, it must be kept in mind that the Late Prehistoric remains were deposited over a period of only 500 years (A.D. 1300-1800). It is much easier to define the limits of Late Prehistoric activities because the remains are more often surficially exposed and time-diagnostic artifacts (arrow points, potsherds) are much more frequent and distinctive than in Archaic contexts. The better visibility and easier recognition of Late Prehistoric camp areas are factors that influence the modern perception of site configurations and may also render the differences between Archaic and Late Prehistoric site shapes more apparent than real. Sites of all periods at locations away from channels on higher terraces and upland margins tend to be more spread out, assuming oval, subcircular, or irregular configurations.

LOCAL LITHIC RESOURCES

Chert suitable for use in the manufacture of chipped stone tools and as a component in hearth construction was widely available in the lower Frio River valley during prehistoric times. Chert occurs in lag gravel pavements along the upland valley edges and margins, it erodes from the faces of older terrace remnants on the floodplain, and it is found in numerous gravel bars along the active channel of the Frio River. No prehistoric site at Choke Canyon is more than four kilometers from the nearest source of chert cobbles and many are within two kilometers of a source.

The chert cobbles found in gravel deposits at Choke Canyon are small and easily portable. As a consequence of portability and the widespread natural distribution of gravels, prehistoric sites at Choke Canyon do not often demonstrate the clear-cut functional differentiation between quarry and nonquarry sites seen in other areas of south Texas (Hester 1981:123). The numbers of cores, thick bifaces, thin biface failures, and pieces of debitage found in test pits and surface collections are variable from site to site, but the inequities are not great enough in most cases to suggest that chert sources played a significant role in site location decisions. At sites where chert could not be procured on location, it appears as if cobbles were being transported in for reduction into finished tools. This activity is not always clearly indicated by the frequency of cores and primary flakes found on the sites. Primary flakes occur in relatively low numbers. Secondary flakes, however, are much more common and are believed to be a good indication of the amount of cobble reduction occurring on the sites. Because of the comparatively small size of chert cobbles found in the Choke Canyon area (maximum 15 cm in diameter), the cortex removal procedures that initiate the reduction process result in fewer primary flakes than would be the case with larger cobbles or pieces of ledge chert common to central Texas.

The use of chert, petrified wood, quartzite, and other igneous or cryptocrystalline rocks in the construction of hearths appears to be related to the proximity of ample natural supplies. The great amounts of fire-fractured rock recovered in several collections from test pits at 41 LK 14, 41 LK 51, 41 LK 74, and 41 MC 84 may reflect the local ease of obtaining such materials, perhaps as they eroded from old terraces upon which the sites rest or from gravel bars in the river channel adjacent to the sites. Integrated habitational features constructed mostly or entirely of chert, petrified wood, and other crystalline rocks were found at a number of sites including 41 LK 31/32, 41 LK 69, 41 LK 206, and 41 LK 207. In addition to being easily obtained, these materials may have provided a functional advantage in the use of the feature for cooking purposes. There is no archaeological evidence to support such a contention, however, or to recognize what the advantage may have been.

As with fire-fractured rock, the occurrence of tuffaceous sedimentary rock ("tuff rock") and sandstone in archaeological deposits at Choke Canyon is generally a function of each site's location within the reservoir basin. At the east end of the project, where the Catahoula Formation crops out, tuffaceous sedimentary rock was the material most commonly used in hearth construction. It also occurs very commonly as a major constituent of excavation level collections made at sites over the eastern end of Choke Canyon. To the west across the Frio Formation, tuff rock becomes less common and, in the vicinity of Calliham, is supplanted by sandstone as a hearth component and an element of general level collections. Westward from Calliham, sandstone derived from exposures of the Jackson Group becomes the predominate noncrystalline rock type found in the prehistoric sites. Utilization of tuff rock, sandstone, and a variety of crystalline rocks (chert, petrified wood, quartzite, and igneous materials) by prehistoric peoples as they occupied sites in the Choke Canyon area was apparently dictated by the proximity of such materials to a particular location at time of need.

EVIDENCE OF EXTRA-REGIONAL CONTACT

For the most part, durable remains found in the prehistoric sites at Choke Canyon indicate that people inhabiting the area had an essentially parochial outlook on life. A small number of marine shell tools and ornaments, lumps of asphaltum, and a piece of bituminous coal are the only materials recovered during the Phase I investigation that suggest extra-regional contacts. Source areas for all of these materials are known in adjacent parts of southern Texas. Based upon the limited number of artifacts and materials derived from other areas, an insular, self-sufficient lifestyle is indicated for Choke Canyon's prehistoric inhabitants.

SUMMARY OF CULTURAL/CHRONOLOGICAL DATA

As a means of summarizing the cultural/chronological data gathered during the Phase I investigations at Choke Canyon, the following working chronology is advanced:

Cultural Period	Age Range
Paleo-Indian	9000 B.C.-6000 B.C.
Pre-Archaic	6000 B.C.-3500 B.C.
Early Archaic	3500 B.C.-2500 B.C.
Middle Archaic	2500 B.C.- 800 B.C.
Late Archaic	800 B.C.-A.D. 1200
Late Prehistoric	A.D. 1200-A.D. 1530

The tentative nature of this proposed chronology is emphasized. Age ranges for the Paleo-Indian and Pre-Archaic periods are as presented by Hester (1980a: 137-138; 146) and have not been verified by any additional radiocarbon assays from Choke Canyon. Hester's (*ibid.*:146) terminal date of 3500 B.C. for the Pre-Archaic period corresponds well with the early dates from 41 LK 31/32 upon which the commencement of the Early Archaic period at Choke Canyon is based. The period from 2500 B.C.-A.D. 1200 encompassing the Middle and Late Archaic periods, is admittedly the least satisfactory segment of the chronology. The date for the transition from Early to Middle Archaic is from 41 LK 31/32 where the next component above the Early Archaic horizon was dated at 2360-2340 B.C. (TX-2922). The date of 800 B.C. for commencement of the Late Archaic period is derived from assays on charcoal collected at 41 LK 67 in deposits containing small stemmed dart points that compare with Late Archaic forms from central Texas. From the standpoint of the central Texas chronology, 800 B.C. is as much as 500 years too early for the Late Archaic to begin. Refinement of age ranges for the Middle and Late Archaic periods is clearly necessary. The age range of A.D. 1200 to A.D. 1530 is considered reasonably accurate for the Late Prehistoric period. The appearance of Cabeza de Vaca on the Texas coast in the 1530s is usually considered the termination period of the Late Prehistoric. It has been noted that little or no Spanish activity subsequent to that of Cabeza de Vaca occurred in south Texas until the 1680s (Campbell and Campbell 1981:1). Acting upon the assumption that Cabeza de Vaca did not actually make contact with all aboriginal groups in south Texas, a later termination date might reasonably be argued for the Late Prehistoric in this area of Texas.

PREHISTORIC SUBSISTENCE PURSUITS

During all periods of prehistory at Choke Canyon, humans apparently obtained food by gathering, fishing, and hunting. There is no evidence of prehistoric horticulture recognized. Only limited evidence of subsistence pursuits is recognized in debris assemblages from prehistoric sites at Choke Canyon.

Mussel shells and *Rabdotus* snail shells were found in varying amounts at every site tested during the Phase I investigation. Mussels and snails are easily obtainable meat foods and, when protein content and bulk are taken into consideration, appear to compliment one another quite well. Mussels yield proportionately greater amounts of meat than do snails, but their protein content is on the order of only 7-12%. Large land snails yield small amounts of meat, but the meat is very high in protein. Consumed together, as the archaeological findings indicate was the case, mussels and snails would have provided a filling, protein-rich contribution to the diet of prehistoric peoples. As noted in ethnohistoric studies of the Mariame Indians, land snails and prickly pear fruit were major sources of food from late May to August in south Texas (Campbell and Campbell 1981:17).

Sandstone grinding implements (grinding slabs and manos) were found on 44 (38%) of the sites investigated during Phase I. Such tools were apparently in use during all periods of the prehistoric sequence. Grinding slabs and manos imply processing of wild plant products such as nuts, beans, and seeds. There is no further <u>direct</u> archaeological evidence recognized to substantiate processing and consumption of such foodstuffs. There are, however, extensive ethnographic and ethnohistoric data indicating the extreme importance of nuts, beans, and seeds to hunting and gathering cultures in general and, more specifically to the Mariame and Avavare Indians who occupied territory east and south of Choke Canyon in early historic times (Campbell and Campbell 1981:18, 26, 29). The prehistoric availability at Choke Canyon of beans and nuts from oaks (acorns), mesquites, and acacias is demonstrated by the recognition of such species in carbon samples from various prehistoric sites in the project area (see Table 36, Appendix IX). Although the presence of these nut and bean producers is established in Choke Canyon's prehistory, there is as yet no way to determine whether or not people were actually harvesting the products for food. If it is assumed that they were, another important, and as yet unresolved problem is the density in which such species were growing. Depending upon how common a given species may have been, it would have made a greater or lesser contribution to the diet of people harvesting food in the area. The great nutritional potential of some of the plant products mentioned above is amply demonstrated by the figures on crude protein and mineral content presented in Table 39, Appendix IX.

Animal bones are extremely scarce or nonexistent in the majority of the prehistoric sites at Choke Canyon. Substantial amounts of bone identifiable as to species were recovered at only three of the tested sites (41 LK 41, 41 LK 201, and 41 MC 222). Soil conditions at most of the sites have apparently not been conducive to bone preservation. The otolith, a particularly durable skeletal element found in some fish, was the only vertebrate faunal material found at some sites. Otoliths suggest that other bones may once have existed in site deposits, but have not survived. The practice of grinding bone into powder for human consumption is a recorded practice of the Mariame Indians (Campbell and Campbell 1981:17). If this practice were common among Choke Canyon's prehistoric inhabitants, animal bone would occur less frequently in archaeological deposits than would otherwise be expected.

The Late Prehistoric period is better represented than are the earlier cultural periods by the limited vertebrate faunal bone recovery at Choke Canyon. Bones found at 41 LK 41, 41 LK 201, and 41 MC 222 occurred primarily in Late Prehistoric context. Site 41 LK 201 has yielded the most extensive collection of vertebrate faunal remains representing the latter stages of the Archaic. At most other sites, such as 41 LK 31/32 and 41 LK 67, Archaic deposits have yielded only fish otoliths, if any bone at all.

Given the limited size of the Phase I collection and the relative underrepresentation of the Archaic, only a very tentative comparison may be made between the Archaic and the Late Prehistoric in terms of animal meat procurement activities. Based mostly upon the findings made at 41 LK 201, it appears that Archaic people were concentrating on the capture of smaller animals such as rodents, rabbits, snakes, lizards, fish, and turtles. Deer were also hunted. During Late Prehistoric times, a much broader and diversified hunting effort seems to have been underway. In addition to the smaller animals, Late Prehistoric people relied heavily upon procurement of larger animals such as bison, antelope, deer, and javelina.

Ethnohistoric data (Campbell and Campbell 1981:18) for the Mariame and Avavare Indians lists roots from two or three kinds of unspecified plants as the primary source of food during the winter months. The roots were cooked for two days in some type of oven. It is possible that such ovens for baking roots are represented among the rock cluster features isolated in some of the sites during the Phase I testing. These features as well as the tremendous amounts of nonintegrated fire-fractured rock, tuffaceous sedimentary rock, and sandstone recovered from the Choke Canyon sites may be the result of plant food preparation. At present, there is no recognized way of demonstrating actual prehistoric usage of the features.

SEASONALITY

Opportunities to determine the seasonality of prehistoric human activity at Choke Canyon are limited. The mild regional climate permits the emergence of cold-sensitive life forms (land snails, tortoises, and snakes) during periodic warm spells in the winter. Tentatively, however, it may be assumed that such species as the *Rabdotus* land snail would be much more in evidence during the spring and summer months than during the fall and winter. For the purposes of constructing a testable settlement model, it could be reasonably assumed that stratigraphic or horizon assemblages of human habitational debris containing greater numbers of *Rabdotus* shells were deposited during spring or summer months. Heaviest rainfall in the region occurs from May through September. Higher flow rates in the Frio River would make it more difficult to collect mussels. Fishing for drum and gar might not be as easy during these months, either, depending upon the particular techniques that may have been used to catch fish in the area.

Many of the south Texas brush species, which produce fruits, nuts, or beans, having potential food value for prehistoric hunter/gatherers bear their produce during the summer months from June to August or September (Everitt and Alaniz 1981:302). It was during these same months that Cabeza de Vaca saw the

Mariame Indians and neighboring groups move *en masse* to the prickly pear fields between Falfurrias and Alice (Campbell and Campbell 1981:14-18). Assuming that there was more grassland and less brush over south Texas in prehistoric times, species such as mesquite, the various acacias, spiny hackberry, and Texas persimmon may have been much less common throughout the area and thus would not have afforded as substantial a food source as their present-day widespread distribution and massive productivity would suggest. Nevertheless, the future discovery of carbonized beans, seeds, or nuts from brushy plants in archaeological deposits at Choke Canyon or elsewhere in south Texas would permit more definitive statements concerning seasonality.

The Texas ebony and the live oak yield beans or acorns from October through December (Everitt and Alaniz 1981:302). At present, ebony does not grow at Choke Canyon (except for some introduced trees planted by a home in Old Calliham), but it becomes much more common from the Alice, Texas, vicinity and southward. Cabeza de Vaca, while among the Avavare Indians near the end of the prickly pear fruit harvest, said that the Avavares, unable to find prickly pear fruit for several days, began gathering seed pods which he described as looking like "vetches" or "lentils" (Campbell and Campbell 1981:26). These seed pods were likely from the Texas ebony. Live oak grows along the major streams in and around Choke Canyon. It produces an acorn which, after appropriate processing, is fit for human consumption. Should carbonized remains of ebony beans or acorns be recovered from prehistoric sites at Choke Canyon, habitation during fall or winter months might be indicated.

PALEOENVIRONMENT

As discussed in Appendix VII, little data are available concerning the paleoenvironment of southern Texas. The lack of information is partially a reflection of the limited amount of archaeological research thus far carried out in the region. Where investigations have been conducted, efforts aimed at increasing knowledge of the paleoenvironment have been effectively thwarted by poor preservation of pollen and other biotic remains which have elsewhere proved useful as environmental indicators. Of necessity, past investigators attempting to characterize the paleoenvironmental situation in south Texas have had to rely upon better known sequences from the Trans-Pecos and central Texas (Lynn, Fox, and O'Malley 1977:39-40).

The archaeological deposits at Choke Canyon do not contain pollen in sufficient quantities for analysis. A group of pollen samples selected from a cross section of prehistoric sites tested during the Phase I investigations was submitted to Dr. Vaughn M. Bryant of Texas A&M University to be tested for the presence of absence of pollen. Bryant reported that the samples did not contain enough pollen to warrant more intensive analysis (personal communication, May 6, 1979). This has been the case in pollen studies at sites throughout southern Texas.

A particularly rewarding area of research relating to Choke Canyon's paleoenvironment involves the identification of wood species burned to form the carbon recovered from archaeological deposits at some of the sites. Results of these studies are discussed in Appendix III. In carbon samples variously dated from 3350 B.C. to A.D. 1290, oak, ash, acacia, mesquite, spiny hackberry, juniper, and willow have been identified (see Table 26, Appendix III and Table 36, Appendix IX). Especially significant are the records of mesquite, acacia, and spiny hackberry dated between 1300 B.C. and 270 B.C. These three species are major components of modern brush communities in south Texas. Their presence in prehistoric context at Choke Canyon suggests that the paleoenvironment may have more nearly approximated present conditions than was previously thought. Juniper identified in carbon from a feature at 41 MC 29 remains problematical. If juniper was actually growing in the Choke Canyon area in the 390 to 270 B.C. time period (TX-2873), it would have important climatic and environmental implications. If, on the other hand, the juniper was driftwood which floated down the Frio River from the Edwards Plateau, it would have little or no bearing on the paleoenvironment at Choke Canyon.

As mentioned in the discussion of aboriginal subsistence pursuits, only a limited amount of vertebrate faunal material was recovered during the Phase I investigations. Among the species identified in bone recovered from prehistoric context were bison and javelina (collared peccary). Appearing in Late Prehistoric components dating around A.D. 1300, these two species may point to significant paleoenvironmental conditions, either local or extraregional, which influenced Choke Canyon's prehistoric populations. Dillehay (1974:180-196) has discussed the significance of apparent cyclical fluctuations in bison populations during the prehistory of Texas. The bison found at Choke Canyon relate to the last major resurgence of bison into prehistoric Texas, and, significantly, occur along with *Perdiz* arrow points, buff-colored pottery, "beveled knives," and other elements of material culture attributed to a Plains influence in the area. The javelina mandible recovered at 41 MC 222 is the earliest known record of the species in southern Texas. It has previously been considered a recent arrival to south Texas from northern Mexico. The javelina remains from 41 MC 222 provide another bit of evidence supporting the presence of stands of brush at Choke Canyon during prehistoric times.

Results of phytolith research presented in Appendix VIII generally corroborate the prehistoric vegetational patterns suggested by the plant species identified in carbonized wood samples. Based primarily upon relative frequencies of various grass phytoliths, changes in rainfall rates and/or temperatures have been tentatively outlined for certain segments of Choke Canyon's prehistory. Periods of increased rainfall are hypothesized to have been times during which the carrying capacity of the local environment was greatest.

SOUTH TEXAS PREHISTORY: ONGOING RESEARCH AND PROBLEMS WITH THE DATA BASE

In the analysis of prehistoric remains recovered during the Phase I testing operation at Choke Canyon, confident separation of remains into assemblages representing discrete periods of human activity on the sites has proven to be an extremely difficult, if not an impossible task. With but very few exceptions, the Choke Canyon prehistoric sites contain multiple components. The crux of the problem in attempting to analyze subsurface debris collections in a meaningful way is that there are so few recognized time-diagnostic artifacts or other materials found with the debris. This problem is compounded by the scarcity of organic remains in quantities adequate for radiocarbon assay and by the infrequent occurrence of clear-cut stratigraphy down through the deposits. As a consequence, it has been necessary at many of the sites to define "horizons" within which debris from contiguous vertical excavation levels is combined into assemblages facilitating comparisons and, in a very gross sense, defining general periods of activity on the sites. In most cases, the definition of horizons in the sites serves only to differentiate "older" and "younger" cultural remains, a distinction based essentially upon the relative stratigraphic relationship of the horizons to one another. As a consequence of poor stratigraphy and/or paucity of time-diagnostic artifacts in most of Choke Canyon's prehistoric sites, it is difficult to compare cultural assemblages diachronically on either an intra- or inter-site basis. These factors probably contribute strongly to the perception, perhaps entirely false, of apparent uniformity in the area's prehistoric remains through time. At some of the sites, recognized time-diagnostic artifacts, radiocarbon assays, well-integrated habitational features, and/or better stratigraphic separation have aided in definition of the horizons.

In the Trans-Pecos and in central Texas, it has been possible to construct sensitive cultural/chronological sequences. Success in developing these chronologies is due in part to the relatively great amount of archaeological research conducted in each region. More importantly, however, is the fact that there are deep, well-stratified sites in these regions which have yielded distinctive artifact forms (primarily dart and arrow points) from clear-cut stratigraphic situations. The relative chronologies have been refined by radiocarbon dating. At Choke Canyon, there are not many well-stratified sites known. In the few that have been isolated (e.g., 41 LK 31/32, 41 LK 201, and 41 LK 51), excavations have simply not yielded many artifact forms readily useful for comparative purposes. Except for rare instances such as at 41 LK 31/32, 41 LK 67, and 41 MC 222, it is difficult even to speculate on the number of discrete periods of encampment on a site that resulted in the habitational debris surviving in the deposits. The same is also true of the poorly stratified sites excavated at Choke Canyon.

In accounting for the scarcity of distinctive artifact forms having utility as time-diagnostics in assemblages recovered from the Choke Canyon sites, two possibilities are now under consideration. Available ethnohistoric and archaeological data relating to the subsistence regime of the region's aboriginal inhabitants suggest that food procurement efforts were heavily oriented toward collection of a variety of plant foods, mussels, snails, fish, turtles, and smaller animals such as rats and rabbits. Such an orientation would not require as elaborate an array of durable tools (particularly such things as dart points) as would a subsistence economy in which greater emphasis was placed on hunting of large animals such as deer and bison. This speculation is meant to apply primarily to Archaic peoples who inhabited the Choke Canyon area. Chipped stone tools such as arrow points, beveled knives, and distinctively shaped trimmed flakes and unifaces (side- and end-scrapers) found along with bones of bison, antelope, deer, and javelina in Late Prehistoric components at Choke Canyon are considered more typical of an economy in which greater reliance is placed on large animal procurement.

The concept of the "generalized resource area" advanced as a settlement mode for prehistoric people at Choke Canyon (Lynn, Fox, and O'Malley 1977:172, 226; Hester 1981:123), may also partially account for the scarcity of clearly stratified sites and of tool forms diagnostic of the Archaic. So many locations in the lower Frio River valley were amenable to settlement that no specific, spatially discrete camping spot was repeatedly occupied through time. THC analysts advanced this hypothesis to account for the extremely long, narrow sites recorded beside channels down in the floodplain. If true, the tendency to camp at slightly different locations on successive visits to the site would act to distribute all forms of cultural debris very broadly across the area. The sites would tend to expand through horizontal progradation rather than vertical aggradation. The probability of sampling remains from all periods of prehistoric cultural activity at such a site is extremely low.

The impact that contemporary nonarchaeological artifact collectors have had on the prehistoric sites in the Choke Canyon area cannot be too strongly emphasized. Numerous individuals have been actively collecting prehistoric materials in the region for years. During the course of Phase I investigations, CAR crew members had the opportunity to view several large artifact collections belonging to people residing in the immediate project area. The late John Mikus and his wife Bessie, residents of Calliham, amassed a collection of approximately 10,000 "perfect" bifaces over a 20-year period ending about 1958. Their collecting activities were most intensive during the severe drought years from about 1951 to 1958. It was during this period that ground cover was light or nonexistent and erosion severe, optimal conditions for surface collection of artifacts. The Mikus' concentrated their efforts in an area bounded roughly by the Frio and Nueces Rivers on the north and south and the towns of Three Rivers and Tilden on the east and west. In 1958, the entire collection was sold to several different people, the proceeds from the sale going to buy feed for drought-starved cattle. Subsequent to this sale and prior to Mr. Mikus' death in the mid 1960s, the couple accumulated another 4000 to 5000 artifacts, all of which have since been sold or given away.

Another avid collector in the region was the late Graves Peeler who lived north of Tilden. Peeler was said to have accumulated a collection of prehistoric artifacts totaling 80 or 90 thousand specimens. Although he had materials from all over North America, the majority were found in southern Texas. Peeler's collection was sold to the King Ranch and is now housed at the Connor Museum, at Texas A&I University in Kingsville, Texas.

The Peeler and Mikus collections are two extreme cases. There have undoubtedly been numerous other people collecting materials through the years at the Choke Canyon sites. The full impact of these activities will never be known, but is a significant consideration to be made when analyzing the sites (Shafer and Baxter 1975). This factor is especially critical for sites where only surface collections are performed. Artifacts most attractive to nonarchaeologists are usually the ones yielding most readily the information necessary in attempting to diagnose site function and time period of occupation. The intensity of past collecting activities at Choke Canyon has resulted in a real, but regrettably incalculable, loss to the archaeological record.

Analysis and interpretation of data gathered during the Phase I field investigations call into question the utility of conducting controlled surface collections at many of Choke Canyon's prehistoric sites. Theoretically, analysis of cultural material recovered from, or observed on the surface of a prehistoric site can provide much useful information about the people who generated the remains. Time diagnostic chipped stone tools indicate the period(s) in prehistory during which the site was occupied. Function diagnostic tools tell of certain of the activities performed by people as they camped on the site. The site-wide distribution of time diagnostics, function diagnostics, and habitational features demonstrate the internal organization and overall configuration of encampments. Other residues incidental to camp life, such as bone, shell, burned rock, and chipping debris, provide direct and indirect evidence of prehistoric subsistence pursuits and environmental conditions.

In practice, attempts at gathering useful cultural information from the surfaces of Choke Canyon sites were often partially or wholly frustrated for a variety of reasons, two of which are particularly critical. As discussed in some detail above, recognized time- and function-diagnostic artifacts are not common anywhere at Choke Canyon. This problem is compounded on exposed sites because many have been intensively scoured by artifact collectors through the years. Consequently, at many of the sites where surface debris was collected, it was virtually impossible in most cases to confidently establish time periods represented by the collections. All too often, cultural materials were concentrated in deflated areas where, especially after subsurface testing, it became obvious that surface evidence represented mixtures of debris derived from two or more discrete periods of cultural activity. These problems of mixing and temporal assignment have effectively prevented utilization of surface collected data from Choke Canyon in the ideal manner outlined above. Information which could be gleaned from the surface collection data in many cases permitted a generalized cultural/chronological period assignment to activities which occurred, a type of information which could have been obtained through collections provenienced by site boundary only. An additional important factor affecting surface collecting activities in south Texas is brush cover. Brush occurs in varying densities on many of the sites at Choke Canyon and can be a severe impediment to surface collection efforts.

In view of the above circumstances, it is suggested that future surface collection efforts at Choke Canyon and elsewhere in southern Texas be premised by a careful consideration of exactly what types of data the surface cultural resource base can reasonably be expected to yield. In general, the Phase I experience at Choke Canyon indicates that intensive, tightly provenienced surface collections at sites where deflation has resulted in mixing of assemblages serve little or no practical purpose. Such carefully controlled, comprehensive collecting efforts should be considered for application only on sites known to represent single period occupations, at quarries, and in certain special instances (e.g., apparent flint working areas or well-integrated hearth features with associated remains) where context suggests that analysis of a comprehensive, provenience-controlled surface collection might prove meaningful. Unprovenienced surface collections, on a site by site basis, are recommended where potential time- and function-diagnostic artifacts are scarce or widely scattered, where there are no exposed habitational features with associated cultural residues, and at sites where brush cover is so heavy that controlled collections cannot be made within a reasonable length of time. Where unprovenienced surface collections are made, primary emphasis should be placed on collection of any time- or function-diagnostic artifacts found.

The continuing need to refine the cultural/chronological sequence (particularly that period from 2500 B.C. to A.D. 1200), the scarcity of recognized time-diagnostic artifacts, and the tendency for sites to be spread out rather than stratified over a limited area are factors which place an added emphasis on the rare well-stratified sites isolated at Choke Canyon. Foremost among these are 41 LK 31/32, 41 LK 201, 41 LK 51, and 41 MC 55. The fact that these well-stratified sites have also yielded vertebrate faunal remains, well-preserved habitational features, substantial amounts of charcoal, and chipped stone tools with time-diagnostic potential make them all the more important.

Pleistocene terrace sites 41 LK 14 and 41 MC 84 are the best examples investigated during Phase I work at Choke Canyon that contain evidence of virtually the entire recognized sequence of prehistoric cultural activity from Paleo-Indian to Late Prehistoric times. These older terrace localities are places where some amount of natural deposition took place concurrent with prehistoric habitation of the sites. More importantly, however, is the fact that those relatively stable surfaces survived Holocene geologic processes which have either destroyed or buried sites of conjectured Paleo-Indian and Early Archaic activity situated in the lower (now deeply buried) reaches of the Frio River valley. Pleistocene terrace sites like 41 LK 14 and 41 MC 84 also contrast known Paleo-Indian and Early Archaic sites at higher elevations in the valley. Sites on valley margin and upland surfaces have been subjected to processes of nondeposition and/or severe deflation and erosion. In either case, debris representing all periods of cultural activity that occurred on a particular site are concentrated on, or collapsed to a common, exposed surface. Herein lies both the curse and blessing of the Pleistocene terrace sites. There was theoretically enough deposition to result in vertical separation between remains of successive periods of activity. However, the Phase I testing efforts at 41 LK 14 and 41 MC 84 demonstrate subsurface deposits to be only 50 to 90 cm thick. Within this restrictively small vertical span, it has not been possible to confidently separate remains into more than two assemblages (Upper and Lower Horizons). Nevertheless, the Pleistocene terrace sites at Choke Canyon offer the only opportunity of isolating *in situ* subsurface Paleo-Indian and/or Pre-Archaic components.

In dealing with densities of cultural debris, especially when only surficial remains are being compared, it is not advisable to attempt a direct comparison between sites on terraces beside major drainages and sites away from drainages (on the floodplain, on the valley walls, and at the upland edge). In depositional environments, remnants of prehistoric habitation or other activity tend to be masked (buried) with the passage of time. On static or degradational surfaces, such as along the valley margins and at upland locations, greater densities of material resulting from prehistoric human activity are often surficially visible. Were the accumulated stratified remains in the thick deposits at sites such as 41 LK 31/32 and 41 LK 201 collapsed to a common surface, the resulting densities of material would greatly exceed those at valley margin and upland sites perceived, on the basis of surface indications, to have been heavily and/or repeatedly occupied through time.

Data recovered during the Phase I archaeological research effort at Choke Canyon indicate that sites along the Frio River, its relict channels, and major tributaries were the scenes of primary human settlement during much of Choke Canyon's prehistory. These locations probably served as hubs for far-ranging hunting and gathering forays, many of which likely resulted in the smaller, less intensively utilized sites and scatters found out away from sites near the channels. Available ethnohistoric data indicates that hunter/gatherer groups scattered out from such base camps as they followed seasonally varied extractive strategies relying on native plant and animal food resources. Considering site characteristics on a reservoir-wide basis, these sites are seen to offer the greatest potential for achieving, insofar as is possible through analysis and interpretation of archaeological data, a broad understanding of prehistoric cultures in the area.

REFERENCES CITED

Arnold, J. B. III

1975 Porosity and Refiring Tests on Ceramics from the George C. Davis Site, Texas. *Bulletin of the Texas Archeological Society* 46:231-241.

Aten, L. E.

1967 Excavations at the Jamison Site (41 LB 2), Liberty County, Texas. *Houston Archeological Society Report* 1.

Bandy, P. A.

1981 Historical Archaeological Resources of the Choke Canyon Reservoir Area in McMullen and Live Oak Counties, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 2.

Benfer, A.

1971 Microscopic Wear Analysis of Stone Tools: A Case Study. Unpublished manuscript on file; Center for Archaeological Research, The University of Texas at San Antonio.

Bennett, M. A.

1974 Basic Ceramic Analysis. San Juan Valley Archaeological Project. *Technical Series, Eastern New Mexico University Contributions in Anthropology* ~~1(6)~~. 6(1)

Black, S. L.

1979 Nueces River Project Ceramic Analysis Preliminary Research Design. Unpublished manuscript on file; Center for Archaeological Research, The University of Texas at San Antonio.

Black, S. L. and A. J. McGraw

1982 The Panther Springs Creek Site: Cultural Change and Continuity in the Upper Salado Drainage, South Central Texas. Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report 100 (in press).

Blair, W. F.

1950 The Biotic Provinces of Texas. *Texas Journal of Science* 2(1): 93-117.

Bogusch, E. R.

1952 Brush Invasion in the Rio Grande Plain of Texas. *Texas Journal of Science* 4(1):85-91.

Brown, K. M., D. R. Potter, G. D. Hall, and S. L. Black

1982 Excavations at 41 LK 67, A Prehistoric Site in the Choke Canyon Reservoir, South Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 7.

Calhoun, C. A.

1965 Archeology of the Coastal Bend. Paper given at a meeting sponsored by the Houston Archeological Society, 1965.

Campbell, T. N.

1962 Origins of Pottery Types from the Coastal Bend Region of Texas. *Bulletin of the Texas Archeological Society* 36:331-336.

1975 Personal communication reported in Some Aspects of Late Prehistoric and Protohistoric Archaeology in Southern Texas, by T. R. Hester and T. C. Hill, Jr.:21. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 1.

1976 Archaeological Investigations at the Morhiss Site, Victoria County Texas, 1932-1940. In An Archaeological Survey of Coleto Creek, Victoria and Goliad Counties, Texas, by A. A. Fox and T. R. Hester: 81-85. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 18.

Campbell, T. N. and T. J. Campbell

1981 Historic Indian Groups of the Choke Canyon Reservoir and Surrounding Area, Southern Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 1.

Chandler, C. K.

1974 Use Wear Analysis of "Clear Fork" Tools from the Falcon Reservoir Area, Southern Texas. *La Tierra* 1(4):15-21.

Clark, J. W.

1978 Mission San Jose y San Miguel de Aguayo, Archaeological Investigations. *Texas Historical Commission, Office of the State Archeologist Report* 29.

Collins, M. B.

1971 A Review of Llano Estacado Archaeology and Ethnohistory. *Plains Anthropologist* 16(52):85-104.

Crabtree, D. E.

1972 An Introduction to Flintworking. *Occasional Papers of the Museum, Idaho State University* 28. Pocatello, Idaho.

Creel, D., A. J. McGraw, F. Valdez, Jr., and T. C. Kelly

1979 Excavations at 41 LK 106, a Prehistoric Occupation Site in Live Oak County, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 62.

Dillehay, T. D.

1974 Late Quaternary Bison Population Changes on the Southern Plains. *Plains Anthropologist* 19(65):180-196.

Dulaney, A. R.

1977 Ceramics from the Fayette River Project. In Archeological Investigations of the Fayette Power Project, Fayette County, Texas, by D. W. Skelton:198-209. *Texas Archeological Survey, The University of Texas at Austin, Research Report* 60.

Dusek, C.

1980 *Plainview* Points from 41 MC 10, McMullen County, Texas. *La Tierra* 7(3):39-41.

Enlow, D. H. and T. N. Campbell

1955 Some Paleo-Indian Projectile Points from the Southeastern Periphery of the Great Plains. *Panhandle Plains Historical Review* 28:29-37.

Epstein, J. F.

1969 The San Isidro Site: An Early Man Campsite in Nuevo Leon, Mexico. ~~*University of Texas Anthropology Series* 7.~~ Department of Anthropology, The University of Texas at Austin, Anthropology Series 7.

Everett, D.

1981 Historical Resources of the Choke Canyon Reservoir Area in McMullen and Live Oak Counties, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 2.

Everitt, J. H. and M. A. Alaniz

1981 Nutrient Content of Cactus and Woody Plant Fruits Eaten by Birds and Mammals in South Texas. *The Southwestern Naturalist* 26(3):301-305.

Fawcett, W. B.

1976 The Artifacts and Artifact Typology. Appendix I in Prehistoric Archeological Investigations at Palmetto Bend Reservoir: Phase I, ~~Phase I,~~ Jackson County, Texas, by P. R. McGuff:184-215. *Texas Archeological Survey, The University of Texas at Austin, Research Report* 58, *Palmetto Reservoir Series* 3.

Fox, A. A. and T. R. Hester

1976 An Archaeological Survey of Coleto Creek, Victoria and Goliad Counties, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 18.

Fox, D. E.

1979 Archaeological Investigations of Two Prehistoric Sites on the Coleto Creek Drainage, Goliad County, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 69.

Fox, D. E., R. J. Mallouf, N. O'Malley, and W. M. Sorrow

1974 Archeological Resources of the Proposed Cuero I Reservoir, DeWitt and Gonzales Counties, Texas. *Texas Historical Commission* and *Texas Water Development Board, Archeological Survey Report* 12.

Gaines, A. M. and J. L. Handy

1977 Ultrasonic Disaggregation of Potsherds for Mineral Separation and Analysis. *American Antiquity* 42(2):252-254.

Gibson, E. C.

1981 Archaeological Investigations in Zavala and Dimmit Counties, Texas: The Internorth Pipeline Project. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 110.

Gilbow, D.

1972 Preliminary Identification of Faunal Remains from the Holdsworth Site (41 ZV 14). In Prehistoric Occupation at the Holdsworth and Stewart Sites on the Rio Grande Plain of Texas, by T. R. Hester and T. C. Hill, Jr.:73-75. *Bulletin of the Texas Archeological Society* 43.

Griffiths, J. C. and M. A. Rosenfeld

1954 Operator Variation in Experimental Research. *Journal of Sedimentary Petrology* 62(1):74-91.

Grozier, R. U., D. C. Hahl, A. E. Hulme, and E. E. Schroeder

1968 Floods from Hurricane Beulah in South Texas and Northeastern Mexico, September-October 1967. *Texas Water Development Board, Report* 83. Austin.

Hartle, D. D. and R. L. Stephenson

1951 Archeological Excavations at the Falcon Reservoir, Starr County, Texas. River Basin Surveys, Smithsonian Institutions. Unpublished manuscript on file; Center for Archaeological Research, The University of Texas at San Antonio.

Heartfield, L.

1966 An Analysis of Leon Plain Typology. Unpublished manuscript on file; Center for Archaeological Research, The University of Texas at San Antonio.

Hemion, R. H.

1979a Further Notes on the Bromley Cooper Collection from McMullen County, Texas. *La Tierra* 7(3):24-29.

1979b Ground and Notched Lithic Artifacts from McMullen County. *La Tierra* 7(4):30-33.

Hester, T. R.

1968a Paleo-Indian Artifacts from Sites Along San Miguel Creek: Frio, Atascosa and McMullen Counties, Texas. *Bulletin of the Texas Archeological Society* 39:147-161.

1968b Notes on Some Pottery-Bearing Sites in Southern Texas. *The Bull-Roarer, University of Texas Anthropological Society Newsletter* 3(2):9-11.

1968c Folsom Points from Southwest Texas. *Plains Anthropologist* 13(40):117.

1969a Notes on South Texas Archeology: Sites Along the Middle Frio River Drainage. *The Record, Dallas Archeological Society* 25(4):25-31.

1969b Archeological Investigations in Kleberg and Kenedy Counties, Texas. *State Building Commission Archeological Program Report* 15. Austin.

1970 Metal Projectile Points from Southern Texas. *The Record, Dallas Archeological Society* 27:9-11.

Hester (continued)

1972 The Surface Archaeology of Three Sites in Duval County, Texas. *Bulletin, Lower Plains Archeological Society* 2:45-71.

1974 A Bibliographic Guide to the Archaeology of Southern Texas. *Journal of South Texas* 1:18-36.

1975a Late Prehistoric Cultural Patterns Along the Lower Rio Grande of Texas. *Bulletin of the Texas Archeological Society* 46:107-125.

1975b Chipped Stone Industries on the Rio Grande Plain: Some Preliminary Observations. *Texas Journal of Science* 26(1-2):213-222.

1975c A Chronological Overview of Prehistoric Southern and South-Central Texas. Paper presented at La Reunión Sobre Aspectos de Arqueología e Historia del Noreste, Monterrey, Nuevo León, México.

1976a *Hunters and Gatherers of the Rio Grande Plain and the Lower Coast of Texas.* Center for Archaeological Research, The University of Texas at San Antonio.

1976b The Archaic of South Texas. In The Texas Archaic, edited by T. R. Hester:83-90. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 2.

1977a Archaeological Research at the Hinojosa Site (41 JW 8), Jim Wells County, Southern Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 42.

1977b The Current Status of Paleoindian Studies in Southern Texas and Northeastern Mexico. In Paleoindian Lifeways, edited by E. Johnson: 169-186. *The Museum Journal* XVII. West Texas Museum Association, Texas Tech University, Lubbock.

1978a An Interim Statement on Archaeological Research at Chaparrosa Ranch, Texas. In Background to the Archaeology of Chaparrosa Ranch, Southern Texas, by T. R. Hester:1-23. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 6(1).

1978b Prehistoric Subsistence and Settlement Systems on the Rio Grande Plain, Southern Texas. In Background to the Archaeology of Chaparrosa Ranch, Southern Texas, by T. R. Hester:37-39. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 6(1).

1978c Some Observations on Archaeology at Chaparrosa Ranch, 1974. In Background to the Archaeology of Chaparrosa Ranch, Southern Texas, by T. R. Hester:33-36. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 6(1).

Hester (continued)

1978d Chipped Stone Industries on the Rio Grande Plain: Some Preliminary Observations. In Background to the Archaeology of Chaparrosa Ranch, Southern Texas, by T. R. Hester:24-32. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 6(1).

1978e Notes on the Edwards Arrow Point Type. *La Tierra* 5(4):21-22.

1979 A Stone Pestle from Dimmit County, Southern Texas. *La Tierra* 6(3):24-25.

1980a *Digging Into South Texas Prehistory*. Corona Publishing Company, San Antonio, Texas.

1980b A Chronological Overview of Prehistoric Southern and South-Central Texas. In Papers on the Prehistory of Northeastern Mexico and Adjacent Texas, edited by J. F. Epstein, T. R. Hester, and C. Graves:119-138. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 9.

1981 Tradition and Diversity Among the Prehistoric Hunters and Gatherers of Southern Texas. *Plains Anthropologist* 26(92):119-128.

Hester, T. R. and F. A. Bass, Jr.

1974 An Archaeological Survey of Portions of the Chiltipin-San Fernando Creeks Watershed, Jim Wells County, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 4.

Hester, T. R., F. A. Bass, Jr., A. Fox, E. S. Harris, and T. C. Kelly

1977 Archaeological Research at the Hinojosa Site (41 JW 8), Jim Wells County, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 42.

Hester, T. R., F. A. Bass, Jr., and T. C. Kelly

1974 Notes on the Miles Site, McMullen County, Texas. *La Tierra* 1(4):22-23.

Hester, T. R. and T. C. Hill, Jr.

1969 Mogollon Ceramics from Southern Texas. *The Artifact* 7(3):11-15.

1970 Archeological Research in Southern Texas in 1970. *Texas Archeology* 15(1):4-5.

1971 An Initial Study of a Prehistoric Ceramic Tradition in Southern Texas. *Plains Anthropologist* 16(52):195-203.

Hester and Hill (continued)

1973 Prehistoric Occupation at the Holdsworth and Stewart Sites on the Rio Grande Plain of Texas. *Bulletin of the Texas Archeological Society* 43:33-75.

1975 Some Aspects of Late Prehistoric and Protohistoric Archaeology in Southern Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 1.

Hester, T. R., T. C. Hill, Jr., D. Gifford, and S. Holbrook

1975 Archaeological Salvage at Site 41 ZV 152, Rio Grande Plain of Texas. *Texas Journal of Science* 26(1-2):223-228.

Hester, T. R., D. Gilbow, and A. D. Albee

1973 A Functional Analysis of "Clear Fork" Artifacts from the Rio Grande Plain, Texas. *American Antiquity* 38(1):90-96.

Hester, T. R. and H. Kohnitz

1975 Chronological Placement of Guadalupe Tools. *La Tierra* 2(2):22-25.

Hester, T. R., J. L. Mitchell, F. Asaro, and F. Stross

1980 Further Notes on Obsidian Artifacts from Dimmit County, Southern Texas. *La Tierra* 7(3):30-33.

Hester, T. R. and R. C. Parker

1970 The Berclair Site: A Late Prehistoric Component in Goliad County, Southern Texas. *Bulletin of the Texas Archeological Society* ~~44:1-23.~~ 41:1-24.

Hester, T. R., L. White, and J. White

1969 Archeological Materials from the Oulline Site (41 LS 3) and Other Sites in LaSalle County, Southwest Texas. *Texas Journal of Science* 21(2):131-166.

Highley, L., C. Graves, C. Land, and G. Judson

1978 Archeological Investigations at Scorpion Cave (41 ME 7), Medina County, Texas. *Bulletin of the Texas Archeological Society* 49:139-194.

Hill, T. C., Jr. and T. R. Hester

1971 Isolated Late Prehistoric and Archaic Components at the Honeymoon Site (41 ZV 34), Southern Texas. *Plains Anthropologist* 15(51):52-59.

1973 A Preliminary Report on the Tortuga Flat Site: A Protohistoric Campsite in Southern Texas. *Texas Archeology* 17(2):10-14.

House, K. and J. Walper

1969 Surface Artifact Survey of Some Sites in Live Oak, LaSalle, and McMullen Counties, Texas. Unpublished manuscript on file; Center for Archaeological Research, The University of Texas at San Antonio. Updated August 1973.

Howard, C. D.

1973 A Study of the Clear Fork Gouge. *Bulletin of the Texas Archeological Society* 44:51-60.

Hughes, J. T.

1980 Some Early and Northerly Occurrences of the Clear Fork Gouge. In Papers on the Prehistory of Northeastern Mexico and Adjacent Texas, edited by J. F. Epstein, T. R. Hester, and C. Graves 143-146. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 9.

Hurlbut, C. S., Jr., and C. Klein

1977 *Manual of Mineralogy (after James D. Dana)*. 19th Edition. John Wiley & Sons, New York.

Inglis, J. M.

1964 A History of Vegetation on the Rio Grande Plain, Texas. *Parks and Wildlife Department Bulletin* 45. Austin, Texas.

Jackson, A. T.

1940 Tubular Pipes and Other Tubes in Texas. *Bulletin of the Texas Archeological and Paleontological Society* 12:99-137.

Jelks, E. B.

1962 The Kyle Site, A Stratified Central Texas Aspect Site in Hill County, Texas. *The University of Texas at Austin, Archeology Series* 5.

Kelley, J. C.

1947 The Lehmann Rock Shelter: A Stratified Site of the Toyah, Uvalde and Round Rock Foci. *Bulletin of the Texas Archeological Society* 18:115-128.

1959 The Desert Cultures and the Balcones Phase: Archaic Manifestations in the Southwest and Texas. *American Antiquity* 24(3):276-288.

Lynn, W. M., D. E. Fox, and N. O'Malley

1977 Cultural Resource Survey of Choke Canyon Reservoir, Live Oak and McMullen Counties, Texas. *Office of the State Archeologist, Texas Historical Commission, Archeological Survey Report* 20.

MacNeish, R. S.

1958 Preliminary Archaeological Investigations in the Sierra de Tamaulipas, Mexico. *Transactions, American Philosophical Society* 48(6).

McReynolds, R. L.

1981 Ground Stone Artifacts from Atascosa and McMullen Counties, Southern Texas. *La Tierra* 8(2):25-28.

McReynolds, R. L., B. McReynolds, and M. McReynolds

1980 Additional Late Paleo-Indian Artifacts from Southwestern Atascosa County, Texas. *La Tierra* 7(3):34-38.

Mallouf, R. J.

1976 Archeological Investigations at Proposed Big Pine Lake, 1974-1975, Lamar and Red River Counties, Texas. *Texas Historical Commission, Archeological Survey Report* 18. Austin, Texas.

Matson, F. R.

1963 Some Aspects of Ceramic Technology. In *Science in Archaeology*, edited by D. Brothwell and E. Higgs: 592-602. Thames and Hudson, London.

Mitchell, J. L.

1974 Notes on Metal Projectile Points from Southern Texas. *Journal of South Texas* 1:47-51.

1976 Artifacts from the Johney Creek Area of LaSalle County, Southern Texas. *La Tierra* 3(3):7-10.

Mokry, E. R., Jr.

1976 Notes on Paleo-Indian Projectile Points from McMullen County, *La Tierra* 3(1):26-27.

Montgomery, J. L.

1978 The Mariposa Site: A Late Prehistoric Site on the Rio Grande Plain of Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Special Report* 6(2).

Mounger, M. A.

1959 Mission Espíritu Santo of Coastal Texas: An Example of Historic Site Archaeology. Unpublished M.A. thesis; The University of Texas at Austin.

Nunley, P. and T. R. Hester

1966 Preliminary Archeological Investigations in Dimmit County, Texas. *Texas Journal of Science* 18(3):233-253.

Orchard, C. D. and T. N. Campbell

1954 Evidences of Early Man from the Vicinity of San Antonio, Texas. *Texas Journal of Science* 6:454-465.

1959 Southwestern Pottery from Sites in the Vicinity of San Antonio, Texas. *Texas Archeology* 4(2):7-8.

Orton, R. B.

1964 *The Climate of Texas and Adjacent Gulf Waters*. U.S. Department of Commerce, Washington, D.C.

Patterson, J. T.

1936 The Corner-Tang Flint Artifacts of Texas. *The University of Texas Bulletin* 3618, *Anthropological Papers* 1(4). Austin, Texas.

Peacock, D. P. S.

1970 The Scientific Analysis of Ancient Ceramics: A Review. *World Archaeology* 1(3):375-389.

Pearce, J. E.

1932 The Present Status of Texas Archeology. *Bulletin of the Texas Archeological and Paleontological Society* 4:44-54.

Pliska, J. R.

1980 Archeological Investigations at the Three Rivers Flood Control Project: A Final Report. *The University of Texas at Austin, Texas Archeological Survey, Technical Bulletin* 30.

Poteet, S.

1938 The Occurrence and Distribution of Beveled Knives. *Bulletin of the Texas Archeological and Paleontological Society* 10:245-262.

Prewitt, E. R.

1974 Archeological Investigations at the Loeve-Fox Site, Williamson County, Texas. *Texas Archeological Survey, The University of Texas at Austin, Research Report* 49.

1976 The Rogers Spring Site: 1974 Investigations. *Texas Archeological Survey, The University of Texas at Austin, Research Report* 54.

Ralph, E. K., H. N. Michael, and M. C. Han

1973 Radiocarbon Dates and Reality. *MASCA Newsletter* 9(1):1-20.

Ray, C. N.

1941 Various Types of Clear Fork Gouges. *Bulletin of the Texas Archeological and Paleontological Society* 13:152-162.

Robinson, D. G.

1980 A Cultural Resource Survey of the Rhode Ranch, McMullen County, Texas. *Texas Archeological Survey, The University of Texas at Austin, Research Report* 79.

Roemer, E., Jr.

1981 The 1979 Archaeological Survey of Portions of the Choke Canyon Reservoir in Live Oak and McMullen Counties, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 4.

Sayles, E. B.

1935 An Archaeological Survey of Texas. *Medallion Papers* XVII. Gila Pueblo, Globe, Arizona.

Scott, R. F. IV and D. E. Fox

1982 Excavations at Sites 41 LK 31/32 and 41 LK 202 in the Choke Canyon Reservoir, South Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 8.

Shafer, H. J.

1969 Archeological Investigations in the Robert Lee Reservoir Basin, West Central Texas. *Texas Archeological Salvage Project Papers*, 17. Austin, Texas.

Shafer, H. J. and E. P. Baxter

1975 An Archeological Survey of the Lignite Project, Atascosa and McMullen Counties, Texas. *Texas A&M University, Anthropology Laboratory, Report* 7.

Shafer, H. J. and T. R. Hester

1971 A Study of the Function and Technology of Certain Bifacial Tools from Southern Texas. *Texas Historical Survey Committee, Archeological Report* 20.

Shepard, A. O.

1976 Ceramics for the Archaeologist. *Carnegie Institute of Washington, Publication* 109.

Shiner, J. L.

1975 The Clear Fork Gouge Revisited. *Bulletin of the Texas Archeological Society* 46:179-188.

Smith, H. P., Jr.

1978 Archaeological Survey and Assessment of Properties for the Conquista Project in Live Oak and Karnes Counties, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 64.

Sollberger, J. B.

1951 Letter Regarding Artifacts Collected from Three Sites in Atascosa County, Texas. *The Record* 9(3):8-14.

1971 A Technological Study of Beveled Knives. *Plains Anthropologist* 16(53):209-218.

1978 A New Type of Arrow Point with Speculations as to Its Origin. *La Tierra* 5(4):13-20.

Sorrow, W. M., H. J. Shafer, and R. E. Ross

1967 Excavations at Stillhouse Hollow Reservoir. *Texas Archeological Salvage Project Papers* 11. Austin, Texas.

Story, D. A.

1968 Archeological Investigations at Two Central Texas Gulf Coast Sites. *State Building Commission, Archeological Program Report* 13.

Suhm, D. A. and E. B. Jelks

1962 Handbook of Texas Archeology: Type Descriptions. *Texas Archeological Society Special Publication* 1 and *Texas Memorial Museum Bulletin* 4. Austin, Texas.

Suhm, D. A., A. D. Krieger, and E. B. Jelks

1954 An Introductory Handbook of Texas Archeology. *Bulletin of the Texas Archeological Society* 25.

Terry, R. D. and G. V. Chilingar

1955 Summary of "Concerning Some Additional Aids in Studying Sedimentary Formations" by M. S. Shuetsov:229-234. *Journal of Sedimentary Petrology* 3(25).

Thoms, A. V., J. L. Montgomery, and A. W. Portnoy

1981 An Archaeological Survey of a Portion of the Choke Canyon Reservoir Area in McMullen and Live Oak Counties, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 3.

Tunnell, C. D. and W. W. Newcomb, Jr.

1969 A Lipan Apache Mission, San Lorenzo de la Santa Cruz, 1762-1771. *Texas Memorial Museum, Bulletin* 14. Austin, Texas.

Ubelaker, D. H.

1978 *Human Skeletal Remains*. Aldine Publishing Company, Chicago.

U.S. Department of the Interior

1975 Final Environmental Impact Statement, Nueces River Project, Choke Canyon Dam and Reservoir Site, Texas. United States Bureau of Reclamation, Southwest Region, Amarillo.

Usrey, S.

1980 Archeological Investigations at Seven Sites in Atascosa County, Texas. *Texas A&M University, Anthropology Research Laboratory, Report* 48.

Wakefield, W. W.

1968 Archeological Survey of Palmetto Bend and Choke Canyon Reservoir, Texas. *Texas Archeological Salvage Project, The University of Texas at Austin, Survey Report* 5.

Weed, C. S. and H. J. Shafer

1981 Archaeological Testing and Collecting at Choke Canyon Reservoir, Nueces River Project, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 6.

Weir, F. A.

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

Wright, W.

1940 The Type, Distribution, and Occurrence of Flint Gravers in Texas. *Bulletin of the Texas Archeological and Paleontological Society* 12:31-48.

APPENDIX I.
SOLICITATION NO. 50-V0897

PHASE I--CULTURAL RESOURCE INVESTIGATIONS
CHOKE CANYON RESERVOIR, NUECES RIVER PROJECT, TEXAS

SCOPE OF WORK

The survey of the area to be impacted by Choke Canyon Reservoir has revealed thousands of years of South Texas heritage preserved in the archaeological record. The alleviation of the adverse effects to this record shall require the recovery of data from large, relatively shallow prehistoric sites; archival research of Coahuiltecan and Anglo-American occupations; and recovery of data from historic sites. The recovery shall be performed in two complementary phases (Phase I and Phase II, Mitigation).

Phase I shall require a data recovery (research) design that will establish a sound cultural chronological framework and examine the settlement and subsistence patterns for the reservoir area and make recommendations for Phase II, Mitigation. Field work at both prehistoric and historic sites will be necessary. Ethnohistoric research of the records of Spanish missions and other primary archival documents to interpret and supplement the archaeological record will be essential. Another requisite of Phase I is the complete preparation of nomination forms for each site or district considered eligible for inclusion in the National Register of Historic Places.

Suggested recommendations for additional investigations of cultural resources made by previous investigators have been incorporated in items a. through d. below. These suggestions should not be interpreted to indicate either a minimum or maximum scope of work.

a. Field work, prehistoric sites

(1) Intensive recovery (3 sites)

Intensive recovery is suggested for three sites (41 LK 41, 41 LK 59, and 41 LK 67) in the dam construction and borrow areas. Work at each site would include site mapping, backhoe trenching, and excavation. Vegetative clearing would be required at 41 LK 67.

(2) Intensive testing (12 sites)

Sites suggested for intensive testing are those believed to contain data which can be recovered by horizontally extensive open excavation units. Work at each site would include site mapping, backhoe trenching, and excavation. Vegetative clearing would be required at 10 sites. The 12 site designations are: 41 LK 13, 41 LK 19, 41 LK 51, 41 LK 85, 41 LK 87, 41 LK 90, 41 LK 94, 41 MC 63, 41 MC 75, 41 MC 87, 41 MC 183, 41 MC 186.

(3) Minimal testing (36 sites)

Minimal testing (one to three test pits) is suggested to evaluate the cultural manifestations at 36 sites for possible Phase II data efforts. Site mapping would also be necessary at each site. The 36 site designations are: 41 LK 8, 41 LK 9, 41 LK 14, 41 LK 15, 41 LK 17, 41 LK 20, 41 LK 34, 41 LK 48, 41 LK 49, 41 LK 53, 41 LK 74, 41 LK 77, 41 LK 88, 41 LK 91, 41 LK 93, 41, LK 97, 41 MC 9, 41 MC 13, 41 MC 15, 41 MC 17, 41 MC 19, 41 MC 24, 41 MC 25, 41 MC 26, 41 MC 28, 41 MC 29, 41 MC 30, 41 MC 31, 41 MC 39, 41 MC 55, 41 MC 60, 41 MC 84, 41 MC 177, 41 MC 181, 41 MC 187, and 41 MC 188.

(4) Surface collection (64 sites)

The sites suggested for surface collection possess cultural deposition too shallow to warrant subsurface examination. Site mapping would also be required at each site. The 64 site designations are: 41 LK 10, 41 LK 18, 41 LK 27, 41 LK 50, 41 LK 52, 41 LK 56, 41 LK 64, 41 LK 65, 41 LK 69, 41 LK 75, 41 LK 86, 41 LK 92, 41 MC 8, 41 MC 10, 41 MC 11, 41 MC 14, 41 MC 18, 41 MC 22, 41 MC 33, 41 MC 36, 41 MC 40, 41 MC 41, 41 MC 42, 41 MC 43, 41 MC 44, 41 MC 45, 41 MC 48, 41 MC 50, 41 MC 52, 41 MC 53, 41 MC 54, 41 MC 56, 41 MC 57, 41 MC 58, 41 MC 59, 41 MC 61, 41 MC 62, 41 MC 64, 41 MC 65, 41 MC 67, 41 MC 68, 41 MC 69, 41 MC 70, 41 MC 72, 41 MC 74, 41 MC 78, 41 MC 79, 41 MC 80, 41 MC 83, 41 MC 86, 41 MC 88, 41 MC 90, 41 MC 91, 41 MC 92, 41 MC 93, 41 MC 94, 41 MC 95, 41 MC 171, 41 MC 173, 41 MC 174, 41 MC 176, 41 MC 178, 41 MC 180, and 41 MC 184.

b. Field work, historic sites

(1) Intensive testing (4 sites)

Intensive testing is suggested for four sites (41 LK 66, 41 MC 15, 41 MC 17, and 41 MC 74) to evaluate the cultural manifestations at each site for possible Phase II, mitigation efforts. Site mapping, surface collection, and test excavation would be necessary at each site.

(2) Surface collection (6 sites)

The sites suggested for surface collection possess cultural deposition too shallow to warrant subsurface examination. Site mapping would be necessary at each. The six site designations are: 41 MC 46, 41 LK 73, 41 MC 91, 41 MC 166, 41 MC 175, and 41 MC 185.

c. Field work, completion of intensive survey

Approximately 6000 acres of land that will be affected by the project remain to be surveyed for cultural resources. The unsurveyed lands lie outside the area of initial project construction (damsite and borrow areas). Two known sites (41 LK 76 and 41 LK 78) extend onto these unsurveyed lands. The purpose of the required intensive survey shall be to locate, identify, and evaluate the significance of all located cultural resources and make recommendations for Phase II, Mitigation and nominations to the National Register of Historic Places.

d. Historic and ethnohistoric search

A search of primary archival documents and other sources such as cemeteries is necessary to interpret and supplement the archaeological record of Coahuiltecan and Anglo-American occupations of the reservoir area. The search should focus on material culture, genealogies, and settlement and subsistence patterns.

e. Analysis of collected data

All data collected under Phase I (items a., b., c., and d. above) shall be analyzed.

f. Reports (See also 5 Scheduling)

The detailed results of the analysis (item e. above) shall be furnished to the Government. These results are to be presented in a series of interrelated reports as follows:

(1) Recommendations for Phase II, Mitigation and National Register of Historic Places.

The report shall contain detailed recommendations for Phase II, Mitigation and detailed recommendations for nomination(s) to the National Register of Historic Places. Two copies of the report shall be submitted initially in draft status. Six copies of final report shall be required.

(2) National Register of Historic Places nomination forms.

Appropriate National Register of Historic Places nomination forms shall be prepared in their entirety for each site or district that appears to meet the criteria for nomination (reference 36 CFR Parts 60 and 800). The Government shall forward the forms to the Texas State Historic Preservation Officer. One original copy and five duplicate copies of each form and supporting document shall be required.

(3) Investigative report: Historical and ethnohistorical resources.

The report shall contain details of both field work and archival search that relate to historical and ethnohistorical resources. Two copies shall be initially submitted in draft status. Fifty copies of final report shall be required.

(4) Investigative report: Prehistoric resources.

The report shall contain details of all field work and analysis of data related to prehistoric resources. May be organized as one or more volumes (e.g., separate volumes for recovery and testing in initial construction areas, recovery and the testing elsewhere within project area, and intensive survey). Two copies (of each) shall be initially submitted in draft status. Fifty copies (of each) final report shall be required.

(5) Two copies of a letter-type progress report shall be submitted bimonthly.

(6) Report Format:

The format of the investigative report shall be in accordance with "Guidelines of Format Standards for Scientific and Technical Reports Prepared by or for the Federal Government," as issued December 1968 by the Committee on Scientific and Technical Information, Federal Council for Science and Technology, Washington, D.C. 20508.

The investigative reports shall contain a list of keywords (descriptors) and a short informative abstract (about 200 words).

The "Scope of Work" of this contract shall be appended to and made a part of the required investigative reports.

The Principal Investigator's signature shall appear on the lower right hand corner of the title page of all copies of the investigative reports. Prior to Bureau approval of all final investigative reports, no portion of the study, its conclusions or recommendations, shall be released to any outside party, or otherwise publicized without prior consent of the Contracting Officer. See Clause No. 21 of the "General Provisions" concerning publication and copyright.

APPENDIX II.

THE GEOMORPHIC FRAMEWORK OF HUMAN OCCUPATION IN THE FRIO RIVER VALLEY, CHOKE CANYON DAM RESERVOIR AREA, LIVE OAK AND MCMULLEN COUNTIES, TEXAS

Russell C. Bunker

INTRODUCTION

Archaeological sites of Archaic and Late Prehistoric age occur throughout the basin of the proposed Choke Canyon Reservoir. The sites occur in two major geomorphic environments: (1) upland sites located on terrace surfaces above modern river grade and (2) floodplain sites buried in alluvium on the modern valley floor. This paper examines the specific geomorphic environments of both types of site, and also views the sites within the context of changing environmental conditions as controlled by the hydrologic regimen of the Frio River.

LOCATION AND SETTING

The study area is located within the basin of the proposed Choke Canyon Reservoir in the Frio River valley in Live Oak and McMullen Counties, Texas (Fig. 92). The study area lies on the inner margin of the western Gulf Coastal Plain physiographic province (Fenneman 1938). The western boundary of the study area approximately coincides with the town of Tilden. The Bordas-Oakville-Kisatchie Escarpment marks the eastern limit of the study area. The escarpment is a northeast-southwest trending cuesta developed on outcropping erosionally resistant Tertiary rocks (*ibid.*). In the study area, the escarpment is underlain by the Catahoula Formation.

The Frio River heads in springs along the Balcones Fault Zone, a prominent physiographic feature which separates the dissected, resistant Cretaceous limestone of the Edwards Plateau from the less-dissected Tertiary sediments to the east (Baker and Penteado-Orellana 1977). During its crossing of the Balcones Fault Zone, the Frio River is a losing stream (Texas Board of Water Engineers 1958). Discharge records, however, indicate continuous streamflow for the period of record of mean annual flow at the Calliham gauging station.

In the study area, the Frio River flows in a low relief alluvial valley eastward across the progradational barrier-strandplain and deltaic systems of the Eocene Jackson Group (Galloway 1977; Fig. 92). The Jackson Group consists of an upper unit (Fashing Clay Member, Calliham Sandstone Member, Dubose Clay Member, and Deweesville Sandstone Member) and a lower unit (Conquista Clay Member) (Barnes 1976). Immediately to the east, the Frio River flows across the Oligocene Frio Clay, after which it flows across the bedload fluvial sediment of the Miocene Catahoula Formation. The latter unit consists in the study area of clay, mudstone, and tuffaceous sandstone.

Quaternary deposits include: (1) isolated patches of siliceous lag gravel (Uvalde Gravel) on drainage basin divides and slopes and (2) discontinuous, multiple level terrace fills of gravel, fine sand, and silt. Regarding the high-level gravel, Gustavson and Cannon (1974) recognize two types of gravel occurrences:

(1) dissected alluvial plains with gravel thicknesses possibly exceeding 12 m and (2) lag gravels forming thin veneers over existing topography (Baker and Penteado-Orellana 1977).

Gravel in the study area occurs as a patchy surface lag which is at most a few centimeters thick. The gravels are ubiquitous on valley walls, and appear to be the lag deposits of former, high level river channels since removed by erosion. Baker and Penteado-Orellana (1977) summarize the general relationships between the upland gravels and their inferred geomorphic history.

Regional bedrock fractures, as indicated by straight stream reaches and other lineations, are common in the region surrounding the study area. The fractures are caused by differential compaction and subsidence of Tertiary sediments above the buried Cretaceous Stuart City reef trend (Freeman 1966; Tucker 1967). Local northeast trending fractures also occur in the study area, and control the alignment of two channel reaches of the Frio River as it crosses the outcrop area of the Frio Clay and the Catahoula Formation. These local fractures are associated with post-Miocene clastic diapirism (Freeman 1966, 1968).

The study area lies within the megathermal semiarid zone (Thornthwaite 1952). The average annual temperature is 21°C (Carr 1967). Precipitation usually results from thunderstorms, and the annual precipitation can vary by 25% from the average annual precipitation of 56 cm (*ibid.*).

TERRACE MORPHOLOGY AND NOMENCLATURE

River terraces are former floodplains which have been abandoned as the river which formed them downcuts to lower levels. Within the study area, the Frio River terraces have been described by Lynn, Fox, and O'Malley (1977). They recognized four terraces. The highest, and therefore oldest, terrace occurs at elevations of 9-20 m above present river level. Lynn, Fox, and O'Malley (1977) named this surface the "Pleistocene Terrace." Their next youngest terrace is the "Fossil Floodplain," located at elevations of 9-10 m above the present river level. Lynn, Fox, and O'Malley (*ibid.*) indicated a post-Pleistocene age for this terrace, whose surface is the most extensive flat surface along the Frio River.

Two additional, less extensive Holocene terraces were identified, these being the "Modern Floodplain" and the "Floodplain," both of which occur at elevations within 9 m above present river level. The areal extent of the terraces is variable: the "Pleistocene Terrace" ranges from 2-7 km^2 in area, while the "Fossil Floodplain's" width ranges from one-tenth to one kilometer (Lynn, Fox, and O'Malley 1977). The "Modern Floodplain" and "Floodplain" are more restricted, and occur as discontinuous, nonpaired terraces.

Field inspection reveals that there are more than four terraces. The additional terraces are isolated, discontinuous, and of such small areal extent that they were not mapped. This study, therefore, recognized only four generalized, mappable terraces which are numbered from one to four in order of increasing age (Figs. 93, 94). The highest terrace, Terrace 4, is equivalent to the "Pleistocene Terrace." Terraces 1, 2, and 3 correspond to the "Modern Floodplain," "Floodplain," and "Fossil Floodplain," respectively.

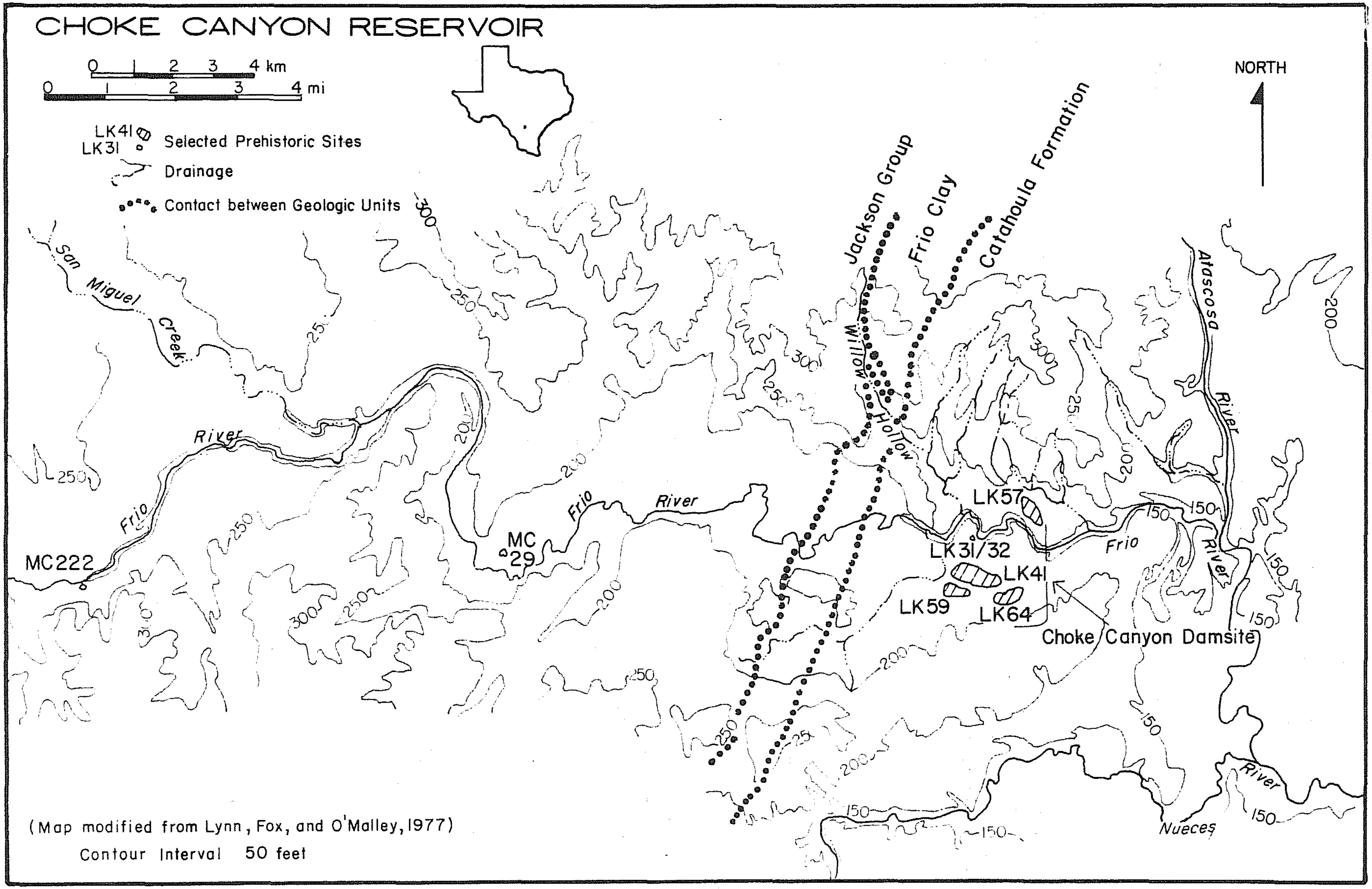


Figure 92. *Map of Choke Canyon Reservoir Area Showing Geologic Units and Archaeological Site Locations.*

The numeric scheme of terrace nomenclature has been chosen as a working terminology, and no correlation with numerically designated terraces elsewhere is necessarily implied. All of the recognized terraces are fill terraces following Howard's (1959) terminology.

The designation of Terraces 1, 2, and 3 as terraces is somewhat arbitrary. While they are abandoned floodplains, all three terraces are occasionally inundated by flood water.

HUMAN OCCUPATION AND THE GEOMORPHIC HISTORY OF THE FRIO RIVER

Environmental reconstruction of archaeological sites in a riverine environment depends in part on the reconstruction of the paleohydrology of the former river--the pattern, sediment load, and the age of the channel. Schumm (1965, 1968, 1978) has shown that river morphology and behavior are influenced by external controls such as climatic change, or tectonic uplift or subsidence of the drainage basin (Schumm 1978). Such external and internal controls produce a dynamic, changing river system as the controls vary in magnitude through time.

The changing hydrologic regimen of the Frio River has resulted in episodes of aggradation and floodplain construction, alternating with episodes of incision of the floodplain to produce terraces. Four former floodplains, now preserved as terraces, occur in the study area. Based on this evidence, it is possible to describe four generalized phases of channel aggradation and floodplain development on the Frio River. While the primary recognition of the four phases is based on terrace morphology, sedimentary textures and radiocarbon dates of cultural material within terrace alluvium support the establishment of a late Quaternary history for the Frio River.

Phase 4 of the Frio River

Terrace 4 consists of the Phase 4 floodplain. The absolute age of Phase 4 deposition is unknown. Deposition of the Terrace 4 alluvium occurred as the Phase 4 Frio River backfilled its valley. A basal layer of chert gravel with occasional rip-up clasts of the underlying Catahoula Formation is overlain by large- and small-scale trough crossbeds of fine sand. The crossbedded sand grades upwards into structureless fine sand, and then into overbank deposits of silt- and clay-rich layers.

The only exposure of Phase 4 alluvium was found in a USBR geologic test pit near site 41 LK 67. Overlying the alluvium, midway through the exposed section, is a soil B-horizon which is buried by two to three meters of structureless sand. This buried soil, or paleosol, is characterized by a well-developed prismatic, blocky structure and local thread and blotchlike accumulations of calcium carbonate.

The soil on the surface of Terrace 4 has been classified as a typic argiustoll (Pernitas Series; J. Guckian, personal communication). Representative profiles display a thick, dark surface horizon (epipedon) with an underlying argillic, or clay-rich horizon. Threads and concretions of calcium carbonate occur in the Cca horizon.

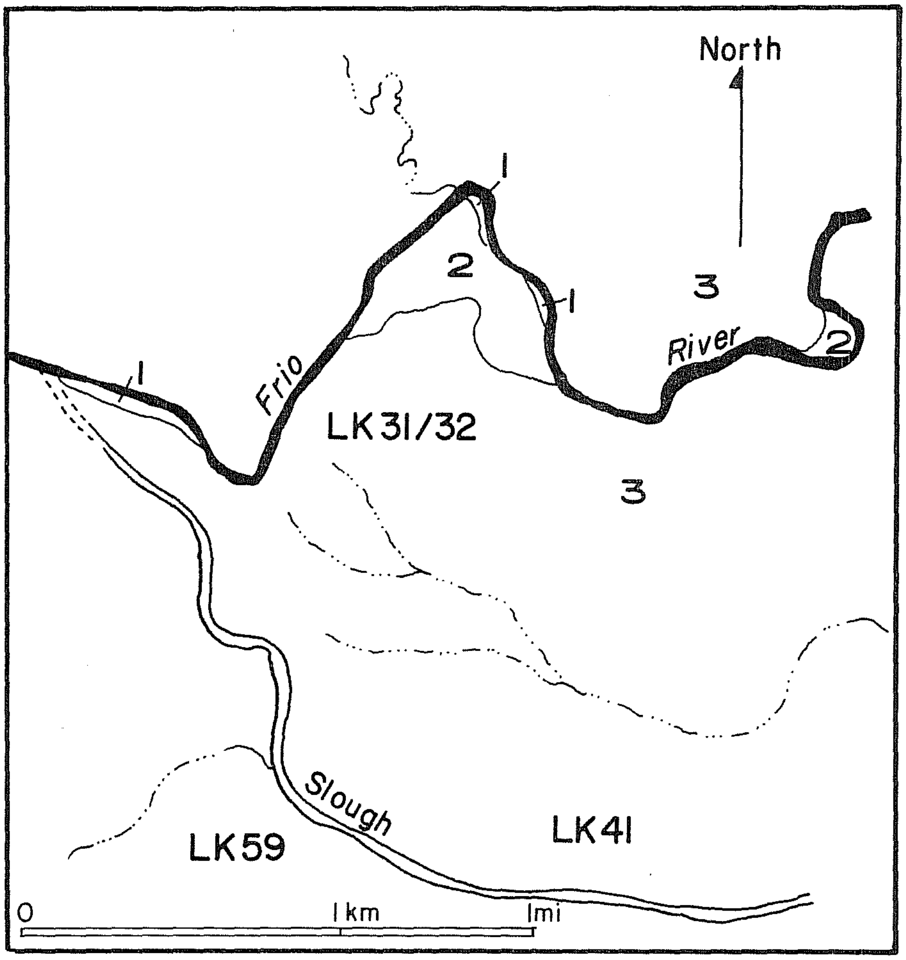


Figure 93. *Drainage Features and Terraces in the Vicinity of Sites 41 LK 31/32, 41 LK 41, and 41 LK 59.*

1 MODERN FLOODPLAIN

2 FLOODPLAIN

3 FOSSIL FLOODPLAIN

4 PLEISTOCENE TERRACE

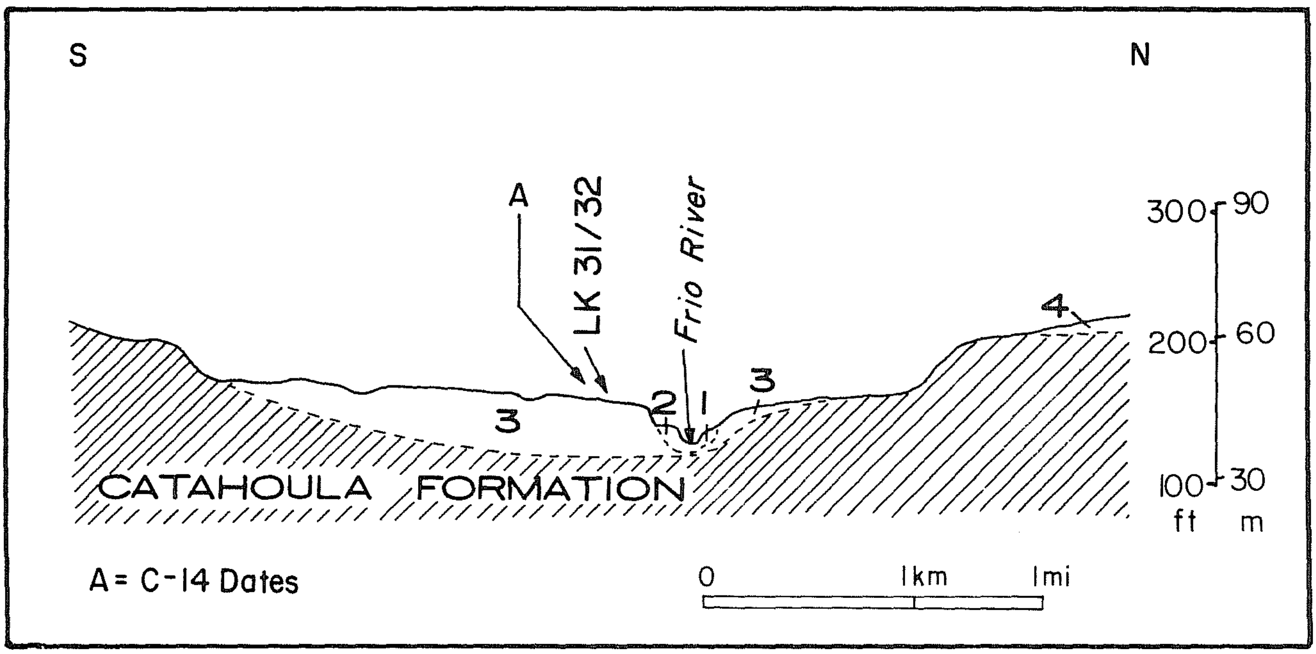


Figure 94. *Cross Section Through Frio River Valley in the Vicinity of 41 LK 31/32.*

Phase 3 of the Frio River

After the establishment of the Phase 4 floodplain, an unknown length of time passed before the Frio River incised its channel and left its Phase 4 floodplain behind as a terrace remnant. The Phase 4 floodplain surface has since been extensively dissected, with numerous gullies eroding its margins.

The period of erosion was followed by renewed aggradation and floodplain construction during Phase 3. Field observations indicate that Phase 3 alluviation resulted in the establishment of a fine-grained meander belt system. The USBR geologic test pits reveal typical fining-upwards sequences similar to those of Phase 4. A basal layer of siliceous channel gravel, approximately one to ten centimeters in maximum diameter, grades upwards into large- and small-scale trough crossbeds of fine sand. The crossbedded sand grades upward into structureless fine sand and overbank deposits of silt and clay.

Exposures in a geologic test pit located slightly southwest of site 41 LK 31/32 revealed sedimentary structures different from the typical fining-upwards sequence of fine-grained point bars. At the base of the test pit, the sedimentary structures seem transitional between those structures associated with the lower part of texturally fining-upwards fine-grained point bars and those structures associated with gravel bars of braided streams. The interpretation of this exposure is speculative: it may represent initial coarse-grained aggradation after which a gradual shift to a finer-grained sediment load occurred.

Once the fine-grained sediment load was established, the channel became stabilized and floodplain construction by lateral and vertical accretion occurred. A highly sinuous channel (sinuosity = 2.25) existed at this time, as shown by channel patterns revealed by gravel isopach maps prepared by the USBR.

Lateral accretion by point bar growth was dominant in building the lower part of the Phase 3 floodplain. The uppermost two to three meters of the Phase 3 floodplain were accreted vertically, as shown by cyclically-bedded layers of structureless sand overlain by overbank silt and clay. Channel upbuilding, as well as vertical floodplain accretion, occurred, as is evinced by stacked channels penetrated by USBR auger holes APA 27 and APC 382.

Some of the depositional surfaces produced by overbank deposition were subaerially exposed for sufficient time to allow pedogenic processes to produce clay-rich soil B-horizons. Such soil profiles typically exhibit blocky structures, as well as nodular and disseminated accumulations of calcium carbonate. The soil profiles, preserved where buried by later overbank sedimentation, are non-uniform in frequency and thickness throughout the Phase 3 floodplain. Lenses of sand representing localized flood scour and deposition are common.

The Floodplain Site: 41 LK 31/32

A detailed chronology of the uppermost two meters of Phase 3 deposition exists at site 41 LK 31/32 (Fig. 95). Archaeological excavations beside a geologic test pit reveal a two-meter deep sequence of cyclic overbank sediment containing a record of human habitation since 5330 radiocarbon years B.P. (TX-2920, MASCA corrected). At present this date represents the oldest absolute date for cultural activity in south Texas. Cultural activity predating 5330 years B.P. in south Texas is recorded, however, by time diagnostic artifacts approximately 10,000 years old (Grant D. Hall, personal communication). The 5330 years B.P. date nonetheless provides the basis for the establishment of an occupation and depositional chronology for site 41 LK 31/32.

The stratigraphy at 41 LK 31/32 is a series of overbank deposits of sand, silt, and clay which were deposited by successive floods of the Phase 3 Frio River. Following the classification of Folk (1974), the texture, or characteristic grain size, of individual layers within the soil monoliths is described in Figure 95. Such description permitted the textural identification of separate episodes of overbank sedimentation. A typical layer of overbank sediment consists of a basal unit of very fine sand or sandy silt passing upward into an upper, dark-colored unit of muddy very fine sand or muddy silt. The increased mud (silt and clay of indeterminate individual proportions) content reflects the deposition of fine-grained suspended sediment during falling flood level. Because coarser sediment such as very fine sand is deposited before the clay and silt, overbank flood deposition produces characteristic alternating light-colored sand-rich layers and dark-colored silt- and clay-rich layers such as are present at 41 LK 31/32.

After a flood has totally subsided, the surface of the floodplain exposes a new depositional surface. The former surface is freshly buried by overbank sediment. Cultural Zone 2, located at two meters depth below original ground surface, was established on such a depositional surface. Radiocarbon dates from depths of 2.30 and 2.25 m indicate that the cultural Zone 2 floodplain surface existed at least 5330 years B.P. Cultural material from this zone includes snail fragments, burned soil, charcoal, and Middle Archaic artifacts.

Three other younger cultural zones have also been identified at this site. The three zones occur at depths of 1.75, 1.34, and 1.22 m below the original ground surface where Monolith 3 was collected. All of the zones occur within sediment whose texture suggests that the cultural zones were developed on depositional surfaces produced by overbank flooding. Sedimentary textures in Monolith 4 permit the tentative correlation of the two uppermost cultural zones from Monolith 3 to Monolith 4 (Fig. 95). Only cultural Zone 2 was identified in Monolith 5A + 5B. Identification of cultural Zone 2 in Monolith 5A + 5B is based on similar depth (approximately 2 m) below original ground surface compared with Monoliths 3 and 4, evidence of similar soil development and artifact content.

The second cultural zone above cultural Zone 2 in Monolith 3 yielded a radiocarbon date of 4300 years B.P. (TX-2922, MASCA corrected). The overall pattern of deposition suggests that settlement occurred on the floodplain of a fine-grained, sinuous, meandering river where the floodplain was occasionally buried by overbank deposition. The lateral extent and degree of soil development of cultural Zone 2 suggests that it existed longer than any of the later floodplain surfaces. Later flooding and overbank deposition appear to have been more frequent, with less time available between floods to permit pedogenic processes to imprint soil profile characteristics on the floodplain surface. None of the sediment layers above cultural Zone 2 exhibit comparable soil development.

The position of the Phase 3 Frio River with respect to site 41 LK 31/32 is unknown. The Frio River was probably located to the north of the site. If the Phase 3 Frio River had originally been present south of the site, the site would

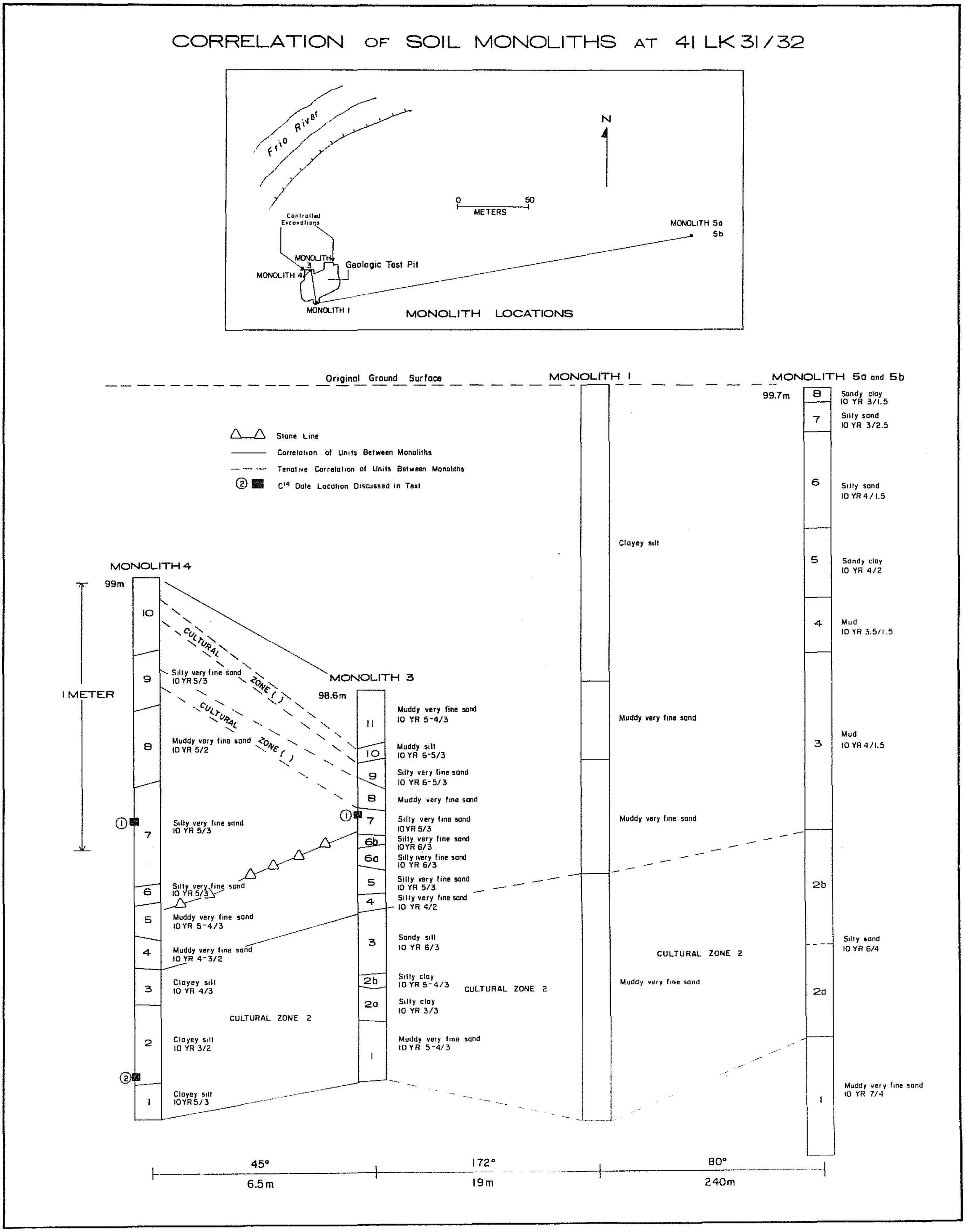


Figure 95. *Correlation of Soil Monoliths at 41 LK 31 32.*

have been destroyed as the river shifted to its present position. Consequently, it is possible to infer that the Phase 3 channel in the vicinity of 41 LK 31/32 was stable and underwent little lateral migration. Other evidence for the stability of the Phase 3 Frio River near 41 LK 31/32 includes the general lack of relict, abandoned channels preserved on the surface of the Phase 3 floodplain (Terrace 3). Minimal channel migration occurred.

A radiocarbon date of 2280 years B.P. (TX-2873, MASCA corrected) from a depth of 50 cm at 41 MC 29 provides the youngest absolute date of occupation of the active Phase 3 floodplain.

The Terrace Site: 41 LK 67

During the same general time of occupation as the Phase 3 floodplain, occupation of the upland terrace surfaces also occurred. Site 41 LK 67 (Figs. 96, 97) is located on a terrace remnant of the older Phase 4 floodplain (Terrace 4) at an elevation of 20 m above present river level. Radiocarbon dates of buried hearths range from 2730 to 2350 years B.P. (TX-2909, TX-2911, both MASCA corrected) at depths of 15-26 cm below ground surface.

This occupation postdates the abandonment of the Phase 4 floodplain. The soil morphology of the terrace surface does not reflect its Pleistocene age. The hearth sites actually occur within the soil profile. Apparently the site was buried by eolian and/or slopewash deposits in which pedogenic processes later developed the typic argiustolls (Pernitas Series) found on the Terrace 4 surface.

After a period of surface stability as represented by the formation of the typic argiustolls, erosion of the terrace surface resumed. Erosion of the area is occurring, and gully fill is being removed from previously cut gullies. Sheet and rill erosion of the terrace surface is occurring from the terrace edges. Removal of the terrace surface has in places exposed plant roots to depths of 20 cm. Near the terrace edges where erosion is most intense, removal of the terrace sand is producing a surface lag of immobile chert gravels. Terrace surface erosion and temporary storage of eroded sand on the sloping terrace edges have caused this Middle Archaic site to be buried under a veneer of slope-derived sediment which is currently being removed (Fig. 98).

Younger Sites Associated with the Phase 3 Floodplain

Skillet Mtn. #4 (41 MC 222, Fig. 99) yields a median radiocarbon age of 675 years B.P. (TX-2875 and TX-2876, both MASCA corrected). This Late Prehistoric occupation occurred after the Phase 3 floodplain had been abandoned and left as a terrace. The site is buried to a depth of 13-33 cm in the levee of an old meander. Although the abandoned meander is probably a relict Phase 3 channel, Late Prehistoric occupation of the site could have occurred when the stage of the Frio River was high enough to fill the meander with water. Even under present conditions water can fill the old channel when the stage of the Frio River is high enough.

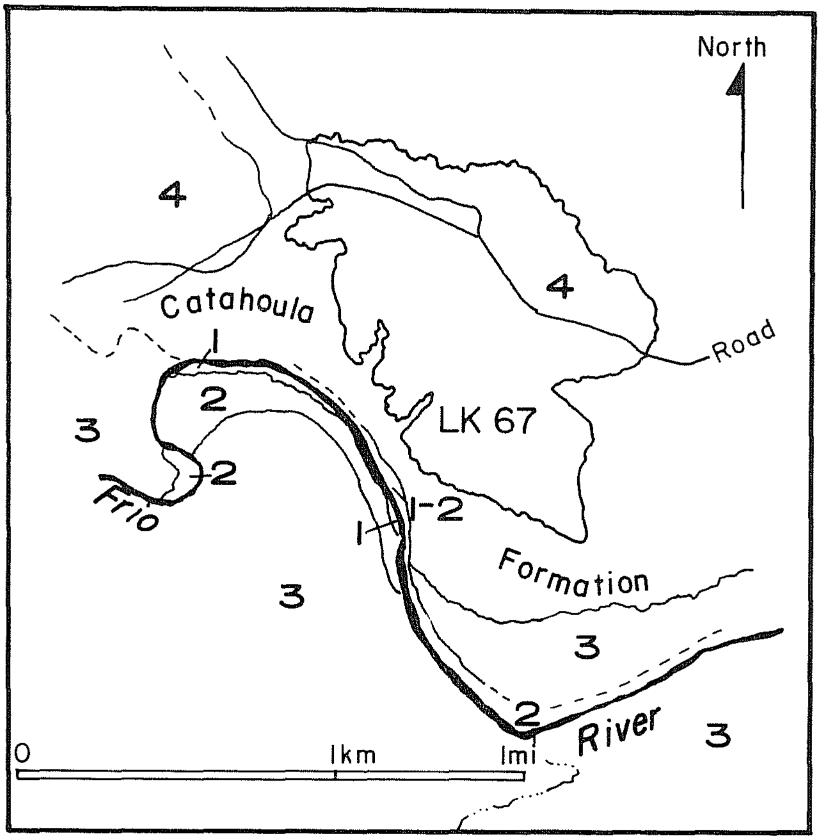


Figure 96. *Drainage Features and Terraces in the Vicinity of 41 LK 67.*

1 MODERN FLOODPLAIN
2 FLOODPLAIN
3 FOSSIL FLOODPLAIN
4 PLEISTOCENE TERRACE

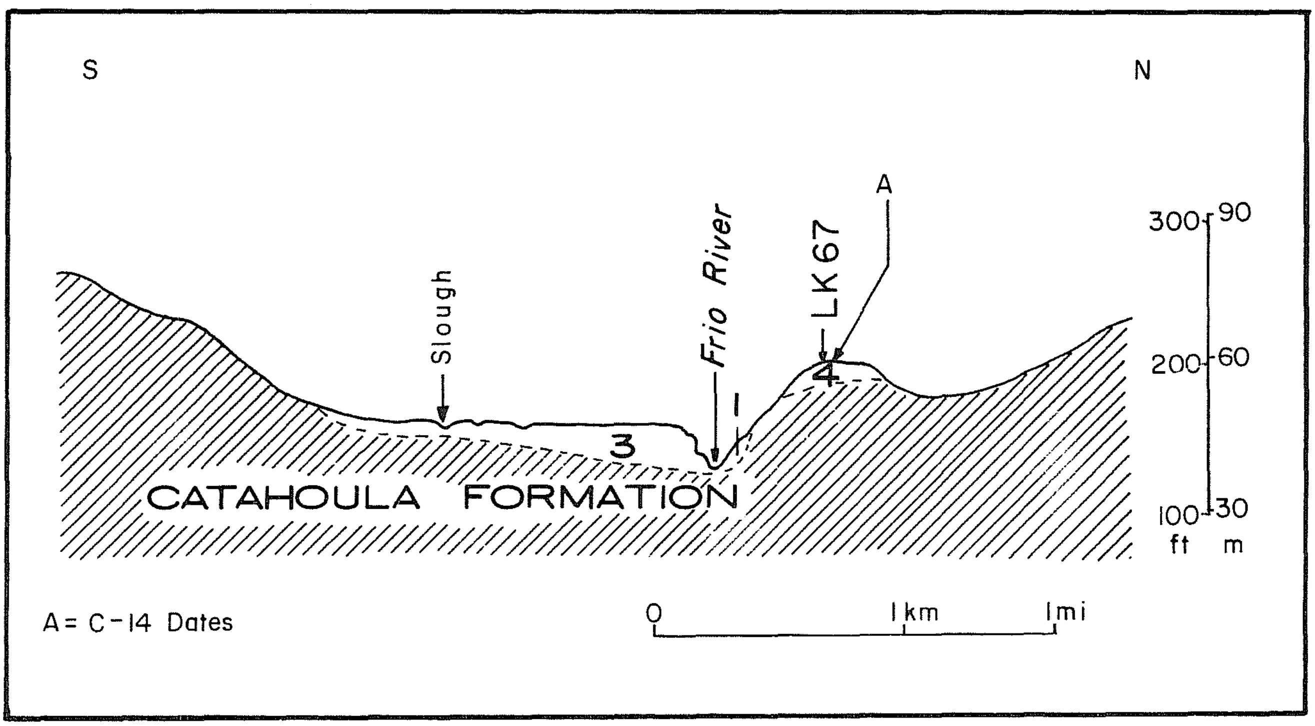


Figure 97. *Cross Section Through the Frio River Valley in the Vicinity of 41 LK 67.*

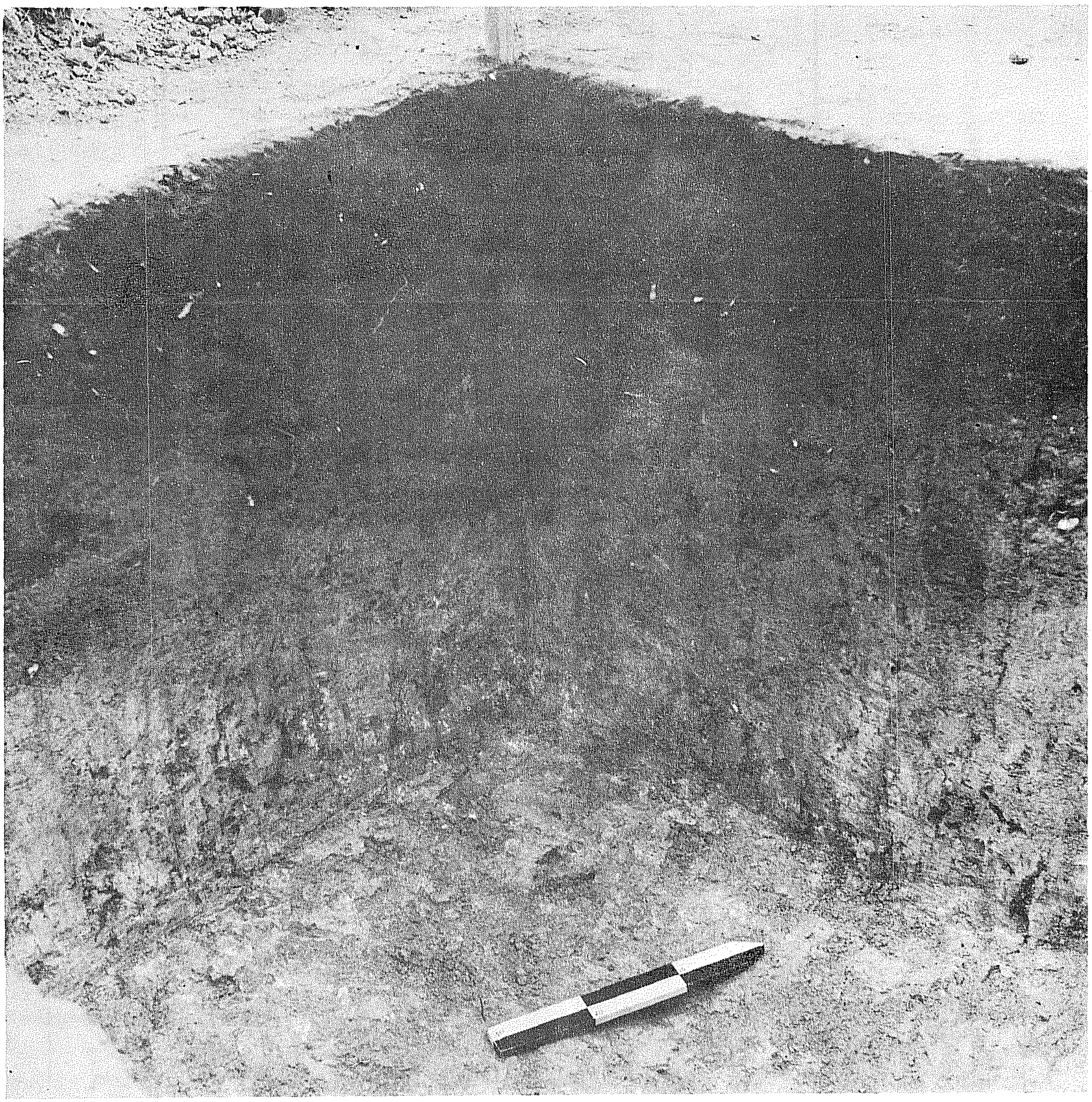


Figure 98. *Typical Soil Profile at Site 41 LK 67.*

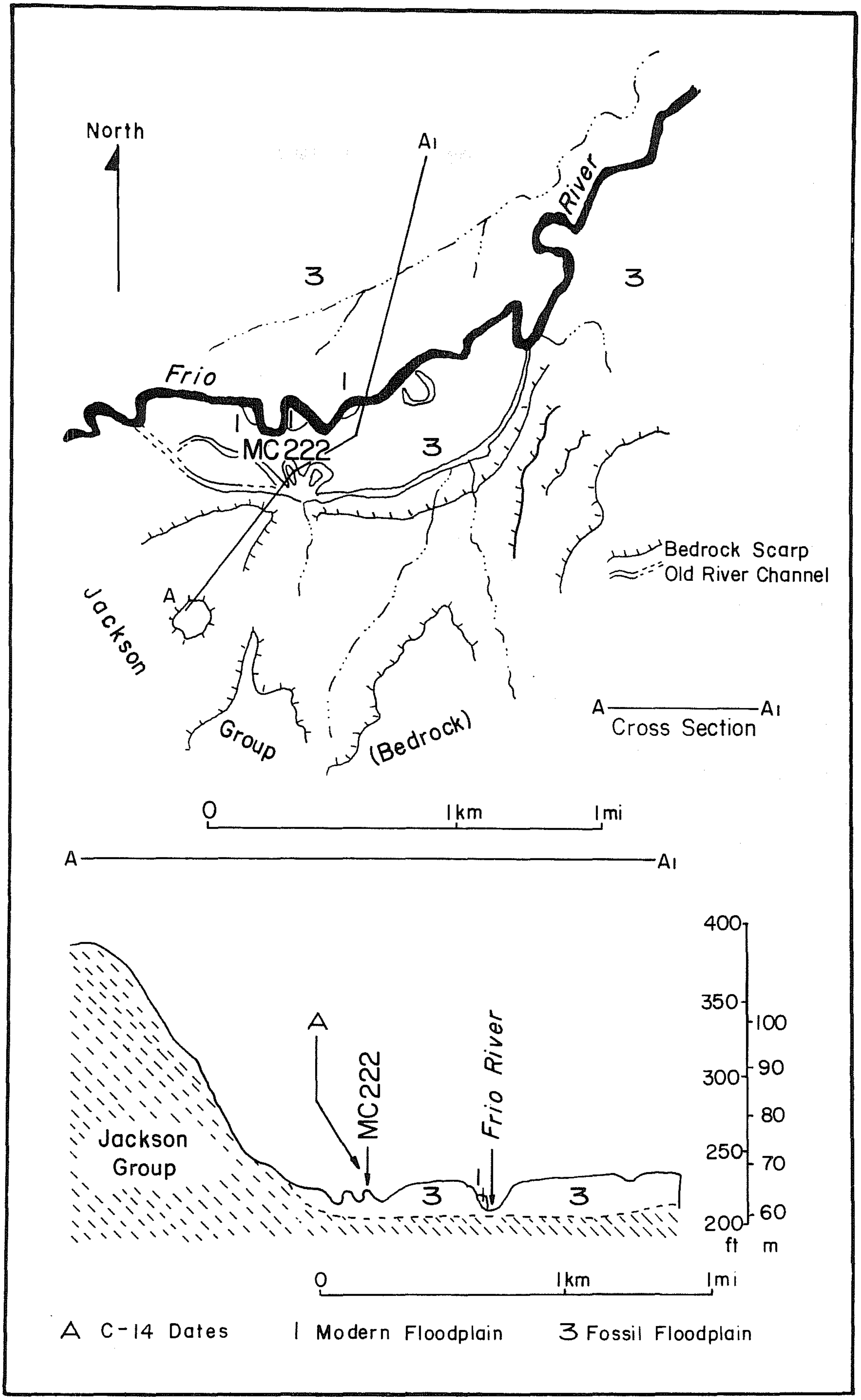


Figure 99. *Drainage Features and Terraces in the Vicinity of Site 41 MC 222 (Upper). Cross Section Through the Frio River Valley in the Vicinity of 41 MC 222 (Lower).*

Phase 3 sediment contains Late Archaic to Late Prehistoric artifacts (Grant D. Hall, personal communication). The Archaic occupation occurred on the active Phase 3 floodplain, whereas Late Prehistoric occupation occurred on Terrace 3 formed by the abandonment of the Phase 3 floodplain. The younger sites such as 41 MC 222 are located at shallow depths in Terrace 2 and are associated with abandoned Phase 3 channels.

Other sites on Terrace 3 are associated with channellike features. Two curvilinear features are present on the Terrace 3 surface near the Choke Canyon Dam site. The northernmost feature is an ephemeral stream whose headward growth has extended it almost completely across the terrace. As the stream has deepened its valley at the eastern end of the terrace, it has re-excavated a pre-existing valley which was cut into the underlying Catahoula Formation prior to burial by the Phase 3 floodplain.

The origin of the southernmost channel, herein termed the Slough, is enigmatic. It may represent either an ephemeral tributary stream to the Frio River or a Phase 3 relict channel. Either could act as a channel for floodwater during overbank flooding. If the Slough is a relict channel, channel facies should be present along its trend. Bedrock depressions, representing scours or channels cut by a former river, might also be expected.

Vertical textural trends of USBR auger holes indicate that the fining-upwards trend of the Phase 3 floodplain exists throughout Terrace 3. A continuous, laterally persistent channel facies with basal gravels fining-upwards into sand, silt, and clay does <u>not</u> exist along the trend of the Slough. The Phase 3 alluvium beneath the Slough's trend therefore indicates that the Sough is a surface feature which postdates the construction of the Phase 3 floodplain. It is not the expression of a relict channel. This interpretation is reasonable in light of the available subsurface information.

USBR engineering cross sections of the alluvial valley and the Phase 3 floodplain show the topography of the bedrock-alluvium contact. The cross sections indicate that buried, incised bedrock channels with channel gravel and sand are not continuously present along the Slough's trend, thus corroborating the interpretation based on auger hole logs.

The Slough is probably a tributary stream whose valley dimensions have been enlarged by erosion during overbank flooding. Floodwaters can readily enter the Slough because its upstream end is on a terrace surface less than three meters above normal river stage. During flooding, water enters the Slough and is conveyed across the southern edge of Terrace 3.

Flood flow through the Slough is evinced by its flanking natural levees. Levees are formed by the deposition of suspended sediment during falling flood level. Because flow through the Slough occurs only during flooding, the levees are evidence of the hydraulic connection of the Slough with the Frio River. In short, the Slough acts as an auxiliary flood channel, or chute, whose origin was as a tributary stream, but whose dimensions are currently adjusted to infrequent overbank floods of the Frio River.

Sites 41 LK 41 and 41 LK 59 are located along the margins of the Slough (Fig. 93). Time diagnostic artifacts from the two sites indicate a Late Archaic to Late

Prehistoric age, thus corroborating the interpretation of the Slough as a post-Phase 3 feature. The availability of water in the Slough may have been more frequent in the past before the recent incision of the modern Frio River occurred.

Phases 1 and 2 of the Frio River

Sometime following the construction of the Phase 3 floodplain, the Frio River incised its channel and abandoned its floodplain. This erosional activity was succeeded by an episode of unknown duration during which the river again aggraded its channel, forming a new floodplain (Terrace 2). Geologic test pit exposures of Phase 2 alluvium indicate that deposition in the uppermost two meters was by vertical accretion of fine-grained overbank sediment.

The duration of Phase 2 is unknown, but it apparently began around 2000 years B.P. (Table 25). The Frio River eventually entered another episode of erosion, during which Terrace 2 was formed. Incision was again succeeded by aggradation during Phase 1, which built the floodplain now represented by Terrace 1. Terrace 1, at an elevation less than two meters above present river level, is narrow and discontinuous. The designation of both the Phase 1 and 2 floodplains as terraces is somewhat arbitrary because, as mentioned earlier, both surfaces are occasionally inundated.

The archaeological and temporal contexts of the Phase 1 and 2 floodplains are unknown. Their origin probably postdates the radiocarbon date of 2280 B.P. at 41 MC 29 in Phase 3 sediment. Their relation to the median radiocarbon date of 675 years B.P. at 41 MC 222 is unknown. The shallow 50 cm depth of the 41 MC 222 date suggests that overbank sedimentation occasionally occurred on the Phase 3 floodplain (Terrace 3) even after its abandonment as an active floodplain.

DISCUSSION

A late Quaternary history for the Colorado and San Gabriel Rivers north of the study area has been established by Baker and Penteado-Orellana (1977). They recognize eight phases of river history, with Phase 5 beginning about 10,000 years B.P. On the Colorado and San Gabriel Rivers Phase 5 resulted in the scour of the fine-grained meander belt deposits of the pre-existing floodplain. Scour was succeeded by coarse bedload aggradation by braided streams. About 7000 radiocarbon years B.P., a transition within Phase 5 from coarse bedload braided streams to fine-grained mixed load meandering streams occurred. By 3000 years B.P. Phase 5 had completed its transition to the fine-grained meandering rivers of Phase 4. Radiocarbon dates and terminal to Late Archaic artifacts indicate Phase 4 lasted from 3000 to 2000 years B.P. (Baker and Penteado-Orellana 1977).

Baker and Penteado-Orellana (1977) hypothesize that the transition from Phase 5 to Phase 4 on the Colorado and San Gabriel Rivers was caused by a more mesic climate induced by changes in the relative strength of the Gulf of Mexico air mass. They cite a variety of evidence for a change to more mesic conditions around 3000 years B.P., a discussion of which is contained in their paper. The

TABLE 25. CORRELATION OF COLORADO-SAN GABRIEL CHANNEL PHASES TO FRIO RIVER CHANNEL PHASES

Colorado-San Gabriel Rivers Channel Phases (Baker and Penteado-Orellana 1977)	Absolute Age (years B.P., all dates uncorrected)	Frio River Channel Phases (this paper)	Absolute Age (years B.P., all dates MASCA corrected)
	0		0
1		1	
2		2	
3			
	2000		2000
4 (fine sediment, high sinuosity)			2280
	3000		
			4300
			5310
			5330
(fine sediment)		3 (fine sediment, high sinuosity)	
5	7000		
(coarse sediment aggradation)			
	?		?
6B (fine sediment)		4 (fine sediment)	

timing of the transition within Phase 5 from coarse bedload braided rivers to fine-grained mixed load meandering rivers is, however, unknown.

An attractive hypothesis for the Frio River is that the hydrology and channel morphology of the Frio River are controlled by the same broad climatic controls as have been hypothesized to exist for the Colorado and San Gabriel Rivers. The possible equivalence of fluvial history between the different rivers is shown in Table 25. The radiocarbon date of 2280 years B.P. from 41 MC 29 within Frio River Phase 3 sediment is within the time range of Phase 4 on the Colorado and San Gabriel Rivers. Both the Frio River Phase 3 and the Colorado-San Gabriel Rivers Phase 4 are represented by the fine-grained deposits of meandering streams. Based on the similarity in radiocarbon dates from similar sediment types, the Frio River Phase 3 and the Colorado-San Gabriel Rivers Phase 4 are probably equivalent.

Prewitt (1974) identified time diagnostic artifacts of 2500 years age in fine-grained Phase 4 sediment at the Loeve-Fox site on the San Gabriel River near Circleville. The radiocarbon dates of 2730 to 2350 years B.P. at 41 LK 67 match the age of Phase 4 at the Loeve-Fox site. The 41 LK 67 dates do not, however, represent Phase 3 of the Frio River inasmuch as they occur on Terrace 4. The dates may nonetheless correspond with the mesic interval beginning around 3000 years B.P. as postulated by Baker and Penteado-Orellana (1977). Mesic conditions could have caused increased vegetation to stabilize the Terrace 4 surface after earlier slope erosion and redeposition had buried 41 LK 67. During this time pedogenic processes could hypothetically develop the typic argiustoll (Pernitas Series) superimposed on the sediment containing the dated hearth sites.

The 5330 to 4300 radiocarbon years B.P. dates at 41 LK 31/32 may represent the time by which the transition within Phase 5 from braided streams to meandering streams had occurred on the Colorado and San Gabriel Rivers. If so, Terrace 3 on the Frio River consists of sediment representing continuous aggradation through an episode of time equivalent to Phases 4 and 5 on the Colorado and San Gabriel Rivers.

Radiocarbon dated flood deposits at the Arenosa rock shelter near the junction of the Pecos River and the Rio Grande indicate that frequent flooding and deposition occurred from 3000 to 2000 years B.P. (Patton 1976). At the shelter, occupation occurred on the surfaces produced by flood deposition. Layers 19 to 8 at Arenosa shelter are bracketed by uncorrected radiocarbon dates ranging from 3270±70 years B.P. (layer 21, TX-536) to 2150±80 years B.P. (Basal layer 7, TX-536). This period of frequent flooding corresponds to the Frio interval, a mesic interval which lasted from 3000 to 2000 years B.P. in the lower Pecos River valley (Bryant 1966). Bryant distinguished the interval on the basis of increased grass and pine pollen, as well as the reappearance of bison at the Bonfire and Arenosa shelters along the Pecos River.

This evidence from the lower Pecos valley corroborates the interpretation of upper Phase 3 sediment at site 41 LK 31/32. As discussed previously, the stratigraphy at 41 LK 31/32 consists of numerous flood sediment units upon which occupation occurred. No correlation between the 11 layers at the Arenosa site and layers at 41 LK 31/32 is implied because it is extremely unlikely that two such geographically separated rivers would have identical flood histories. Nonetheless, the overall similarity between the nature and frequency of flooding and flood sedimentation in the lower Pecos River valley and the study area suggests that regional climatic controls existed from 3000 to 2000 years B.P. Such controls evidently were in effect for the San Gabriel, Colorado, Frio, and Pecos Rivers during this time.

The exact relationship of the Colorado-San Gabriel Phase 5 to the Frio River Phases 3 and 4 is unclear. Frio River Phase 4 is presumed to be equivalent to Phase 6B of the Colorado River on the basis of similar relative position in the terrace sequence and similar fine-grained sediment. After incision and scour of the Frio River Phase 4 floodplain (Terrace 4), aggradation eventually resumed. The period of incision and initial aggradation by coarse bedload braided streams is represented by Phase 5 on the Colorado and San Gabriel Rivers. The record of an equivalent phase on the Frio River was not observed. The 5330 to 4300 years B.P. radiocarbon dates from fine-grained overbank sediment at 41 LK 31/32 may represent the terminal fine-grained phase of the Phase 5 equivalent for the Frio River.

Occupation of the Phase 3 Frio River floodplain likely occurred before 5330 years B.P. However, any sites established during the presumed initial phase of coarse sediment aggradation would have had a poor chance of preservation. Site preservation in riverine environments depends upon the site not being destroyed by the erosion of a migrating channel. On an unstable floodplain occupied by a coarse bedload braided stream, flood scour and frequent channel migration would probably destroy many archaeological sites. Only as flow became more uniform would a relatively stable floodplain surface be established. This condition would enhance the preservation of archaeological sites located on the floodplain. Such floodplain sites would be subjected to only occasional inundation and burial by overbank sediment.

The stability of such floodplain sites is evinced by the pedogenic imprint on the floodplain surface upon which cultural Zone 2 at 41 LK 31/32 occurs. Well-developed blocky and prismatic soil structures indicate that sufficient time for the formation of a clay-rich soil B-horizon existed before later overbank sediment buried the site.

CONCLUSIONS

Archaic and Late Prehistoric Indian occupation along the Frio River occurred in two main geomorphic environments: terrace surfaces and the Frio River floodplain. The terraces are older than the floodplain sites, but do not contain sites of greater age. Occupation of the terraces occurred after they had been abandoned as floodplains.

Four phases of fluvial history for the Frio River are recorded in the study area. Most of the archaeological sites occur within the terrace representing the floodplain of the Phase 3 Frio River. Sometime before 5330 years B.P. the Phase 3 Frio River was aggrading its channel and constructing a floodplain by lateral point bar growth and vertical overbank sedimentation. The aggradation was probably in response to a mesic interval. Increased precipitation and the resulting improvement in vegetal cover on side slopes resulted in finer-grained weathering products being supplied to the Frio River as sediment. The consequent change in sediment load from coarse sediment to fine sediment, together with more uniform base flow and reduced flood discharge, caused the Frio River to develop a floodplain occupied by a relatively stable, meandering channel.

The Frio River meandered across its Phase 3 floodplain at the time of the Middle Archaic occupation of 41 LK 31/32. Since Phase 3 time (approximately 5330 to 2280 years B.P.) the Frio River has straightened, narrowed, and downcut, leaving its former Phase 3 floodplain as an extensive terrace approximately 50 m above present river level. This change in the morphology of the Frio River was possibly in response to more xeric conditions.

Two smaller, discontinuous terraces exist between the extensive Phase 3 terrace and the present river. All three terraces, however, are occasionally inundated depending on the depth of flooding.

Sites younger than those buried by Phase 3 overbank sediment are associated with: (1) abandoned meander loops (oxbow lakes) and (2) a linear, channellike feature on the surface of the Phase 3 floodplain near the Choke Canyon Dam site. While the abandoned channel sites such as 41 MC 222 are associated with probably Phase 3 relict channels, occupation of the sites postdates Phase 3. Such occupation was possible because some of the abandoned channels still receive water from the Frio River if river stage is high enough. Similar conditions presumably existed in the past with occupation of such sites occurring when a local source of water was available.

The channellike feature on the Phase 3 floodplain surface postdates incision and abandonment of the Phase 3 floodplain. It is not a relict Phase 3 channel, but is a modern tributary stream valley which acts as a channel in conveying flood flows across the terrace surface during modern overbank flooding. Floods have modified the morphology of the tributary stream valley, building natural levees along its margins. Late Archaic and Late Prehistoric occupation of sites 41 LK 41 and 41 LK 59 probably occurred during times when water was present in the channel. The channel may have contained water more frequently in the past before the recent incision of the modern Frio River occurred.

ACKNOWLEDGMENTS

The cooperation of U.S. Bureau of Reclamation personnel in obtaining pertinent data for the study is appreciated. Victor R. Baker and Robert L. Folk of the Department of Geological Sciences, The University of Texas at Austin, provided useful criticism and suggestions. Charles Palmer of the Texas Natural Resources Information System made air photos of the study area available. Bill Bath patiently suffered as a foil for many of the ideas developed during the study.

REFERENCES CITED

Baker, V. R. and M. M. Penteado-Orellana

1977 Adjustment to Quaternary Climatic Change by the Colorado River in Central Texas. *Journal of Geology* 85:395-422.

Barnes, V. E., Project Director

1976 Geologic Atlas of Texas: Crystal City-Eagle Pass Sheet. Dolan Hoye Eargle Memorial Edition. *The University of Texas at Austin, Bureau of Economic Geology.*

Bryant, V. M., Jr.

1966 Pollen Analysis: Its Environmental and Cultural Implications in the Amistad Reservoir Area. Unpublished M.A. thesis, The University of Texas at Austin.

Carr, J. T.

1967 The Climate and Physiography of Texas. *Texas Water Development Board Report* 53.

Fenneman, N. M.

1938 *Physiography of the Eastern United States.* McGraw-Hill, New York.

Folk, R. L.

1974 *Petrology of Sedimentary Rocks.* Hemphill Publishing Co., Austin.

Freeman, P. S.

1966 Clastic Diapirism in the Gueydan (Catahoula) Formation, Live Oak and McMullen Counties, Texas. Unpublished M.A. thesis, The University of Texas at Austin.

1968 Exposed Middle Tertiary Mud Diapirs and Related Features in South Texas. In *Diapirism and Diapirs*, edited by J. Braunstein and G. D. O'Brien:162-182. American Association of Petroleum Geologists, Tulsa.

Galloway, W. E.

1977 Catahoula Formation of the Texas Coastal Plain: Depositional Systems, Composition, Structural Development, Ground-Water Flow History, and Uranium Distribution. *The University of Texas at Austin, Bureau of Economic Geology, Report Inventory* 87.

Gustavson, T. C. and P. J. Cannon

1974 Preliminary Environmental Geologic Mapping of the Inner Coastal Plain, Southwest Texas. In Approaches to Environmental Geology, edited by E. G. Wermund:79-100. *The University of Texas at Austin, Bureau of Economic Geology, Report Inventory* 81.

Howard, A. D.

1959 Numerical Systems of Terrace Nomenclature. *Journal of Geology* 67:239-243.

Lynn, W. M., D. E. Fox, and N. O'Malley

1977 Cultural Resource Survey of Choke Canyon Reservoir, Live Oak and McMullen Counties, Texas. *Office of the State Archeologist, Texas Historical Commission, Archeological Survey Report* 20.

Patton, P. C.

1976 Geomorphic Criteria for Estimating the Magnitude and Frequency of Flooding in Central Texas. Unpublished Ph.D. dissertation, The University of Texas at Austin.

Prewitt, E. R.

1974 Archeological Investigations at the Loeve-Fox Site, Williamson County, Texas. *Texas Archeological Survey, The University of Texas at Austin, Research Report* 49.

Schumm, S. A.

1965 Quaternary Paleohydrology. In *Quaternary of the United States*, edited by H. E. Wright, Jr. and D. G. Frey:783-794. Princeton University Press, Princeton.

1968 Speculations Concerning Paleohydrologic Controls of Terrestrial Sedimentation. *Geological Society of America, Bulletin* 79:1573-1588.

1978 *The Fluvial System*. Wiley and Sons, New York.

Texas Board of Water Engineers

1958 Compilation of Surface Water Records in Texas Through September 1957. *Texas Board of Water Engineers Bulletin* 5807A.

Thornthwaite, C. W.

1952 Evapotranspiration in the Hydrologic Cycle. In *The Physical and Economic Foundation of Natural Resources* 2:25-35. U.S. Congress, House of Representatives, Committee on Interior and Insular Affairs.

Tucker, D. A.

1967 Faults of South and Central Texas. *Gulf Coast Association of Geological Societies Transactions* 17:144-147.

APPENDIX III.

ANALYSIS OF CARBONIZED BOTANICAL REMAINS FROM THE CHOKE CANYON RESERVOIR AREA

Philip Dering*

INTRODUCTION

Because the recovery of organic materials from archaeological sites in south Texas is a rarity, there is very little direct evidence pertaining to prehistoric environments in the region. The results of this charcoal analysis represent the first botanical evidence for the interpretation of prehistoric vegetation in south Texas.

The objective of this report is to relate the methods and results from the analysis of wood charcoal samples recovered from the following archaeological sites in the Choke Canyon Reservoir area: 41 MC 17, 41 MC 29, 41 MC 30, 41 MC 201, 41 MC 222, 41 LK 31/32, 41 LK 67, 41 LK 88, and 41 LK 201. The data will be discussed in the light of previous research on past and present vegetation in Texas to arrive at a preliminary interpretation of prehistoric vegetation in the Choke Canyon Reservoir area.

THE STUDY AREA

The study area is located on the Frio River approximately 14 km west of its confluence with the Nueces River, in the physiographic region most commonly known as the Rio Grande Plain (Huss 1959). The Balcones Fault, which marks the border of the Rio Grande Plain with the Edwards Plateau, lies about 145 km north of the study area; the Gulf Coastal Plain lies just beyond the Oakville-Kisatchie Escarpment, 25 km to the south.

Blair (1950) and Dice (1948) placed the area in the Tamaulipan Biotic Province. Gould (1969) included the region in his South Texas Plains vegetation zone.

Information on modern vegetation in the Choke Canyon Reservoir area was scarce and difficult to obtain. Geographical entities of the Nueces River watershed, which includes the study area, have been described by Huss (1959). Each geographical zone was defined on the basis of topography, soils, vegetation, and geology. Johnston and Darr (1977) conducted a brief vegetational survey and discovered two endangered plants, *Prunus minutiflora* and *Caesalpinia drummondii*.

The Choke Canyon Reservoir study area crosses two major geographical divisions of the Nueces River watershed. Most of the region is located within the Jackson Plain, a heterogenous area originating from the Jackson geological formation.

---

*Charcoal identifications from sites 41 LK 88, 41 LK 201, 41 MC 17, 41 MC 30, 41 MC 201, as well as some samples of charcoal from 41 LK 31/32 and 41 MC 222, were made by Kathleen Volman. Information from these identifications has been incorporated into Appendix III.

A northwest facing escarpment is characteristic of the Jackson Plain and is especially obvious near Tilden and Campbellton. A blackbrush-guajillo (*Acacia rigidula-Acacia berlandierii*) shrubland grows on this escarpment and adjacent soils. Below the escarpment, a belt of black clay supports a mesquite shrubland vegetation.

In the more impervious soils of the river bottoms, mesquite is replaced by large stands of huisache (*Acacia farnesiana*) and huisachillo (*Acacia tortuosa*). Along the river banks, Mexican ash (*Fraxinus berlandieriana*), black willow (*Salix nigra*), cedar elm (*Ulmus crassifolia*), sugarberry (*Celtis laevigata*) and others abound. Live oak (*Quercus virginiana*) grows on low caliche ridges and is scattered along the edges of the valley.

The upland areas and cuestas are covered with xeric shrubs, while flatlands of clay are dominated by mesquite. The river bottoms are occupied by the characteristic Texas riparian woody species (Tharp 1939), presenting the appearance of a gallery forest.

PREHISTORIC VEGETATION AND EARLY HISTORIC OBSERVATIONS

No paleovegetation studies have been conducted in south Texas. Poor preservation of organic materials, especially pollen and charcoal, and a lack of suitable stratified sites with well-preserved remains, such as bogs, river terraces, or rockshelters, account for this lack of information. As a result, very little can be said about the prehistoric vegetation of south Texas.

Bryant and Shafer (1977) have recently synthesized most of the available information on prehistoric environments of Texas. Bog sites 150-200 km north-northeast of the study area have provided data pertaining to Full Glacial and Late Glacial vegetation in adjacent regions, but a lack of radiocarbon dates for Postglacial deposits precluded much speculation about the nature of vegetation during the Choke Canyon Reservoir time span. Archaeological deposits as near as 340 km to the west have yielded a rich source of pollen and plant macrofossil data (*ibid.*). Botanical analyses of ancient pack rat middens have provided detailed lists of plants which were present in the Pleistocene of west Texas. Paleobotanical studies from west Texas have recorded no significant changes in vegetation since 8000 B.P. (Van Devender, Freeman, and Worthington 1978). Thus, one would expect that no major changes have occurred in the environment of adjacent southern Texas during the 6000 years covered by the Choke Canyon Reservoir archaeological study.

Adams (1977) found that isolated populations of *Juniperus ashei* in the Sierra del Carman and the Big Bend region were allied to a few *Juniperus ashei* populations on the southern and western edges of the Edwards Plateau. After reviewing pollen, plant macrofossil and modern systematics studies, Adams (*ibid.*) felt that the *Juniperus ashei* of the Edwards Plateau enjoyed a much wider distribution throughout western Texas and northern Mexico during the Pleistocene. Perhaps because of a lack of paleobotanical data, the possibility of a southward migration of *Juniperus ashei* onto the caliche outcrops of south Texas was not mentioned.

Early historic reports are also lacking in information. Although investigators know that the vegetation of the Southwest has changed radically since the recent expansion brought cattle and fences to the land; timing, causes, and degree of change are not well documented.

Prior to the 1800s, much of the flatlands in southern and western Texas were large expanses of grasslands with low stunted woody plants encroaching on the plains. Significant stands of woody plants were confined to rocky slopes, mesa tops, erosional breaks, canyons, and river floodplains (Smith 1899; Cook 1908; Johnston 1963; Inglis 1964).

What caused the destruction of these grasslands is a topic of much disagreement. Overgrazing by cattle was a major destructive force according to Cottle (1931) and Smith (1899). Others maintained that the removal of fire from the ecosystem was responsible for allowing the expansion of woody species onto the grasslands (Bentley 1898; Bray 1901; Cook 1908). Harris (1966) took the most radical stand on fire by insisting that grasslands of the Southwest were disclimax communities perpetuated strictly by fires set by Indians.

Johnston (1963) criticized the views of the other writers, pointing out that they tended to extrapolate from single observations to entire regions, ignoring local differences in topography, soils, and other critical factors. By carefully considering topographical and geological factors in south Texas, Johnston (*ibid.*) was able to reconstruct a more detailed description of vegetation during early historic times.

Even prior to extensive cattle grazing, the Choke Canyon study area was definitely not a homogeneous grassland. Erosional breaks along the Frio and Nueces Rivers northwest of the Bordas Scarp housed stands of dense brush (Johnston 1963). The woody vegetation grew low and open in upland areas between the erosional breaks in McMullen County, especially where the soil was sandy. Johnston (*ibid.*) emphasized that these areas were not prairies, but more closely resembled mesquite grasslands. To the south, the Gulf Coastal Plain abounded in prickly pear cactus, as early as 1555, during the time of Cabeza de Vaca's explorations (Johnston 1963: 457). According to Johnston's (*ibid.*) analysis, the great expanse of brushland in the area today did not result from an invasion of plant species from the south or from more xeric regions, but from an expansion of species already present in the area.

The fragmentary nature of the evidence for prehistoric vegetation presented in this literature review cannot be overemphasized. Wells (1966, 1970) has warned repeatedly of generalizing vegetation reconstructions from single, isolated, or distant data sources. Johnston (1963) has echoed the same warnings in connection with the use of early historic records. Similar caution will be utilized in the interpretation of the results from this charcoal analysis.

CHOKE CANYON CHARCOAL ANALYSIS

Methods

The research proceeded in two steps: (1) collection and preparation of wood charcoal reference specimens from fresh material and (2) identification of the charcoal samples by comparison to these knowns.

Charcoal specimens were snapped into transverse, radial, and tangential sections and glued to pieces of cork mounted on the inside of baby food jar lids for storage.

Identification of the wood charcoal samples was accomplished by comparison to these knowns. Each vial of the wood charcoal pieces was weighed and counted before examination. Then each fragment was snapped into pieces along the transverse and longitudinal planes in order to expose a fresh surface (Leney and Casteel 1975). Each newly exposed area was examined using an epi-illuminated stereoscope.

Results

Identifications of the wood charcoal specimens are presented in Table 26. Results of the analysis from each archaeological site will be discussed briefly in the following text.

41 MC 222: Date--A.D. 1290.

Twenty-nine pieces of charcoal weighing 6.9 grams were examined. The condition of the charcoal was excellent in two of the vials and identification was fairly easy. Ash (*Fraxinus* sp.) and willow (*Salix* sp.) were identified from vials one and two. The sample in vial three was in poor condition, and was identified only as a hardwood.

41 LK 67: Date--780 B.C.

The condition of this charcoal from the second oldest sample submitted to the lab was surprisingly excellent. The material consisted of seven pieces of charcoal weighing 6.1 grams. The samples have been identified as *Acacia* sp., a common shrub genus of south and west Texas.

41 MC 29: Date--390-270 B.C.

Although this was the smallest sample, it was certainly the most diverse and interesting sample of all. Fourteen small pieces of charcoal weighing 2.7 grams were examined. The analysis yielded four plant species, mesquite (*Prosopis glandulosa*), live oak (*Quercus virginiana*), desert hackberry (*Celtis pallida*), and by far the most significant finding of the study, *Juniperus* sp.

41 LK 31/32: Date--2360-2340 B.C.

All the material which the author analyzed from this site was in very poor condition. Most of the vials contained a mixture of fire-hardened clay and charcoal dust. This becomes obvious in Table 26 when one compares the weight of these samples to the lighter charcoal samples from the other sites. Almost all of the specimens lacked a woody structure typical of identifiable charcoal. For this reason, no identification of these samples was made.

Kathleen Volman analyzed seven specimens weighing 20.4 grams from site 41 LK 31/32. Acacia (*Acacia* sp.) and ash (*Fraxinus* sp.) were identified, as well as tentative identifications of mesquite (*Prosopis glandulosa*) and oak (*Quercus* sp.).

TABLE 26. RESULTS OF CHARCOAL IDENTIFICATION

SITE NO.	PROVENIENCE	DATE**	WEIGHT	CONDITION	IDENTIFICATION
41 MC 222	N104 E89 Level 3	A.D. 1290 (TX-2876)	3.5 g	excellent	*Fraxinus* sp.
	N105 E88 Level 2	A.D. 1290 (TX-2875)	0.9 g	excellent	*Salix* sp.
	N105 E88 Level 3	A.D. 1290 (TX-2876)	2.5 g	fair-poor	hardwood
	N104 E88 Level 1	________	0.1 g	distorted	hardwood*
41 LK 67	N903 E1000 Level 3, Feature 5	780 B.C. (TX-2909)	4.8 g	excellent	*Acacia* sp.
	N903 E1000 Level 3, Feature 5	780 B.C. (TX-2909)	1.3 g	excellent	*Acacia* sp.
41 MC 29	Feature 1	390-270 B.C. (TX-2873)	2.7 g	excellent	*Prosopis glandulosa* *Celtis pallida* *Quercus virginiana* *Juniperus* sp.
41 LK 31/32	Feature 3, Zone 2; Unit N1056 E863	2360-2340 B.C. (TX-2922)	ranged from 7.5-22 g	very poor	none
	N1117 E998 Level 7, NW	undated	0.1 g	very hard	*Acacia* sp.*
	N1059 E865 Level 10, NE	undated	4.4 g	splintered, in sediment	none*

TABLE 26. (continued)

SITE NO.	PROVENIENCE	DATE**	WEIGHT	CONDITION	IDENTIFICATION
41 LK 31/32 (cont.)	N950 E838 Level 1, NE	undated	0.1 g	very hard	cf. *Prosopis glandulosa* Torr.*
	Feature 6	2360-2340 B.C. (TX-2922)	9.5 g	okay	*Fraxinus* sp.*
	N1059 E865 Level 10, NE	undated	1.8 g	soft	none*
	Feature 3	3370-3350 B.C. (TX-2921)	2.4 g	very soft, in sediment	none*
	Feature 3	3370-3350 B.C. (TX-2921	2.1 g	very soft, in sediment	cf. *Quercus* sp.*
41 LK 201	Test Pit 3, Level 17, Feature 2	1300 B.C. (TX-3022)	12.3 g	fractured	hardwood*
	Test Pit 3, Level 18	undated	0.6 g	soft	*Quercus* sp.*
	Test Pit 2, Level 20	1300 B.C. (TX-3022)	6.2 g	okay	*Prosopis glandulosa* Torr.*
	Test Pit 3, Level 16, Feature 2	1300 B.C. (TX-3022)	3.5 g	very fractured	*Quercus* sp.*
	Test Pit 3, Feature 2	1300 B.C. (TX-3022)	10.5 g	very thin, fractured	*Quercus* sp.*
	Test Pit 3, Level 16, Feature 2	1300 B.C. (TX-3022)	56.7 g	very fractured	*Quercus* sp.*

TABLE 26. (continued)

SITE NO.	PROVENIENCE	DATE**	WEIGHT	CONDITION	IDENTIFICATION
41 LK 201 (cont.)	Test Pit 3, Feature 2 W 1/3 of unit	1300 B.C. (TX-3022)	43.7 g	very fractured	hardwood*
41 MC 222	N104 E88 Level 1	undated	0.1 g	distorted	hardwood*
41 MC 17	Test Pit 2, Level 2	undated	3.0 g	okay	*Prosopis glandulosa* Torr.*
41 MC 30	Test Pit 1, Level 3	undated	0.9 g	okay	*Prosopis glandulosa* Torr.*
41 MC 201	Test Pit 1, Level 3-4, Hearth 23	1140-1110 B.C. (TX-3020)	10.5 g	very hard	*Prosopis glandulosa* Torr.*
41 LK 88	Test Pit 2, Level 3	A.D. 940 (TX-3607)	1.1 g	________	cf. *Prosopis glandulosa* Torr.*
	Test Pit 2, Level 3	A.D. 940 (TX-3607)	3.9 g	________	cf. *Fraxinus* sp.*
	Test Pit 2, Level 3	A.D. 940 (TX-3607)	2.6 g	________	cf. *Acacia* sp.*
	Test Pit 2, Level 3	A.D. 940 (TX-3607)	4.5 g	________	*Prosopis glandulosa* Torr.*
	Test Pit 2, Level 3	A.D. 940 (TX-3607)	2.9 g	________	cf. *Acacia* sp.*

*Information on these samples is from Kathleen Volman's identification
**All radiocarbon dates are MASCA corrected (Ralph, Michael, and Han 1973).

41 LK 201: Date--1300 B.C.

Eight pieces of charcoal weighing 138.5 grams were examined. Most of the charcoal was very fractured. Mesquite (*Prosopis glandulosa*), oak (*Quercus* sp.), and specimens identified only as hardwood were present at this site.

41 MC 17: Undated.

One charcoal specimen weighing 3.0 grams was identified as mesquite (*Prosopis glandulosa*).

41 MC 30: Undated.

One piece of charcoal weighing 0.9 grams was identified as mesquite (*Prosopis glandulosa*).

41 MC 201: Date--1140-1110 B.C.

One specimen weighing 10.5 grams was identified as mesquite (*Prosopis glandulosa*).

41 LK 88: Date--A.D. 940

Five charcoal specimens weighing 15.0 grams were examined. One specimen was identified as mesquite (*Prosopis glandulosa*). The other specimens were tentatively identified as mesquite, ash (*Fraxinus* sp.), and *Acacia* sp.

Interpretation

Watts (1973) has maintained that plant macrofossils provide concrete evidence that a particular plant was growing in the locality at the time period of deposition. Pollen, on the other hand, provides information of regional instead of local significance. Since the sites were located either within or adjacent to the Frio River erosional breaks, I cannot extrapolate these data beyond the immediate areas within which the charcoal samples were found, nor can I speculate as to the size or density of the wooded stands or the grasslands that grew among them. However, these results do answer a few questions regarding the nature of prehistoric vegetation in south Texas.

In general, the environment of south Texas has not changed drastically over the last 2000-3000 years which are covered by the confirmed identifications made in this study. Mesquite (*Prosopis glandulosa*), desert hackberry (*Celtis pallida*). acacia (*Acacia* sp.), and live oak (*Quercus virginiana*) were all present as early as 2700 years ago (Table 26). Plants typical of Texas riparian environments, such as ash (*Fraxinus* sp.) and willow (*Salix* sp.), were recovered from the more recent 41 MC 222 site which is dated to A.D. 1290. These results provide the first concrete evidence that mesquite, acacia, and desert hackberry did not invade the area after some recent man-induced environmental calamity. The relatively xeric shrubs have been in the region a long time--at least for 2200 years.

The woody plants identified in the analysis could have occupied topographic breaks throughout the study area, as proposed by Johnston (1963).

The identification of *Juniperus* sp. charcoal from 41 MC 29, 2200-2300 years old, does represent the first evidence of a southward expansion of its range from the Edwards Plateau. The finding is significant, although not surprising, because Adams (1977) has already maintained that *Juniperus ashei* migrated westward during the Pleistocene and northward from one limestone outcrop to another shortly after the Pleistocene. Since caliche outcrops are not uncommon in south Texas, a southerly migration could have occurred during the Pleistocene, and the 2200-year old remains of *Juniperus* sp. from McMullen County document what was probably at that time a relict stand in the area. The site is located 135 km south of the modern distributional limits of *Juniperus ashei* (Adams 1975).

The presence of *Juniperus* sp. *in situ* with xeric shrubs presently common in south Texas indicates the possibility that the prehistoric vegetation was less differentiated than is the case today; i.e., there was a greater species abundance, at least in the case of woody species, in the area. A smiliar situation has been documented in the Big Bend region by Wells (1966), who found vegetational elements of the Chihuahuan Desert in association with woodland elements in samples dated from the Pleistocene. Today these woodland elements are restricted to higher elevations in west Texas. On the western edge of the Edwards Plateau in the Lower Pecos River region, *Juniperus ashei* still grows in association with most of the woody plants present today in the Choke Canyon Reservoir area. The elements of this ancient south Texas vegetation community became segregated gradually with the onset of more severe environmental conditions present in the area today, during which time the junipers expired. Quite probably only isolated stands of juniper grew on several limestone outcrops in south Texas, and these stands subsequently died off over the last few thousand years.

CONCLUSIONS

The limitations of this study did not allow a comprehensive vegetation reconstruction for the Choke Canyon Reservoir area. However, there was no indication that a drastic change in the environment or vegetation occurred in the area during the time period covered by this study. Mesquite, desert hackberry, acacia, and probably other xeric shrubs were definitely growing in the area 2000-3000 years ago. These plants probably occupied rocky uplands and erosional breaks in the vicinity of the Frio River.

The fragments of ash and willow charcoal which were identified in the study represent elements of an ancient riverine floodplain woodland present on the Frio River around A.D. 1290.

The presence of juniper *in situ* with typical southern Texas xeric shrubs could have been significant because juniper was a fairly important natural resource to the native Americans of the Southwest (Yanovsky 1936). In addition, the junipers could have been accompanied by other Edwards Plateau flora and fauna, resulting in greater species abundance and a more varied subsistence base than was available to the local inhabitants by the time of the first European contact.

Adams (1977) and Wells (1966) cautiously refer to a westward expansion of Edwards Plateau biota during the Pleistocene. Now that juniper has been discovered in the prehistoric vegetation of southern Texas, it is possible that a concurrent southward expansion also occurred.

SUMMARY

Charcoal samples from four archaeological sites in the Choke Canyon Reservoir area were examined for identification. The four sites ranged from 4300-700 years in age. The oldest charcoal specimens that were positively identified were 2700 years old.

A charcoal reference collection of woody species from the Choke Canyon Reservoir area was assembled for the study. The analysis resulted in the identification of seven woody plants: willow (*Salix* sp.) and ash (*Fraxinus* sp.) dated to A.D. 1290; acacia (*Acacia* sp.) dated to 780 B.C.; mesquite (*Prosopis glandulosa*), live oak (*Quercus virginiana*), desert hackberry (*Celtis pallida*), and juniper (*Juniperus* sp.) dated to 390-270 B.C. Material from the oldest site, 41 LK 31/32, was in very poor condition and was not identified.

The limitations of this study did not allow a comprehensive vegetation reconstruction for the Choke Canyon Reservoir area, but the analysis revealed several interesting points about prehistoric vegetation in southern Texas:

(1) The genus *Acacia* was growing in the area as early as 780 B.C.

(2) Mesquite and desert hackberry, both relatively xeric shrubs, were growing in the area as early as 1300 B.C. and 390-270 B.C., respectively.

(3) Junipers, probably the Edwards Plateau *Juniperus ashei*, were growing in the region around 390-270 B.C. This represents a 135 km southward extension of the modern range of these junipers.

(4) The south Texas junipers probably migrated into the area during the Pleistocene, and the specimens collected from the Choke Canyon Reservoir area probably represent a relict stand which was growing in the area about 2200 years ago.

(5) The possibility exists that the presence of juniper at archaeological sites in south Texas is a sign of a general incursion of Edwards Plateau biota. Such an incursion would have significantly increased the species abundance and the availability of natural resources to the prehistoric peoples of southern Texas.

REFERENCES CITED

Adams, R. P.

1975 Gene Flow Versus Selection Pressure and Ancestral Differentiation in the Composition of Species: Analysis of Populational Variation of *Juniperus ashei* Buch. Using Terpenoid Data. *Journal of Molecular Evolution* 5:177-185.

1977 Chemosystematics--Analyses of Populational Differentiation and Variability of Ancestral and Recent Populations of *Juniperus ashei*. *Annals of the Missouri Botanical Garden* 64:184-209.

Bentley, H. L.

1898 Cattle Ranges in the Southwest: A History of the Exhaustion of the Pasturage. *United States Department of Agriculture, Farmers Bulletin* 72.

Blair, W. F.

1950 The Biotic Provinces of Texas. *The Texas Journal of Science* 2:93-117.

Bray, W. L.

1901 The Ecological Relations of the Vegetation of Western Texas. *Botanical Gazette* 32:99-123, 195-217, 262-291.

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

1977 The Late Quaternary Paleoenvironment of Texas: A Model for the Archeologist. *Bulletin of the Texas Archeological Society* 48:1-25.

Cook, O. F.

1908 Change of Vegetation on the South Texas Prairies. *United States Department of Agriculture, Bureau of Plant Industry Circular* 14.

Cottle, H. J.

1931 Studies in the Vegetation of Southwestern Texas. *Ecology* 12(1): 105-125.

Dice, L. R.

1948 *The Biotic Provinces of North America*. University of Michigan Press, Ann Arbor.

Gould, F. W.

1969 *Texas Plants: A Checklist and Ecological Summary*. The Texas A&M University System. The Texas Agricultural Experiment Station. MP-585, Revised.

Harris, D. R.

1966 Recent Plant Invasions in the Arid and Semi-Arid Southwest of the United States. *Annals of the Association of American Geographers* 56:408-422.

Huss, D. L.

1959 Brush Types of the Nueces River Watershed as Related to Soil, Climatic, and Geological Factors. Unpublished Ph.D. dissertation, Texas A&M University, College Station.

Inglis, J. M.

1964 A History of Vegetation on the Rio Grande Plain. *Texas Parks and Wildlife Department Bulletin* 45.

Johnston, M. C.

1963 Past and Present Grasslands of Southern Texas and Northeastern Mexico. *Ecology* 44:456-466.

Johnston, M. C. and D. Darr

1977 Vegetational Survey. In Cultural Resource Survey of Choke Canyon Reservoir, Live Oak and McMullen Counties, Texas, by W. M. Lynn, D. E. Fox, and N. O'Malley:247-255. *Texas Historical Commission, Archeological Survey Report* 20.

Leney, L. and R. W. Casteel

1975 Simplified Procedure for Examining Charcoal Specimens for Identification. *Journal of Archeological Science* 2:153-159.

Ralph, E. K., H. N. Michael, and M. C. Han

1973 Radiocarbon Dates and Reality. *MASCA Newsletter* 9(1):1-20.

Smith, J. G.

1899 Grazing Problems in the Southwest and How to Meet Them. *United States Department of Agriculture, Division of Agrostology, Bulletin* 16.

Tharp, B. C.

1939 The Vegetation of Texas. *Texas Academy of Science Publications in Natural History, Non-Technical Series* 1.

Van Devender, T. R., C. E. Freeman, and R. D. Worthington

1978 Full Glacial and Recent Vegetation of the Livingstone Hills, Pecos County, Texas. *Southwestern Naturalist* 23:289-302.

Watts, W. A.

1973 Rates of Change and Stability in Vegetation in the Perspective of Long Periods of Time. In *Quaternary Paleoecology*, edited by E. J. Cushing and H. E. Wright:195-206. Yale University Press, New Haven.

Wells, P. V.

1966 Late Pleistocene Vegetation and Degree of Pluvial Climatic Change in the Chihuahuan Desert. *Science* 153:970-975.

1970 Postglacial Vegetational History of the Great Plains. *Science* 167:1574-1582.

Yanovsky, E.

1936 Food Plants of the North American Indians. *United States Department of Agriculture, Publication* 237. Washington, D.C.

APPENDIX IV.

THE IMPACT OF BRUSH CLEARING ON ARCHAEOLOGICAL SITES IN THE CHOKE CANYON RESERVOIR

Curtis Dusek

INTRODUCTION

A major problem to be considered in the course of archaeological investigations at Choke Canyon Reservoir concerns archaeological sites that lie in areas that have been artificially cleared. It can be assumed that sites in such areas are disturbed, but the degree and extent of such disturbances is more difficult to determine. As more and more acres of land are cleared, the problem becomes more acute. The archaeologist must be familiar with the various methods of clearance that may have been utilized in a given area as well as their effect upon the land and the site, both during and after the clearing operation.

The methods employed in land clearance are generally dictated by the type of land to be cleared, type and density of covering vegetation, the options and resources available, and the desired results. The discussion will be limited to the south Texas region, particularly the area encompassed by Live Oak and McMullen Counties, although much of the information may be pertinent to other areas. With the ongoing construction of Choke Canyon Reservoir in this area, and the surveying, testing, and mitigation work on a large number of archaeological sites within the reservoir area, it was possible to observe the impact that land clearance had made upon many of these sites.

South Texas is often referred to as "the brush country," and the clearance of this brush is of primary concern in any land clearing operation. McMullen and Live Oak Counties lie in the area of Texas often designated as the Rio Grande Plain. A Soil Conservation Service (SCS) survey conducted in Texas in fall and winter 1963 revealed that in the Rio Grande Plain 93% of the land was infested by brush; the majority of this was under thick infestation (more than 20% canopy; Smith and Rechenthin 1964:7). In another survey conducted by the SCS in 1958 and 1959 it was learned that about 73% of the uncontrolled brush in the Rio Grande Plain is now of a density exceeding 45% ground coverage and a height exceeding 7.5 feet. Another 20% had an infestation below this, but with a density exceeding 25% and a height of over 2.5 feet. It was also learned that the severity of brush infestation on uncontrolled rangeland has increased very slowly over the last 30 years (Davis and Spicer 1965:8). Perhaps the intensity of the brush problem was best stated by John Young, who as far back as the 1880s remarked:

> I have been snagged by the stubble brush of northern New Mexico and southern Colorado--and that brush is bad. I have dodged through the splintering cedar brakes of the Llano hills--and that brush is bad too. I made what I consider my record ride after a stampeding herd of five hundred wild horses through a great blackjack thicket east of the San Antonio River--and that brush is worse. I am acquainted with the 'tornillo' tangles of the upper Rio Grande. I worked for years in the 'mogotes' of huisache and mesquite in San Patricio and

> Nueces counties, sometimes following cows and sometimes cow thieves--and brush is so bad that it could hardly be worse. Nevertheless, by and large, taking it thicket after thicket, the worst brush in the United States of America that I know anything about is what the Mexicans used to call the Brasada, in McMullen, Webb, Duval, and Live Oak, and other counties between the Nueces River and the Rio Grande (Dobie 1943:190-191).

Various methods of clearing have been utilized, each having a somewhat different effect upon the land. Each of these methods will be discussed, with emphasis given to their possible impact upon archaeological sites which may lie within their area of use.

HAND METHODS

Before the introduction of heavy machinery into the area it was necessary to clear the land by hand. Hand methods are generally slow and costly, making them limited in usage. Common methods of hand clearing are grubbing, cutting, girdling, and burning (Rechenthin *et al.* 1964:3). Henry Dusek of McMullen County stated that when they first settled in the county in the 1930s the brush was cleared by hand, using a grubbing hoe to dig it out of the ground. The larger trees were cut down, and soil was dug away from the stumps in order to expose some of the stump below the surface. The brush and debris from the tree were then piled over the stump and ignited. More brush was generally added daily to keep the fire burning. After several days the stump was completely burned, leaving only a hole full of ashes where the stump previously existed. Prickly pear was often cut down, and, using a pitchfork, placed on the burning brush to remove the thorns before feeding to cattle (Henry Dusek, personal communication).

It is obvious that if this method was utilized to clear the land over an archaeological site, the burning of stumps would tend to introduce charcoal into the soil as the stump and roots burned downward. If archaeological work was then carried out on the site some years later, this charcoal might be mistaken to be of prehistoric origin. This would be especially true if brush was allowed to reinvade the cleared land, making it appear in later years to be undisturbed. If the land was kept cleared or placed under cultivation (more disturbance), the possibility of intrusive charcoal might be more readily apparent to the archaeologist.

It would be extremely difficult if not impossible on a site cleared by this method to determine the locations where individual plants had been grubbed. Grubbing would be particularly harmful to shallow sites, although the degree of harm would depend primarily on the amount of brush removed by this method. If mesquite was grubbed out, it might often be necessary to dig 14 to 16 inches beneath the surface to remove the bud zone and thus prevent resprouting (Rechenthin *et al.* 1964:3).

Simple cutting and girdling of trees and brush would not tend to harm an archaeological site unless subsequent burning of debris was carried out, leading to the possibility of intrusive charcoal.

POWER METHODS

With the introduction of the crawler tractor into the Live Oak-McMullen Counties area in the late 1930s and early 1940s (Joe Coughran, Soil Conservation Service agent, McMullen County, personal communication), the possibility of clearing land on a large scale was realized. Basically there are four major methods of clearing land using power equipment: (1) complete removal of trees and stumps by physically uprooting them, and then moving them into piles for disposal by burning or other means; (2) shearing the vegetation off at ground level and removal to windrows or piles for burning; stumps and roots can be removed, left to decay in the soil, or shattered in subsequent operations by root plowing or harrowing; (3) knocking down all vegetation and crushing it for later burning in place; and (4) plowing and chopping the vegetation into the top 6 to 8 inches (15 to 20 cm) of the soil in a once-over plowing operation. The vegetation is allowed to decay before a crop is planted or while the crop is growing (Caterpillar Tractor Company 1974).

The method of clearing employed depends primarily on the end use to which the cleared land will be put. For each method various types of equipment can be utilized. Following is a discussion of the various types of equipment and methods employed and their possible effect upon archaeological sites over which they are utilized.

Dozing

This method of land clearing employs the use of the straight or angling bulldozer blade, sometimes with specialized attachments. Dozing is one of the most effective methods for controlling larger trees and brush because it pushes or pulls them out by the roots. It is most applicable to open stands of large trees and brush or for use in rocky soils where other means are limited. It is not very effective in thick stands of mesquite or chaparral because of the many species which will resprout (Rechenthin *et al.* 1964:8). Often, when a large tree which cannot be pushed over is encountered during dozing operations, then it must be dug out. While in use the bulldozer blade often has the disadvantage of removing areas of valuable topsoil. It is also not very effective during piling operations because it takes too much soil to the windrows with the brush (Caterpillar Tractor Company 1974:32).

The effects of dozing on archaeological sites can be somewhat variable. If a large number of trees are dug up on a site, the result can be devastating, expecially to shallower sites. Also, on shallow sites the movement of topsoil containing cultural debris can be quite damaging, destroying features and disrupting artifact provenience. The depth of penetration of the bulldozer blade into the soil is variable. At best the archaeologist should regard the horizontal and vertical provenience of artifacts recovered from shallow sites that have been bulldozed with a certain amount of suspicion.

Raking

Raking consists of clearing land with a toothed or rakelike "stacker" with teeth 5.5 to 14 inches apart utilized instead of the solid bulldozer blade. The teeth pull the plants out by the roots and break up the soil surface (Rechenthin *et al.* 1964:7). Various types of rakes are manufactured, each designed for a specific purpose. Rakes have the advantage of letting soil sift through the teeth, while at the same time ripping out and pushing forward rocks, stumps, and brush (Caterpillar Tractor Company 1974:32).

Used alone, raking would not cause a great deal of damage to subsurface archaeological material except in spots where stumps and other larger forms of vegetation were uprooted. However, artifacts and cultural features exposed on the surface could be damaged and their proveniences disrupted by raking operations. Raking is often followed by some other operation such as root plowing or disking, which would also have to be considered in determining the extent of damage to an archaeological site.

The eastern end of one site in McMullen County, 41 MC 55, appeared to have been raked with no subsequent follow-up operation. Large piles of unburned debris remained on the site, and the area was rapidly being reclaimed by a dense growth of whitebrush. Shallow basins were noted where large trees had been uprooted, and which were slowly being refilled by soil. Three test pits were placed in this area of the site. If any subsurface disturbance was caused by the raking, it was not observed.

Chaining

In the chaining operation, a naval anchor chain at least 100 feet long with links of 80 pounds or more is pulled behind two tractors, uprooting vegetation as it is dragged along. Two-way chaining, pulling the chain first in one direction and then in the opposite direction, is generally more effective than one-way chaining. Chaining is most effective on single-stemmed trees such as oaks, blueberry juniper, and tree-type mesquites growing on loose, sandy or shallow soils, or in moist soils where the roots can be easily pulled out. In brush the chain often simply bends over or breaks off the tops, permitting prolific resprouting (Rechenthin *et al.* 1964:7-8).

Chaining, much like raking, would not be expected to disrupt subsurface archaeological material a great deal except in spots where larger vegetation was uprooted. On sites covered by dense groves of larger trees this could be somewhat damaging. As with raking, however, artifacts and features exposed on the surface could be damaged and proveniences disrupted by chaining activities. Chaining is often followed by some other operation, such as raking and root plowing. In some cases chaining may be used alone. If this is the case, brush can quickly reclaim the area, making it appear undisturbed; this is a situation in which the archaeologist must be cautious.

Railing

Railing is a method of clearing primarily for the control of prickly pear and tasajillo in south Texas. The rail drag generally consists of three to nine railroad rails or heavy angle irons chained or welded together in tandem in sets of two or three. The rails are dragged twice over an area in opposite directions, crushing most of the cactus stems and pads. Cattle are sometimes turned into the newly cleared area to clean up crushed, broken pads and to prevent their taking root. Railing can also be used in areas having small brush (Rechenthin *et al.* 1964:9).

Generally the only major effect railing will have on an archaeological site is the disturbance of artifacts and features exposed on the surface. Due to the fact that railing is not often utilized in areas where large trees or brush are present, the uprooting of such larger vegetation is not often a problem. If obstructions such as large trees are present however, the tractor operator may utilize the dozer blade to remove such obstructions, causing a certain amount of disturbance if done on an archaeological site.

Railing operations were carried out on the Bracken Ranch in 1977, exposing the site of Skillet Mountain #4 (41 MC 222). Other than a small amount of disturbance caused by the dozer blade skimming the surface of the site, the majority of subsurface material appeared to have remained fairly well intact.

Chopping

A chopper is basically a roller equipped with cutting blades. Choppers can vary in size, some 15,000 to 20,000 pounds and larger. The blades are generally 8 to 14 inches apart. Medium-sized brushlike condalias, granjeno, catclaw, blackbrush, acacia, and guajillo can be effectively cut with a weight of about 1500 to 2000 pounds per linear foot of cutter blade. Larger choppers are needed for average mesquite and similar-sized trees (*ibid.*:10).

Choppers are available either as self-propelled models or as models pulled by track-type tractors. Often the drum of the chopper can be filled with water to increase its weight (Caterpillar Tractor Company 1974:42).

As the chopper is pulled over brush, the blades cut, fracture, and shatter growth, penetrating 6 to 10 inches (15 to 25 cm) deep. The soil crust is furrowed and loosened, with a minimum amount to topsoil disturbance. The woody vegetation is left in a thick flattened mat (*ibid.*).

One of the main disadvantages of chopping is that it cannot be used on large diameter trees; also, in order for the vegetation to be burned in place, it must be left for long periods of time to dry thoroughly (Rechenthin *et al.* 1964:42). Chopping is only a temporary method of brush control, since resprouting soon follows. Therefore, it is only effective where repeated treatment is planned, or where additional follow-up methods that more effectively kill the brush are used (*ibid.*).

Chopping alone would not be expected to greatly disturb archaeological sites. The chopper would not tend to severely displace surface cultural material, and since vegetation is not uprooted, disturbance due to this would not occur. Penetration of the blades into the topsoil might cause minimal disturbance to shallow sites, but this would be negligible compared to disturbances caused by other means of clearing.

Chopping or chaining were the most commonly used methods during the earliest years of brush control in the Rio Grande Plain. During the period 1932 through 1949, chaining or chopping accounted for almost all of the acreage put under brush control. These methods showed a marked increase in usage during the period 1950 through 1955, but have declined in use after that time (Davis and Spicer 1965:25). Chopping is not commonly used in the Live Oak-McMullen Counties area today. Robert Matulla of Mesquite Construction Co. in McMullen County (personal communication) stated that he does not generally utilize this method because the chopper is hard on the track-type tractor pulling it.

Hydromower

One of the newer devices designed to clear brush is the Hydromower. The Hydromower utilizes a large shredding device to reduce small trees and brush to a chopped mulch in seconds as it passes over them. With the Hydromower, 1.5 acres of dense, heavy underbrush can be disposed of in an hour. The height of the cutter and rpm of the blade are controlled by the operator. The Hydromower is well suited for brush control on power lines and highway right-of-ways, fence lines, industrial plant sites, and other applications (Pettibone Hydromower n.d.).

The Hydromower does not kill brush, so to prevent resprouting subsequent follow-up operations must be utilized. A site over which the Hydromower is used to clear brush would not suffer any apparent disturbance. The Hydromower, however, has yet to be widely used as a common means of clearing large acres of brush in south Texas.

Disc Harrows

Heavy-duty offset and gang harrows can be highly effective in land clearance. The harrows are generally pulled by a track-type tractor equipped with a bulldozer blade. The vegetation is bent over with the dozer blade and then cut and chopped into the soil by the harrow. In small brush the dozer blade is not needed (Caterpillar Tractor Company 1974:44).

Various sizes and configurations of disc harrows are manufactured, and are primarily designed for breaking ground and plowing, pulverizing, and mixing vegetation into the soil. Some harrows are designed for penetration to 19 inches (482 mm) into the soil (*ibid.*:22-24).

Due to its mixing action, the disc harrow can be very damaging to shallow archaeological sites, tending to disturb artifacts and features. The depth of damage will depend upon the type of harrow used. Often raking will precede the harrowing of land. If the raked debris is burned and then harrowed, it can result in charcoal being intermixed with the cultural debris of an archaeological site.

Root plowing

Root plowing is a means of brush control in which a horizontal blade is pulled below the ground surface behind a track-type tractor, cutting off brush below the surface in the process. Root plows range from small six-foot blades to large 14-foot blades. Fins or projections welded to the top of the blade force roots up and out of the ground, thus reducing the chance that the plant may take root and continue to grow. Root plowing normally kills 90% or more of the brush (Rechenthin *et al.* 1964:13). Root plowing, however, is not applicable to large-sized trees, and does not tend to work well in sandy or wet soils (Caterpillar Tractor Company 1974:21).

Root plows are designed to kill brush and other forms of vegetation by undercutting them at the crown or bud ring, and in the process to shatter hard surface crusts and hardpan, resulting in better water retention and preparation of a good seedbed. The depth of the plow can vary from 8 to 20 inches (20 to 50 cm). Normally the root plow is operated in the "float" position, with depth controlled by a depth setting arrangement with several adjustments (*ibid.*:35). Generally a depth of 14 to 16 inches is required to kill mesquite, with lesser depths for other forms of brush (Rechenthin *et al.* 1964:13). Robert Matulla (personal communication) states that most root plowing averages about 12 inches in depth, but that it can vary with different types of brush.

About 30% of rangeland in the Rio Grande Plain has been subjected to some form of brush control, of which about 18% has been root plowed and seeded (Davis and Spicer 1965:27). The practice of root plowing has increased since about 1955; it represented about one-fourth of all control for the period from 1956 to March 1960 (*ibid.*:25). Root plowing in the McMullen County area first began about 1954, with seeding being done by hand (Joe Coughran, personal communication).

In relation to its degree of disturbance to archaeological sites, root plowing is often considered one of the more damaging forms of land clearance. Surface as well as subsurface cultural artifacts and features can be displaced and damaged. The depth of disturbance caused by root plowing is generally the problem given the most serious consideration. Since the depth of root plowing often varies, there is no definitive answer, and the archaeologist must use his best judgment in dealing with the situation. The upper 12 inches, however, should be the most highly suspected of root plowing disturbance, with greater depths of disturbance still possible. Land that is to be root plowed is often first chained and/or raked to clear away as much surface vegetation as possible before the root plowing begins.

CHEMICALS

Today chemicals are being widely used in the fight to control brush. Some of the more widely used chemicals are oils, ammates, liquid hormone herbicides, and pelletized materials, with new materials constantly being tested. Various forms of application, such as basal treatment, ground spraying, and aerial spraying, are utilized in the application of chemicals to brush (Rechnethin *et al.* 1964:15-26).

A lengthy discussion of the various chemicals and their methods of application is unnecessary since their intended end result is the in-place killing of the vegetation to which they are applied. The use of chemicals alone to control vegetation should not disturb the cultural material in an archaeological site;

however, if subsequent operations such as raking are carried out for the removal of the dead vegetation, then these must be considered in any determination of the degree of disturbance caused to a site.

PROBLEMS POSED BY LAND CLEARANCE

The impact that land clearance can have upon archaeological sites was readily apparent during archaeological work in the proposed Choke Canyon Reservoir area. Of the minimal testing and surface collecting carried out on the 59 sites in the McMullen County portion of the reservoir, 24 (over 40%) of the sites lay entirely or partially on lands that had been cleared. This does not take into account roads or *senderos* that cut through sites. Of the 33 sites in the Live Oak County portion of the reservoir, 18 (over 54%) of the sites were wholly or partially in cleared lands. Therefore, it can be seen that 42 (over 45%) of the 92 sites subjected to minimal testing and surface collecting in the Choke Canyon Reservoir area were in some degree affected by land clearance (Nueces River Project, minimal testing and surface collection site notes).

Archaeological sites that were situated on cleared lands planted in coastal Bermuda following clearance operations posed several special problems. The coastal Bermuda tended to conceal surface material, thus making surface examination and collection on such sites difficult. Large cores were generally the only cultural material readily visible on such sites, with smaller items such as flakes, bifaces, and mussel shells visible only in road cuts, washes, and areas denuded of grass. The coastal Bermuda can also hide areas in which the vegetation was stacked and burned during clearing operations. This problem arose during testing of site 41 MC 9, which lay in cleared land planted with coastal Bermuda. Test Pit 2 was unknowingly laid out over such an area, and it was not until after two levels were dug and large chunks of charcoal began to appear that the earlier stacking and burning were apparent. Work on the test pits was then terminated.

Archaeological surveying in lands planted in coastal Bermuda can be especially difficult. Although such areas are conducive to the walking of well-spaced and unhindered transects by survey crews, the concealment of surface cultural debris by the coastal Bermuda makes site identification difficult. This problem was encountered during site surveying in September 1979 in a coastal Bermuda field near San Miguel Creek as well as surveying near the headwaters of Elm Creek in McMullen County. In some areas the grass was especially dense, making surface examination impossible. Sites were, however, located in areas where the grass was sparse or in small areas denuded of grass, revealing surface cultural material. Whether or not there was some association between archaeological sites and areas where coastal Bermuda was sparse or absent could not be determined. The grass also tended to hinder the determination of site boundaries in areas where it was dense.

Sites situated in regularly cultivated fields also present a variety of problems. Disturbance to both surface and subsurface cultural material within the plow zone is an ongoing process. When crops are not growing, a large quantity of cultural material is often present on the surface, especially if the site is somewhat shallow. It is generally possible to determine the boundaries of sites lying in cultivated fields, and in the Choke Canyon area the boundaries of many such sites were mapped with what we considered to be a good degree of accuracy. It was also possible to note surface concentrations of various materials in such situations and to map them if desired.

Historical sites lying within cleared areas can be heavily damaged by clearing operations. Many such instances were encountered during work in the Choke Canyon area. Such sites generally consisted of the remnants of sandstone houses and chimney foundations, with fragments of pottery, glass, metal objects, and other household goods strewn about the surface. During clearing operations many of the sites would be almost totally destroyed, with much of the sandstone rubble often being pushed or carried out of the cleared area, sometimes to be used as fill for small washes. In certain instances the lower portion of the chimney foundation would be the only portion that remained intact.

In dealing with archaeological sites lying within cleared lands, there are basically three general steps that the archaeologist must follow:

1. The archaeologist must first determine whether the land has been cleared. This may sound like a simple task, but under certain circumstances in which the land is cared for improperly following clearing activities, the vegetation may regrow to a state in which it may be indistinguishable from vegetation in a noncleared area. The rapid rate at which brush can reclaim cleared lands in south Texas makes this problem particularly difficult. Generally lands which have been only chained, railed, or raked, without subsequent operations at later periods to control brush regrowth, are very susceptible to rapid regrowth. This can also occur in fields which were at one time cultivated but later abandoned, although regrowth is generally at a much slower rate since the brush must "reinvade" the area. Mesquite is the most common form of brush to quickly reclaim cleared land, and dense stands of mesquite, all of which are about the same age, are often good indicators of once-cleared lands. Land owners, tenants, or local people may also be able to remember if the land under question was at one time cleared.

2. The method or methods utilized in clearing the land under question should be determined. This is of primary importance in revealing the extent and degree of disturbance. Land owners or tenants are generally able to supply such information if there is some doubt as to the methods used.

3. The most difficult problem is determining the degree of disturbance that land clearance has had upon a site. Due to the large number of variables present in any situation, this is almost impossible to determine to any degree of precision. The archaeologist must deal individually with each case attempting to isolate the degree of disturbance in each situation so that it will not distort the overall picture. With knowledge of the various factors involved, however, the archaeologist can have confidence in his decision.

SUMMARY

With the ever increasing intensity of land clearance, the problem of archaeological sites lying within cleared areas will continue to grow. Dealing effectively with such sites is of major importance if they are to yield information that can be effectively applied to an overall cultural framework. Special emphasis must be placed upon the isolation of information which may have been skewed due to clearing activities. Knowledge of various methods of land clearance and their possible degree of disturbance to archaeological sites is essential in order to recognize and isolate such information. Disturbances related to subsequent usage of the land following clearing operations must also be recognized and effectively dealt with. With proper care, however, even sites lying within cleared areas can continue to be valuable sources of potential information for the archaeologist.

REFERENCES CITED

Caterpillar Tractor Company

1974 *The Clearing of Land for Development*. Form AEA 13009.

Davis, R. B. and R. L. Spicer

1965 Status of the Practice of Brush Control in the Rio Grande Plain. *Texas Parks and Wildlife Department, Bulletin* 46.

Dobie, J.

1943 *A Vaquero of the Brush Country*. Little, Brown and Company, Boston.

Pettibone Hydromower

n.d. Bulletin No. P-2203A.

Rechenthin, C. A., H. M. Bell, R. J. Pederson, and D. B. Polk

1964 *Grassland Restoration, Part II: Brush Control*. United States Department of Agriculture, Soil Conservation Service, Temple, Texas.

Smith, H. N. and C. A. Rechenthin

1964 *Grassland Restoration, The Texas Brush Problem*. United States Department of Agriculture, Soil Conservation Service, Temple, Texas.

APPENDIX V.
AN ANALYSIS OF UNIONIDS (FRESHWATER MUSSELS) RECOVERED IN PHASE I ARCHAEOLOGICAL INVESTIGATIONS AT CHOKE CANYON RESERVOIR

Harold D. Murray*

INTRODUCTION

Most unionids (freshwater mussels) collected from prehistoric sites at Choke Canyon were fragmented. Specimens which were either fragments of valves or hinge lines too small for positive identification were recorded as specimens to show overall density of occurrence within the sites. Species and generic identifications were made in those cases where sufficient umbo, hinge line, pseudocardinal teeth, lateral teeth, and/or shell surface pattern were preserved for accurate determinations. Every attempt was made to be conservative by identifying only those specimens with sufficient characteristics for positive identifications.

Identification by fragments is, at best, difficult. To improve the quality and quantity of identifications, comparisons of unionid fragments were made to the extant unionid fauna in the immediate area of the Frio River. In addition, species and records of species obtained from the Nueces River drainage (the Frio River is a tributary of the Nueces River) were examined and compared to the fragments of unionids recovered from the Choke Canyon prehistoric sites.

The following species were identified in collections made at the sites:

Lampsilis anodontoides	*Megalonaias gigantea*
Cyrtonaias tampicoensis	*Quadrula quadrula*
Carunculina parva	*Quadrula aurea*
Fusconaia flava	*Leptodea fragilis*
Amblema plicata	

The above nine species presently occur in the Nueces River drainage. Although extensive field work has not been undertaken on the Frio River, these species are expected in the extant fauna of the river. The following genera were identified and are briefly discussed.

Lampsilis sp. Most specimens identified as *Lampsilis* sp. were probably *Lampsilis anodontoides*, but there is the possibility of *Lampsilis hydiana* in the collections. Because umbo fragments of *Lampsilis anodontoides* and *Lampsilis hydiana* are similar, no differentiation was attempted on questionable fragments.

Quadrula sp. The hinge lines of most species of *Quadrula* are similar. There were at least two species of *Quadrula* in the collections, *Quadrula aurea* and *Quadrula quadrula*; therefore, species identification of small fragments was not possible.

*Professor of Biology, Trinity University

Amblema sp. Most, if not all, of the *Amblema* sp. were probably *Amblema plicata*; however, some small fragments examined did not allow positive identification as to species.

Villosa sp. There is doubt that *Villosa* sp. actually occurred in the collection. This is a genus having a small shell size closely resembling *Carunculina parva*. Shell differentiation of *Villosa* and *Carunculina* is based on differences in the umbo sculpture. The *Villosa* sp. listed have worn umbos; therefore, the identifications may be an error. These specimens of *Villosa* sp. may be malformed *Carunculina parva*.

Truncilla sp. Occurrence of *Truncilla* sp. in this geographic area was unexpected. It does occur in east Texas. Shell configuration of this genus is such that there is little doubt that *Truncilla* sp. is a correct identification.

Each site will be considered separately, with a discussion of observations relating to unionids from that site followed by a summary for that site. Sites are presented in an east to west order as they are situated over the project area.

SITE DISCUSSIONS AND SUMMARIES

41 LK 67, Area A

Discussion

The following species and numbers of specimens were obtained from 41 LK 67, Area A:

Species	No. of Specimens
Lampsilis anodontoides	4
Lampsilis sp.	476
Cyrtonaias tampicoensis	514
Carunculina parva	16
Amblema sp.	1
unidentified fragments	298

Cyrtonaias tampicoensis and *Lampsilis* species (994 specimens) were the unionids most commonly occurring in Area A of 41 LK 67. The large number of identified specimens of small shell size and the occurrence of 16 specimens of *Carunculina parva* indicate that some specimens were collected in shallow water (less than 60 cm in depth). Shallow water collecting by the inhabitants is further suggested by the presence of one specimen of a sphaeriid in Level 5 of N906 E1002. Sphaeriids are fingernail clams (less than 15 mm shell length) which normally occur in shallow water (less than 30 cm in depth). This is the only sphaeriid recorded in this study. Its presence may be as a contaminant on other materials removed from the water and brought to the campsite by the inhabitants.

Summary

Cyrtonaias tampicoensis and *Lampsilis* species are the unionid species most commonly represented in the Area A collection. *Carunculina parva* and the one sphaeriid indicate that some of the specimens were collected in shallow water (less than 60 cm in depth).

41 LK 67, Area C

Discussion

The following species and numbers of specimens were identified from 41 LK 67, Area C:

Species	No. of Specimens
Lampsilis anodontoides	90
Lampsilis sp.	500
Cyrtonaias tampicoensis	1610
Carunculina parva	22
Amblema sp.	4
Villosa sp.	3
Quadrula aurea	1
Quadrula sp.	11
unidentified fragments	5792

This is the only collection in which *Villosa* sp. was recovered. Since *Villosa* sp. has never been recorded in this area of Texas, and since the specimens had worn umbos, there is some doubt that this identification is correct. The three *Villosa* sp. may be *Carunculina parva*, possibly unusual forms. *Cyrtonaias tampicoensis* and *Lampsilis* species are the most common shells recognized in the Area C collection. The high number of these groups in comparison to the other species correlates to the relationships of numbers in the extant unionid fauna.

Carunculina parva normally inhabit shallow water (less than 60 cm deep). Below is the stratigraphic distribution of *Carunculina parva* from 41 LK 67, Area C:

Level	*Carunculina parva*
1	0
2	7
3	5
4	6
5	4
6-10	0

This suggests that both Late Archaic and Late Prehistoric inhabitants at 41 LK 67 obtained some of their material from shallow water and collected the same relative numbers of *Carunculina parva*.

The overall pattern of numbers of specimens and distribution of specimens in 41 LK 67, Areas A and C, are similar, as the table below indicates:

	41 LK 67, Area A		41 LK 67, Area C	
Level	Identified Specimens	Unidentified Fragments	Identified Specimens	Unidentified Fragments
1	286	149	344	1586
2	193	56	525	1475
3	190	31	480	1089
4	154	33	447	945
5	105	22	365	556
6	43	5	53	91
7	15	0	14	42
8	9	1	5	4
9	9	1	0	3
10	1	1	1	1
11	5	0	-	-

Summary

The following observations can be made with regard to unionids at 41 LK 67, Area C:

1. *Cyrtonaias tampicoensis* and *Lampsilis* species served as the primary species of unionids used for food in Area C at 41 LK 67.

2. There are units within Area C where densities of mussel shell were notably higher than in adjacent units.

3. There is no apparent change in species composition or numbers of specimens between distinct cultural components (Late Archaic and Late Prehistoric) recognized in the Area C remains.

4. Occurrence of *Carunculina parva* confirms that some specimens were collected from shallow water (less than 60 cm deep).

5. There is a similarity in composition of unionid assemblages between Area A and Area C of 41 LK 67, based on numbers of specimens and species per level.

41 LK 41

Discussion

The following species and numbers of specimens were obtained from 41 LK 41:

Species	No. of Specimens
Lampsilis anodontoides	11
Lampsilis sp.	240
Cyrtonaias tampicoensis	638
Carunculina parva	16
Amblema sp.	1
Amblema plicata	37
unidentified fragments	159

Lampsilis species and *Cyrtonaias tampicoensis* are the unionid species most commonly represented on the site. The presence of *Carunculina parva* and small specimens of the other species indicates that most collections of unionids by the inhabitants were made in shallow water (less than 60 cm in depth).

The greatest numbers of unionids were recovered from Levels 1 through 3 at 41 LK 41, as indicated in the following list:

Level	Identified Species	Unidentified Fragments
1	545	84
2	296	30
3	248	19
4	83	14
5	59	10
6	6	1
7	7	1
8	8	0
9	0	0
10	1	0

There is an unexplained high number of *Amblema plicata* (total 33) in the surface levels excavated at 41 LK 41. No other levels of excavation included in this study show this concentration. The low number of *Amblema plicata* from other excavations and the low number of *Amblema plicata* from other levels at 41 LK 41 cannot be explained. *Amblema plicata* presently occurs in this drainage system, and it was expected in larger numbers from other excavations.

Summary

Unionid analysis at 41 LK 41 indicates that:

1. *Cyrtonaias tampicoensis* and *Lampsilis* species were the unionid species most frequently used for food by prehistoric inhabitants of 41 LK 41.

2. At least some species were obtained from shallow water as indicated by the presence of *Carunculina parva*.

3. Greatest densities of unionids occurred in Levels 1, 2, and 3 at 41 LK 41.

4. There is an unexplained high number of *Amblema plicata* occurring in Level 1 of 41 LK 41.

Unionids Recovered from Tested Sites in Live Oak County

Test pits excavated in the Live Oak County sites listed below yielded few specimens, no specimens, or no discernible pattern of activity in the site; therefore, these test pits are not considered in the remainder of this report:

41 LK 13	41 LK 74
41 LK 34	41 LK 77
41 LK 49	41 LK 91
41 LK 53	

Test pits at 41 LK 8, 41 LK 14, 41 LK 15, and 41 LK 17 will be considered because of their overall similarities. Listed below are the total numbers of identified and unidentified specimens by levels from each site:

Levels	No. of Specimens			
	41 LK 8	41 LK 14	41 LK 15	41 LK 17
1	45	223	45	5
2	80	176	69	8
3	45	165	66	14
4	38	121	26	22
5	26	54	12	82
6	28	24	17	27
7	9	35	9	7
8	11	9	12	0
9	2	11	2	0
10	1	-	-	-
11	2	-	-	-
12	1	-	-	-
13	0	-	-	-

Lampsilis species and *Cyrtonaias tampicoensis* were the most common species recovered from 41 LK 8, 41 LK 14, 41 LK 15, and 41 LK 17, and this correlates with all other excavations. *Carunculina parva* was recovered from Levels 1 through 8 in each of the four sites, and this suggests shallow water collecting for some of the specimens. *Megalonaias gigantea* was recovered from some Live Oak County sites; this species will be discussed later under "Opinions and Conclusions."

Site 41 LK 201 is reported separately because this area was excavated to Level 21, and activity appears different from the above four sites. The total number of identified specimens and unidentified fragments for 41 LK 201 are listed below:

Level	No. of Specimens	Level	No. of Specimens
1	22	12	35
2	41	13	5
3	33	14	43
4	44	15	19
5	44	16	10
6	26	17	0
7	26	18	2
8	8	19	0
9	9	20	4
10	16	21	0
11	16		

The most commonly recovered species at all sites tested in Live Oak County were *Lampsilis anodontoides*, *Lampsilis* sp., and *Cyrtonaias tampicoensis*. There was a continued appearance of *Carunculina parva* at all of these sites, indicating some collecting from shallow water.

Summary

The following observations can be made with regard to certain unionids from Live Oak County tested sites:

1. *Lampsilis anodontoides*, *Lampsilis* sp., and *Cyrtonaias tampicoensis* were the unionids most commonly used for food at tested sites in Live Oak County.

2. *Carunculina parva* occurred at all Live Oak County sites yielding unionids and suggests that collection of some unionids was from shallow water.

3. The occurrence of *Megalonaias gigantea* at 41 LK 8 is important and will be discussed further below.

41 LK 59

Discussion

The following species and numbers of unionid specimens were recovered from 41 LK 59:

Species	No. of Specimens
Lampsilis anodontoides	59
Lampsilis sp.	1169
Cyrtonaias tampicoensis	2339
Carunculina parva	90
Quadrula sp.	1
unidentified fragments	1280

Cyrtonaias tampicoensis and *Lampsilis* species were the species of unionids most commonly recovered in excavations at 41 LK 59. This is the highest number of *Carunculina parva* recovered at any site included in this study and clearly indicates many collections were from shallow water (less than 60 cm deep). The assumed use of *Carunculina parva* as a food source is amazing considering that the species averages about 25 mm in shell length.

Following are the numbers of specimens recovered from combined levels of excavation areas at 41 LK 59:

Level	Identified Specimens	Unidentified Specimens
1	488	235
2	584	242
3	714	274
4	984	262
5	720	221
6	163	46

Summary

Unionid analysis at 41 LK 59 indicates that:

1. *Lampsilis* species and *Cyrtonaias tampicoensis* were the most common species recovered at 41 LK 59 and probably served as a major source of food among the unionids collected.

2. The 90 specimens of *Carunculina parva* indicate considerable shallow water collecting by the inhabitants.

41 LK 31/32

Discussion

The following species and numbers of unionids were recovered at 41 LK 31/32:

Species	No. of Specimens	Species	No. of Specimens
Lampsilis anodontoides	29	*Amblema plicata*	1
Lampsilis sp.	29	*Leptodea fragilis*	3
Cyrtonaias tampicoensis	60	*Leptodea* sp.	2
Carunculina parva	42	*Truncilla* sp.	2
Quadrula sp.	3	unidentified fragments	148
Amblema sp.	4		

Lampsilis sp., *Cyrtonaias tampicoensis*, and *Carunculina parva* were the species of unionids most commonly represented in collections from site 41 LK 31/32. The high number of *Carunculina parva* indicates extensive shallow water collecting (less than 60 cm deep). *Carunculina parva* averages 25 mm in shell length; therefore, the large number of *Carunculina parva* in relation to other unionid species at 41 LK 31/32 suggests that the species was an important food resource.

This is the only location in which the genus *Leptodea* was identified; however, this genus may unknowingly occur in the unidentified fragments from other excavations. *Leptodea* sp. is a species uncommon to this river system; therefore, the appearance of five specimens at 41 LK 31/32, where the total number of specimens is low, is important. The age of the earliest horizons at 41 LK 31/32 (2400-3400 B.C.) suggests that *Leptodea* sp. may have been more common in the drainage at this early date.

Significant also is the occurrence of two specimens of *Truncilla* sp. in the 41 LK 31/32 assemblage. These are well-preserved specimens; thus, there is little doubt of their identification. *Truncilla* sp. has not been recorded in the southern part of the state of Texas (south of the Colorado River). If these two specimens were, in fact, collected by prehistoric inhabitants from the Frio River and were not carried in from some river to the north, this is an important record, and it suggests a faunal change since the occupation of 41 LK 31/32.

The total number of specimens, identified and unidentified, from 41 LK 31/32 are listed by level following the 41 LK 31/32 *Summary*.

Summary

With regard to unionid analysis at 41 LK 31/32, the following can be observed:

1. *Lampsilis* sp. and *Cyrtonaias tampicoensis* were the most common species of unionids recovered at 41 LK 31/32.

2. There is a surprising number of *Carunculina parva* at this location. In relative numbers, this is a high proportion compared to other excavations. This suggests a large area of shallow water and extensive collecting by the inhabitants in the shallow water.

3. The occurrence of *Leptodea* sp. at 41 LK 31/32 is unusual, considering that no other excavation shows its presence. This is particularly noteworthy considering the age of 41 LK 31/32.

4. The occurrence of *Truncilla* sp. is totally unexpected, and it is outside of the presently known geographic range. This may suggest a change in fauna in the area since 2400 B.C.

5. The small numbers of specimens do not permit clear analysis of stratigraphic or lateral distribution at 41 LK 31/32.

Level	No. of Specimens	Level	No. of Specimens
0	4	9	9
1	7	10	18
2	13	11	9
3	12	12	2
4	15	13	2
5	15	14	5
6	17	15	2
7	13	16	2
8	20		

Unionids Recovered from Tested Sites in McMullen County

Discussion

Lampsilis sp. and *Cyrtonaias tampicoensis* comprise the largest number of specimens recovered from sites tested in McMullen County. *Carunculina parva* appears in large numbers in selected areas as indicated in Table 27.

Carunculina parva occurred in other McMullen County test pits; however, Table 27 illustrates the significant number of this species from the test pits as compared to other sites.

Summary

Unionid analysis from five tested McMullen County sites indicates that:

1. The location of many of the tested McMullen County sites at some distance from the present location of the Frio River, and the large number of *Carunculina parva* at certain test pits, suggest that these unionids came from a river other than the Frio River, possibly Opossum Creek. This, however, is not confirmed.

TABLE 27. PROVENIENCE OF *CARUNCULINA PARVA* SPECIMENS

Site	Test Pit	Level	No. of Specimens
41 MC 15	3	1	4
		2	1
		4	13
		5	12
		6	5
	4	4	1
		5	2
		6	6
		7	1
		8	6
41 MC 17	1	3	2
		4	7
		5	6
		6	5
41 MC 19	1	2	7
		4	3
		5	13
		6	8
		7	2
		8	3
41 MC 30	1	1	5
		2	14
		3	12
		4	5
		5	3
		6	2
41 MC 84	1	1	1
		2	2
		3	14
		4	35
	2	1	1
		2	2
		3	3
		4	22
		5	12

2. The presence of *Megalonaias gigantea* is surprising if the above assumption is correct, as this species would not be expected in association with large numbers of *Carunculina parva*.

3. *Lampsilis* sp. and *Cyrtonaias tampicoensis* were the unionids most commonly used as a source of food by the prehistoric inhabitants of the McMullen County sites yielding mussel shell.

41 MC 222

Discussion

41 MC 222 is the westernmost area analyzed for unionids in this study. The site yields the following species and numbers:

Species	No. of Specimens
Lampsilis anodontoides	22
Lampsilis sp.	74
Cyrtonaias tampicoensis	291
Carunculina parva	4
Quadrula sp.	2
Amblema plicata	3
unidentified fragments	16

All species occurring at 41 MC 222 occur at one or more of the more eastern localities, such as 41 LK 67. The absence of *Villosa* sp., *Fusconaia flava*, and other species at 41 MC 222 is judged unimportant, since these species occur in low numbers at most locations. Their absence at any one area, in this case 41 MC 222, is not surprising.

Lampsilis anodontoides, *Lampsilis* sp., and *Cyrtonaias tampicoensis* totaled 387 specimens of the 412 collected at 41 MC 222. These two genera, therefore, are assumed to have been the major source of food from the unionids. Four specimens of *Carunculina parva* were collected, and this suggests that at least some specimens came from shallow water. *Carunculina parva* normally inhabits water less than 60 cm deep.

The numbers of specimens by level at 41 MC 222 are as follows:

Level	No. of Specimens
1	110
2	153
3	149

OPINIONS AND CONCLUSIONS

Approximately 18,000 specimens of unionids were examined during this study. Over 12,000 unionids were identified to either genus or species. The remaining 6000± unionid specimens were recorded as unidentified fragments. The following opinions and conclusions are, therefore, based on sufficient numbers of unionids to justify these views.

It is most important to note the absence of the genus *Anodonta* from all collections. *Anodonta grandis* and *Anodonta imbecilis* presently occur in the Nueces River drainage, including the Frio River; however, no specimens were observed in this study. *Anodonta* shells are some of the most fragile of all unionids, and most of the collections were of fragmented shells. This might suggest that *Anodonta* were present but not recognized due to fragmentation. However, it is concluded that *Anodonta* are absent, as opposed to unrecognized, in these collections because:

1. *Carunculina parva* occurs in most sites. *Carunculina parva* is a small (25± mm shell length), fragile unionid. *Carunculina parva* lives in a habitat similar to *Anodonta*. Since *Carunculina parva* is confirmed, *Anodonta* could have been identified if present.

2. Since over 18,000 specimens were examined, it is judged that sufficient specimens were examined to conclude that *Anodonta* is not in the collections.

The following are offered as possible explanations for the absence of *Anodonta* from the collections:

1. *Anodonta* did not occur in the Nueces River drainage (or Frio River) at the time the prehistoric inhabitants lived and collected the area.

2. *Anodonta* may have had a taste unpleasant to the prehistoric inhabitants; thus, it may have been present but was ignored. This implies that, as each group of inhabitants collected in the area, they had prior knowledge of a taste preference against *Anodonta*.

It is my opinion that the evidence indicates that the *Anodonta* was not a part of the fauna of this area at the time the prehistoric inhabitants utilized the unionids for food. The geographical distribution of unionids is dependent upon an appropriate species of fish because the larva of the unionid (glochidium) is parasitic on a fish for several weeks. Each species of unionid has restricted species of fishes it can parasitize. Although the glochidium of *Anodonta imbecilis* can bypass the parasitic stage, *Anodonta grandis* is not known to do so; therefore, this study indicates that this area of the Frio River was not inhabited by the species of fish used by *Anodonta*, or the species of fish was present but *Anodonta* did not become a part of the unionid fauna until later.

Throughout this report, reference is made that the inhabitants used the unionids for food. Few specimens showed evidence of being worked into tools or ornaments. It is judged, therefore, that the predominant use of the unionids was as a food source. This is further indicated by the fact that large whole shells were broken at the posterior end for removal of the meat and were not further worked into tools or ornaments.

Two unionid groups, *Lampsilis* sp. and *Cyrtonaias tampicoensis*, comprise the largest number of unionid specimens apparently used as food by the inhabitants at all sites. The large number of these two groups in relation to smaller numbers of other species of unionids probably reflects the relative numbers of each during the periods of collecting. These relationships of numbers occur today, as both *Lampsilis anodontoides* and *Cyrtonaias tampicoensis* occur in greater numbers than other species in the drainage area.

Carunculina parva is represented by the third largest number of specimens of all unionid species obtained. *Carunculina parva* is interesting since it is a small species rarely exceeding 25 mm shell length in these collections. Clearly one obtains less meat from this species than from others ranging up to 100 mm or more in shell length; yet, *Carunculina parva* was consistently collected and utilized as an apparent food source.

The presence of *Carunculina parva* in the collections shows that the prehistoric inhabitants regularly collected in shallow water (less than 60 cm in depth). This is further confirmed by the fact that large numbers of the other species (*Cyrtonaias tampicoensis*, for example) were also small specimens of 40± mm shell length. Small specimens of species which grow large (> 60 mm) commonly spend their juvenile life in shallow water.

Megalonaias gigantea is considered an important recovery from these sites because of its more restricted habitat. Although this species may occur in shallow water when young, it is usually found in deep (5 meters or more), fast running water. *Megalonaias gigantea* was recovered from prehistoric sites in three areas of Live Oak and McMullen Counties as indicated below:

East Area		Middle Area		West Area	
Site	No. of Specimens	Site	No. of Specimens	Site	No. of Specimens
41 LK 8	2	41 MC 54	1	41 MC 15	13
41 LK 10	1	41 MC 55	1	41 MC 19	2
		41 MC 65	1	41 MC 74	1
		41 LK 73	2	41 MC 75	1
		41 LK 74	1	41 MC 72	4
				41 MC 79	1
				41 MC 223	1

Although many of the specimens were from uncontrolled surface collections (13 from 41 MC 15, Area A, Lot 88), some specimens were obtained from subsurface excavations. In addition, specimens were broken in the same way as other species from other sites. Some of the uncontrolled surface collections may be the result of deposits of shells after heavy flooding; however, sufficient specimens showed use and should be considered as tools or ornaments used by some of the early inhabitants.

Presence of *Megalonaias gigantea* indicates the inhabitants collected some specimens in deep water or collected *Megalonaias gigantea* in deep pools which were shallow from drought conditions. *Megalonaias gigantea* is not common in the Frio River, and this species is the largest unionid in North America (200-280 mm shell lenth). The greatest number of specimens of *Megalonaias gigantea* coming from the western end of the excavations probably reflects conditions of the river channel during the periods of local aboriginal activity. The river in this western portion today is faster running, with deeper pools than the more eastern areas of the excavation.

No evidence is here presented to explain how the unionids were prepared for consumption; however, because *Carunculina parva* is a small species, it might be suggested that the animals were in a "stew or chowder-like" preparation. It is difficult to visualize a person individually "baking" and eating the meat of an animal 25 mm in shell length.

It is also noted that some of the shells may have been collected for their beauty. *Cyrtonaias tampicoensis* produces an inner nacre (mother-of-pearl) ranging from white to a dark purple. Also, *Cyrtonaias tampicoensis* is a copious pearl producer, more so than most unionids. Pearl usage may have played some role in their collection. *Lampsilis anodontoides* has an attractive bright yellow exterior with a white inner nacre. Although beauty may have played some role in their use, the breakage of shells suggests consumption of the meat rather than the routine use of the shell for tools or ornaments.

The occurrence of *Truncilla* sp. at 41 LK 31/32, and the absence of *Anodonta* sp., as noted above, from all sites, suggest that there has been a change in unionid fauna in this area from the time of use by the inhabitants to the extant fauna. As noted earlier, *Truncilla* sp. has not been previously recorded in this area of Texas.

SUMMARY

Lampsilis sp., *Cyrtonaias tampicoensis*, and *Carunculina parva* served as important sources of food for the prehistoric inhabitants of this area. All three species were widely used over a long time span, and few specimens showed evidence of being worked.

A change in the unionid fauna has occurred from the time that these sites were active compared to the extant fauna of the area. The absence of *Anodonta* from all sites but present in the extant fauna, and the presence of *Truncilla* in the sites but absent in the extant fauna, confirm this opinion. Most, but not all, specimens appear to have been collected from shallow water (60± cm). The numbers of specimens of each species from the various sites show that *Cyrtonaias tampicoensis* was the most commonly used species, followed in descending order of numbers by *Lampsilis* sp., *Carunculina parva*, and then all other species. This relationship of numbers of each species is reflected in the extant unionid fauna of this drainage.

APPENDIX VI.

COMPUTER DOCUMENTATION: A GUIDE TO THE COLLECTION, STORAGE, AND RETRIEVAL OF THE PHASE I DATA

Joel Gunn, Elizabeth G. Frkuska, and Royce A. Mahula

The Nueces River Project (NRP) was planned from its inception around a computer based data retrieval system that would afford ready access to quantities of information on site location and description. The information was gathered during the course of intersite and intrasite survey, excavations, and laboratory analysis. By May 1979, data files for the project contained more than 200,000 individual items of information. The purpose of this guide is to describe the structure and substance of the Nueces River Project System Data File that contains the project data and the programs by which these data are accessed.

The data are arranged in a hierarchical order from most general to least general, i.e., from site through unit, level, and finally, specific artifactual and ecofactual observations, including individual artifact analysis and counts. A system of programs was written in FORTRAN that enabled individuals involved in the analysis of the data to retrieve classes of information and construct frequency tables, data sets, and maps for further analysis in other program systems such as SPSS and BMD. The goals of NRP computer studies are the following: (1) to facilitate the recording and analysis of the large mass of project data and (2) to insure and maintain a high level of data quality control in order to properly document and study the prehistoric and historic cultural systems in the project area.

NRP SYSTEM DATA FILE--FILE STRUCTURE

The computerized data management facility can best be discussed by a brief description of the file structure that facilitates data storage and retrieval. We take the "site" to be the basic unit of storage. A "site block" is a series of computer records (80 column cards) variously defined by functions for storing survey, excavation, and laboratory data on that site. The first record in each site block is a CAR Site Survey Record (Fig. 100). This record includes the location of the midpoint of the site in UTM Coordinates, Smithsonian numbers, and ecological and conditional information on the site.

Subsequent records are variable in function as defined by the first two digits on the record. Formats 2 and 3, for instance, are excavation data formats defining excavation units and levels. Numerous other formats for surface artifacts and laboratory analysis follow. Programming for management of these formats is discussed below. Data such as measurements of artifacts are also stored as subsets of appropriate levels of the hierarchy.

Data Quality Control

Data quality control is naturally a substantial problem in a large contract ranging over years of time and involving subcontractors, tens of persons with varying analytical ambitions, and levels of training.

The greatest difficulty with data quality control and consistency was encountered with the site survey records. All three contracting units were involved in various aspects of the site survey effort. The CAR-UTSA testing crews filled out forms on sites as they were tested. Recording was performed by Stephen L. Black who has had experience with all of the previous projects in which the forms were used, so relative internal consistency both within the project and with previous projects can be expected. Anthropology Research Laboratory (ARL), Texas A&M University, forms were filled out under the supervision of Carol Weed. Alston Thoms and John Montgomery were responsible for Cultural Resource Institute (CRI), Texas Tech University, forms. We noticed that the CRI crew was very much concerned with vegetation and extended the vegetational categories to match a somewhat broader expertise in this field. They added a much broaded set of variables to the standard form and the results are reported by Thoms, Montgomery, and Portnoy (1981). They, as well as Grant D. Hall, were also concerned with a relatively flat topographic situation and therefore gave considerable emphasis to extending the physiographic transect observation.

Coordinating these diverse observations to system standard procedures was the responsibility of Royce A. Mahula, James E. Ivey, and Elizabeth G. Frkuska. Statistical tests indicate that there was considerable biasing of observations toward the points of view of the various teams, and care must be taken to consider this fact when broad scale analyses are being run on the original data.

All of the unit and level information was managed by the CAR field crews under the supervision of Grant D. Hall. Checking and data entry tasks were supervised by Elizabeth G. Frkuska. Since various crew members filled out the forms, there may be individual biasing. However, team consistency should be good, as many individuals were with the project for its duration.

Laboratory analysis was supervised by Grant D. Hall, and data entry managed by Elizabeth G. Frkuska. Laboratory analysis was managed completely by Janet Stock with the assistance of Stephen L. Black and Lynn Highley. Additional special analyses were carried out by certain laboratory personnel: bifaces, Lynn Highley; ceramics, Stephen L. Black; and malacology, Janet Stock. Janet Stock also collected constant volume data and managed many laboratory functions to the benefit of data quality. Any biases should therefore be minimal.

Data Management System Programs

A series of programs was written in FORTRAN to facilitate access to the NRP SYSTEM DATA FILE. The Programs were written by Joel Gunn for the specific purpose of accessing the IBM CMS data file NRP SYSDAT, which contains Nueces River Project data. The system has two basic capabilities.

The first capability is to generate data sets out of NRP SYSDAT, which can be entered for analysis in other custom programs and in standard statistical systems such as SPSS or BMD. This function is regarded as the basic purpose of the data retrieval system. Because of the immense size of NRP SYSDAT, it would be very inefficient to access the file again and again for minimal tasks. The best mode of operation is to plan a number of analyses, extract the necessary variables from NRP SYSDAT in a single run, and then submit that subset of data to relevant programs for analysis.

The second is to generate frequency tables directly from NRP SYSDAT. The frequency tables are ordered on the same hierarchical principles as the data files that are intended to allow ready access to counts stored in running formats (see definitions below).

A few basic concepts are necessary to operate the data extraction process. The first of these is the data ITEM. A data ITEM is taken to be any observation at any level of analysis. It may be a card number, any sort of identification number, site or unit coordinates, nominal or metric observations on sites, units, levels or artifacts, counts or artifacts within analytical units, type numbers of those counted artifacts, etc. A VALUE is an ITEM observed on one unit of observation. Thus, the number of times a type of uniface occurs in a level within a certain unit and site is a value for that item.

Before generating a data set, the analyst has to define the ANALYSIS UNIT. Currently there are three analysis units: 1, Site; 2, Field Unit; 3, Level. Thus, if the analysis unit is set at 3 (Level), then the system will generate a record for every level in every field unit in every site in the project area. If the analysis unit is set at 1 (Site), then values will be given for each site only.

The OUTPUT FORMAT is the standard FORTRAN format under which the accumulated, selected items are to be output. The analyst must anticipate the largest number to be output in each field and provide enough integer columns to allow for it. If too few columns are allowed, asterisks will appear in the output data. In runs where counts are being summed, relatively large numbers can be expected.

ITEM SELECTION is the means whereby data are chosen to be extracted from the main data file. Each item is uniquely defined by a card number and an item number. Item selection is accomplished by informing the program of the item numbers desired and the card numbers on which they appear.

There are five kinds of data stored in NRP SYSDAT. It is important to understand the nature of each when creating analyzable data sets:

1. IDENTIFICATION VALUES are card numbers, site numbers, lot numbers, unique numbers, etc.

2. INTERVAL VALUES are items which measure locations of sites, distances, lengths of artifacts, etc.

3. ORDINAL VALUES are linearly based observations in which the interval is not known. Values are scaled relative to each other, but the magnitude of their differences are not known or not regarded as important enough to be recorded. Ordinal values include such observations as physiographic transects, which is in essence a measure of elevation above stream bottoms, but values are represented as topographic types such as "upland" and "hill tops" rather than meters above stream beds. Other examples would be field estimates of materials present in excavation units, essentially "few" or "many."

4. NOMINAL VALUES are values which have no underlying linear relationship such as type of vegetation present.

5. TYPES AND COUNTS are values which represent the number of certain types of things found in certain units. For instance, parallel-edged flakes are a type, and there might be five of them in a given level in a given unit.

Two kinds of formats are used to store these data in NRP SYSDAT. The first, FIXED FORMATS, always stores the same information on the same location on a card. If the analyst wants to recover information on bifaces from a fixed format card, it is only necessary to specify the card number and the item number on that card.

The second type of format is somewhat more complex. In some analyses there are many types, many of which only occur rarely. Using a fixed format would be very wasteful of disk area since most of the card would be zeros. Under these conditions types and counts are stored in a RUNNING FORMAT. On these cards (see Fig. 103 as an example), data are stored as sets of type numbers followed by the count of that type of artifact for the unit being analyzed. There are ten such sets per card. Running formats save space on the disk areas because only as much space needs to be filled as there are types present in a unit.

When the analyst is extracting these items the type is specified and NRPSYS FORTRAN accumulates the counts at the analysis unit specified. Do not select the item counts. This will result in the generation of spurious data.

Item Catalog

The card numbers and item numbers necessary for item selection can be found by referring to the following forms (Figs. 101-112). The forms are only slightly revised from those used in the field or laboratory and reflect the organization of NRP SYSDAT file.

EXECUTION OF NRP DATA SYSTEM PROGRAMS

Explanation and Procedures

The following is a description of what the programs in the NRP DATA SYSTEM do and how to run them. Some of the programs are data preparation programs and are of little concern to normal usage. The data preparation programs are important when the file is being expanded by additional data records. These programs include INDEX FORTRAN and BLANK FORTRAN. NRP FORTRAN, on the other hand, is the system's main data retrieval program and concerns the user directly (see Fig. 113).

CENTER FOR ARCHAEOLOGICAL RESEARCH
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

format item

If there are any blanks when you walk away from a site, you did something wrong.

Zero = Missing Data

1.I2 __ Card Number

2.I4 ____ Unique Number
3.I2 __ State
4.I2 __ County
Location
5.I3 ___ Site Number
6.I7 _______ East Coordinate
7.I7 _______ North Coordinate
8.I5 _____ Elevation
Components (Field Estimates)
9.I1 _ Paleo-Indian
10.I1 _ Archaic
11.I1 _ Late Prehistoric
12.I1 _ Historic
Site Environment
13.I1 _ Geologic Formation (1=Catahoula, 2=Frio, 3=Dubose-Deweesville, 4=Conquista-Dillworth)
14.I2 __ Physiography (see physiography list)
15.I1 _ Distinctive Land Form within 1 mile (1=Hill, 2=Ridge, 3=Major Rock outcrop, 4=Ravine, 5=Upland Valley, 6=Lake or Pond, 7=Depression or Basin, 8=Stream or River, 9=Other [note on back])
16.I1 _ Site Orientation with Respect to Land Form (1=Upon, 2=North of, 3=East of, 4=South of, 5=West of)
17.I1 _ Vegetation on site (see vegetation list)
18.I1 _ Vegetation off site (" " ")
19.I1 _ Permanent water source (1=On site, 2=<100 m, 3=<1 km, 4=>1 km)
20.I1 _ Seasonal water source (1=On site, 2=<100 m, 3=<1 km, 4=>1 km)
21.I1 _ Wildlife in area (enter 1 when observed species have been recorded on back)
22.I2 __ Lithic outcrops (see outcrop list)
23.I2 __ Soil type (see soil list)
Site Dimensions
24.I3 ___ Long orientation (degrees East of North)
25.I4 ____ Meters long
26.I3 ___ Meters wide
Artifact Density (Sitewide)
27.I1 _ Ceramic (1=1-10, 2=10-50, 3=50-100, 4=>100)
28.I1 _ Chipped Stone (1=1-10, 2=10-50, 3=50-100, 4=>100)
29.I1 _ Ground Stone (count, 9=>9)
30.I1 _ Glass (9=>9)
31.I1 _ Metal (9=>9)
32.I1 _ Structural Traces (9=>9)
33.I2 __ Number of Hearths
Site Condition
34.I1 _ Collecting of site (1=surface collected, 2=potholed, 3=destroyed by human activity)
35.I1 _ Economic Activity (1=undisturbed, 2=partially disturbed, 3=wholly disturbed)
36.I1 _ Erosion (1=undisturbed, 2=partially eroded, 3=wholly eroded)
37.I1 _ Surveyor
38.I4 __/__ Day/Month

Figure 100. *Site Survey Coding Form.*

CENTER FOR ARCHAEOLOGICAL RESEARCH
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

item format

1. I2 0 2 Card Number

2. I4 ____ Unique Number

3. I7 _______ East Coordinates

4. I7 _______ North Coordinates

Figure 101. *Unit Form.*

*Fill all blanks, Zero = Missing data

_ _ _ _ _ _ _ _ Card-Site #

_ _ _ _ _ Field Number of Substratum Unit

meters centimeters

_ _ _ _ . _ _ East

_ _ _ _ . _ _ North

_ _ . _ _ Depth to Top (of Substratum Unit)

_ _ Datum

_ _ Thickness

_ _ . _ _ Substratum

before excavation

Color

_ _ . _ Hue

_ (Y=1, YR=2, R=3)

_ . _/_ (Value and Chroma

_ Constant Volume

_ Pollen Sample

after excavation

_ Consolidation (1=soft, 2=hard)

_ Grain Size (1=Clay, 2=Silt, 3=Sand)

_ Charcoal (1=flecks, 2=C-14)

_ Features(2) (#)

Shell

_ Terrestrial (1=0-10, 2=10-25, 3=25-50, 4=>50)

_ Aquatic (1=0-10, 2=10-25, 3=25-50, 4=>50)

Chipped Stone (Field Estimate)

_ _ _ Debitage

_ _ Tools

Bone

_ # (9=>9)

_ Burned (9=>9)

_ Type (Primarily) (1=Lg. mammal, 2=sm. mammal, 3=bird, 4=reptile, 5=human, 6=1&2, 7=1, 2 & 3, 8=2, 3 & 4, 9=unidentifiable)

_ Ceramics (9=>9)

_ Ground Stone (9=>9)

_ Metal (9=>9)

_ Glass (9=>9)

_ Extent of Excavation (0=no, 1=N, 2=E, 3=S, 4=W)

_ Inspected

_ Mapped

_ Day

_ Month

_ Year

Excavators ____________

____

____

____

Photo #s ____________

Section #s ____________

Map # ____________

_ _ _ _ # Rocks

_ _ _ _ Volume Rocks

_ _ _ _ % Rocks Burned

_ _ _ _ Weight (Grams)

FOR ABOVE
(999=Missing data)

COMMENTS TO BE WRITTEN ON BACK

Figure 102. *Substratum Unit Form.*

item	*format*		
		SITE ________	AREA ________ ELEVATION ________
		UNIT ________	LEVEL ________ UNIT SIZE ________ LOT ________

1.	I2	__ __	Card No.
2.	I4	__ __ __ __	Unique No.
3.	IX		Card Seq. No.

UNMODIFIED ROCK

4.	I7	0 0 1 __ __ __ __	Tuff Ct.
5.	I7	0 0 2 __ __ __ __	Tuff Wt. (g)
6.	I7	0 0 3 __ __ __ __	Polished Pebbles Ct.
7.	I7	0 0 4 __ __ __ __	Polished Pebbles Wt. (g)
8.	I7	0 0 5 __ __ __ __	Caliche Ct.
9.	I7	0 0 6 __ __ __ __	Caliche Wt. (g)
10.	I7	0 0 7 __ __ __ __	Chert Cobbles Ct.
11.	I7	0 0 8 __ __ __ __	Chert Cobbles Wt. (g)
12.	I7	0 0 9 __ __ __ __	Quartzite Cobbles Ct.
13.	I7	0 1 0 __ __ __ __	Quartzite Cobbles Wt. (g)
14.	I7	0 1 1 __ __ __ __	Silicified Wood Ct.
15.	I7	0 1 2 __ __ __ __	Silicified Wood Wt. (g)
16.	I7	0 1 3 __ __ __ __	Pumice Ct.
17.	I7	0 1 4 __ __ __ __	Pumice Wt. (g)
18.	I7	0 1 5 __ __ __ __	Sandstone Ct.
19.	I7	0 1 6 __ __ __ __	Sandstone Wt.(g)

BURNED ROCK

20.	I7	0 1 7 __ __ __ __	Fire-Cracked Ct.
21.	I7	0 1 8 __ __ __ __	Fire-Cracked Wt. (g)
22.	I7	0 1 9 __ __ __ __	Sandstone Ct.
23.	I7	0 2 0 __ __ __ __	Sandstone Wt.(g)
24.	I7	0 2 1 __ __ __ __	Clay Ct.
25.	I7	0 2 2 __ __ __ __	Clay Wt. (g)

MUSSEL SHELL

26.	I7	0 2 3 __ __ __ __	Umbo Ct.
27.	I7	0 2 4 __ __ __ __	Umbo Wt. (g)
28.	I7	0 2 5 __ __ __ __	*Helisoma* Ct.
29.	I7	0 2 6 __ __ __ __	Other Aquatic Snail Ct.

LAND SNAILS

30.	I7	0 2 7 __ __ __ __	*Rabdotus* Ct.
31.	I7	0 2 8 __ __ __ __	*Polygyra* Ct.
32.	I7	0 2 9 __ __ __ __	*Practicolla* Ct.
33.	I7	0 3 0 __ __ __ __	*Helicina* Ct. (Mesodon)
34.	I7	0 3 1 __ __ __ __	*Succinea* Ct.
35.	I7	0 3 2 __ __ __ __	Other Land Snails Ct.

BONE

36.	I7	0 3 3 __ __ __ __	Total Bone Ct.
37.	I7	0 3 4 __ __ __ __	Total Bone Wt. (g)

WORKED MUSSEL SHELL

38.	I7	0 3 5 __ __ __ __	Worked Mussel Shell Ct.

MARINE SHELL

39.	I7	0 3 6 __ __ . __ __	Marine Shell Ct.

ABORIGINAL CERAMICS

40.	I7	0 3 7 __ __ __ __	Aboriginal Ceramic (Ct.)

BIFACES

41.	I7	0 3 8 __ __ __ __	Complete Ct.
42.	I7	0 3 9 __ __ __ __	Proximal Ct.
43.	I7	0 4 0 __ __ __ __	Medial Ct.
44.	I7	0 4 1 __ __ __ __	Distal Ct.
45.	I7	0 4 2 __ __ __ __	Miscellaneous Fragments Ct.

UNIFACES

46.	I7	0 4 3 __ __ __ __	Uniface Ct.

HAMMERSTONES

47.	I7	0 4 4 __ __ __ __	Hammerstone Ct.

GROUND STONE

48.	I7	0 4 5 __ __ __ __	Grooved Abrader
49.	I7	0 4 6 __ __ __ __	Grinding Slab Fragment
50.	I7	0 4 7 __ __ __ __	Mano
51.	I7	0 4 8 __ __ __ __	Gypsum Rods

CORES

52.	I7	0 4 9 __ __ __ __	Core Ct.

CHARCOAL

53.	I7	0 5 0 __ __ __ __	Flecks
54.	I7	0 5 1 __ __ __ __	C14 Sample
55.	I7	0 5 2 __ __ __ __	Wood Species I.D.

FLAKES

56.	I7	0 5 3 __ __ __ __	Primary Flake Total Ct.
57.	I7	0 5 4 __ __ __ __	Primary Cortex Platform Ct.
58.	I7	0 5 5 __ __ __ __	Primary Cortex Platform Modified Ct.
59.	I7	0 5 6 __ __ __ __	Primary Cortex Platform Trimmed Ct.
60.	I7	0 5 7 __ __ __ __	Primary Single Facet Ct.
61.	I7	0 5 8 __ __ __ __	Primary Single Facet Modified Ct.

Figure 103. *Nueces River Project: Material Analysis Form.*

FLAKES (cont)

item	*format*		
62.	I7	0 5 9 _ _ _ _	Primary Single Facet Trimmed Ct.
63.	I7	0 6 0 _ _ _ _	Primary Other Ct.
64.	I7	0 6 1 _ _ _ _	Primary Other Modified Ct.
65.	I7	0 6 2 _ _ _ _	Primary Other Trimmed Ct.
66.	I7	0 6 3 _ _ _ _	Secondary Flake Total Ct.
67.	I7	0 6 4 _ _ _ _	Secondary Cortex Platform Ct.
68.	I7	0 6 5 _ _ _ _	Secondary Cortex Platform Modified Ct.
69.	I7	0 6 6 _ _ _ _	Secondary Cortex Platform Trimmed Ct.
70.	I7	0 6 7 _ _ _ _	Secondary Single Facet Ct.
71.	I7	0 6 8 _ _ _ _	Secondary Single Facet Modified Ct.
72.	I7	0 6 9 _ _ _ _	Secondary Single Facet Trimmed Ct.
73.	I7	0 7 0 _ _ _ _	Secondary Small Multiple Facet Ct.
74.	I7	0 7 1 _ _ _ _	Secondary Small Multiple Facet Modified Ct.
75.	I7	0 7 2 _ _ _ _	Secondary Small Multiple Facet Trimmed Ct.
76.	I7	0 7 3 _ _ _ _	Secondary Large Multiple Facet Ct.
77.	I7	0 7 4 _ _ _ _	Secondary Large Multiple Facet Modified Ct.
78.	I7	0 7 5 _ _ _ _	Secondary Large Multiple Facet Trimmed Ct.
79.	I7	0 7 6 _ _ _ _	Secondary Lipped (Biface Thinning) Ct.
80.	I7	0 7 7 _ _ _ _	Secondary Lipped (Biface Thinning) Modified Ct.
81.	I7	0 7 8 _ _ _ _	Secondary Lipped (Biface Thinning) Modified Ct.
82.	I7	0 7 9 _ _ _ _	Tertiary Flakes (Total)
83.	I7	0 8 0 _ _ _ _	Tertiary Single Facet Ct.
84.	I7	0 8 1 _ _ _ _	Tertiary Single Facet Modified Ct.

FLAKES (cont)

85.	I7	0 8 2 _ _ _ _	Tertiary Single Facet Trimmed Ct.
86.	I7	0 8 3 _ _ _ _	Tertiary Small Multiple Facet Ct.
87.	I7	0 8 4 _ _ _ _	Tertiary Small Multiple Facet Modified Ct.
88.	I7	0 8 5 _ _ _ _	Tertiary Small Multiple Facet Trimmed Ct.
89.	I7	0 8 6 _ _ _ _	Tertiary Large Multiple Facet Ct.
90.	I7	0 8 7 _ _ _ _	Tertiary Large Multiple Facet Modified Ct.
91.	I7	0 8 8 _ _ _ _	Tertiary Large Multiple Facet Trimmed Ct.
92.	I7	0 8 9 _ _ _ _	Tertiary Lipped (Biface Thinning) Ct.
93.	I7	0 9 0 _ _ _ _	Tertiary Lipped (Biface Thinning) Ct.
94.	I7	0 9 1 _ _ _ _	Tertiary Lipped (Biface Thinning) Trimmed Ct.

CHIPS

95.	I7	0 9 2 _ _ _ _	Chip Total Ct.
96.	I7	0 9 3 _ _ _ _	Chip Corticate Ct.
97.	I7	0 9 4 _ _ _ _	Chip Corticate Modified Ct.
98.	I7	0 9 5 _ _ _ _	Chip Corticate Trimmed Ct.
99.	I7	0 9 6 _ _ _ _	Chip Partially Corticate Ct.
100.	I7	0 9 7 _ _ _ _	Chip Partially Corticate Modified Ct.
101.	I7	0 9 8 _ _ _ _	Chip Partially Corticate Trimmed Ct.
102.	I7	0 9 9 _ _ _ _	Chip Decorticate Ct.
103.	I7	1 0 0 _ _ _ _	Chip Decorticate Modified Ct.
104.	I7	1 0 1 _ _ _ _	Chip Decorticate Trimmed Ct.

CHUNKS

105.	I7	1 0 2 _ _ _ _	Chunks Total Ct.
106.	I7	1 0 3 _ _ _ _	Corticate Ct.
107.	I7	1 0 4 _ _ _ _	Partially Corticate Ct.
108.	I7	1 0 5 _ _ _ _	Decorticate

Figure 103. (continued)

CENTER FOR ARCHAEOLOGICAL RESEARCH
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

item.format		
1.I2	0 5	Card Number
2.I4	_ _ _ _	Unique Number
3.I2	_ _	PST (Primary Flake=1, Secondary Flake=2, Tertiary Flake=3)
4.I2	_ _	Length 1 (Number of Flakes from .00 to .50 cm)
5.I2	_ _	Length 2 (Number of Flakes from .51 to 1.00 cm)
6.I2	_ _	Length 3 (Number of Flakes from 1.01 to 1.50 cm)
7.I2	_ _	Length 4 (Number of Flakes from 1.51 to 2.00 cm)
8.I2	_ _	Length 5 (Number of Flakes from 2.01 to 2.50 cm)
9.I2	_ _	Length 6 (Number of Flakes from 2.51 to 3.00 cm)
10.I2	_ _	Length 7 (Number of Flakes from 3.01 to 3.50 cm)
11.I2	_ _	Length 8 (Number of Flakes from 3.51 to 4.00 cm)
12.I2	_ _	Length 9 (Number of Flakes from 4.01 to 4.50 cm)
13.I2	_ _	Length 10 (Number of Flakes from 4.51 to 5.00 cm)
14.I2	_ _	Length 11 (Number of Flakes greater than 5.00 cm)
15.I2	_ _	Width 1 (Number of Flakes from .00 to .50 cm)
16.I2	_ _	Width 2 (Number of Flakes from .51 to 1.00 cm)
17.I2	_ _	Width 3 (Number of Flakes from 1.01 to 1.50 cm)
18.I2	_ _	Width 4 (Number of Flakes from 1.51 to 2.00 cm)
19.I2	_ _	Width 5 (Number of Flakes from 2.01 to 2.50 cm)
20.I2	_ _	Width 6 (Number of Flakes greater than 2.50 cm)
21.I3	_ _ _	Thick 1 (Number of Flakes from .00 to .25 cm)
22.I2	_ _	Thick 2 (Number of Flakes from .26 to .50 cm)
23.I2	_ _	Thick 3 (Number of Flakes from .51 to .75 cm)
24.I2	_ _	Thick 4 (Number of Flakes from .76 to 1.00 cm)
25.I2	_ _	Thick 5 (Number of Flakes greater than 1.00 cm)
26.I2	_ _	Cat 1 (Number of Flakes with a subparallel shape)
27.I2	_ _	Cat 2 (Number of Flakes with a parallel shape)
28.I2	_ _	Cat 3 (Number of Flakes with a divergent shape)
29.I2	_ _	Cat 4 (Number of Flakes with a convergent shape)
30.I2	_ _	Cat 5 (Number of Flakes with an intermediate shape)
31.I2	_ _	Cat 6 (Number of Flakes with a displaced shape)
32.I2	_ _	Cat 7 (Number of Flakes with an unclassified shape)
33.I2	_ _	Cat 8 (Number of Flakes with a divergent-convergent shape)

Figure 104. *Debitage Analysis Form.*

CENTER FOR ARCHAEOLOGICAL RESEARCH
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

item	format		
1.	I2	_ _	Card Number
2.	I4	_ _ _ _	Unique Number
3.	I1	_	Collection Method (uncontrolled surface=1, controlled surface=2)
4.	I6	_ _ _ _ _ _	PTM/Sequence
5.	I4	_ _ _ _	North Coordinate (m)
6.	I4	_ _ _ _	East Coordinate (m)
7.	I4	_ _ _ _	Length (cm)
8.	I3	_ _ _	Width (cm)
9.	I3	_ _ _	Thickness (cm)
10.	I4	_ _ _ _	Weight (g)
11.	I4	_ _ _ _	Type (cultural type ID)

Figure 105. *Surface Collection Analysis Form.*

CENTER FOR ARCHAEOLOGICAL RESEARCH
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

item	*format*	
1.	I2	0 7 Card Number
2.	I4	_ _ _ _ Unique Number
3.	I1	_ Recorder (Janet=1, Lynn=2, Steve=3, Becky=4)
4.	I1	_ Fraction (heavy=1, light=2)
		MATERIAL ABSENT/PRESENT
5.	I1	_ Vegetal Material (roots, wood, etc.,)
6.	I1	_ Seeds
7.	I1	_ Seeds Unburned
8.	I1	_ Seeds Burned
9.	I1	_ Seeds Other
10.	I1	_ Mussel Fragments
11.	I3	_ _ _ Mussel Whole Count
12.	I1	_ Land Snail Fragments
13.	I3	_ _ _ Land Snail Whole Count
14.	I1	_ Insect Parts
15.	I2	_ _ Unburned Bone Count
16.	I2	_ _ Burned Bone Count
17.	I1	_ Charcoal
18.	I1	_ Quartz
19.	I2	_ _ Flake Count
20.	I2	_ _ Fire-Fractured Chert Count
21.	I3	_ _ _ Fish Scales

Figure 106. *Constant Volume Analysis Form.*

CENTER FOR ARCHAEOLOGICAL RESEARCH
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

item	*format*	
1.	I2	_ _ Card Number
2.	I4	_ _ _ _ Unique Number
3.	I7	_ _ _ _ _ _ _ Site Number
4.	I2	_ _ Unit Number (TP#)
5.	I2	_ _ Level
6.	I2	_ _ Feature
7.	I1	_ Fraction (heavy=1, light=2)
8.	I3	_ _ _ *Rabdotus* Count
9.	I3	_ _ _ *Polygyra* Count
10.	I3	_ _ _ *Practicolella* Count
11.	I3	_ _ _ *Succinea* Count
12.	I3	_ _ _ *Helicina* Count
13.	I3	_ _ _ *Heliodiscus* Count
14.	I3	_ _ _ *Carychium* Count
15.	I3	_ _ _ *Gastrocopta* Count
16.	I3	_ _ _ *Lymnaea* Count
17.	I3	_ _ _ *Pupisoma* Count
18.	I3	_ _ _ *Pupoides* Count
19.	I3	_ _ _ *Microceramus*
20.	I3	_ _ _ *Helisoma* (Aquatic) Count
21.	I3	_ _ _ Unidentified Count
22.	I3	_ _ _ Unidentified Count
23.	I3	_ _ _ Unidentified Count
24.	I3	_ _ _ Unidentified Count
25.	I3	_ _ _ Unidentified Count

Figure 107. *Malacological Analysis Form.*

CENTER FOR ARCHAEOLOGICAL RESEARCH
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

item *format*

1\. I2 0 9 Card Number
2\. I5 _ _ _ _ _ Unique Number
3\. I7 _ _ _ _ _ _ _ Site Number
4\. I4 _ _ _ _ Lot Number
5\. I5 _ _ _ _ _ PTM/Sequence
6\. I1 _ Collection Method (Uncontrolled Surface=1, Controlled Surface=2, Excavated=3)

METRIC ATTRIBUTES

7\. I3 _ _._ Length (cm)
8\. I3 _ _._ Width (cm)
9\. I2 _._ Thickness (cm)
10\. I2 _._ Stem Length (cm)
11\. I2 _._ Stem Width (cm)
12\. I2 _._ Neck Width (cm)
13\. I4 _ _ _._ Weight (g)
14\. I4 _ _ _ _ Bit Angle (deg)

DESCRIPTIVE ATTRIBUTES

15\. I2 _ _ Stage (Core-Biface=1, Primary Thick Biface=2, Secondary Thick Biface=3, Primary Thin Biface=4, Secondary Thin Biface-5, Finished Biface=6)
16\. I2 _ _ Core Type (Indeterminate=1, Flake=2, Cobble=3)
17\. I2 _ _ Biface Fragment (Indeterminate=1, Distal=2, Medial=3, Basal-4, Whole=5)
18\. I2 _ _ Shape (Indeterminate=1, Discoidal=2, Ovate=3, Rectangular=4, Square=5, Triangular=6, Lanceolate=7, Stemmed=8)
19\. I2 _ _ Cross section (Plano-Convex=1, Biconvex=2)
20\. I2 _ _ Cortex (Absence=1, Presence=2)
21\. I2 _ _ Material (Quartz=1, Chert=2, Silicified Wood=3, Sandstone=4, Other=5)
22\. I2 _ _ Patina (None=1, Light=2, Moderate=3, Heavy=4)
23\. I2 _ _ Hafting Glue (Absence=1, Presence=2)
24\. I2 _ _
25\. I2 _ _ Cusp/Edge Index
26\. I2 _ _ Bevel Depth
27\. I2 _ _ Bevel Thickness
28\. I1 _ Lateral Edge Dulling (Nône=1, Both=2, Right=3, Left=4)
29\. I1 _ Distal Edge Step Scars, Dorsal (None=1, Entire Bit Edge=2, Central Area=3, Right Side=4, Left Side=5)
30\. I1 _ Distal Edge Step Scars, Ventral (None=1, Entire Bit Edge-2, Central Area=3, Right Side=4, Left Side=5)
31\. I1 _ Dulled/Polished Flake Ridges, Dorsal (None=1, General=2, Proximal=3, Distal=4, Medial=5, Bevel Face=6)
32\. I1 _ Dulled/Polished Flake Ridges, Ventral (None=1, General=2, Proximal=3, Distal=4, Medial=5, Bevel Edge=6)
33\. I1 _ Bevel Corner Polish, Dorsal (None=1, Both Corners=2, Right=3, Left=4)
34\. I1 _ Bevel Corner Polish, Ventral (None=1, Both Corners=2, Right=3, Left=4)
35\. I1 _ Bevel Edge Polish, Dorsal (None=1, Entire Edge=2, Localized=3)
36\. I1 _ Bevel Edge Polish, Ventral (None-1, Entire Edge=2, Localized=3, Localized with Striations=4)
37\. I1 _ Bevel Edge Dulling (Absent=1, Present=2)
38\. I1 _ Gloss Patches/Spots, Dorsal (None=1, General=2, Proximal=3, Distal=4, Medial=5)
39\. I1 _ Gloss Patches/Spots, Ventral (None=1, General=2, Proximal=3, Distal=4, Medial=5)

Figure 108. *Biface and Uniface Analysis Form.*

NUECES RIVER PROJECT
CERAMIC ANALYSIS 1979

PROVENIENCE ATTRIBUTES

__ __ __ __ Unique #
__ __ __ __ __ Site #
__ __ __ __ Lot #
__ Collection Method

DESCRIPTIVE/METRIC ATTRIBUTES

__ Sherd Fragment
__ Sherd Condition
__ Thickness
__ __ Sherd Length
__ __ Sherd Width
__ Hardness
__ __ Sherd Weight

SURFACE ATTRIBUTES

EXTERIOR	INTERIOR			
	__ __	Surface Color	__ __	__ __
__ __	__	Surface Color Irregularities		
__	__	Surface Condition		
__	__	Asphaltum		
__	__	Sooting		
__	__	Crazing		
__	__	Pitting/Flaking		
__	__	Leaching		
__	__	Evenness		
__	__	Texture		
__	__	Luster		
__	__	Filler Protrusion		
__	__	Filler Particle Size		
__	__	Filler Density		
__	__	Surface Treatment Techniques		

PASTE CORE ATTRIBUTES

__ __ Core Color __ __
__ __ Paste Color __ __
__ __ Core Zoning
__ __ Asphaltum
__ __ Paste Texture
__ __ Paste Porosity/Compactness

PASTE INCLUSION ATTRIBUTES

DENSITY	SIZES:	<.125	.125-.25	.25-.5	.5-1	1.-2.
__	Sand	__	__	__	__	__
__	Bone	__	__	__	__	__
__	Shell (F or M)	__	__	__	__	__
__	Hematite	__	__	__	__	__
__	Grog	__	__	__	__	__
__	Unidentified Calcareous	__	__	__	__	__
__	______	__	__	__	__	__
__	______	__	__	__	__	__
__	______	__	__	__	__	__

Figure 109. *Sherd Attribute Record, Form 1A.*

PROVENIENCE ATTRIBUTES
__ __ __ __ __ __ Unique #
__ __ __ __ __ __ Site #
__ __ __ __ __ __ Lot #
__ Collection Method

DESCRIPTIVE/METRIC ATTRIBUTES
__ Sherd Fragment
__ Sherd Condition
__ Thickness
__ __ Sherd Length
__ __ Sherd Width
__ __ Sherd Weight

GENERAL SURFACE ATTRIBUTES
__ Asphaltum
__ Sooting
__ Pit Leaching
__ Condition
__ ________

EXTERIOR SURFACE ATTRIBUTES
__ __ Color
__ Color Irregularities
__ Crazing
__ Luster
__ Slip
__ Self-Slip
__ Wash
__ Burnishing
__ Wet Brush
__ ________

INTERIOR SURFACE ATTRIBUTES
__ __ Color
__ Texture
__ Filler Density
__ Slip
__ Self-Slip
__ Wash
__ Burnishing
__ Wet Brush
__ ________

PASTE/CORE ATTRIBUTES
__ __ Core Color
__ __ Paste Color
__ __ Core Zoning
__ __ Grease
__ __ __ ________

PASTE INCLUSION ATTRIBUTES
__ Sand __ Two
__ Bone
__ Hematite __ One __ Two
__ Resin
__ Unidentified
__ ________

Figure 110. *Sherd Attribute Record, Form 1B.*

Site # ________

Group # ________

Variety ________ Descriptive Name: ________

sherds ________ - # coded ________ = # uncoded ________

Provenience: # uncontrolled surface ________ # controlled surface ________
uncontrolled subsurface ________ # controllec subsurface ________

Sherd fragment: # rim ____ # neck ____ # body ____ # basal ____ # other ____

Sherd thickness: range: ______-______ cm average: ______ cm

Sherd length: range: ______-______ cm average: ______ cm

Sherd condition: ________

Paste: ________

Core: ________

Exterior surface: ________

Interior surface: ________

Inclusions: Bone: quantity ________ particle size ________ comment:

Sand: quantity ________ particle size ________ shape ________

comment: ________

______: quantity ________ particle size ________ comment: ________

Other: ________

Estimated # of vessels: ________ comment: ________

(see reverse for group discussion)

Figure 111. *Nueces River Project Ceramics, Site Form.*

UNIT ______________________ ELEVATION ______________________

LEVEL ______________________ UNIT SIZE ______________________

AREA ______________________ LOT NO. ______________________

item	*format*		
1.	I2	1 1	Card Number
2.	I4	_ _ _ _	Unique Number
3.	I7	0 0 1 _ _ _ _	*Lampsilis anodontoides*
4.	I7	0 0 2 _ _ _ _	*Lampsilis* sp.
5.	I7	0 0 3 _ _ _ _	*Cyrtonaias tampicoensis*
6.	I7	0 0 4 _ _ _ _	*Carunculina parva*
7.	I7	0 0 5 _ _ _ _	*Quadrula* sp.
8.	I7	0 0 6 _ _ _ _	*Amblema* sp.
9.	I7	0 0 7 _ _ _ _	*Villosa* sp.
10.	I7	0 0 8 _ _ _ _	*Fusconaia flava*
11.	I7	0 0 9 _ _ _ _	*Amblema plicata*
12.	I7	0 1 0 _ _ _ _	*Megalonaias gigantea*
13.	I7	0 1 1 _ _ _ _	*Quadrula quadrula*
14.	I7	0 1 2 _ _ _ _	*Quadrula aurea*
15.	I7	0 1 3 _ _ _ _	*Rabdotus*
16.	I7	0 1 4 _ _ _ _	*Anguispira alternata*
17.	I7	0 1 5 _ _ _ _	*Helicina arbiculata*
18.	I7	0 1 6 _ _ _ _	Unidentified fragment
19.	I7	0 1 7 _ _ _ _	*Sphaerium*
20.	I7	0 1 8 _ _ _ _	Unidentified umbo
21.	I7	0 1 9 _ _ _ _	*Leptodea fragilis*
22.	I7	0 2 0 _ _ _ _	*Polydyra* sp.
23.	I7	0 2 1 _ _ _ _	*Truncilla* sp.
24.	I7	0 2 2 _ _ _ _	Unknown value
25.	I7	0 2 3 _ _ _ _	*Anadota* sp.
26.	I7	0 2 4 _ _ _ _	*Elliptio* sp.
27.	I7	0 2 5 _ _ _ _	*Leptodea* sp.

Figure 112. *Nueces River Project: Freshwater Mussel Analysis Form.*

```
C       SUBROUTINE DATAG
C        EXTRACTS DEFINED DATA SETS FROM SYSTEM STANDARD FILES
C
C        THE FOLLOWING DIMENSIONS PESTRAIN THE NUMBER OF ITEMS THAT CAN BE
C        MXFRM=1ST SUBSCRIPT=MAXIMUM NUMBER OF FORMATS DIMENSIONED FOR
        DIMENSION IFORM(15,50),ITEMS(15,49),IPL(15,49)
C
        DIMENSION IDUM(26),IFMT(19),KFMT(20),JAU(4)
        DIMENSION LOAD(200),INP(80),MINV(200),MAXV(200),JSEL(200)
        DIMENSION LAB(50,10)
        DATA ISTAR/'*   '/,IBL/'    '/,JAU/'SITE','UNIT','LEVL','ZONE'/
C
        MXFRM=15
C
C        INPUT AND OUTPUT LOGICAL UNITS
        INPAR=1
        INDAT=2
        KOUT=3
        KCHK=4
C
C        THIS PROGRAMS ASSUMES A CATA FILE FOR INDEXED DATA RECORDS ARRANG
C        IN AN HIERARCHICAL ORDER FROM HIGHEST(SITE) TO LOWEST(ITEM WITHIN
C          DATA RECORD FORMATS
C          1. FIRST ITEM MUST BE A FORMAT NUMBER(I2)
C          2. SECOND ITEM MUST BE A UNIQUE NUMBER(I4)
C          3. LAST ITEM MUST BE AN INDEX NUMBER(I2)
C        FIXED FORMATS--METRIC ITEMS CR COUNTS IN FIXED LOCATIONS
C        RUNNING FORMATS--TYPE NUMBERS(I3), AND COUNTS(I4), IN TEN SETS PE
C
C        READ CARD NO.(I1),FIXED(1)/RUNNING(2) FORMAT(I1), N FIELDS(I2),
C            FORMAT(<76)
C          LAST CARD MUST BE BLANK
C          LAST FIELD ON FORMATS MUST BE -X,I2), SO THAT I2 IS ON COLS 79
C              AND 80
        DO 90 I=1,MXFRM
        READ(INPAR,100) (IFORM(I,J),J=1,22)
100     FORMAT(I2,I1,I2,18A4,A3)
        IF(IFORM(I,1).EQ.0) GO TO 91
90      CONTINUE
        WRITE(KCHK,900)
900     FORMAT(' TOO MANY FORMS FCR DIMENSION, CHANGE MXFRM AND DIM.')
        STOP
91      NFMT=I-1
        WRITE(KCHK,101) ((IFORM(I,J),J=1,22),I=1,NFMT)
101     FORMAT('1FORMATS FOR SYSTEM DATA CARDS'/
       1' CARD TYPEFM NFIELDS FORMAT'/ (I4,I5,I7,5X,19A4))
C
C        READ OUTPUT FORMAT
        READ(INPAR,102) KFMT
102     FORMAT(20A4)
        WRITE(KCHK,103) KFMT
103     FORMAT(/' OUTPUT FORMAT IS  ',20A4)
C
C        READ ANALYSIS UNIT(AU): (1)SITE, (2)UNIT, (3)LEVEL, (4)ZONE
C
        READ(INPAR,110) IAU
110     FORMAT(I1)
        WRITE(KCHK,111) IAU,JAU(IAU)
111     FORMAT(/' ANALYSIS UNIT IS ',I1,'(',A4,')')
C
C        ITEM SELECTION: KARD=CARD NO(I2),ITEM NO(I4),9999=END OF SELECTIO
C        VALUE SELECTION: VALUE OR MINIMUM VALUE(I4)
C                         MAXIMUM VALUE(I4)
C                         SELECTICN MCDE(I2)
C                               0=NO SELECTION
C                               1=INPUT ITEM BY INPUT ITEM(FIXED FORMAT)
C                               2=OUTPUT RECORD BY INPUT ITEM(FIXED AND RU
C                               3=INPUT RECORD BY INPUT ITEM(S)(RUNNING)
C
        DO 118 I=1,NFMT
        DO 118 J=1,21
        ITEMS(I,J)=0
118     IPL(I,J)=0
        N=0
119      N=N+1
         READ(INPAP,120)KARD,ITEM,MINV(N),MAXV(N),JSEL(N),(LAB(N,L),L=1,10)
120      FORMAT(I2,3I4,I2,2X,10A4)
         IF(KARD.EQ.99) GO TO 140
         ITEMS(KARD,1)=ITEMS(KARD,1)+1
         J=ITEMS(KARD,1)+1
         ITEMS(KARD,J)=ITEM
         IPL(KARD,J)=N
         GO TO 119
140      CONTINUE
         N=N-1
         WRITE(KCHK,141) (I,(ITEMS(I,J),J=1,21),I=1,NFMT)
141      FORMAT(/' SELECTED ITEMS '/' CARD NITEMS ITEMS-->'/
        1(1X,I4,I3,3X,20I3))
C
C         CHECK FOR OUT CF RANGE ITEMS
C
         DO 147 I=1,NFMT
         K=ITEMS(I,1)+1
         DO 147 J=2,K
         IF( ITEMS(I,J).GT.IFORM(I,3).AND.IFORM(I,2).EQ.1) WRITE(KCHK,148) I
148      FORMAT(//' ITEM SELECTEC IN CARD ',I1,' IS OUT OF RANGE.')
147      CONTINUE
C
         WRITE(KCHK,142) (I,(IPL(I,J),J=2,21),I=1,NFMT)
142      FORMAT(/' POSITIONS IN LOAD VECTOR'/' CARD POSITIONS-->'/
        1(1X,I4,(6X,20I3)))
C
C
C         SET UP VALUE SELECTICN VECTORS
C
         DO 149 I=1,N
         IF(MINV(I).GT.0.AND.MAXV(I).EQ.0) MAXV(I)=MINV(I)
149      CONTINUE
         WRITE(KCHK,1490) (MINV(I),MAXV(I),JSEL(I),(LAB(I,J),J=1,10),I=1,N)
1490     FORMAT('0VALUE SELECTION'/'0MINIMUM MAXIMUM SELECT'/
```

Figure 113. *Nueces River Project:* FORTRAN.

```
     1(1X,3I7,2X,10A4))
C
C
C     READ FIRST DATA CARD, CONTAINS ONLY AN INDEX IN LAST COLUMN
C
      READ(INDAT,150) INDEX
150   FORMAT(78X,I2)
C
      DO 154 I=1,19
154   IFMT(I)=IBL
      DO 155 I=1,N
155   LOAD(I)=0
      INDOL=99
      IFLAG=0
      KFLAG=0
      JNDEX=0
C
C                                                         DATA PROCESSING
C
C     CHECK IF NEXT CARD HAS SELECTED ITEMS
C
160   CONTINUE
      IF(INDEX.EQ.0) GO TO 1000
      IF(ITEMS(INDEX,1).GT.0) GO TO 170
      IF(INDEX.LE.IAU)
     1CALL OUT(LOAD,N,INDEX,KFMT,KOUT,NFMT,ITEMS,MXFRM,IPL,
     2 MINV,MAXV,JSEL,KFLAG)
      READ(INDAT,150) INDEX
      GO TO 160
170   CONTINUE
C
C     IF NECESSARY MOVE FORMAT TO FORMAT VECTOR
C
      IF(INDEX.EQ.JNDEX) GO TO 190
      DO 180 I=1,19
      IP3=I+3
180   IFMT(I)=IFORM(INDEX,IP3)
      JNDEX=INDEX
190   CONTINUE
      INDOL=INDEX
      IT=IFORM(INDEX,3)
      READ(INDAT,IFMT) (INP(I),I=1,IT),INDEX
C
C     CHECK FOR INDEXING PROBLEMS
      IF(INP(1).EQ.INDOL) GO TO 1905
      WRITE(KCHK,1902) INP(2)
1902  FORMAT(//' INDEXING PROBLEM AT ',I10,'. PROGRAM STOPS****'//)
      STOP
1905  CONTINUE
C
C
C     IF NEXT CARD IS AN AU OR ABOVE IN THE HIERARCHY, UNLOAD RECORD
C
      IF(INDOL.LE.IAU.AND.IFLAG.EQ.1)
     1CALL OUT(LOAD,N,INDOL,KFMT,KOUT,NFMT,ITEMS,MXFRM,IPL,
     2 MINV,MAXV,JSEL,KFLAG)
      IF(INDOL.EQ.IAU) IFLAG=1
C
C     BRANCH IF FORMAT IS RUNNING
C
      IF(IFORM(INDOL,2).EQ.2) GO TO 210
C
C     LOAD FIXED FORMAT OBSERVATIONS
      IT=ITEMS(INDOL,1)
      DO 200 I=1,IT
      IP1=I+1
C     MAKE VALUE SELECTION(MODE 1)
      IF(JSEL(IPL(INDOL,IP1)).EQ.1) GO TO 198
      LOAD(IPL(INDOL,IP1))=INP(ITEMS(INDOL,IP1))
      GO TO 200
198   IF(INP(ITEMS(INDOL,IP1)).GE.MINV(IPL(INDOL,IP1)).AND.
     1 INP(ITEMS(INDOL,IP1)).LE.MAXV(IPL(INDOL,IP1)))
     2 LOAD(IPL(INDOL,IP1))=INP(ITEMS(INDOL,IP1))
200   CONTINUE
      GO TO 160
C     LOAD FIXED FORMAT COUNTS
C                   TO BE PROGRAMED
C
C     LOAD RUNNING FORMAT COUNTS
210   CONTINUE
C
C     MAKE VALUE SELECTIONS(MODE 3)
C
      IT=ITEMS(INDOL,1)
      DO 213 I=1,N
      IF(JSEL(I).NE.3) GO TO 213
C      IF CONTEXT IS NOT IN RANGE, DONT SUM.
      IF(LOAD(I).GE.MINV(I).AND.
     1 LOAD(I).LE.MAXV(I))
     2 GO TO 213
      GO TO 160
213   CONTINUE
C
      KFLAG=1
      DO 220 I=4,24,2
C
C     DEBITAGE ANALYSIS IS A COUNT RATHER THAN METRIC OBSERVATION, SUM?
C
      ITP1=ITEMS(INDOL,1)+1
      DO 215 J=2,ITP1
      IF(INP(I).EQ.ITEMS(INDOL,J)) LOAD(IPL(INDOL,J))=
     1LOAD(IPL(INDOL,J))+INP(I+1)
215   CONTINUE
220   CONTINUE
      GO TO 160
C
1000  CONTINUE
      KDJMY=1
      CALL OUT(LOAD,N,KDJMY,KFMT,KOUT,NFMT,ITEMS,MXFRM,IPL,
     2 MINV,MAXV,JSEL,KFLAG)
```

Figure 113. (continued)

```
      WRITE(KOUT,1010)
1010  FORMAT(/' CHECK THE LAST RECORD, IT MAY NOT BE MEANINGFUL.'/)
      STOP
      END
C
C-----------------------------------------------------------------------
C
C       WRITE OUT LOADED VECTOR
      SUBROUTINE OUT(LOAD,N,INDEX,KFMT,KOUT,NFMT,ITEMS,MXFRM,IPL,
     2 MINV,MAXV,JSEL,KFLAG)
      DIMENSION LOAD(200),KUM(9),KFMT(20),ITEMS(MXFRM,21),IPL(MXFRM,21)
      DIMENSION MINV(200),MAXV(200),JSEL(200)
C
C       PERFORM OUTPUT SELECTION
C               COMPLETE OPERATION FOR MODE 2
C
      DO 20 I=1,N
C       IF SELECTION IS MODE 2, DO RECORD SELECTION
      IF(JSEL(I).NE.2) GO TO 19
      IF(LOAD(I).LT.MINV(I).OR.LOAD(I).GT.MAXV(I)) GO TO 100
19    CONTINUE
C       IF SELECTION IS MODE 3, CHECK FLAG(KFLAG)
      IF(JSEL(I).NE.3) GO TO 20
      IF(KFLAG.EQ.0) GO TO 100
20    CONTINUE
C
      WRITE(KOUT,KFMT) (LOAD(I),I=1,N)
C
100   CONTINUE
      DO 300 I=INDEX,NFMT
      L=ITEMS(I,1)
      IF(L.EQ.0) GO TO 300
      L=L+1
      DO 200 J=2,L
      M=IPL(I,J)
      LOAD(M)=0
200   CONTINUE
300   CONTINUE
      KFLAG=0
      RETURN
      END
```

Figure 113. (continued)

```
$JOB
C       INDEX NEXT FORM
      DIMENSION L1(80),L2(80)
      DATA NINE/'5'/
      READ(1,10) L1
10    FORMAT(80A1)
20    READ(1,10,END=1000) L2
      L1(80)=L2(1)
      WRITE(2,10) L1
      DO 30 I=1,79
30    L1(I)=L2(I)
      GO TO 20
1000  CONTINUE
      L1(80)=NINE
      WRITE(2,10) L1
      STOP
      END
```

Figure 114. *System Program Index FORTRAN.*

```
      DIMENSION L(80)
      DATA IBL/' '/,IZER/'0'/
      I=0
1     CONTINUE
      I=I+1
      READ(1,10,END=1000) L
10    FORMAT(80A1)
      DO 5 I=1,80
      IF(L(I).EQ.IZER) L(I)=IBL
5     CONTINUE
      WRITE(2,20) L
20    FORMAT(80A1)
      GO TO 1
C
1000  CONTINUE
      STOP
      END
```

Figure 115. *System Program Blank FORTRAN.*

Indexing the Data File

FORTRAN Program: INDEX FORTRAN
Input File: Unindexed NRP SYSDAT

The efficiency of the NRP data retrieval system is largely dependent on the ability of the program to anticipate the next data format and load the proper input format before reading it. This is done by indicating at the end of each record the number of the next card. Thus, when NRP SYSDAT is fully operational it contains the number of the data format (card number) in the first two columns of each card and the number of the next card in the last two columns. Before reading a card, NRP FORTRAN checks the user supplied selection list to determine if information has been requested by the operator/researcher. If it has, it loads the proper format; if it has not, it reads only the index of the next card. This procedure results in an enormous saving in input and output time, as the data file is being read serially, or in other words, card by card.

INDEX FORTRAN, as it appears in Figure 114, is specific to the way NRP SYSDAT was set up at the end of the data entry phase and has to be modified if it is used on some other data base. It first sets the north and east coordinates equal to the first level record to avoid output of incomplete cards at the beginning of the operation. It then reads in the first card and changes the field card numbers to numbers assigned later. If the next card is a new unit from the previous level, a unit card is prepared and output. It converts alphanumeric coordinates to numeric to keep track of the change in units, writing the unit record if it is required. It writes the indexed record to NRP SYSDAT, then returns to read another record. If the end-of-file is encountered, it writes out the last record with a zero in the last two columns and terminates execution.

Saving Space on Disk by Converting Zeros to Blanks

When visually reading files of data it is helpful to have zeros in the listing. However, the NRP DATA SYSTEM does not distinguish between blanks and zeros, and if zeros are converted to blanks a great deal of disk area can be saved when NRP SYSDAT is stored on disk in its packed form by issuing the command $PACK <*filename*><*filetype*><*filemode*>.

The program BLANK FORTRAN performs the task of converting zeros to blanks (see Fig. 115).

Retrieving DATA from NRP SYSDAT with NRP FORTRAN

FORTRAN Program: NRP FORTRAN
Input File: NRP PARAM, contains data retrieval requests
Input File: NRP SYSDAT, contains NRP data, indexed

The primary use of data retrieval in the NRP system is the combining of various data sets into integrated data sets at various levels of analysis. There are occasions when data retrieval is useful and others when it is not. For instance, if an analyst wants to process some data on bifaces without any reference to any other variables in the project area, it makes little sense to go through the process of retrieving the data from the NRP DATA SYSTEM. It would be more efficient to simply acquire the data deck for bifaces and add the necessary BMD or SPSS cards to it. If, on the other hand, the researcher wants to know the provenience of the bifaces, whether they are associated with grinding stones in the same sites, and if the soils tend to be acid in the sites where bifaces and grinding stones occur together, then it is far more efficient to retrieve the data from a fully integrated data base.

Unfortunately it is impossible to write a program capable of retrieving data in every possible combination of circumstances. The system is capable of: (1) retrieving any item (variable) in any order, the maximum number of items from a given card being 21 items; (2) counts coded-in running format (see section on formating) can be accumulated across analysis units, i.e., levels, units or sites. See Table 28 for data retrieval procedures.

Selection Mode

The appropriate selection mode must be used when value selections are made. The overall format of the items' selection card is as follows:

I2	Card Number
I4	Item Number on Card
I4	Minimum Value
I4	Maximum Value
I2	Selection Mode
10A4	Name and Comments on Items

Minimum and maximum values are entered as integers, disregarding decimals. Thus, if one desired to retrieve a coordinate of 10.53, the value entered for minimum value would be 1053, right justified in the field.

Selection modes are a complicated process designed to accomodate archaeologists' complicated desires to see sites, units, and levels in different combinations. A brief explanation will be attempted; however, reason and experiment are the only sure way to get the right combination of selection features.

Mode 1. The programs select values for loading immediately after a record is input. If the value falls within a certain range, it is saved; if not, it is discarded without any effect on other values in the input record.

Mode 2. The programs determine, on output, if value(s) fall within the minimum-maximum range. If any value is outside the specified range(s), the entire records are not output.

Mode 3. An entire input record is eliminated because criterion value(s) fall outside the range.

The best way to explain the use of input modes is by an example: Grant D. Hall wanted to know what the frequencies of artifacts of various types were in agglomerated levels across the Choke Canyon Reservoir area. Based on field observations, he thought that low lying sites were rather consistently occupied during two

TABLE 28. DATA RETRIEVAL PROCEDURES

Commands	Definition/Functions
L *<handle>* *<password>*	Log onto a terminal.
DEF STOR 1M	Define storage, one megabit.
I CMS	Restores CMS environment. See Tape Drive Procedures.
Z333	Defines temporary disk with five cylinders of storage.
L NRP * A	Gives listing of all files with the name NRP regardless of *<filetype>* within *<filemode>* A. Check to make sure the following files are on the disk: NRP FORTRAN NRP PARAM NRP SYSDAT If they are not, they will have to be retrieved from Tape NRP02. (See Tape Drive Procedures, Table 29.)
E NRP PARAM	Edit file NRP PARAM. The first set of formats before the blank line are system formats and must not be altered. The format after the blank card is user output format and must conform to the requests entered below for variables. The format must specify less than 80 columns. The next card contains the analysis unit: 1. Site 2. Unit 3. Level 4. Zone 5. Levels by Site The next lines select the items to be retrieved, the order they are to be retrieved in, and the range of values to be selected (see data selection section for explanation).
E NRP PARAM (cont.)	Code 99999 indicates that no further selections are desired and execution of the data retrieval process begins.
FORTHX NRP	Compiles NRP FORTRAN.
NRP EXEC	Executes NRP EXEC which specifies the input and output files and executes the program.
R; T=208.48/212.65 9:10:58	Ready message. When the data retrieval is finished this message will appear on the screen. The first numbers indicate the amount of CMS CPU time used to execute the retrieval. The last number is the time of day.
L * * Z(L)	Requests a list of all the files on Z disk. The file NRP OUT Z1 should appear and the number of records on the file should correspond to user estimate of the number of records expected from the data retrieval; compiled selection information appears on NRP CHK Z.
PUNCH *<SB or JPL>* NRP OUT	If the deck is less than a few hundred cards and the user wants a card copy of it, this command punches it off to either SB or JPL as specified.
COPY NRP OUT Z = = *<filename><filetype>* A	If there is room to store the file on the A disk area, copy it from Z disk to A disk. The user supplies the new file name and new file type. This new data set can be used as input for BMD, SPSS or other programs. Remember, Z disk is <u>temporary</u> and anything left on it will be lost at logoff.
$PUN NRP OUT Z *<handle>*	Moves the output to another user disk area. This command is useful when there is no room in your disk area.
DISC	This detaches your Virtual Machine temporarily. If for some reason there is no space available on A disk and there is no space on another user disk area, then a user has this command available to him so that Z disk can be temporarily stored until a course of action is available. Safe storage of Z disk must follow before midnight of the same day. To reconnect, log as usual to a terminal and then enter B, which restores all files, including Z disk files, as they were at the time of disconnection. Remember the reconnection and storage of all desired Z disk files must occur before midnight of the same day or all Z disk files will be lost.
LOG	Logoff, remember that anything left on Z disk will be permanently lost.

different horizons. The upper horizon normally ranged from the surface to about 30 cm. The low horizon was from about 40 cm to 100 cm. To retrieve this information, the substratum was specified along with several counts to be selected. Two runs of the programs were made with substratum 10-30 cm being selected on the first run and 40-100 cm on the second. After the counts were retrieved, the output files were combined into a single file for analysis. Selection Mode was set at 3. The first run summed frequencies for the upper horizon and the second summed for the lower horizon, eliminating the upper horizon.

PERMANENT STORAGE ON MAGNETIC TAPE

Magnetic tape is the most desirable form of long term storage for large data sets. It is inexpensive, permanent, portable, and exportable. Three nine-track tapes were maintained by Elizabeth G. Frkuska for the project. They are written in standard IBM format. The character set is EPCIDIC and the density is 1600 bpi. These tapes are easily accessed via the IBM 3247 terminal.

Tape NRP01 (Fig. 116) contains systematic saves during the early stages of data set construction. Some of these intermediate files may prove important should problems be discovered in the system data file later. Some of the save sets also are courtesy saves for people whose disk areas had to be commandeered to make enough disk area for the NRP operation.

Tape NRP02 (Fig. 117) contains the intermediate stages of the NRP data collecting effort. The first file is NRPSYS FORTRAN, the data retrieval program which accesses the subsequent file, NRP SYSDAT, the overall data file. As of May 1979, NRP SYSDAT contained about 10,000 records and required 2.3 cylinders of disk storage unpacked.

Tape NRP03 (Fig. 118) contains the final products of the NRP computerization effort. It contains all the main data program written by Joel Gunn and discussed earlier. The tape also contains all minor FORTRAN programs designed to output selected data for utilization in analysis and for appendices for the report. These programs were written by Elizabeth G. Frkuska. The SPSS and BMD programs used during the NRP analysis phase are also stored on this tape. Should any of these tapes need to be accessed, the procedure is explained in Tape Drive Procedures (Table 29).

Save Sets	Date	Contents
Save Set 1	4/21/79	Unique #s, etc., not much
Save Set 2	4/21/79	Bullis, Jake's Backup
Save Set 3	5/04/79	Material Analysis & Graphs
Save Set 4	5/04/79	Steve Black Backup, Ceramics, Graph SPSS
Save Set 5	5/22/79	All NRP Data to Date Unsorted, NRP System Program
Save Set 6	5/30/79	All UNITLEV, IJAKE Backup
Save Set 7	6/19/79	NRP Backup, Verified File Segments

Figure 116. *Tape Log NRP01.**

Save Sets	Date	Contents
Save Set 1	6/05/79	NRP FORTRAN, NRP PARAM, NRP Index, NRP Red
Save Set 2	8/13/79	NRP FORTRAN, NRP PARAM, NRP SYSDAT
Save Set 3	8/13/79	NRP File, Backup

Figure 117. *Tape Log NRP02.**

Save Sets	Date	Contents
Save Set 1	12/12/80	Final NRP Phase I Systems Backup

Figure 118. *Tape Log NRP03.**

*The individual files on all Tape Save Sets are available upon request.

TABLE 29. TAPE DRIVE PROCEDURES

Command	Definition/Functions
L <*handle*> <*password*>	Log on to the IBM 3277. This attaches your Virtual Machine while in the Control Program (CP) environment. The Control Program controls the resources of the real machine and manages communications with all Virtual Machines (VM) and any Virtual Machine to its system. All CAR computer research activities are performed while in the Conversational Monitoring System (CMS) environment.
CP	Enter Control Program environment.
DEF STOR 1M	Defines one megabit (one million bits) of storage.
I CMS	Restores Conversational Monitoring System.
Z333 <*number of cylinders*>	Defines the number of storage cylinders needed. If the number of cylinders is omitted, then it assumes five cylinders of storage.
MSG VS1 <*message*>	This allows communication with the VS1 operator. When desiring to use a tape, the VS1 operator must be contacted and informed as to what tape to mount and then give mounting instructions. When files are only to be transferred from tape to disk, then the tape should be mounted without the write ring for file safety. If, however, updating or modification of files is necessary, then the tape must be mounted with the write ring.
TAPE DRIVE NOT AVAILABLE	A message sent from the VS1 operator when a tape drive is not available. An inquiry as to how long it will be before a tape drive is available should be made.
DEVICE 181 ATTACHED	A message sent from the VS1 operator when the tape is mounted.
TAPE SCAN	This scans the contents of the tape until an end of file or tape mark is reached. As the tape is scanned, a list of each <*filename*> <*filetype*> is listed. Each time a tape mark is reached, a save set ends. A save set is the contents of a tape storage segment and may contain one or numerous files. Each tape scan advances the tape one save set. The tape scan command may be used as many times as there are save sets to scan. If the tape is
TAPE SCAN (continued)	scanned past all existing files, then the VS1 operator must be contacted so that the tape may be rewound. The operator will send a message when the tape is ready again.
TAPE LOAD <*filename*> <*filetype*> <*filemode*>	This command loads one specific file in a save set on a specific disk area as determined by the filemode. The filename is the name of the file and the filetype is the type of file; for example: the NRP FORTRAN A. NRP is the file name and FORTRAN is the file type indicating FORTRAN program; A is the filemode.
TAPE LOAD * * <*filemode*>	This command loads all files within a save set until an end of file or tapemark is reached. * equals any filename and any filetype.
TAPE DUMP <*filename*< >*filetype*< >*filemode*>	This command dumps a particular file from your Virtual Machine to tape. Make sure the tape has scanned past all previously stored files or they will be written over.
TAPE DUMP * * <*filemode*>	This command dumps all files on the Virtual Machine to tape. Make sure the tape has advanced past all existing files before this command is executed.
TAPE WTM	This command writes a tape mark at the end of a file or save set. When finished dumping a file or group of files, the end of the tape dump should be marked with a tape mark. The save set should also be recorded on the appropriate tape log (Figs. 116-118).
TAPE REW	This command rewinds the tape.
TAPE RUN	This command rewinds, unloads, and detaches the tape drive.
DETACH 181	Detaches tape from tape drive 181. Use this command only after tape has been rewound.
HT	Halt tape. If an incorrect command has been executed, then the tape may be halted with this command.

APPENDIX VII.

CLIMATIC CHANGE IN SOUTHERN TEXAS

Joel Gunn, Thomas R. Hester, Richard Jones,
Ralph L. Robinson, and Royce A. Mahula

INTRODUCTION

This paper serves to summarize efforts to discover the processes which govern climate in the south Texas region, and to suggest, in the perspective of that research, potentially profitable avenues of approach to the problem of climatic change. The work done to date has been conducted by the staff of the Center for Archaeological Research, at The University of Texas at San Antonio as part of the Nueces River Project, Phase I.

The interest of the senior author in climatic change was kindled by historic reports of dramatically different weather during the last century. For instance, the ill-fated march of the Mexican General Santa Anna to the Alamo in 1836 was punctuated by two snow storms the likes of which have never been observed in written records in the region. Jose Enrique de la Peña (1975), one of Santa Anna's field commanders, kept an extensive diary during the march and likened it to Napoleon's attempted conquest of Russia because of the miserable weather.

We have acquainted ourselves with the wide range of relevant information and have constructed an outline of a model. In the following pages, background information is broadly outlined, and the model is roughed out for consideration and examination.

Two things are important to keep in mind relative to the findings. First, it was an essential goal of the project to determine how climatic change in Texas fits into continental and global climatic change. Knowledge of these relationships will hopefully allow us to infer and test south Texas climate from synchronic events known elsewhere during prehistoric periods as we have little local information. Alternatively, we may be able to predict probable future climate from observed, present day trends in global climate. Our efforts to date have yielded only the outlines of the global-local relationship and the thinking presented in this chapter is regarded as a first approximation to climatic reality and a model which requires extensive testing, refinement, and probable reformulations. Second, many of the concerns we have approached were governed by the interests of the U.S. Bureau of Reclamation which provided funding for the various lines of research.

CLIMATOLOGY OF TEXAS

As is indicated by Figure 119, Texas is a state of generally low relief topography. With the exception of the Balcones and Caprock Escarpments, each rising over 1000 feet in a few miles, the state is composed of plains and plateaus. Elevations range from less than 500 feet in the east to 3000-4000 feet in the west. Only the western panhandle features mountainous topography. Despite this physiographic uniformity, a dramatic range of climates are represented from

Figure 119. *Physiography of the State of Texas.*

border to border. Average annual rainfall ranges from over 1400 mm (56 inches) in the east to 200 mm (8 inches) in the west, and vegetation consists of dense deciduous woodlands in the east, grading to desert in the west. Palmer (1961) characterized the climates of the United States on the basis of several variables, and the Texas segment of his map is reproduced in Figure 120. Of the four decades studied, years to the east were consistently humid and those to the west were consistently arid. The central regions of the state varied considerably from year to year.

Most precipitation originates off the Gulf of Mexico. A cell of the subtropical high is generally located in the Gulf whose clockwise air flow sets up a south-easterly movement of moist air onto the land. Most precipitation over the state falls in the spring and autumn when conditions are most ideal for collisions between warm, moist gulf air and arctic cold fronts. Other localized rainfall patterns include summer precipitation from convection cells in the west and late summer rainfall in the coastal southeast.

Precipitation off the Pacific Ocean is controlled by the subtropical flow of the jet stream. If the jet stream locates across northern Mexico, Pacific moisture follows, exploding into clouds over the low mountains in northern Mexico and colliding with cold fronts in south Texas to produce rainfall. Precipitation is most frequent when these air movements are accompanied by an upper level trough. Spectacular amounts of moisture can occur when the jet is favorably situated, as it was in the winter of 1976-1977. If, on the other hand, it is located over the Sierra Mountains in California, little Pacific moisture reaches the Texas plains and winters are dry.

Most of the work associated with this project is oriented toward resolving local climatic problems in south Texas. However, the location of Texas on the broad ecotone between eastern and western United States affords an interesting perspective on climatic change for most of North America.

PRESENT DAY OBSERVATIONS

Some communities in Texas have kept records on the weather from as early as 1846, and a few months were observed from time to time before that. While these observations are valuable, most of the wide range of observations necessary to measure subtle variations in climate are not available until the 1930s. An intensive study of south Texas climatic indicators from 1931-1977 was undertaken by the senior author using 20th-century meteorological data to calibrate climatic change in south Texas. Changes in the global climatic pattern were used to project these calibrations into the prehistoric past.

The model which informed this effort was simply that the amount of solar energy reaching the earth controls the structure of atmospheric circulation and thereby local climate. After a considerable amount of experimentation with different data sets, it was found that a reasonable explanation of the variations in Palmer Indices, a complex estimate of soil moisture calculated from precipitation and various other observations (Palmer 1961), could be drawn from variations in solar activity (estimated by sunspot numbers Rz) and the amount of dust in the atmosphere (atmospheric transparency, mostly volcanic activity, data supplied by Reid Bryson). Other variables such as the average temperatures of the northern

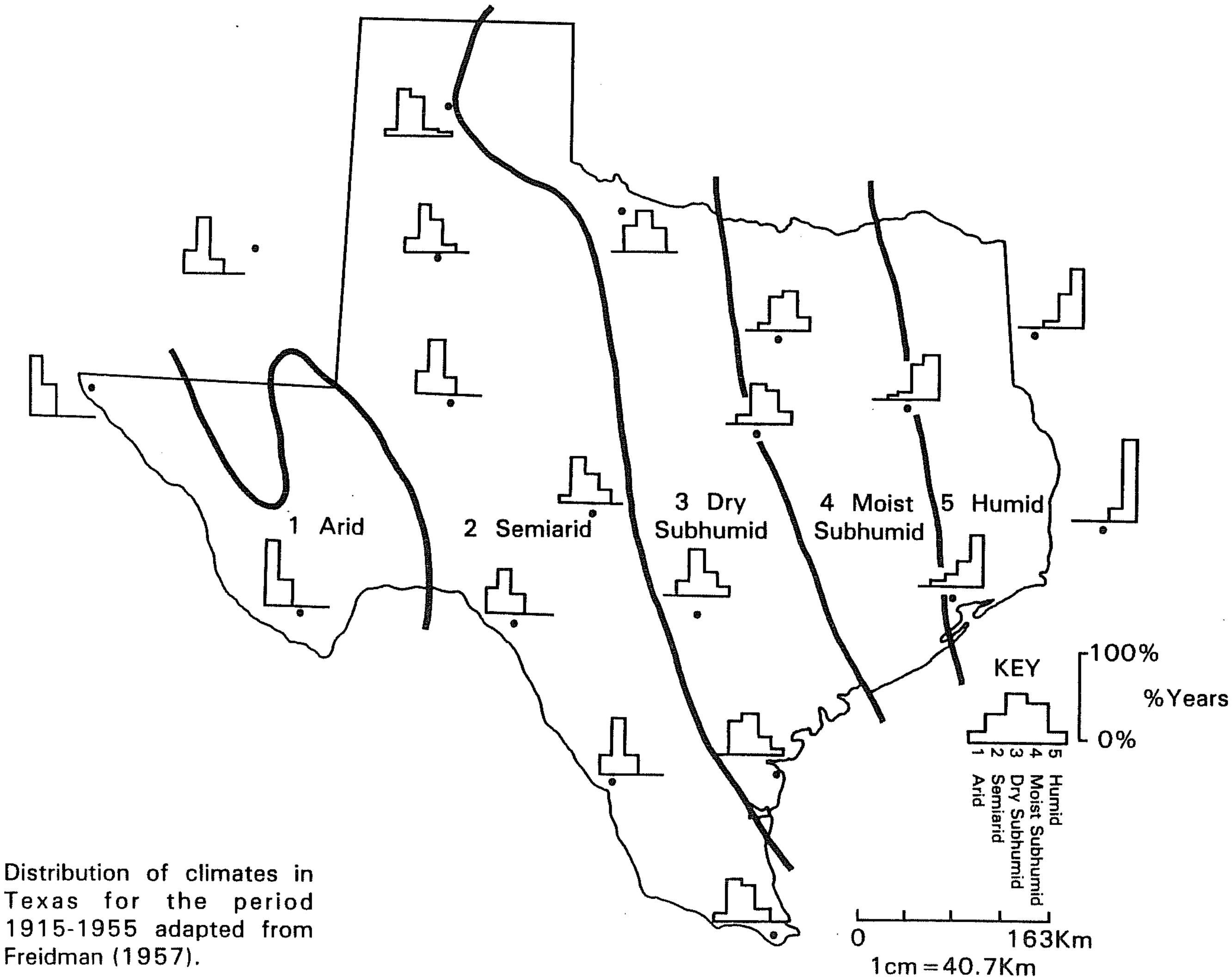


Figure 120. *Distribution of Climates in Texas for the Period 1915-1955.*

hemisphere and average temperatures for eastern and western United States were included in the principal components analysis to clarify the details of the relationship between the causal variables, solar input and atmospheric shielding, and the caused variable, south Texas soil moisture. The average temperature of the northern hemisphere is an estimate of the global energy balance (Budyko 1974; data supplied by James K. Angell), while the eastern United States average temperature represents the moist eastern United States air mass activity (basically Arctic), and the western United States average temperature indicates dry, subtropical high air movements in western North America.

The resulting principal components analysis is displayed in Table 30. Average temperatures for the northern hemisphere were eventually removed because they were virtually identical with the amount of dust in the atmosphere and tended to distort the results. The relationships implied by the three components in Table 30 are displayed graphically as path diagrams in Figures 121-123. Component I (Fig. 121) shows that as atmospheric shielding increases (and the global energy balance goes down) average annual temperatures in the eastern United States decrease. In other words, as the global temperatures go down, the circumpolar vortex expands and the tendency for arctic fronts to dominate climate in the eastern United States increases (Angell and Korshover 1975, 1977, 1978). The overall effect is to increase soil moisture in south Texas. No doubt part of the effect is caused by reduced evaporation and improved effective moisture. Also, recall that more Pacific moisture is likely to be deposited in south Texas as the jet stream moves south. This set of interactions accounts for nearly half of the climatic behavior in the system (41%).

Component II (Figure 122) indicates that, independent of the factors just discussed in Component I, there are also forces acting to reduce soil moisture relative to atmospheric shielding. These forces are associated with the western air mass. The direct relationship between atmospheric shielding in this case is to decrease moisture. This is taken to mean that as dust blocks the sun's rays less moisture is evaporated off the oceans resulting in less rainfall. This relationship is moderated by the western United States air mass which has a peculiar inverse relationship to global energy balance and thus reinforces the downward tendency in south Texas moisture. This set of factors has much less control over the behavior of the system as it accounts for only 24% of the variance.

Component III (Figure 123) shows that as solar activity increases there is a tendency for the amount of soil moisture to increase. This suggests that a hotter sun evaporates more moisture off the oceans, and that moisture is deposited to the land. The relationship accounts for only 22% of the system's behavior.

Perhaps the most outstanding feature of the analysis is that the amount of volcanic dust and other atmospheric obstructions to the sun's energy clearly control, in large part, the amount of soil moisture in south Texas. The amount of solar activity has a secondary though, as we shall see, an important role. That such is the case can be clearly seen in Figure 124, a, and c where there are clear instances of correlation between solar activity and the Palmer Index.

A careful examination of the component scores plotted in Figure 124,b reveals some of the details of these relationships. The heavy solid line represents

TABLE 30. VARIMAX ROTATED PRINCIPAL COMPONENT ANALYSIS OF FIVE GLOBAL AND LOCAL CLIMATIC VARIABLES FOR THE PERIOD 1931-1977*

Causal Variables	Component I	Component II	Component III	Communality
Solar Activity	.02	-.10	.96*	.93
Atmospheric Shielding/Global Energy Balance	.87*	-.40*	-.09	.92
Local Climatic Variables				
Eastern United States Temperature	-.95*	.03	-.09	.91
Western United States Temperature	-.20	.88*	-.15	.83
South Texas Soil Moisture	.59*	.51*	.39*	.76
Percent Variance	.41	.24	.22	.87

*Solar Activity lagged one year, four point running average on all variables.

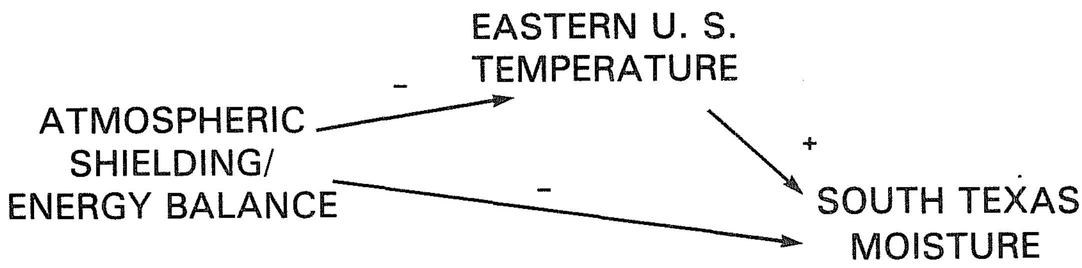


Figure 121. *Path Diagram, Component I.* Increased atmospheric shielding conserves soil moisture in south Texas when moderated by the eastern United States air mass, 41% of variance.

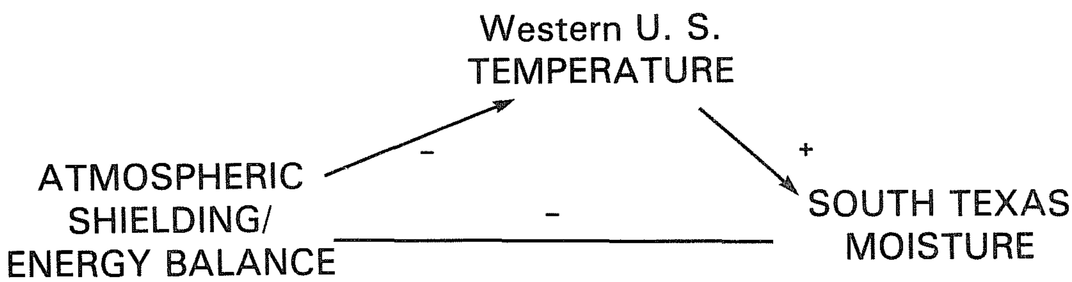


Figure 122. *Path Diagram, Component II.* Increased atmospheric shielding dissipates south Texas soil moisture when moderated by the western United States air mass, 24% of variance.

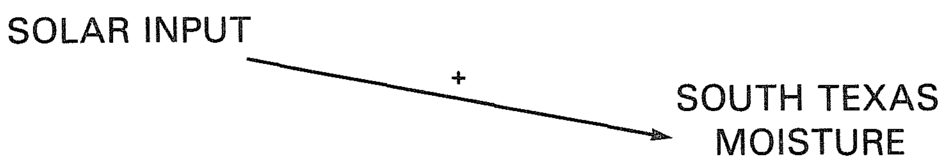


Figure 123. *Path Diagram, Component III.* Increased solar input results in increased precipitation and cloud cover which maintains soil moisture, 22% of variance.

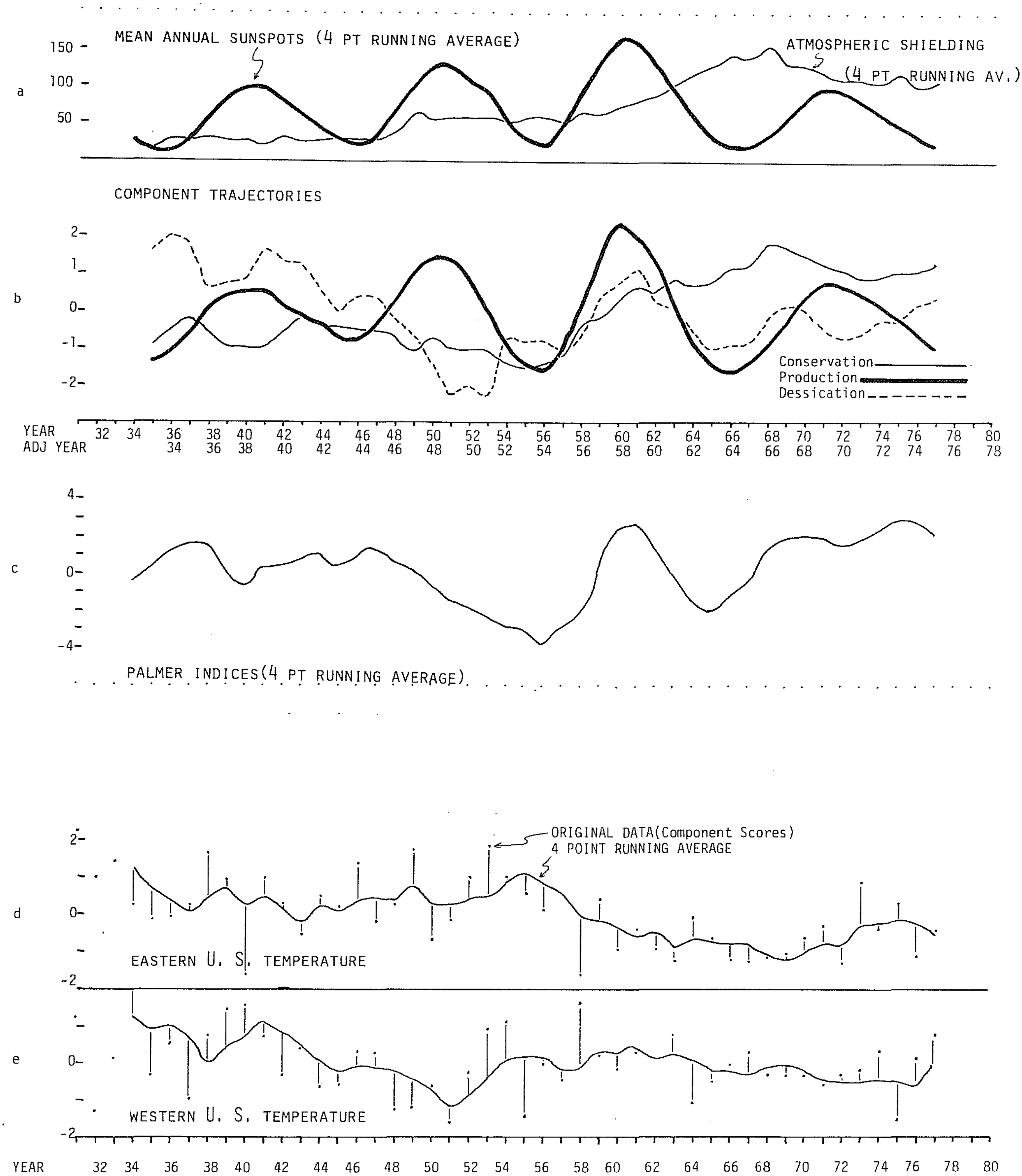


Figure 124. *Correlation Between Solar Activity and the Palmer Index.* a, sunspots and atmospheric shielding; b, components of south Texas climate; c, Palmer Indices of drought; d, eastern United States temperatures; e, western United States temperatures.

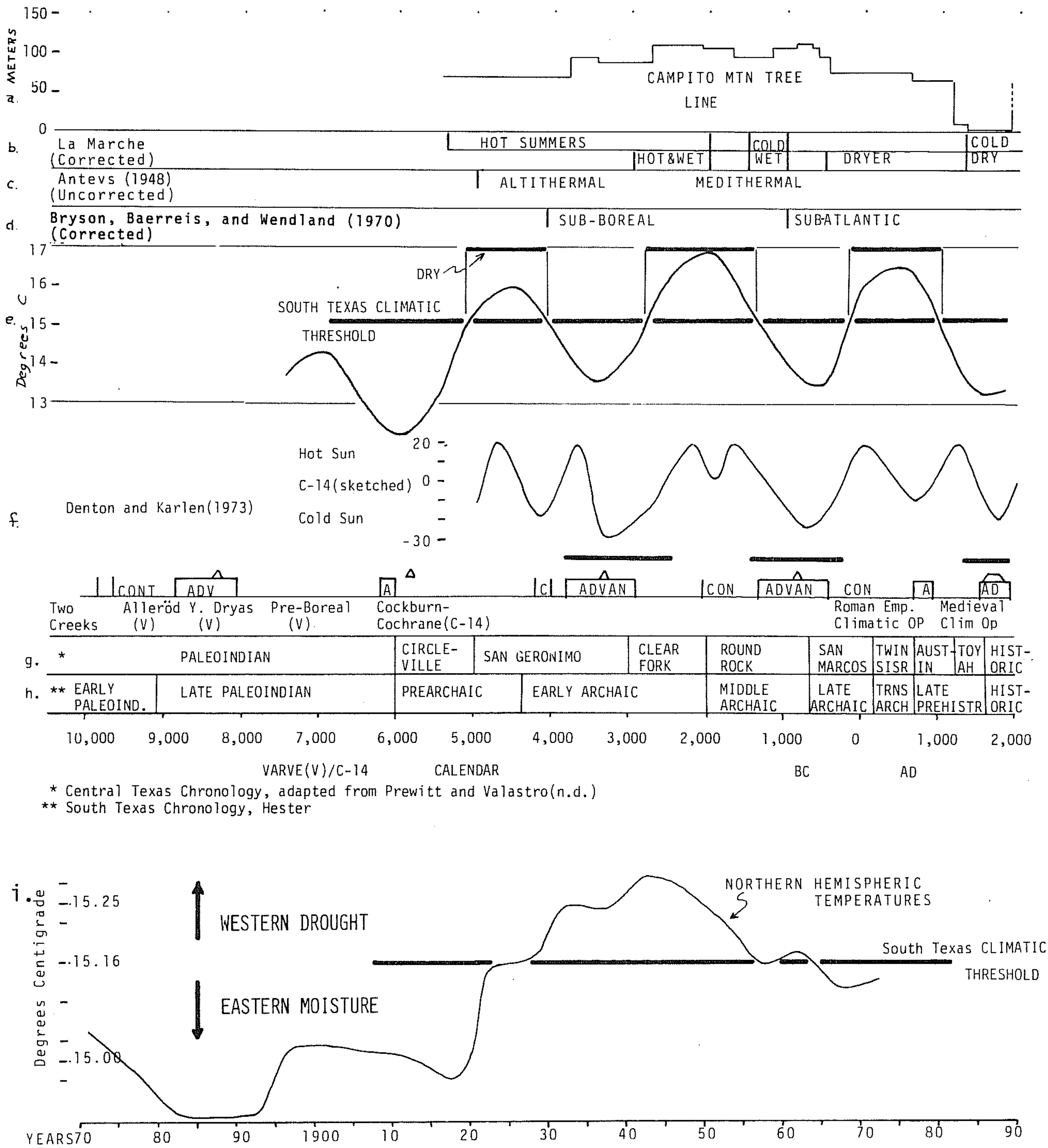


Figure 125. *Various Environmental and Cultural Chronologies Pertaining to Holocene Changes at the Global and Regional Levels.* a, ups and downs of the bristlecone pine tree line on Campito Mt., California, since 1854 B.C. (corrected, adapted from La Marche 1974); b, La Marche's verbal description of climatic change in the White Mts.; c, Antev's original scheme for climatic change in Holocene North America; d, results of analysis of radiocarbon dates by Bryson, Baerreis, and Wendland (corrected); e, dry periods in south Texas estimated by projecting off summed sine waves; f, variations in atmospheric radiocarbon (top) and arctic glacial chronology adapted from Denton and Karlén (1973). Glaciers advance (A,ADV) or contract (C,CON); g, cultural chronology from central Texas adapted from Prewitt and Valastro (n.d.); h, cultural chronology for south Texas adapted from Hester (1977); i, South Texas Climatic Threshold, global temperatures which result in major droughts.

the behavior of Component III through time. High values indicate that both solar input and soil moisture are high; in other words, this is the component in the system capable of actually producing moisture, or the "production line." The lighter solid line represents the eastern United States temperatures and the forces that can conserve moisture though not produce it, the "conservation line." Finally, the dashed line represents the dissipating forces of the western United States air mass of Component II, the "dessication line." When the dashed line, the dessication line, exceeds the production line, south Texas is prone to drought as in the 1930s and early 1950s. When the conservation line dominates as it has since about 1960, cooler and damper climate characterizes the region. The full details of this argument are present in Gunn (1979); however, the plot resembles a soil-water budget diagram.

Relative to calibrating local climatic change to global energy balance, the 1950s appear to be a decade of transition from the desertlike climate of the 1930s and 1940s to the more woodland climate of the 1960s and 1970s. If 1960 is taken as the threshold of transition, it can be projected onto an estimate of the global energy balance (Fig. 125,a). As it turns out, when the average temperature of the Northern Hemisphere is above 15-16°C, south Texas is more desertic in climate, apparently the result of an invasion of dry subtropical air. When global energy balance is below the south Texas climatic threshold, conditions are more moist.

Projecting the climatic threshold into the past is a matter of extending it into prehistory. The curve in Figure 125,b is constructed by summing two sine waves, one with a period of 22,000 years and an amplitude of 5°C, and the other with a period of 2525 years and amplitude of 3°C. The 22,000 period accounts for the Milankovitch mechanism after the fashion of Kukla (1975). The 2525 year period is taken from Denton and Karlén's (1973) discussion of Holocene glacial chronology. The exact 2525 year period was determined by using the year 8450 B.C. (Varve) as the coldest point in the Younger Dryas and A.D. 1650 as the coldest point in the Little Ice Age. The low points in the sine wave were adjusted to fall on those years. Amplitude of the 2525 year cycle was taken from Bergthorsson's (1969) estimated temperatures of the Little Ice Age by ice flow observations in Iceland. This amplitude appears to be about 3°C. If the temperature change from 15,000 B.C., the coldest point of the Wurm, to 4000 B.C., the warmest point in the Holocene, is taken to be 9°C to 17°C, a range of 8°C, then 5°C is the amplitude of the 2000 cycle after the 3°C for the 2525 year cycle is accounted for.

When the south Texas climatic threshold is projected across this estimate of Holocene temperatures as in Figure 125,b, then periods when the curve is above the threshold should be dry, those below wet. Archaeologists working in south Texas, then, should find wet and dry periods shown in Table 31.

TABLE 31. EXPECTED DRY AND WET PERIODS IN SOUTH TEXAS

Dates (Calendar)	Climate
300 B.C.-A.D. 100	Dry
1300 B.C.-300 B.C.	Wet
2800 B.C.-1300 B.C.	Dry
4000 B.C.-2800 B.C.	Wet
5000 B.C.-4000 B.C.	Dry
>5000 B.C.	Wet

The figures in Table 31 represent only the most general variations in climate and must be regarded with caution. For instance, we know that there was an early stage of the Little Ice Age between A.D. 600 and A.D. 900 that had widespread effects on human cultures in North America. The curve sketched in Figure 125,c is taken from the tree ring radiocarbon curve which some believe follows solar variation. There appears to be another cycle or cycles which accounts for brief excursions of the climatic spectrum. Culturally, the Round Rock Phase (Middle Archaic) of the Central Texas Archaic cultural period (Fig. 125,e) is thought to be associated with a humid, woodland climate. It does, in fact, correspond in part to glacial advance (Fig. 125,d), low solar activity (Fig. 125,c), and our theoretical estimate of climatic change (Fig. 125,b).

In summary, while the above presentation is based on assumptions which have been questioned by some, i.e., that the solar constant is related to sunspot activity, and that climatic change and solar activity are related to the radiocarbon content of the atmosphere, etc., there do appear to be encouraging signs in the analysis, so much so that the model and data bear refinement and closer examination.

Relative to the effect that the 20th-century climatic changes have had on vegetation, Jones (1979) has demonstrated that there are measurable effects on unirrigated crop yields between 1959 to 1976. The state was divided into eight regions, and after the effects of improving technology and ecotonal transition were removed, it was found that climatic change accounted for about 27% of the increase in sorghum yields over the study interval. The data indicate that changes in temperature are actually more important than changes in precipitation (Table 32), probably due to the moisture-dissipating effect of increased evapotranspiration. Over the 18-year study, interval temperatures went down and moisture levels rose. The effects are clearly more evident in the western agricultural provinces, which we take to be positive evidence that the ecotone between the humid east and the arid west is shifting westward with cooling global temperatures. We hope to use this information to calibrate the effect of climatic change on prehistoric plant biomass, particularly on buffalo grass, a staple of frequently hunted large game.

PREHISTORIC OBSERVATIONS

South and central Texas have proven most intractable relative to the recovery of paleoclimatic evidence. Numerous attempts to recover pollen have failed. Thus, while dry southwest Texas caves have given prolific evidence through paleobotanical and palynological studies of climatic change (Hester 1977, Bryant and Shafer 1977) and at least something is known about east Texas from a series of bogs (Bryant 1977), south Texas was a virtual unknown until recently. Over the past several years, soil samples have been processed from a number of south and central Texas archaeological sites and virtually all were found to contain biosilicates, that is, phytoliths, diatom skeletons and sponge skeletons, all of which have proven useful for determining paleoclimates (Robinson 1979). Robinson fully analyzed a biosilica column from one south Texas site (41 GD 21) and several more are in process, so there will soon be a substantial amount of information on paleoclimate in south Texas. The first results of Robinson's efforts suggest that biosilicates are truly an effective means of measuring the paleoenvironment. For instance, the dryland and moistland grasses shown in Figure 126,b clearly vary synchronously with the glacial chronology, Figure 126,g,

TABLE 32. RESULTS OF PREDICTIVE MODEL FOR TEXAS SORGHUM YIELD

	Beta Coefficients for: Technol.	Temp.	Precip.	Proportionate Explanation* of:			e	
Region	(b)	(c)	(d)	t	T	P	(unexplained influences)	Total
1 Lower Plains	0.23	-0.68	-0.04	17	48	3	32	100
2 North Central	0.65	-0.01	0.14	40	1	9	50	100
3. East	0.79	0.06	0.02	55	4	1	40	100
4 Edwards	0.23	-0.80	-0.41	8	30	15	47	100
5 South Central	0.58	-0.42	-0.36	18	13	11	58	100
6 Upper Coast	0.91	0.00	-0.20	68	0	15	17	100
7 South	0.44	-0.78	-0.54	14	25	18	43	100
8 Valley	0.62	-0.19	0.08	42	13	6	39	100
	8-region Averages:			(33)	(17)	(10)	(40)	(100)

*These percentages were derived, for each of the variables t, T, and P, by applying to the explained variance in yield the multiplier $\frac{|\beta_i|}{\sum_i |\beta_i|}$, where β_i represents the beta coefficient for explanatory variable i .

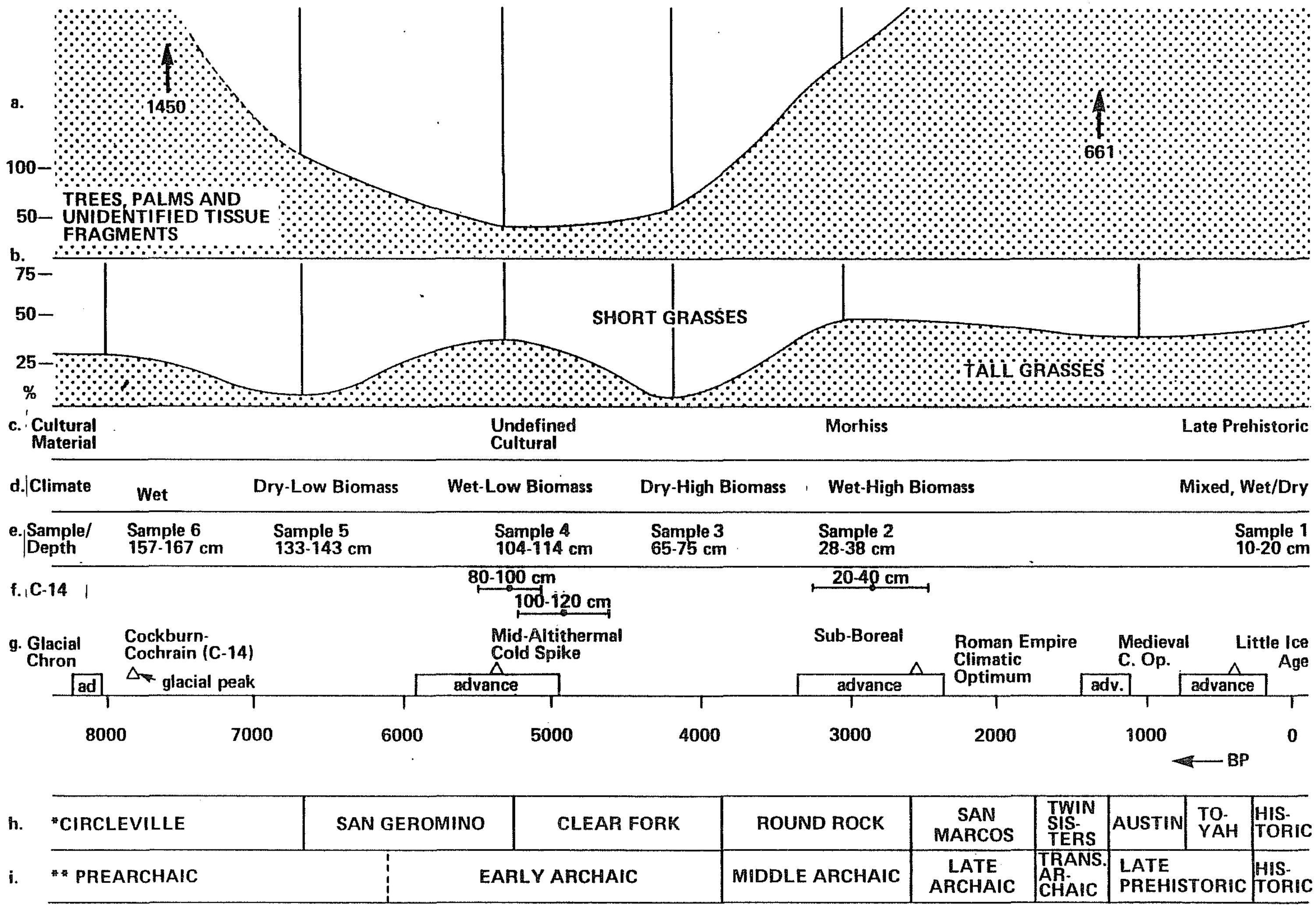


Figure 126. *Phytolith Analysis from 41 GD 21, an Archaeological Site on the South Texas Coast.** a, relative plant biomass estimated from phytoliths of trees and palms, and silicified tissue fragments; b, variations in relative frequencies of phytoliths from short and tall grasses; c, associated cultural material; d, verbal description of climate; e, sample number and depth below surface; f, corrected radiocarbon dates; g, glacial chronology (adapted from Denton and Karlén 1973); h, central Texas cultural chronology; i, south Texas cultural chronology.

*Adapted from Robinson 1979.

which supports the idea that cooler temperatures bring moist climate to south Texas. In addition to the moist-humid measurement, certain aspects of the biosilicate population provide intriguing insights into the plant biomass. The biomass appears to be very high during the final stage of the Pleistocene. The Holocene biomass is relatively low and varies synchronously with the dry-humid chronology.

Additional studies have been made into cultural and climatic change in North America as a whole. A very interesting study by Sanchez and Kutzbach (1974) shows that during the climatic changes of this century moisture and temperature variations can be followed in bands across North America corresponding to northern United States, southern United States, northern Mexico, southern Mexico, and Yucatan, Central America. Projecting this scheme into the past by means of the climatic curves discussed above shows that much of the ups and downs of Mesoamerican civilizations and cultural change in northern Mexico and the United States can be explained, at least in part, by climatic change (Gunn and Adams 1981). Those instances where climatic change does not provide an adequate explanation can be covered by a few alternative concepts such as economic buffering and invulnerability to climate in the local environments.

CONCLUSIONS

Our research supports the current idea that climatic change is fostered by atmospheric shielding and variation in the amount of energy arriving at the earth from the sun. We have managed to quantify the parameters of that relationship in broad perspective. Testing of those relationships are now in their preliminary stages, and nature seems to be favorably disposed toward our model at the level of resolution we are now working at. However, that level of conceptual and temporal resolution is so low that there could very easily be gross misestimates of quantities or badly defined relationships, and their discovery will have to await refinement of concepts and data. Our primary goal in the near future, then, will be to refine measurement and perspective.

Robinson's efforts with biosilicates will continue, and accumulated data should provide more satisfying tests of the wet-dry climate problem. Of most importance is to define the exact duration of the wet and dry periods with those points where the Climatic Threshold is crossed. Such information will allow us to adjust and refine the sine waves, perhaps fine-tune the climatic threshold value and determine if it is a true constant. With regard to climatic cycles, we obviously need more cycles, and such an effort is planned when we acquire a new set of radiocarbon/tree ring calibrations.

The question of whether atmospheric radiocarbon varies with climate needs to be explored in depth. It is clear that atmospheric shielding and solar activity act quite independently of each other in the modern data to create climatic changes. This conclusion is supported by some refined aspects of the analysis of drought not presented above. Basically, the ability of solar variation to create short term droughts appears to be undiminished by increased atmospheric shielding. The reason probably goes back to the notion that the sun heats surfaces, land or sea, but does not heat the air directly. Thus, a burst of solar activity can produce moist air, particularly at lower latitudes, irrespective of the atmospheric transparency, at least within limits. On the other hand, the fate of that moisture once produced seems to fall in large part to atmospheric shielding. Of course the two elements of the system cannot be completely independent of each other, but there is a component of independence that appears to have a profound effect on climate.

Applied at a grander scale, this independence may bear the seeds of explanation for some of the mysteries of the wet-dry/cold-warm combinations of paleoclimates that seem to appear in inexplicable sequences in almost every paleoclimatic chronology. Most of these variants of climate seem to have something to do with seasonality of precipitation. Therefore, let us examine the independence of solar and shielding variation in the context of seasons (Fig. 127).

First, suppose that summers are more under the control of solar output, because it is during this season that the sun is overhead and exerts direct influence on the surfaces. In contrast, the winters must be assumed to be more under the control of shielding effects. In the same way that shielding could have little effect on an overhead sun in the summer, and therefore solar variation comes pouring through, so shielding exerts major effects in the winter because the relatively indirect rays of the sun are overwhelmed by the reflective effect of atmospheric dust. Thus, the secret to the independence of solar variation and shielding is hidden away in the march of seasons.

Now examine the Holocene sequence assuming that solar variation is represented by the 22,000 year Milankovich cycle and atmospheric shielding is inverse to the 2525 year cycle. A year in which solar input is high and shielding is low (Fig. 127,d) would produce scorching temperatures in the summer and warm winters, conditions which are likely to reduce the circumpolar vortex and expand the subtropical high northward, a likely desertic period in Texas. Robinson's biosilicate analysis in fact shows that during the most extreme such interval in south Texas during the Holocene there was a very low plant biomass and high erosion/deposition, in other words a desert.

The alternative Holocene situation would be with high solar input and high shielding. This would produce hot, dry summers but the winters would be relatively cool and moist. Such conditions would explain the periods of the Holocene when short grasses dominate with a relatively high biomass. The cool, moist winter and spring support the growth of short grasses but the hot summer detains the tall grasses which prefer moist environments.

The Pleistocene and the Neothermal provide examples of the remaining two combinations since solar input was and is lower. A period with relatively cool summers and cold winters provides maximum moisture throughout the year and so, in the latitudes of southern United States and Texas, encourages the growth of woodlands, especially deciduous trees and the southern pine forests. The most favorable condition of all is the cool summer and warm winter. Such conditions are thought to have been characteristic of the Pleistocene. An environmental diversity develops which fosters a very broad spectra of biological organisms. This combination of seasons has not existed as a climate since the Pleistocene so far as is known.

Questions that must be asked relative to this model are many. Are there other factors which control the distribution of energy through the year such as the

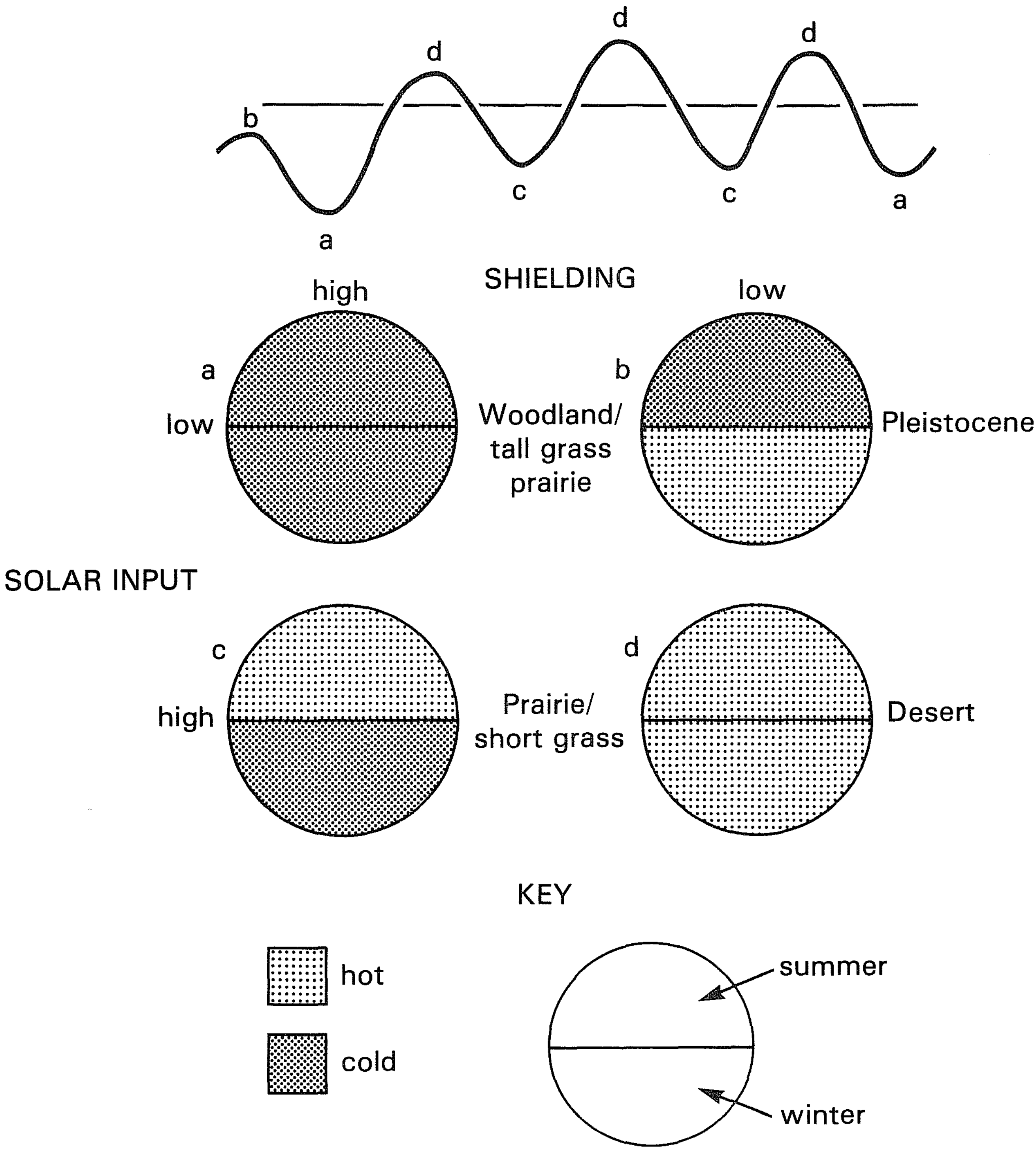


Figure 127. *Various Permutations of Solar Input/Shielding and Implied South Texas Environments.*

amount of carbon dioxide in the air? Bryson (Bryson and Murray 1977) thinks it does. Also, irregularities in the cycle of shielding which is apparently either unpredictable or quasi-cyclical need to be pursued with extreme diligence.

While studies such as those by Harlin (1979) and Kelly (1977) leave little doubt that there is some sort of relationship between sunspots, solar input to the earth's atmosphere, and variation in global circulation patterns, the relationship needs to be made explicit and refined.

REFERENCES CITED

Angell, J. K. and J. Korshover

1975 Estimate of the Global Change in Tropospheric Temperature Between 1958 and 1973. *Monthly Weather Review* 103:1007-1012.

1977 Variation in Size and Location of the 300 mb North Circumpolar Vortex Between 1963 and 1975. *Monthly Weather Review* 105:19-25.

1978 The Expanded North Circumpolar Vortex of 1976 and Winter of 1976-1977, and Attendant Vortex Displacement. *Monthly Weather Review* 106:137-142.

Antevs, E.

1948 Climatic Change and Pre-White Man. In The Great Basin, With Emphasis on Glacial and Post-Glacial Times. *Bulletin of the University of Utah* 38(20):168-191.

Bergthorsson, P.

1969 An Estimate of Drift Ice and Temperature in Iceland in 1000 Years. *JOKULL (Journal of the Icelandic Glaciological Society)* 9:94-101.

Bryant, V. M., Jr.

1977 A 16,000 Year Pollen Record of Vegetational Change in Central Texas. *Palynology* 1:143-156.

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

1977 The Late Quaternary Paleoenvironment of Texas: A Model for the Archeologist. *Bulletin of the Texas Archeological Society* 48:1-26.

Bryson, R. A., D. A. Baerreis, and W. M. Wendland

1970 The Character of Late-Glacial and Post-Glacial Climatic Changes, In Pleistocene and Recent Environments of the Central Great Plains, edited by W. Dort, Jr. and K. Jones, Jr. *University of Kansas, Special Publication* 3.

Bryson, R. A. and T. J. Murray

1977 *Climates of Hunger: Mankind and the World's Changing Weather.* University of Wisconsin Press, Madison.

Budyko, M. I.

1974 *Climate and Life.* Academic Press, New York.

de la Peña, J. E.

1975 *With Santa Anna in Texas.* Carmen Perry, trans., Texas A&M Press.

Denton, G. and W. Karlén

1973 Holocene Climatic Variations, Their Pattern and Possible Cause. *Quaternary Research* 3(2):155-205.

Friedman, D. G.

1957 The Prediction of Long Continuing Drought in South and Southwest Texas. *The Travelers Insurance Company.*

Gunn, J.

1979 Global Climate and Texas Moisture. Working Papers Number 1, Impact of Climatic Change Project. Research by the Center for Archaeological Research, The University of Texas at San Antonio for the Ewing Halsell Foundation of San Antonio and the United States Bureau of Reclamation.

Gunn, J. and R. E. W. Adams

1981 Climatic Change, Culture, and Civilization in North America. *World Archaeology* 13(1):87-100.

Harlin, J. M.

1979 Solar Influence on Mean Annual Precipitation. *Professional Geographer* 31(1):25-33.

Hester, T. R.

1977 The Current Status of Paleoindian Studies in Southern Texas and Northeastern Mexico. *The Museum Journal* XVII:169-186. West Texas Museum Association, Texas Tech University, Lubbock.

Jones, R.

1979 Recent Crop Yields and Climate in Texas. Working Papers Number 5, The Impact of Climatic Change Project. Research by the Center for Archaeological Research, The University of Texas at San Antonio for the Ewing Halsell Foundation of San Antonio and the United States Bureau of Reclamation.

Kelly, P. M.

1977 Solar Influence on North Atlantic Mean Sea Level Pressure. *Nature* 269:320-322.

Kukla, G. J.

1975 Missing Link Between Milankovitch and Climate. *Nature* 253:600-603.

LaMarche, V. C., Jr.

1974 Paleoclimatic Inferences from Long Tree-Ring Records. *Science* 183:1043-1048.

Palmer, W. C.

1961 Meteorological Drought. *Superintendent of Documents, United States Government Printing Office.*

Prewitt, E. R.

1981 Cultural Chronology in Central Texas. *Bulletin of the Texas Archeological Society* 52:65-90.

Prewitt, E. R. and S. Valastro, Jr.

n.d. From Circleville to Toyah: Comments on Central Texas Chronology. Manuscript on file; Center for Archaeological Research, The University of Texas at San Antonio.

Robinson, R. L.

1979 Biosilica and Climatic Change at 41 GD 21 and 41 GD 21A. Appendix IV in Archaeological Investigations of Two Prehistoric Sites on the Coleto Creek Drainage, Goliad County, Texas, by D. E. Fox. *Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report* 69.

Sanchez, W. A. and J. E. Kutzbach

1974 Climate of the American Tropics and Subtropics in the 1960s and Possible Comparisons with Climatic Variations of the Last Millenium. *Quaternary Research* 4(2):128-135.

Weir, F. A.

1976 The Central Texas Archaic. Unpublished Ph.D. dissertation, Washington State University.

APPENDIX VIII.

BIOSILICA ANALYSIS OF THREE PREHISTORIC ARCHAEOLOGICAL SITES IN THE CHOKE CANYON RESERVOIR, LIVE OAK COUNTY, TEXAS: PRELIMINARY SUMMARY OF CLIMATIC IMPLICATIONS

Ralph L. Robinson

Choke Canyon Reservoir is in a critical area for the analysis of prehistoric vegetation and climatic change as it is in an ecotone between the western margin of the Western Gulf Coastal Plain and the eastern margin of the Rio Grande Plain.

Organic microfossil evidence of prehistoric vegetation such as pollen is not well preserved in this area of Texas. However, microfossil evidence of silica accumulator biota, biosilica, is well preserved and very abundant. This analysis required the refinement of methods of separation and concentration of biosilica from archaeological matrix samples of hearths and highly calcareous sediments; the collection, identification, and processing of modern plants for comparative samples; the analysis of geologic sources of biosilica; taxonomic research involving the identification, and classification of the various types of biosilica; the calculation of the concentration of diagnostic biosilica types per gram of matrix; and the interpretation of the diverse microfossil assemblage.

The families of silica accumulator biota found to be of importance in this analysis were the Bacillariophyceae (diatoms), Gramineae (grasses), Palmae (palm), Ulmaceae (elm and hackberry), Fagaceae (oak), and Spongillidae (freshwater sponge). The Gramineae was subdivided into three subfamilies, the Chloridoideae, Panicoideae, and Pooideae. The following generalizations were made of the environmental preferences of three subfamilies of grasses:

1. Chloridoideae: Characteristic of and dominant in arid environments with summer rainfall such as the Desert Plains Grassland (short and mid-grasses) and the Shortgrass Prairie (short grasses). These grasses prefer warm environments.

2. Panicoideae: Characteristic of and dominant in mesic grasslands with summer rainfall such as the Tall Grass Prairie Association and the Coastal Prairie. These Tall Grasses prefer humid, tropical to subtropical habitats. Temperature is the primary limiting factor while moisture is the secondary limiting factor.

3. Pooideae: Grasses which prefer cool climates or seasons and winter rainfall. Moisture is the secondary limiting factor. These grasses are often referred to as Wintergrasses.

Three prehistoric archaeological sites on the Frio River in Live Oak County were selected for biosilica analysis: 41 LK 31/32, 41 LK 201, and 41 LK 67. The matrix samples from these sites are referred to in the following manner: 41 LK 31/32 (31/32-1 to 7), 41 LK 201 (201-1 to 6), and 41 LK 67 (67-1 to 11).

When analyzed as a biostratigraphic sequence there are several outstanding changes in the 47 types or groups of biosilica present in these 24 matrix samples. The silica accumulator biota of these local environments within the Choke Canyon area has therefore exhibited considerable change during the Holocene, whether the causitive agents are climatic, biological, cultural, geological/edaphic, pyric, or combinations of these factors.

The oldest samples analyzed from the Choke Canyon area are from 41 LK 31/32. Sample 31/32-1 is older than 5330 B.P. and is therefore within the middle of the Hypsithermal Period and the Atlantic Climatic Episode. The grasses of the subfamily Chloridoideae are dominant and remain dominant until 4300 B.P. In samples 31/32-2 and 31/32-3, the Pooideae are observed for the first time at 5300 B.P., which corresponds to the peak of the glacial expansion of the Mid-Hypsithermal glacial advance. *Quercus* sp. (oak) and the freshwater sponges increase during this time. These data suggest a mesic period with the possibility of winter and summer rainfall or perhaps cooler conditions with no change in rainfall or rainfall patterns. Between 5330 B.P. and 4300 B.P., in sample 31/32-4 the Pooideae are not observed, but the Panicoideae increase as do *Quercus* sp. (oak). The concentration of biosilica per gram of matrix is at its highest point during the Atlantic Climatic Episode. I would suggest that sample 31/32-4 is closer to 5000 B.P. in age than 4300 B.P. and therefore within the Mid-Hypsithermal mesic interval. By 4300 B.P., in samples 31/32-5 and 31/32-6, the Pooideae have reappeared, and phytoliths of dicotyledons reach their highest percentage when compared to the Gramineae. Based on soil development, this surface existed longer than any other at 41 LK 31/32 which may explain the high percentage of dicotyledons. The end of this period, which corresponds to the end of the Atlantic Climatic Episode and the beginning of the Sub-Boreal Climatic Episode, is between the two radiocarbon dates of 4300 B.P. and 3250 B.P. This transitional period, represented by samples 31/32-7 and 201-1, is characterized by the virtual disappearance of the Chloridoideae, the dominance of the Pooideae, a decrease in the Panicoideae, and a decrease in *Quercus* sp. (oak) and other dicotyledons. Freshwater sponges also decrease. These two samples had the lowest concentration of biosilica for either of the two floodplain sites, 41 LK 31/32 and 41 LK 201. These data suggest a period of winter rainfall and perhaps erosion or rapid aggradation. Deposition during the spring season could produce similar data.

By 3250 B.P., samples 201-2 and 201-3 correspond to the glacial expansion of the Sub-Boreal Climatic Episode; the Panicoideae are well represented, and the Pooideae are dominant. The first evidence of the elm family is present. *Quercus* sp. (oak) is at its greatest abundance as are the freshwater sponges. The concentration of biosilica per gram of matrix is the highest of any examined in the Choke Canyon area. The evidence suggests a mesic environment with a high biomass of silica accumulator biota. Rainfall may have occurred during both winter and summer seasons. An environment both cooler and more mesic than today's is implied.

After 3250 B.P. and before 1000 B.P., samples 201-4 and 201-5 show the Panicoideae are dominant for the first time, *Celtis* sp. (hackberry) is abundant, and *Ulmus crassifolia* (cedar elm) is present. Freshwater diatoms reach their maximum abundance. Although a lack of radiocarbon dates for samples 201-4 and 201-5 prevents a statement of exact age, I would suggest a date of approximately 2400 B.P. to 2800 B.P. for sample 201-4, based on biosilica research at

41 GD 21 and 41 GD 21A. Sample 201-4 is from a mesic environment with summer rainfall. Although *Celtis* sp. and other members of the elm family are present in sample 201-5, and the Panicoideae are still dominant, the concentration of biosilica per gram of matrix is less than half that of sample 201-4. The Pooideae are well represented in this sample. Sample 201-5 is from a mesic environment but less mesic than samples 201-2 to 201-4. There is also the possibility that this sample represents rapid aggradation or deposition during a cool season.

At approximately 2540 B.P. in the uplands of 41 LK 67, in samples 67-1 to 67-11, the dominant grasses are the Chloridoideae with low percentages of the Panicoideae and no evidence of the Pooideae. The phytolith evidence combined with the charcoal evidence of *Acacia* sp. suggests an environment similar to that of the present, short grasses with an overstory of shrubs.

By approximately 1000 B.P., from sample 201-6, during the Sub-Atlantic Climatic Episode, the Chloridoideae have regained dominance on the floodplain of the Frio River. The Panicoideae and the Pooideae are well represented. There is little evidence of *Quercus* sp. (oak) and other dicotlyedons. The concentration of biosilica per gram of matrix is very low. These data imply a more xeric environment than that of the Sub-Boreal Climatic Episode, but perhaps more mesic than the present environment. I do not think that it is coincidental that there is abundant evidence of *Bison bison* at 41 LK 201 during the time when the short grasses have regained dominance on the floodplain.

The silica accumulator biota of three prehistoric archaeological sites on the Frio River has exhibited considerable change through approximately 5000 years of the Holocene. Two major mesic periods corresponding to glacial expansions are suggested with the mesic interval during the Sub-Boreal expansion being the most mesic. The carrying capacity of the local environment in the Choke Canyon area was probably greatest during these mesic intervals.

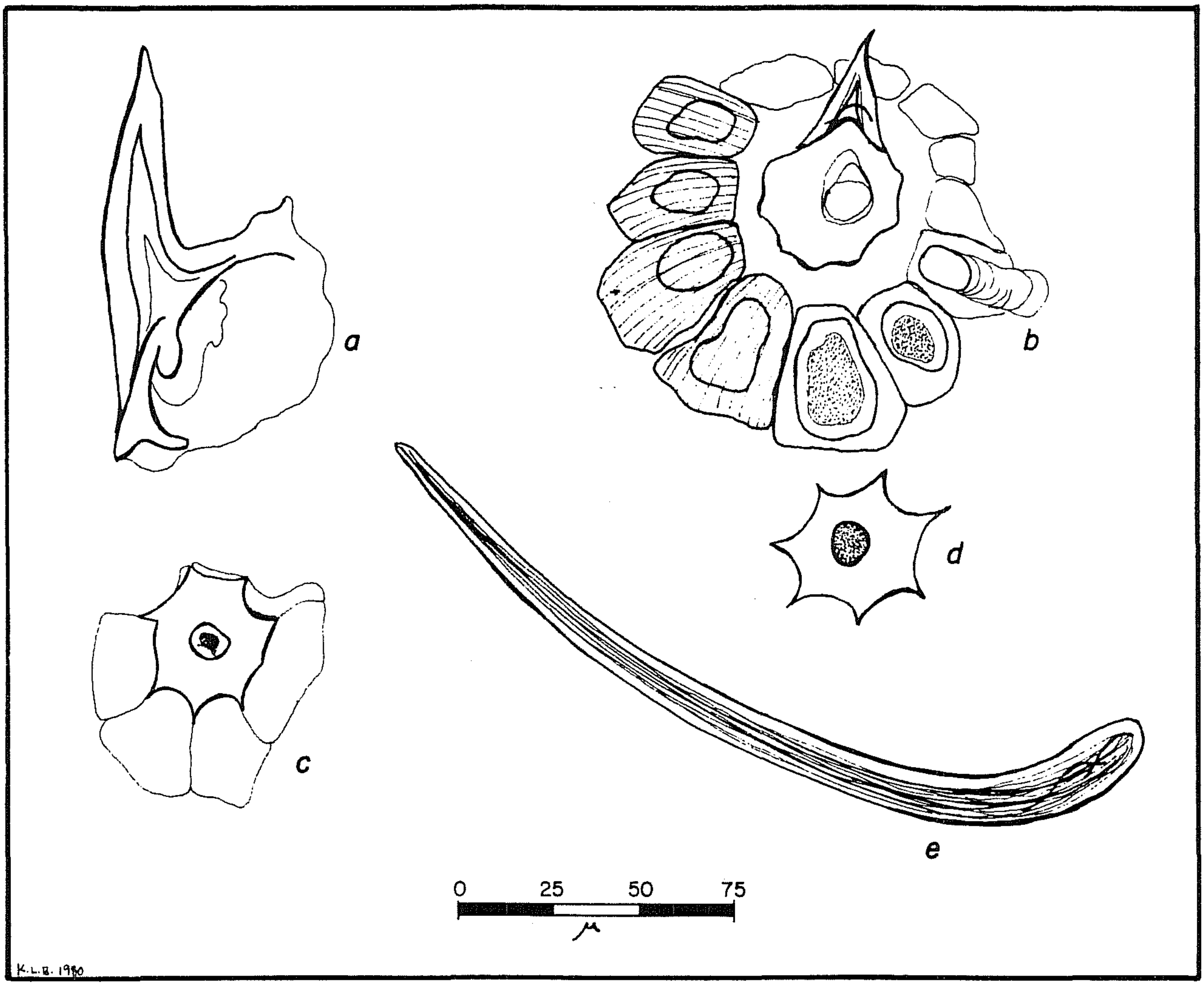


Figure 128. *Comparative Samples of Phytoliths from Leaves of Two Species of Celtis* (*Hackberry*). a,b, *Celtis pallida* Torr. (desert hackberry), (a, trichome and trichome base [lateral view]; b, silicified tissue fragment; trichome, trichome base, and surrounding epidermal cells); c-e, *Celtis reticulata* Torr. (netleaf hackberry), (c, silicified tissue fragment; trichome base with surrounding epidermal cells; d, trichome base; e, trichome).

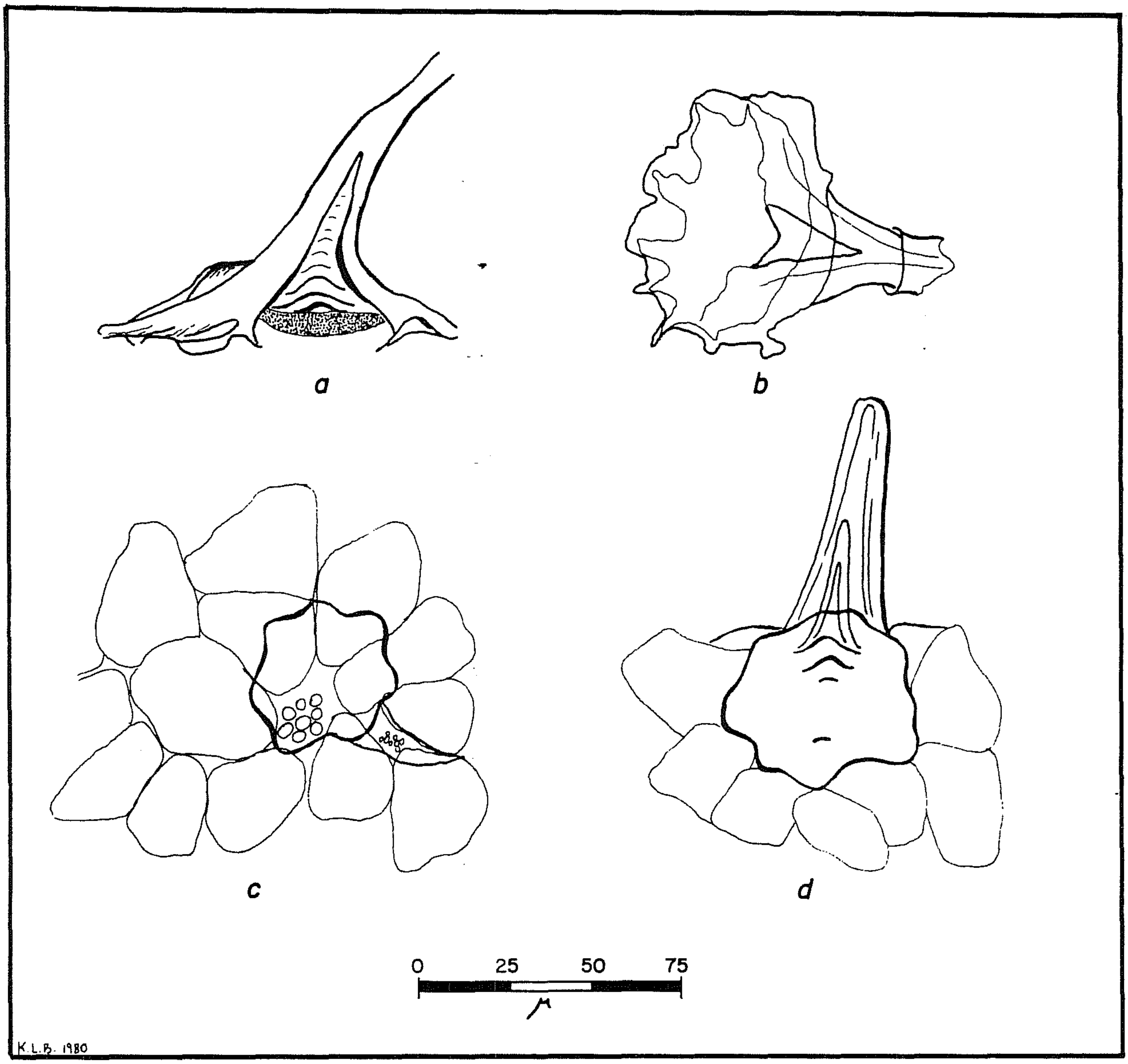


Figure 129. *Comparative Samples of Phytoliths from Leaves of Ulmus crassifolia Nutt. (Cedar Elm).* a, trichome and trichome base (lateral view); b, trichome and trichome base (lateral-ventral view); c,d, silicified tissue fragments; trichome, trichome base, and surrounding epidermal cells (c, ventral view; d, dorsal view).

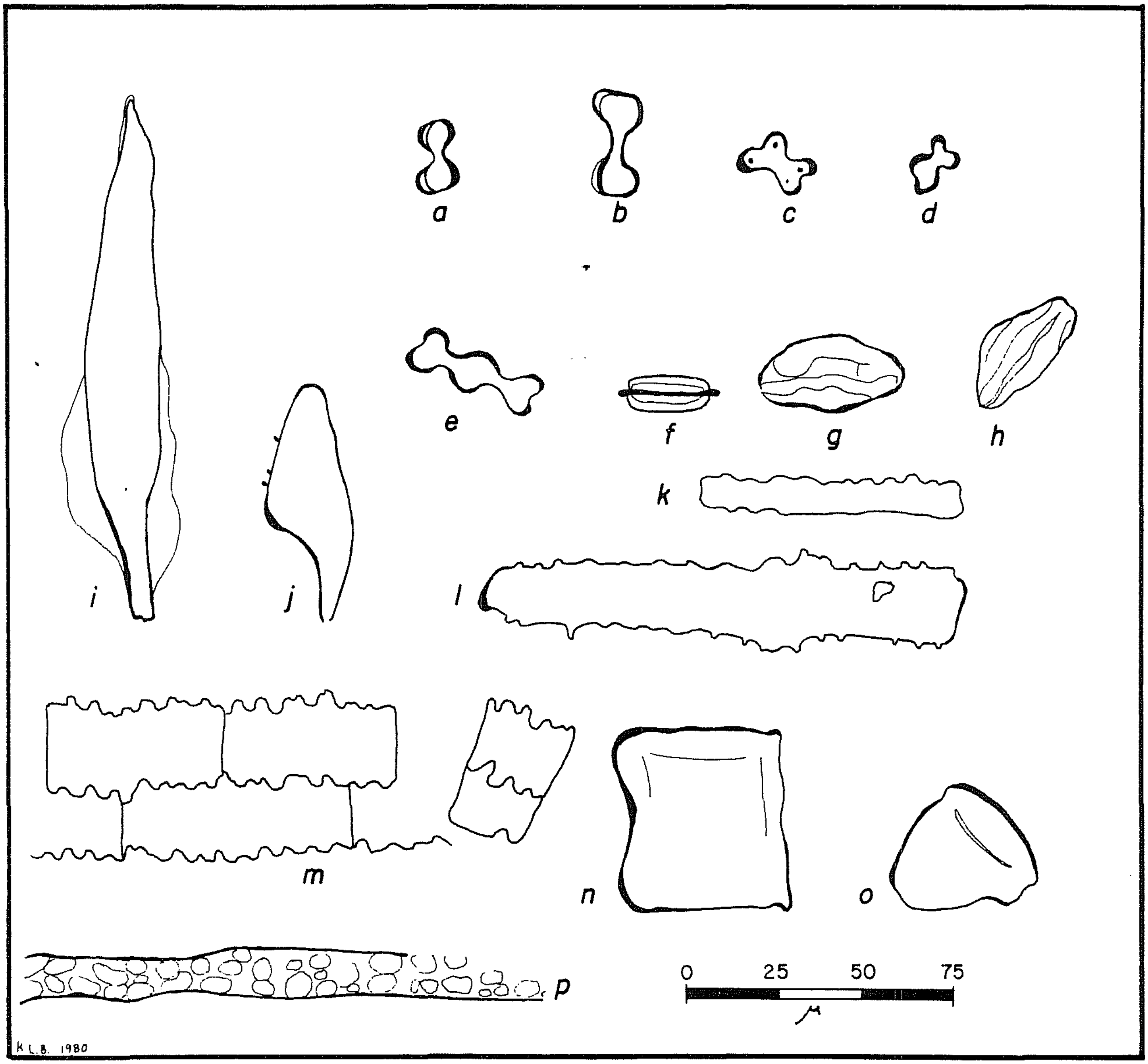


Figure 130. *Comparative Samples of Phytoliths from the Uppermost Leaf Blade of the Culm of Andropogon gerardii Vitman (Big Bluestem).* a-e, panicoid short cells; f-h, silicified stomata; i,j, trichomes (macro-hairs); k,l, long cells; m, tissue fragments (long cells); n,o, bulliform cells; p, mesophyll.

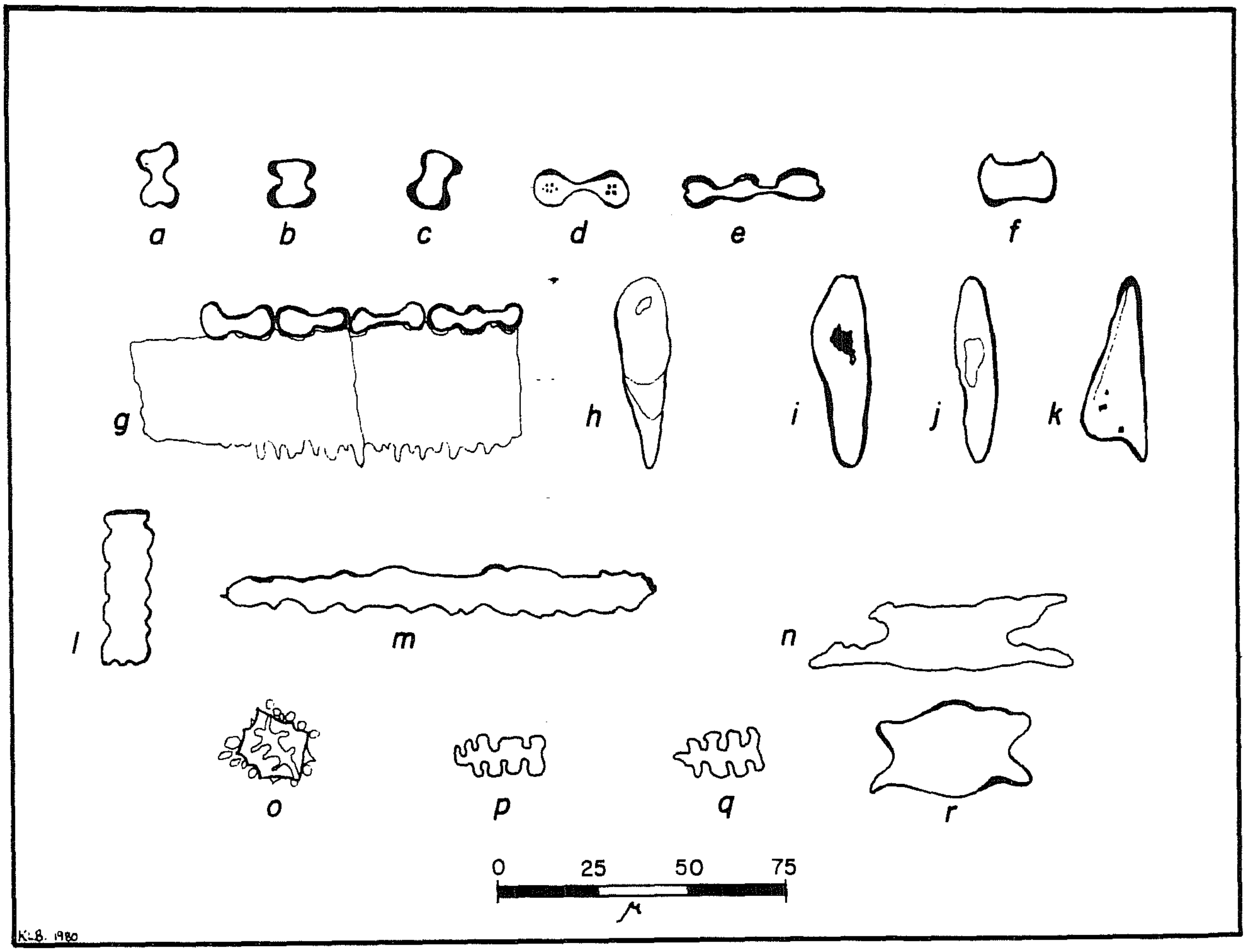


Figure 131. *Comparative Samples of Phytoliths from the Uppermost Leaf Blade of the Culm of Schizachyrium scoparium (Michx.) Nash (Little Bluestem).* a-f, panicoid short cells; g, tissue fragment (short and long cells); h-k, trichomes (macro-hairs); l,m, long cells; n,r, long cells (interstomatal); o-q, mesophyll.

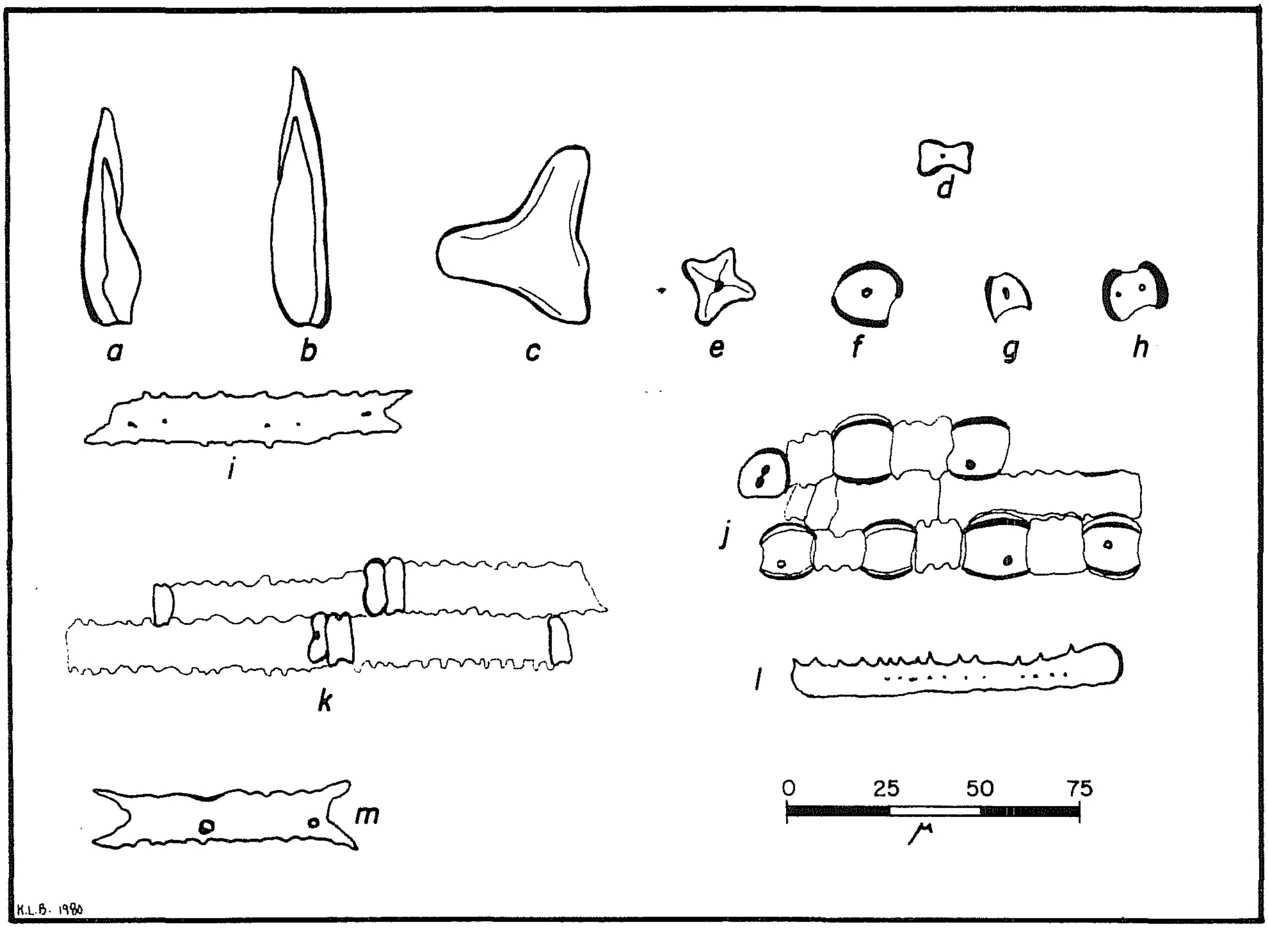


Figure 132. *Comparative Samples of Phytoliths from the Uppermost Leaf Blade of the Culm of Bouteloua rigidiseta (Strud.) Hitchc. (Texas Grama).* a,b, trichomes (macro-hairs); c, bulliform cell; d-h, chloridoid short cells; i,m, long cells (interstomatal); j,k, tissue fragments (short and long cells); l, long cell.

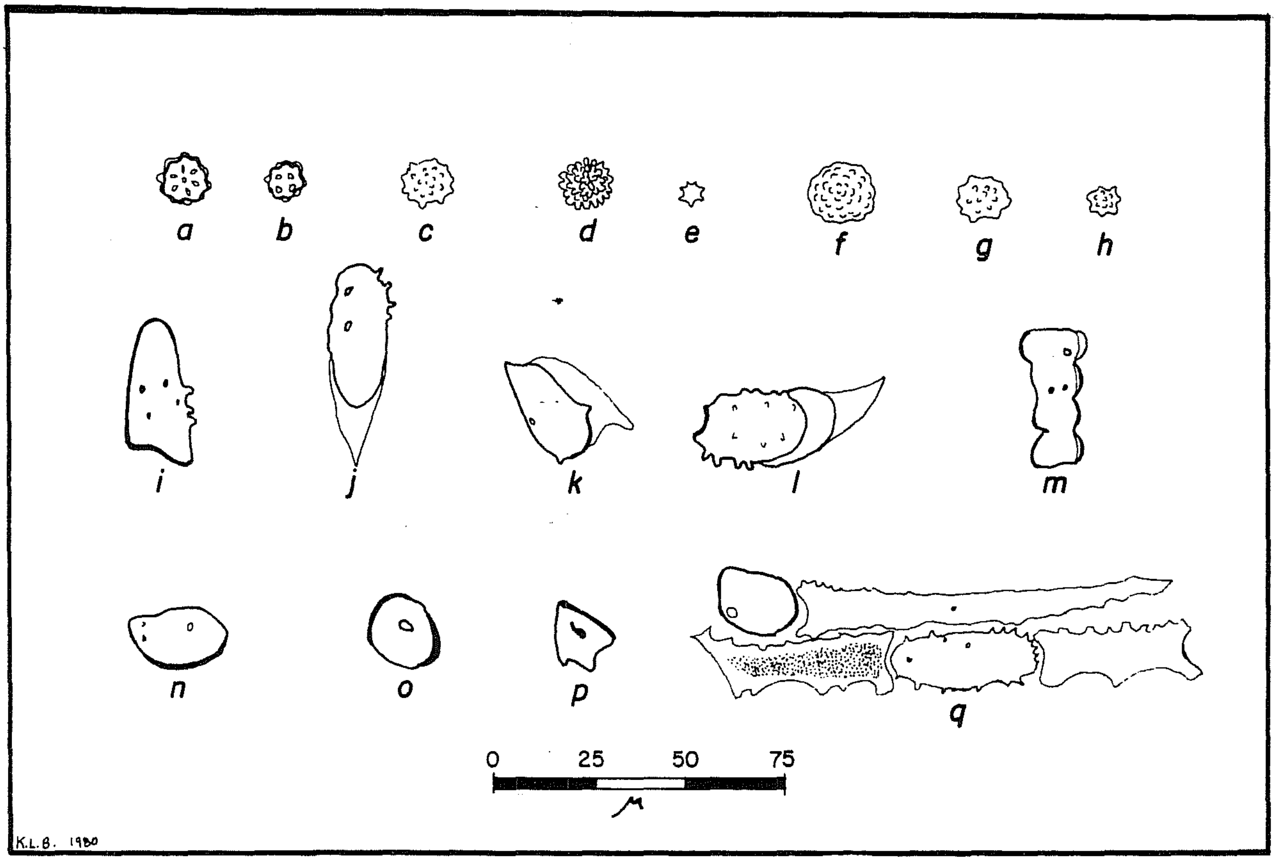


Figure 133. *Comparative Samples of Phytoliths from the Leaves of Sabal minor (Jacq.) Pers. (Dwarf Palmetto Palm), and from the Uppermost Leaf Blade of the Culm of Elymus canadensis L. (Wildrye).* a-h, *Sabal minor* (Jacq.) Pers. (dwarf palmetto palm), coryphoid phytoliths; i-q, *Elymus canadensis* L. (wildrye), phytoliths (i-l,p, trichomes [macro-hairs]; m-o, festucoid short cells; q, tissue fragment [short and long cells with one trichome]).

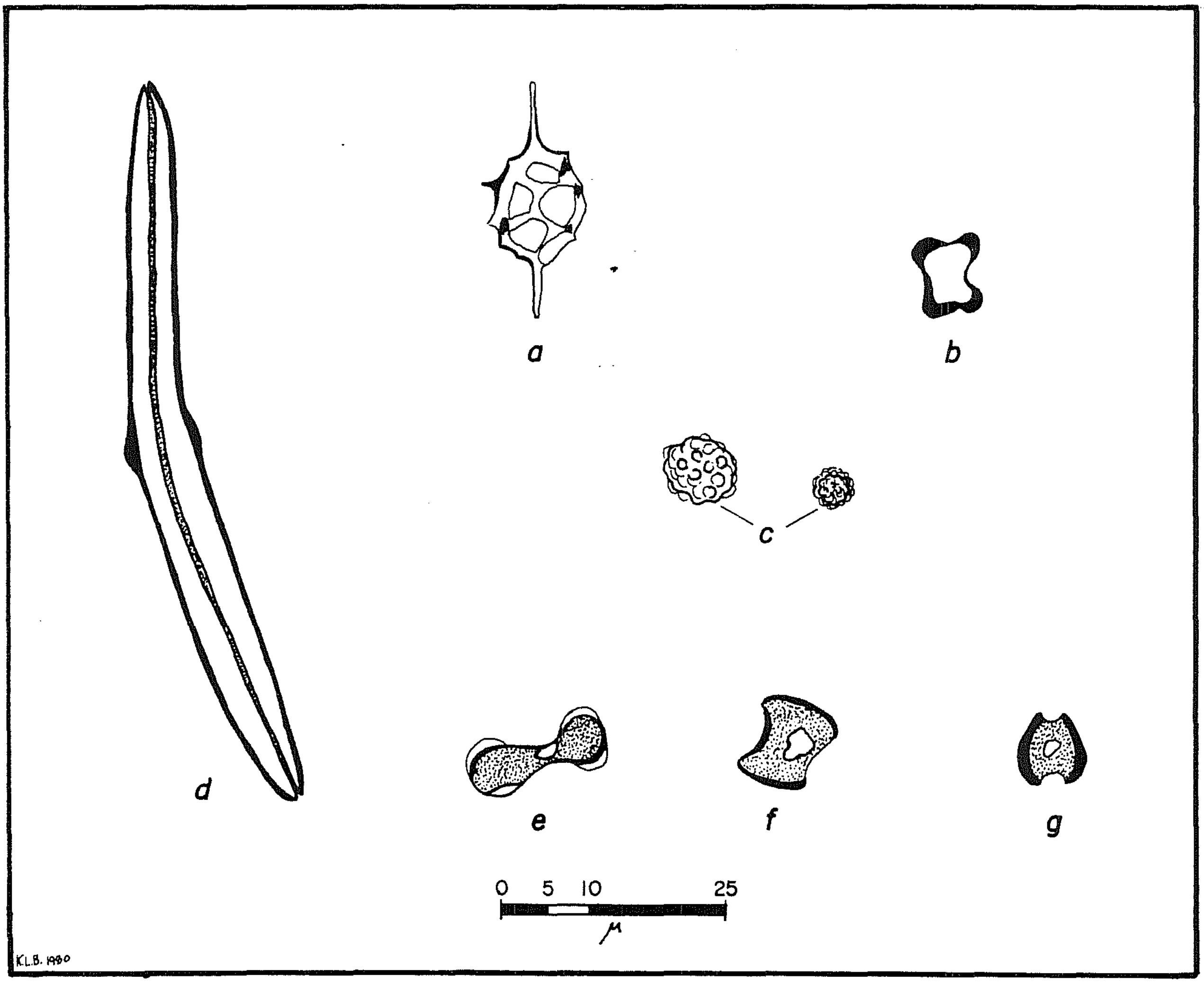


Figure 134. *Biosilica from 41 LK 31/32 and the Catahoula Tuffaceous Sandstone (Oligocene/Miocene Boundary, 24 ± 1 Million B.P.).* a, sample 31/32-2, feature 2: silicoflagellideae, silicoflagellate, biosilica type code #40; b, sample 31/32-6, level 6: Gramineae, panicoid short cell phytolith, biosilica type code #1; c, phytoliths from the Catahoula tuffaceous sandstone: composite drawings of coryphoid phytoliths of the Palmae family, biosilica type code #16; d, spongillideae, freshwater sponge spicule, smooth megasclere, biosilica type code #41; e, sample 31/32-4, level 11: Gramineae, panicoid short cell phytolith, biosilica type code #1; f,g, sample 31/32-3, level 15: Gramineae, chloridoid short cell phytoliths, biosilica type code #3.

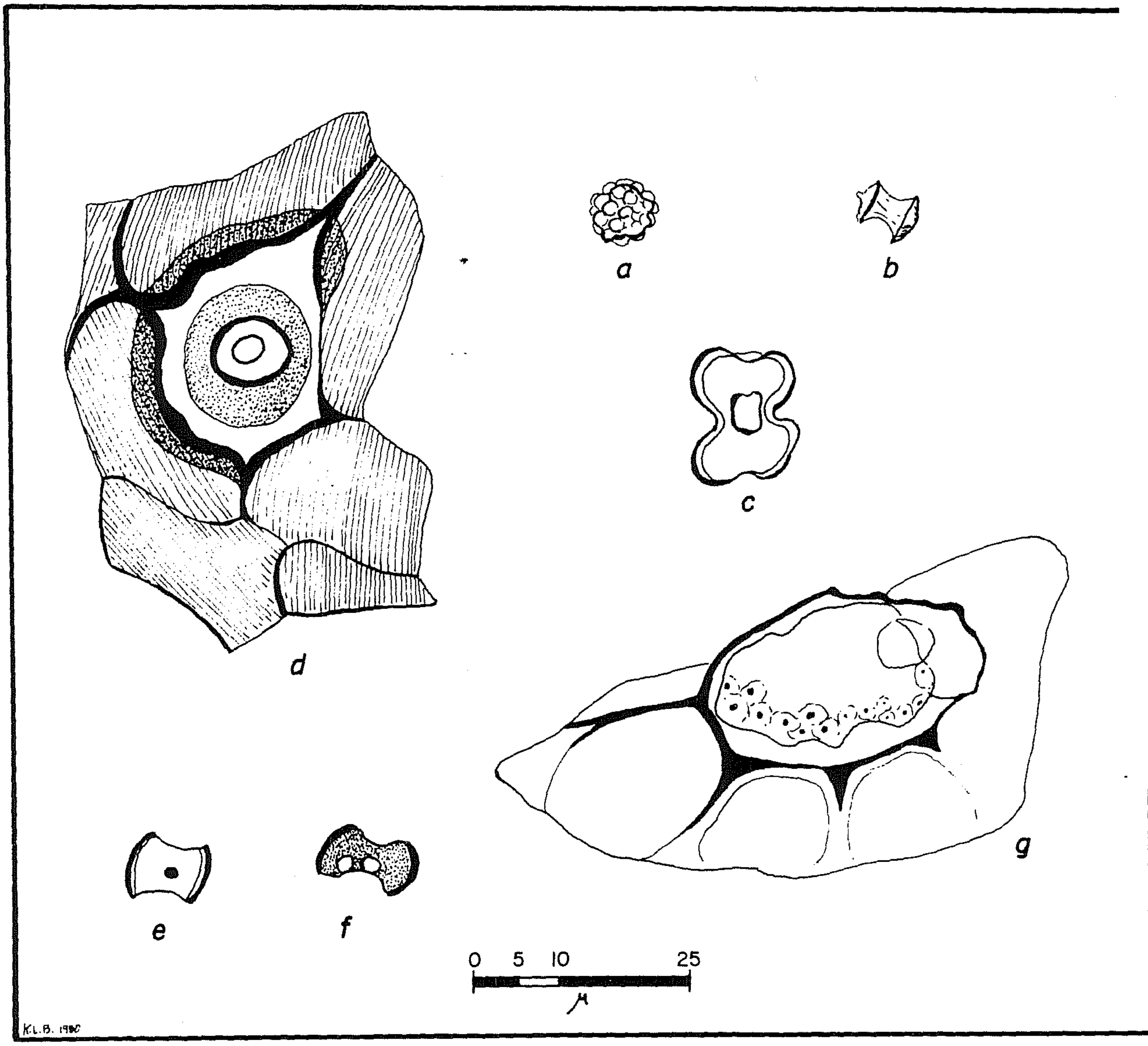


Figure 135. *Biosilica from 41 LK 201, Sample 201-2, Feature 2 Matrix, Level 18*. a, Palmae, coryphoid phytolith, biosilica type code #16; b, spongillideae, freshwater sponge spicule, biroltulate gemmosclere, biosilica type code #46; c,e,f, Gramineae phytoliths (c, panicoid short cell, biosilica type code #2; e,f, chloridoid short cells [f, eroded], biosilica type code #3); d,g, Ulmaceae, silicified tissue fragments, trichome bases with surrounding epidermal cells (d, unknown Ulmaceae, biosilica type code #33; g, *Celtis* sp. [hackberry], biosilica type code #32).

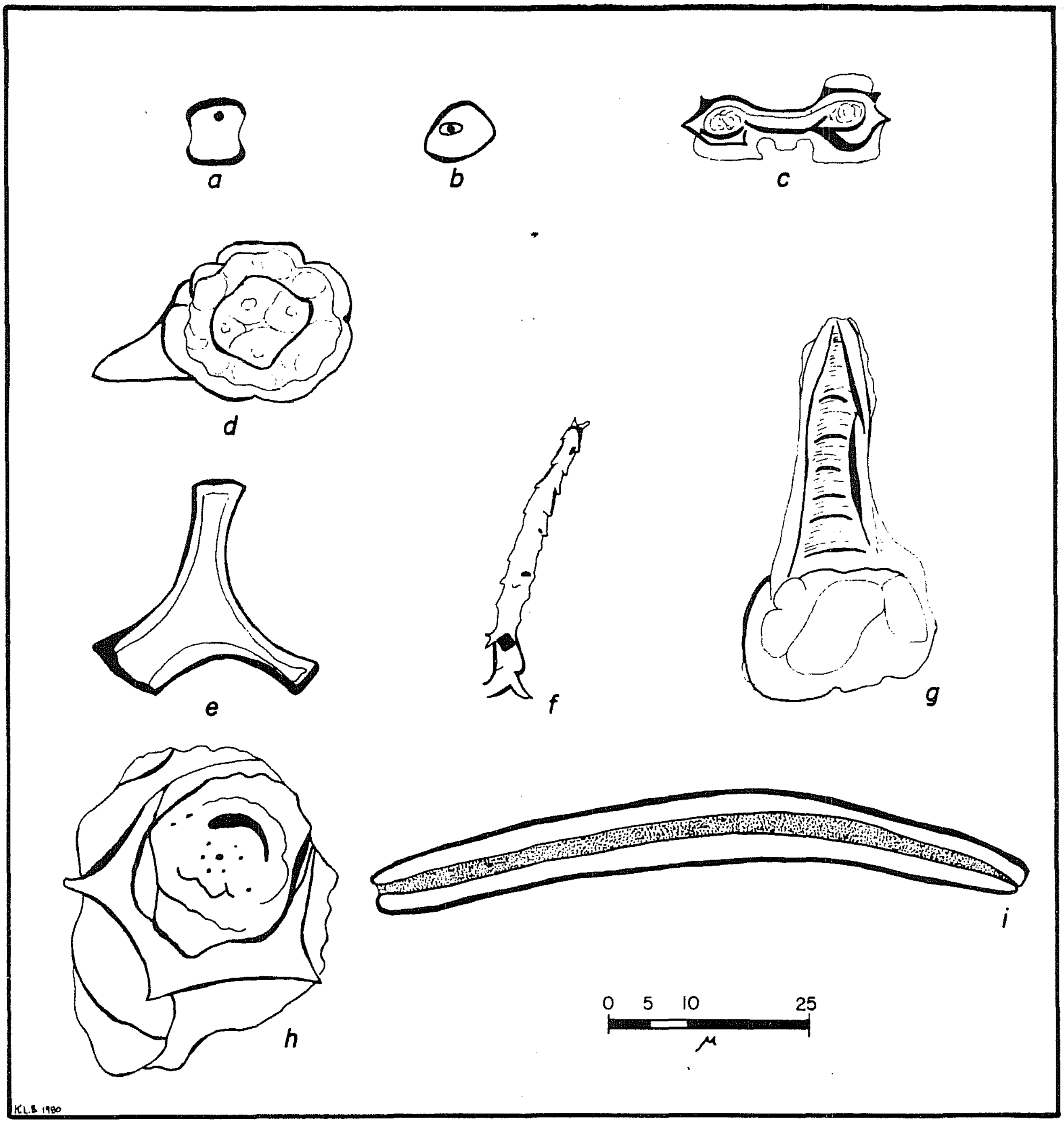


Figure 136. *Biosilica from 41 LK 201, Sample 201-4, Level 8.* a-c,e, Gramineae phytoliths (a, chloridoid short cell, biosilica type code #3; b, festucoid short cell, biosilica type code #5; c, panicoid short cell, lateral view, biosilica type code #1; e, bulliform cell [cf. chloridoid bulliform cell, biosilica type code #9]); f,i, spongillideae, freshwater sponge spicules (f, spinose gemmosclere, biosilica code #47; i, smooth megasclere, biosilica type code #41); d,g,h, Ulmaceae phytoliths (d, *Ulmus crassifolia* Nutt. [cedar elm], trichome and trichome base, ventral view, biosilica type code #28; g, unknown [cf. Ulmaceae, trichome and trichome base, lateral view, biosilica type code #31]; h, *Celtis* sp., silicified tissue fragment, trichome base with surrounding epidermal cells, biosilica type code #32).

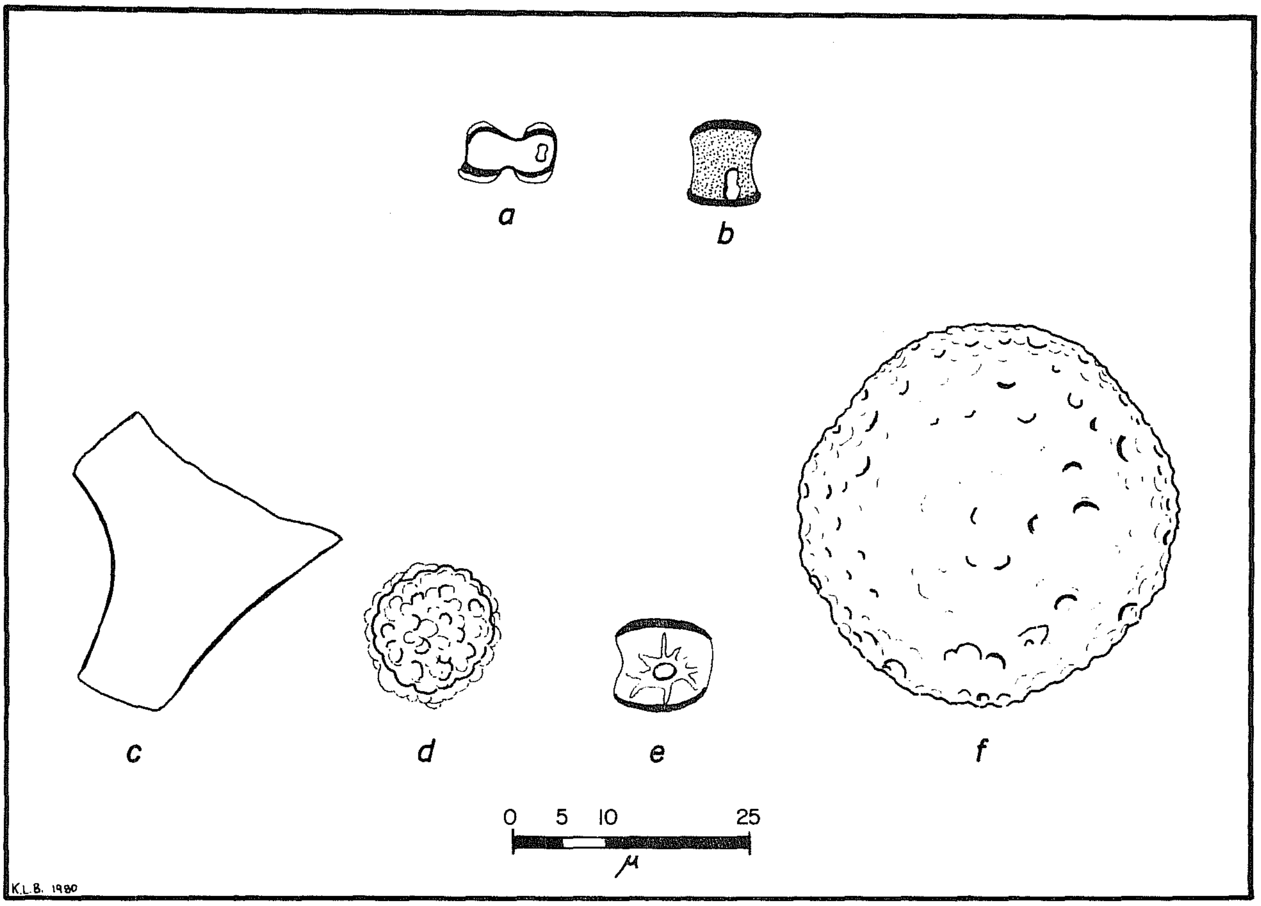


Figure 137. *Phytoliths from 41 LK 67*. a,b, sample 67-3, Gramineae (a, panicoid short cell, biosilica type code #1; b, chloridoid short cell, biosilica type code #3); c,e, sample 67-1, Gramineae (c, bulliform cell, biosilica type code #9; e, chloridoid short cell, biosilica code #3); d,f, Palmae (d, coryphoid phytolith, biosilica type code #16; f, unknown [cf. Palmae, biosilica type code #16]).

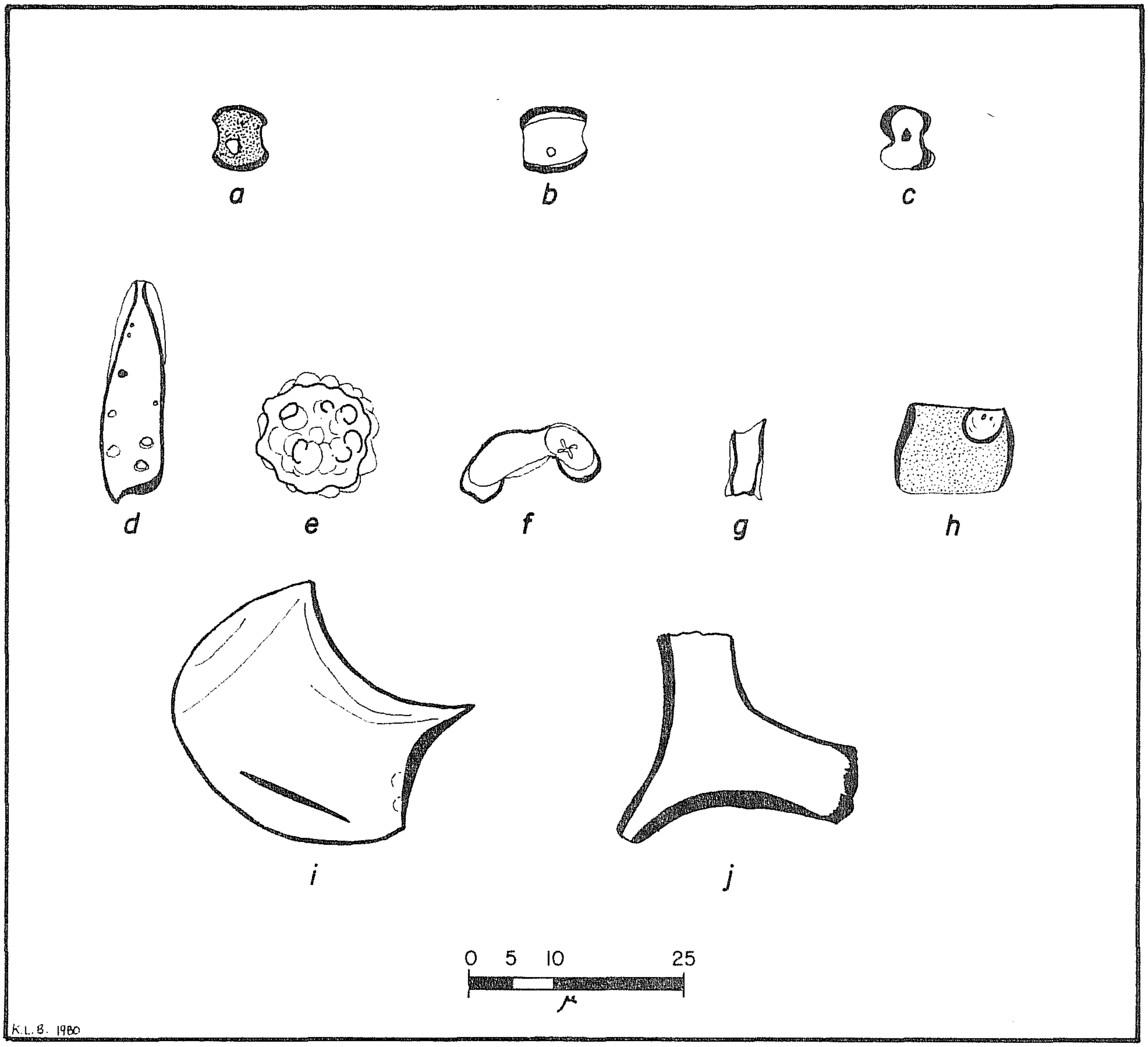


Figure 138. *Phytoliths from 41 LK 67.* a-c, sample 67-7, feature 22, Gramineae (a,b, chloridoid short cells, biosilica type code #3; c, panicoid short cell, biosilica type code #1); d,f-j, sample 67-9, metate surfaces, Gramineae (d, trichome [macro-hair], biosilica type code #8; f, unknown, lateral view of panicoid or chloridoid short cell, biosilica type code #6; g, unknown [cf. Gramineae short cell]; i,j, bulliform cells [j, cf. chloridoid bulliform cell; biosilica type code #9]); e, Palmae, coryphoid phytolith, biosilica type code #16.

APPENDIX IX.

GENERAL DATA TABLES

MATERIAL ANALYSIS RECORDS

Key to Column Entries for Table 33

SITE - Site number.

NORTH/EAST - Grid coordinates for southwest corner of excavation unit.

TP - Test pit number.

LEV - Vertical level in excavation unit starting with surface level (1) and proceeding downward. Most levels are 10-cm thick. Some 5-cm thick levels were excavated at 41 MC 222.

A *Tuff weight, in grams

B *Sandstone weight, in grams

C *Fire-fractured rock weight, in grams

D Mussel shell umbo count

E *Mussel shell weight (umbos and fragments), in grams

F Rabdotus count

G *Bone weight, in grams

H Primary flakes, total count

I Primary flakes, modified, total count

J Secondary flakes, total count

K Secondary flakes, modified, total count

L Tertiary flakes, total count

M Tertiary flakes, modified, total count

N Chips, total count

*Last digit in each weight figure represents tenths of a gram.

TABLE 33. MATERIAL ANALYSIS RECORDS

SITE	NORTH	EAST	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
LK 41	1114.00	1400.00	1	960	0	10	10	210	7	31	1	0	1	0	3	0	14
LK 41	1114.00	1400.00	2	104	0	0	9	283	58	30	0	0	0	0	0	0	11
LK 41	1114.00	1400.00	3	65	0	0	5	390	72	40	0	0	1	0	0	0	0
LK 41	1114.00	1400.00	4	115	0	0	6	266	52	78	0	0	0	0	2	1	5
LK 41	1114.00	1400.00	5	110	0	0	4	235	45	35	0	0	0	0	0	0	0
LK 41	1114.00	1401.00	1	530	0	10	8	280	3	30	0	0	0	0	3	1	20
LK 41	1114.00	1401.00	2	1480	0	0	6	290	42	400	0	0	2	0	0	0	7
LK 41	1114.00	1401.00	3	20	0	0	3	90	57	40	0	0	1	0	1	0	4
LK 41	1114.00	1401.00	4	135	0	0	6	170	40	3	0	0	0	0	0	0	0
LK 41	1114.00	1401.00	5	230	0	0	2	220	36	25	0	0	1	1	0	0	6
LK 41	1114.00	1402.00	1	1865	0	0	8	255	3	0	0	0	4	3	5	1	19
LK 41	1114.00	1402.00	2	39	0	0	6	213	39	24	0	0	2	0	1	0	9
LK 41	1114.00	1402.00	3	75	0	0	7	195	52	45	0	0	1	1	0	0	2
LK 41	1114.00	1402.00	4	1445	0	0	7	253	56	10	0	0	0	0	0	0	1
LK 41	1114.00	1402.00	5	70	0	0	4	110	37	14	0	0	0	0	0	0	1
LK 41	1115.00	1400.00	1	1020	0	45	2	39	8	10	1	0	3	0	5	0	19
LK 41	1115.00	1400.00	2	6858	0	10	4	680	71	29	0	0	1	0	0	0	2
LK 41	1115.00	1400.00	3	622	0	0	4	283	67	0	0	0	0	0	2	1	4
LK 41	1115.00	1400.00	4	115	0	0	4	158	40	58	0	0	0	0	0	0	0
LK 41	1115.00	1400.00	5	47	0	0	6	150	55	100	0	0	0	0	0	0	1
LK 41	1115.00	1400.00	6	235	0	0	4	70	23	47	0	0	0	0	0	0	1
LK 41	1115.00	1400.00	7	212	0	0	3	151	27	55	0	0	0	0	1	1	2
LK 41	1115.00	1400.00	8	17	0	0	6	12	4	15	0	0	0	0	0	0	2
LK 41	1115.00	1400.00	9	8082	0	0	0	58	4	0	0	0	0	0	0	0	1
LK 41	1115.00	1400.00	10	1	0	0	1	22	7	29	0	0	0	0	0	0	0
LK 41	1115.00	1401.00	1	2161	0	113	6	210	6	10	0	0	2	2	3	1	11
LK 41	1115.00	1401.00	2	147	0	0	4	125	43	10	0	0	1	0	2	0	7
LK 41	1115.00	1401.00	3	153	0	73	1	94	24	20	1	0	0	0	0	0	4
LK 41	1115.00	1401.00	4	377	0	0	7	242	31	25	0	0	0	0	0	0	2
LK 41	1115.00	1401.00	5	393	10	0	5	112	33	10	0	0	0	0	0	0	1
LK 41	1115.00	1402.00	1	2837	0	0	3	227	4	15	0	0	4	2	2	0	9
LK 41	1115.00	1402.00	2	100	0	0	3	238	24	9	0	0	2	0	4	0	12
LK 41	1115.00	1402.00	3	454	0	10	4	300	61	10	0	0	1	1	2	0	3
LK 41	1115.00	1402.00	4	181	0	0	4	40	46	10	0	0	0	0	1	0	1
LK 41	1115.00	1402.00	5	665	0	45	2	269	53	67	0	0	1	0	1	0	1
LK 41	1116.00	1400.00	1	1090	0	0	8	180	11	30	0	0	1	1	6	2	9
LK 41	1116.00	1400.00	2	10	0	30	2	0	33	125	0	0	1	0	1	0	5
LK 41	1116.00	1400.00	3	4740	0	10	3	118	38	55	1	0	2	1	2	1	0
LK 41	1116.00	1400.00	4	25	0	10	4	140	37	20	0	0	0	0	0	0	3
LK 41	1116.00	1400.00	5	84	0	161	1	13	30	104	0	0	0	0	1	0	1
LK 41	1116.00	1401.00	1	19	0	0	7	21	6	41	0	0	4	1	5	0	5
LK 41	1116.00	1401.00	2	1625	10	10	5	343	49	40	0	0	1	1	10	2	5
LK 41	1116.00	1401.00	3	475	1073	0	3	96	91	17	0	0	2	0	2	0	13
LK 41	1116.00	1401.00	4	1044	0	10	3	111	59	15	0	0	0	0	2	0	1
LK 41	1116.00	1401.00	5	562	0	10	3	197	27	35	0	0	0	0	1	0	4
LK 41	1116.00	1402.00	1	870	0	20	8	228	9	15	0	0	5	0	7	2	16
LK 41	1116.00	1402.00	2	120	0	766	3	216	25	86	0	0	2	1	5	0	4
LK 41	1116.00	1402.00	3	110	90	0	3	82	31	10	0	0	1	0	2	1	3
LK 41	1116.00	1402.00	4	34	0	13	4	135	55	23	1	0	0	0	1	0	3
LK 41	1116.00	1402.00	5	35	0	17	2	95	6	10	0	0	1	0	0	0	0
LK 41	1117.00	1400.00	1	2083	45	10	6	210	4	10	0	0	3	2	4	1	19
LK 41	1117.00	1400.00	2	1741	0	813	9	825	42	10	0	0	2	1	0	0	7
LK 41	1117.00	1400.00	3	38	0	0	5	382	44	37	1	0	0	0	1	0	1
LK 41	1117.00	1400.00	4	10	0	0	2	72	28	0	0	0	1	0	0	0	2
LK 41	1117.00	1400.00	5	20	0	0	0	0	8	45	0	0	0	0	1	0	1
LK 41	1117.00	1400.00	6	10	0	0	1	35	12	10	0	0	0	0	1	0	0
LK 41	1117.00	1400.00	7	20	0	0	2	26	5	10	0	0	0	0	0	0	3
LK 41	1117.00	1401.00	1	1155	0	35	8	225	7	20	0	0	2	0	7	1	10
LK 41	1117.00	1401.00	2	2310	136	10	11	930	24	10	1	0	0	0	0	0	3
LK 41	1117.00	1401.00	3	17	0	0	2	190	35	15	0	0	0	0	2	0	1
LK 41	1117.00	1401.00	4	75	0	15	1	197	18	20	0	0	1	0	0	0	2
LK 41	1117.00	1401.00	5	10	0	0	1	10	7	77	0	0	1	0	1	0	1
LK 41	1117.00	1402.00	1	325	10	395	5	450	9	10	0	0	3	0	3	1	9
LK 41	1117.00	1402.00	2	1190	0	0	13	2565	30	10	0	0	3	1	1	0	0
LK 41	1117.00	1402.00	3	888	0	0	1	127	49	0	0	0	3	0	2	0	0
LK 41	1117.00	1402.00	4	70	0	25	0	30	28	10	0	0	0	0	0	0	0
LK 41	1117.00	1402.00	5	10	0	0	2	60	17	0	0	0	0	0	1	0	0
LK 41	1135.00	1441.00	1	1070	0	0	2	800	1	0	0	0	4	0	4	0	8
LK 41	1135.00	1441.00	2	870	0	0	0	80	14	10	0	0	2	0	2	1	4
LK 41	1135.00	1442.00	1	745	0	0	1	62	1	10	0	0	1	1	5	0	8
LK 41	1135.00	1442.00	2	0	0	0	2	68	9	0	0	0	0	0	0	0	2
LK 41	1136.00	1441.00	1	440	0	10	2	76	3	10	0	0	3	1	4	2	8
LK 41	1136.00	1441.00	2	60	0	0	2	92	12	10	0	0	1	0	2	0	2
LK 41	1136.00	1442.00	1	716	0	353	4	74	3	10	0	0	3	0	4	0	4
LK 41	1136.00	1442.00	2	93	0	0	3	128	8	0	0	0	0	0	4	0	5
LK 41	1144.00	1474.00	1	763	25	440	17	397	15	10	0	0	3	0	1	0	17
LK 41	1144.00	1474.00	2	1200	0	0	3	85	23	10	2	0	8	0	0	0	5
LK 41	1144.00	1474.00	3	841	0	0	6	640	13	0	0	0	0	0	0	0	0
LK 41	1144.00	1474.00	4	35	0	0	18	1116	5	0	0	0	0	0	0	0	0
LK 41	1144.00	1474.00	5	26	0	0	4	175	4	0	0	0	2	1	0	0	2
LK 41	1144.00	1475.00	1	460	0	0	9	300	11	0	1	0	5	0	8	0	18
LK 41	1144.00	1475.00	2	18	0	0	13	390	15	40	0	0	0	0	2	0	5
LK 41	1144.00	1475.00	3	187	0	0	11	662	0	1487	0	0	0	0	1	0	7
LK 41	1144.00	1475.00	4	346	0	395	11	581	12	274	0	0	3	2	0	0	3
LK 41	1144.00	1475.00	5	420	629	479	10	378	12	0	0	0	0	0	1	0	4
LK 41	1144.00	1476.00	1	417	0	532	10	30	1	10	1	0	7	0	1	0	9
LK 41	1144.00	1476.00	2	160	0	100	102	4880	9	0	0	0	1	0	0	0	1
LK 41	1144.00	1476.00	3	2465	0	0	129	4660	16	10	0	0	0	0	0	0	1
LK 41	1144.00	1476.00	4	450	0	1210	29	880	25	0	0	0	1	1	4	1	0
LK 41	1144.00	1476.00	5	320	0	0	3	375	17	0	0	0	2	2	1	0	2
LK 41	1145.00	1474.00	1	370	0	70	20	390	13	100	0	0	2	0	1	0	9
LK 41	1145.00	1474.00	2	0	0	0	10	530	20	370	0	0	0	0	0	0	3
LK 41	1145.00	1474.00	3	220	0	0	11	540	14	40	1	0	1	0	1	0	1
LK 41	1145.00	1474.00	4	1140	0	0	3	170	14	0	0	0	0	0	0	0	2
LK 41	1145.00	1474.00	5	20	0	0	1	20	5	180	0	0	0	0	0	0	0
LK 41	1145.00	1475.00	1	690	0	90	16	320	5	30	1	0	5	1	1	0	28
LK 41	1145.00	1475.00	2	20	0	0	9	310	15	710	1	0	0	0	2	0	0
LK 41	1145.00	1475.00	3	940	0	40	15	630	23	81	0	0	0	0	2	1	0
LK 41	1145.00	1475.00	4	80	0	40	2	210	19	80	0	0	0	0	0	0	4
LK 41	1145.00	1475.00	5	510	0	10	4	60	8	10	0	0	1	0	0	0	2
LK 41	1145.00	1476.00	1	980	0	70	16	290	0	10	0	0	2	0	2	0	18
LK 41	1145.00	1476.00	2	40	0	60	110	4580	15	10	0	0	0	0	0	0	1
LK 41	1145.00	1476.00	3	1120	0	0	104	4530	24	0	0	0	1	1	2	0	5
LK 41	1145.00	1476.00	4	600	260	590	10	350	16	0	0	0	0	0	0	0	1
LK 41	1145.00	1476.00	5	130	0	270	18	470	23	0	0	0	0	0	2	0	6
LK 41	1153.00	1469.00	1	620	0	0	20	560	10	10	0	0	2	0	4	0	16
LK 41	1153.00	1470.00	1	2580	0	20	13	340	4	10	0	0	3	1	1	0	11
LK 41	1154.00	1469.00	1	160	0	20	16	490	3	10	0	0	2	1	3	0	31
LK 41	1154.00	1470.00	1	365	0	20	10	319	2	10	0	0	7	0	3	0	31

TABLE 33. (continued)

SITE	NORTH	EAST	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
LK 59	954.00	555.00	1	125	0	0	29	500	3	0	0	0	0	0	1	0	1
LK 59	954.00	555.00	2	390	0	15	55	1685	11	0	0	0	0	0	1	0	2
LK 59	954.00	555.00	3	370	0	500	46	1545	22	0	0	0	0	0	2	0	4
LK 59	954.00	555.00	4	350	0	130	67	2765	28	0	0	0	1	0	4	0	2
LK 59	954.00	555.00	5	415	0	170	68	3030	26	0	1	0	3	0	2	0	0
LK 59	954.00	555.00	6	165	0	10	20	865	19	0	0	0	0	0	0	0	0
LK 59	954.00	556.00	1	150	0	0	31	655	1	0	0	0	1	0	0	0	0
LK 59	954.00	556.00	2	430	0	95	53	1370	11	0	0	0	3	0	1	0	3
LK 59	954.00	556.00	3	5	0	25	33	1460	11	0	0	0	3	0	4	1	5
LK 59	954.00	556.00	4	1585	0	95	56	2425	12	0	0	0	4	2	0	0	4
LK 59	954.00	556.00	5	500	0	340	53	2415	13	10	0	0	0	0	2	0	4
LK 59	954.00	556.00	6	60	0	35	28	1130	16	0	0	0	2	0	0	0	2
LK 59	954.00	557.00	1	90	0	20	41	840	10	0	0	0	4	0	0	0	2
LK 59	954.00	557.00	2	160	0	70	57	1830	19	0	0	0	4	1	1	0	2
LK 59	954.00	557.00	3	130	0	20	46	1620	9	0	0	0	5	1	2	1	6
LK 59	954.00	557.00	4	50	0	90	35	1420	14	0	0	0	0	0	3	0	1
LK 59	954.00	557.00	5	170	0	250	48	2020	31	0	0	0	1	0	3	0	2
LK 59	954.00	557.00	6	150	0	190	36	1350	16	0	0	0	2	0	3	1	2
LK 59	954.00	558.00	1	70	0	10	45	820	10	10	0	0	0	0	1	0	2
LK 59	954.00	558.00	2	90	0	10	52	1390	11	0	0	0	3	0	1	0	1
LK 59	954.00	558.00	3	80	0	20	39	1330	20	0	0	0	3	0	4	0	0
LK 59	954.00	558.00	4	2330	0	100	40	1760	22	0	0	0	2	1	4	0	3
LK 59	954.00	558.00	5	210	0	0	36	1670	18	0	0	0	4	0	1	0	1
LK 59	954.00	558.00	6	0	0	190	17	860	17	0	1	0	6	1	1	0	3
LK 59	955.00	555.00	1	130	0	115	41	650	2	0	0	0	1	1	2	0	0
LK 59	955.00	555.00	2	210	0	35	63	1525	10	0	0	0	0	0	2	0	1
LK 59	955.00	555.00	3	235	0	40	72	2515	24	0	1	0	1	0	2	0	2
LK 59	955.00	555.00	4	1735	0	0	68	2315	13	0	0	0	0	0	0	0	2
LK 59	955.00	555.00	5	145	0	18	56	2605	28	0	0	0	0	0	0	0	0
LK 59	955.00	556.00	1	340	0	10	46	970	8	0	1	0	2	1	4	0	3
LK 59	955.00	556.00	2	320	0	0	49	1320	7	0	0	0	0	0	2	0	0
LK 59	955.00	556.00	3	580	0	40	81	2480	14	0	0	0	1	0	4	1	4
LK 59	955.00	556.00	4	2280	0	30	97	3800	29	0	1	0	2	0	2	0	2
LK 59	955.00	556.00	5	80	0	320	30	1410	7	0	0	0	3	0	2	0	1
LK 59	955.00	557.00	1	100	290	520	78	1820	10	0	1	0	2	1	3	0	5
LK 59	955.00	557.00	2	1330	0	20	44	1530	9	0	0	0	2	1	1	0	3
LK 59	955.00	557.00	3	55	0	5	60	3520	11	1	0	0	2	0	3	2	0
LK 59	955.00	557.00	4	6425	0	120	66	2610	11	0	0	0	3	0	1	0	4
LK 59	955.00	557.00	5	90	0	10	17	885	5	0	0	0	0	0	1	0	0
LK 59	955.00	558.00	1	60	0	0	43	820	5	0	0	0	4	1	2	1	2
LK 59	955.00	558.00	2	30	0	40	59	1630	20	0	0	0	3	0	4	1	2
LK 59	955.00	558.00	3	1590	0	0	60	1830	21	0	0	0	1	0	1	0	3
LK 59	955.00	558.00	4	100	0	0	58	2810	20	0	0	0	4	0	1	0	5
LK 59	955.00	558.00	5	1140	0	0	76	2700	15	0	0	0	5	0	3	0	8
LK 59	955.00	558.00	6	60	0	0	25	900	16	0	0	0	3	0	3	0	3
LK 59	956.00	555.00	1	65	0	340	45	705	0	0	0	0	4	1	0	0	3
LK 59	956.00	555.00	2	130	0	50	55	1495	18	0	0	0	1	0	2	1	0
LK 59	956.00	555.00	3	1265	0	100	91	2310	14	0	0	0	5	2	0	0	1
LK 59	956.00	555.00	4	940	0	1	53	2040	16	0	0	0	1	0	2	0	3
LK 59	956.00	555.00	5	240	0	240	104	5030	21	0	0	0	0	0	1	0	0
LK 59	956.00	555.00	6	7	0	550	29	775	6	0	0	0	0	0	3	0	0
LK 59	956.00	556.00	1	680	0	20	44	800	4	0	0	0	0	0	0	0	2
LK 59	956.00	556.00	2	230	0	0	42	2250	23	0	0	0	0	0	0	0	1
LK 59	956.00	556.00	3	610	0	1090	73	2430	20	0	1	0	2	0	7	2	1
LK 59	956.00	556.00	4	1990	0	30	109	4250	32	0	0	0	4	0	0	0	1
LK 59	956.00	556.00	5	770	0	0	57	3100	20	0	0	0	2	0	1	0	4
LK 59	956.00	556.00	6	1100	0	0	25	1460	5	0	0	0	1	0	1	0	1
LK 59	956.00	557.00	1	1525	205	100	75	3460	14	0	0	0	3	0	2	0	2
LK 59	957.00	555.00	1	55	0	0	24	535	0	0	0	0	1	1	1	1	1
LK 59	957.00	555.00	2	60	0	0	31	1070	13	0	1	0	0	0	2	1	0
LK 59	957.00	555.00	3	185	0	145	69	1895	14	0	0	0	1	1	2	1	0
LK 59	957.00	555.00	4	520	0	15	52	2000	17	0	0	0	1	1	1	0	2
LK 59	957.00	555.00	5	615	895	0	99	4070	16	0	1	0	1	1	4	0	4
LK 59	957.00	556.00	1	240	0	40	49	1010	2	0	0	0	0	0	2	0	1
LK 59	957.00	556.00	2	180	0	0	67	1580	20	0	1	0	0	0	2	0	1
LK 59	957.00	556.00	3	930	0	14	115	3270	15	0	0	0	3	0	2	0	3
LK 59	957.00	556.00	4	8230	0	110	283	1240	25	0	0	0	7	2	7	2	11
LK 59	957.00	556.00	5	0	0	0	0	0	0	0	0	0	3	0	0	0	1
LK 59	957.00	556.00	6	60	0	0	29	1240	15	0	0	0	0	0	1	0	1
LK 59	958.00	555.00	1	270	0	0	50	820	6	0	0	0	1	0	0	0	1
LK 59	958.00	555.00	2	155	0	70	61	1615	8	0	0	0	5	2	1	0	0
LK 59	958.00	555.00	3	45	0	5	75	1670	8	0	0	0	1	1	0	0	2
LK 59	958.00	555.00	4	280	0	5	96	3865	20	0	1	0	3	0	1	0	2
LK 59	958.00	555.00	5	580	0	155	61	2450	0	0	0	0	1	0	2	0	2
LK 59	958.00	556.00	1	220	0	0	44	890	4	0	0	0	0	0	0	0	6
LK 59	958.00	556.00	2	340	0	0	96	2970	16	0	0	0	2	0	1	0	5
LK 59	958.00	556.00	3	1050	0	0	94	3380	11	0	1	0	1	0	0	0	2
LK 59	958.00	556.00	4	2530	0	1030	154	7090	25	0	0	0	3	0	3	2	1
LK 59	958.00	556.00	5	2870	0	0	133	6540	27	0	1	0	5	0	0	0	5
LK 59	958.00	556.00	6	590	0	24	25	1080	6	0	0	0	0	0	1	1	1
LK 59	981.00	823.00	1	820	0	350	3	40	0	0	0	0	3	0	3	0	17
LK 59	981.00	823.00	2	1004	0	170	5	70	11	0	0	0	2	0	8	0	14
LK 59	981.00	823.00	3	880	0	185	4	220	16	0	0	0	6	1	14	2	21
LK 59	981.00	823.00	4	575	95	35	5	85	10	0	0	0	0	0	3	0	3
LK 59	981.00	824.00	1	1540	0	820	9	95	8	0	0	0	6	1	8	0	16
LK 59	981.00	824.00	2	800	0	55	5	110	20	0	2	0	6	1	10	0	23
LK 59	981.00	824.00	3	775	0	5	1	30	6	0	0	0	4	0	9	0	12
LK 59	981.00	825.00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 59	981.00	825.00	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 59	981.00	825.00	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 59	981.00	826.00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 59	981.00	826.00	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 59	981.00	826.00	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 59	981.00	827.00	1	660	0	90	10	110	2	0	0	0	3	0	9	0	27
LK 59	981.00	827.00	2	675	15	215	1	50	16	0	0	0	5	1	8	0	20
LK 59	981.00	827.00	3	5555	0	20	2	35	23	0	0	0	2	0	7	1	13
LK 59	982.00	823.00	1	1410	0	275	7	60	4	0	1	0	7	0	10	2	19
LK 59	982.00	823.00	2	685	0	40	5	55	7	0	2	0	8	2	14	3	14
LK 59	982.00	823.00	3	1510	0	105	3	55	6	0	0	0	1	1	9	0	7
LK 59	982.00	824.00	1	1855	0	90	4	60	1	0	0	0	1	1	7	1	14
LK 59	982.00	824.00	2	160	0	25	2	50	3	0	0	0	4	0	4	0	5
LK 59	982.00	824.00	3	1845	0	100	2	80	10	0	1	0	4	1	13	2	15
LK 59	982.00	824.00	4	410	0	0	1	20	9	0	0	0	2	0	4	0	5
LK 59	982.00	825.00	1	2070	0	230	7	95	9	0	1	0	5	2	10	1	22
LK 59	982.00	825.00	2	3395	0	45	2	20	5	0	1	0	3	0	5	0	20
LK 59	982.00	825.00	3	1005	0	15	1	25	10	0	0	0	2	0	5	1	6
LK 59	982.00	826.00	1	2100	0	1180	2	45	6	0	0	0	3	0	17	1	22
LK 59	982.00	826.00	2	1435	0	240	4	70	20	0	0	0	4	0	14	1	20
LK 59	982.00	826.00	3	1050	0	0	0	10	11	0	0	0	4	0	9	0	8
LK 59	982.00	827.00	1	1160	0	540	2	5	4	0	0	0	9	1	13	1	22
LK 59	982.00	827.00	2	2620	0	220	1	40	11	0	0	0	7	1	9	0	10

SITE	NORTH	EAST	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
LK 59	983.00	823.00	1	0	0	0	0	0	0	0	2	0	5	2	14	3	21
LK 59	983.00	823.00	2	805	0	0	2	130	13	0	1	0	5	1	7	0	7
LK 59	983.00	823.00	3	35	0	5	1	15	3	0	0	0	1	0	1	0	1
LK 59	983.00	824.00	1	890	0	550	3	95	10	0	2	0	8	4	13	2	26
LK 59	983.00	824.00	2	1105	0	110	5	130	21	0	1	0	2	0	9	0	8
LK 59	983.00	824.00	3	200	0	0	0	20	4	0	2	0	1	0	3	0	9
LK 59	983.00	825.00	1	2055	105	600	7	110	7	0	1	0	7	1	21	3	21
LK 59	983.00	825.00	2	605	0	80	1	190	15	0	0	0	4	1	4	0	10
LK 59	983.00	825.00	3	1505	0	20	4	70	14	0	0	0	0	0	9	1	7
LK 59	983.00	826.00	1	1955	0	275	7	95	8	0	1	0	12	5	13	0	26
LK 59	983.00	826.00	2	525	0	105	3	70	20	0	1	0	4	0	6	0	13
LK 59	983.00	826.00	3	1490	0	20	0	40	8	0	0	0	3	1	7	0	13
LK 59	983.00	827.00	1	1375	0	630	3	55	1	0	0	0	6	1	11	1	18
LK 59	983.00	827.00	2	3340	160	30	2	100	10	0	1	0	5	1	12	0	26
LK 59	983.00	827.00	3	4615	0	0	1	40	24	0	1	0	4	1	5	0	5
LK 59	1010.00	857.00	1	985	0	420	7	110	0	0	0	0	4	0	5	0	26
LK 59	1010.00	857.00	2	2400	0	140	5	60	2	0	0	0	4	0	7	0	9
LK 59	1010.00	857.00	3	150	0	655	1	45	3	0	0	0	2	1	2	1	6
LK 59	1010.00	857.00	4	90	0	40	1	15	2	0	0	0	0	0	1	0	2
LK 59	1010.00	949.00	1	4070	0	0	0	0	0	0	0	0	1	0	0	0	1
LK 59	1010.00	949.00	2	330	0	0	0	0	1	0	0	0	0	0	0	0	0
LK 59	1010.00	949.00	3	50	0	0	0	0	1	0	0	0	0	0	0	0	0
LK 59	1010.00	949.00	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 59	1010.00	949.00	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SITE	TP	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
LK 8	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 8	1	2	2070	0	3060	11	370	3	0	4	0	13	4	20	4	7
LK 8	1	3	4220	0	1840	6	380	4	1	1	0	9	0	20	0	21
LK 8	1	4	4210	0	1950	9	440	18	0	2	0	10	1	21	0	38
LK 8	1	5	2740	0	3030	9	220	19	0	0	0	14	0	16	0	26
LK 8	1	6	2060	0	310	1	70	15	0	1	0	4	0	9	0	8
LK 8	2	1	115	0	350	12	210	3	1	0	0	13	1	12	2	6
LK 8	2	2	1660	0	1950	20	567	7	0	1	0	18	6	15	2	18
LK 8	2	3	2820	0	3250	32	1190	12	0	0	0	11	3	27	9	30
LK 8	2	4	2175	0	2025	26	860	12	0	2	0	16	1	20	3	18
LK 8	2	5	2210	610	1180	14	440	10	0	3	0	14	0	21	2	13
LK 8	2	6	1700	0	2600	18	570	12	0	0	0	7	1	28	0	25
LK 8	2	7	7250	0	2040	10	210	20	0	2	0	10	0	36	3	12
LK 8	2	8	1700	0	1190	5	580	13	0	0	0	8	1	7	0	6
LK 8	2	9	65	0	560	0	20	4	0	0	0	3	1	6	2	5
LK 8	3	1	410	0	520	2	1	0	1	0	0	9	1	15	3	8
LK 8	3	2	1150	0	3050	5	0	9	0	5	0	19	1	65	1	9
LK 8	3	3	2850	120	3360	9	110	10	0	2	0	18	1	0	1	16
LK 8	3	4	2730	0	2380	4	90	8	0	0	0	23	2	33	3	14
LK 8	3	5	3010	0	2240	4	80	9	0	2	0	22	1	29	0	24
LK 8	3	6	1610	0	1170	4	110	23	0	0	0	17	2	19	0	22
LK 8	3	7	3340	0	4570	8	160	16	0	1	0	14	1	29	2	16
LK 8	3	8	5200	0	3770	6	190	24	0	0	0	13	1	30	1	23
LK 8	3	9	1210	0	7240	2	40	30	1	2	0	15	2	31	0	34
LK 8	3	10	3730	0	2950	1	60	19	0	1	0	14	0	17	1	31
LK 8	3	11	2100	0	1410	2	40	33	0	1	0	11	2	13	1	18
LK 8	3	12	1440	0	1990	1	150	28	0	1	0	10	3	13	3	16
LK 8	3	13	1080	0	460	0	20	7	0	1	0	5	1	13	1	15
LK 8	4	1	6600	0	7150	20	360	10	0	4	0	44	4	60	0	62
LK 8	4	2	5110	0	2690	6	130	6	0	2	0	24	4	31	1	23
LK 8	4	3	8370	0	1630	5	110	21	0	1	0	18	0	45	4	28
LK 8	4	4	2230	0	0	0	0	26	0	1	0	15	2	20	2	15
LK 8	4	5	2680	0	730	7	50	15	0	0	0	6	1	13	0	14
LK 8	4	6	100	0	650	2	20	7	0	0	0	0	0	7	0	0
LK 13	1	1	0	0	1380	98	3740	5	0	0	0	0	0	0	0	0
LK 13	1	2	200	0	2680	43	2430	6	0	1	0	1	0	2	1	5
LK 14	1	1	270	0	3120	34	680	5	0	1	0	15	2	0	1	38
LK 14	1	2	1280	0	5160	53	1710	46	0	5	0	23	6	22	4	73
LK 14	1	3	2600	0	2220	22	940	38	0	3	0	7	2	13	3	31
LK 14	1	4	170	60	6210	12	740	38	0	1	0	10	3	10	0	30
LK 14	1	5	910	20	8120	12	480	23	0	0	0	7	3	9	1	21
LK 14	1	6	2530	0	6630	11	320	29	0	2	0	3	1	16	2	27
LK 14	1	7	40	0	1270	3	150	7	0	0	0	1	0	1	0	16
LK 14	1	8	10	0	10	1	20	2	0	1	0	0	0	1	0	1
LK 14	2	1	2010	0	9999	100	1900	16	0	2	0	30	7	57	3	91
LK 14	2	2	31	0	9600	48	1370	31	0	4	0	28	2	31	1	59
LK 14	2	3	1960	9999	9999	49	1380	32	0	1	0	24	4	43	2	54
LK 14	2	4	610	0	9999	23	720	28	1	0	0	16	1	31	4	124
LK 14	2	5	240	120	1490	7	260	22	0	0	0	7	3	16	1	69
LK 14	2	6	0	80	1350	6	130	4	0	0	0	0	0	1	0	2
LK 14	2	7	0	0	30	0	20	0	0	0	0	0	0	0	0	2
LK 14	3	1	1450	0	5970	34	0	2	0	0	0	21	9	19	1	62
LK 14	3	2	260	0	5870	23	910	14	0	3	0	16	1	26	5	83
LK 14	3	3	1940	180	8480	29	1060	17	1	2	0	12	2	13	1	69
LK 14	3	4	2110	0	9999	26	0	44	0	2	0	14	7	22	5	84
LK 14	3	5	630	0	9720	5	420	36	0	2	1	11	6	15	1	65
LK 14	3	6	850	0	7760	7	300	24	0	1	0	10	4	9	0	33
LK 14	3	7	720	0	1630	2	90	3	0	0	0	0	0	2	1	11
LK 14	4	1	780	0	8140	55	1180	39	0	1	0	10	2	15	4	38
LK 14	4	2	2510	0	7640	47	1310	88	1	1	0	11	1	9	1	19
LK 14	4	3	2430	0	9230	67	1410	106	0	1	0	14	1	16	3	0
LK 14	4	4	3280	0	8800	63	1740	85	0	0	0	9	4	11	0	8
LK 14	4	5	2580	1320	9910	33	1460	47	0	1	0	13	4	13	1	11
LK 14	4	6	1830	2230	9740	22	1230	49	0	0	0	11	4	9	0	19
LK 14	4	7	30	1170	3980	30	910	33	0	0	0	5	2	10	1	6
LK 14	4	8	320	0	4090	8	540	11	0	0	0	5	3	7	0	4
LK 14	4	9	1030	0	2650	11	700	9	0	0	0	5	0	3	0	4
LK 15	1	1	490	0	4340	24	620	13	0	1	0	11	3	25	2	33
LK 15	1	2	3390	0	5450	29	880	24	1	2	0	18	3	34	3	45
LK 15	1	3	1510	0	3700	24	1100	66	0	2	0	10	1	16	0	34
LK 15	1	4	1500	0	4110	9	510	30	1	2	0	15	1	15	1	16
LK 15	1	5	3730	0	8130	8	500	61	20	0	0	12	0	21	1	35
LK 15	1	6	1810	0	1900	6	220	17	0	0	0	1	1	3	0	17
LK 15	1	7	100	0	1190	3	70	11	0	0	0	1	0	3	1	9
LK 15	1	8	390	0	1700	7	140	20	0	0	0	2	0	5	2	11
LK 15	1	9	210	0	270	2	50	2	0	0	0	0	0	1	0	4
LK 15	2	1	440	0	1260	24	620	1	0	0	0	4	1	8	0	27
LK 15	2	2	190	0	2710	43	1350	14	0	1	0	3	3	10	1	29
LK 15	2	3	1120	950	2440	42	1610	31	0	0	0	9	1	12	1	72
LK 15	2	4	2200	340	3270	15	440	9	0	1	0	6	1	4	0	29
LK 15	2	5	2410	0	8290	18	740	27	0	2	0	1	0	8	0	2
LK 15	2	6	180	0	2060	9	230	23	0	1	0	9	2	5	0	37
LK 15	2	7	0	0	70	2	20	2	0	0	0	0	0	0	0	0
LK 15	2	8	0	0	10	0	1	0	0	0	0	0	0	1	0	2
LK 15	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 15	3	1	0	5935	9999	17	380	3	0	3	0	17	0	21	0	79
LK 15	3	2	60	0	1920	6	200	3	0	1	0	4	2	4	0	17
LK 15	3	3	500	0	130	0	0	4	0	0	0	0	0	2	1	1
LK 15	4	1	110	250	110	7	180	0	0	3	0	1	1	3	0	17
LK 15	4	2	20	50	920	1	130	1	0	1	0	6	2	2	2	12

TABLE 33. (continued)

SITE	TP	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
LK 15	4	3	130	0	20	0	10	0	0	0	0	0	0	2	0	7
LK 15	4	4	1390	0	1210	2	40	0	0	0	0	0	0	3	0	6
LK 15	4	5	640	0	20	4	200	5	0	0	0	0	0	0	0	4
LK 15	4	6	590	0	30	1	30	3	0	1	0	2	1	2	0	10
LK 15	4	7	30	0	0	2	20	4	0	1	0	2	1	1	0	1
LK 15	4	8	0	0	0	1	1	2	0	0	0	0	0	0	0	1
LK 15	5	1	30	0	40	0	0	0	0	1	0	4	3	8	1	28
LK 15	5	2	0	0	10	0	0	0	0	0	0	0	0	0	0	6
LK 15	5	3	0	0	660	0	0	0	0	0	0	0	0	0	0	4
LK 15	5	4	0	0	60	0	0	0	0	0	0	2	1	6	2	17
LK 15	5	5	0	0	290	0	0	0	0	0	0	1	0	1	0	8
LK 15	5	6	0	0	270	0	0	0	0	1	0	0	0	1	1	6
LK 15	5	7	0	0	1060	2	10	0	0	0	0	0	0	0	0	7
LK 17	1	1	170	270	190	4	70	0	0	0	0	1	0	2	0	6
LK 17	1	2	270	0	760	4	110	5	0	0	0	3	0	1	0	2
LK 17	1	3	80	0	240	10	210	11	0	0	0	1	0	1	0	3
LK 17	1	4	830	0	780	11	440	20	0	0	0	1	0	5	0	3
LK 17	1	5	8720	0	500	48	1420	24	0	1	0	1	0	5	0	1
LK 17	1	6	60	0	140	13	180	13	0	0	0	6	0	4	0	6
LK 17	1	7	0	550	420	3	70	11	0	0	0	6	0	5	0	21
LK 17	1	8	290	0	490	0	20	2	0	0	0	1	0	1	1	2
LK 17	1	9	360	0	0	1	20	2	0	0	0	0	0	1	0	0
LK 17	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK 17	2	2	10	0	0	0	0	4	0	0	0	0	0	0	0	0
LK 17	2	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0
LK 17	2	4	0	0	0	0	0	2	0	0	0	0	0	0	0	0
LK 17	3	1	0	20	590	0	0	0	0	0	0	1	0	0	0	0
LK 17	3	2	117	0	175	0	10	1	0	0	0	1	0	3	1	0
LK 17	3	3	0	0	96	0	10	4	0	0	0	0	0	0	0	0
LK 17	3	4	180	0	167	1	10	16	0	0	0	2	0	1	0	5
LK 17	3	5	2377	180	5955	9	118	18	0	1	0	6	2	16	4	11
LK 17	3	6	2540	2390	8325	12	168	21	0	1	0	11	1	10	1	22
LK 17	3	7	3020	0	880	5	60	4	0	1	0	2	1	4	0	25
LK 17	4	1	10	0	930	2	30	0	10	0	0	1	1	1	1	3
LK 17	4	2	20	0	1710	4	10	2	10	0	0	0	0	0	0	2
LK 17	4	3	290	0	1760	4	50	0	10	0	0	0	0	0	0	6
LK 17	4	4	510	0	472	10	110	13	0	0	0	1	1	0	0	10
LK 17	4	5	250	0	5670	16	190	19	10	0	0	7	2	7	0	45
LK 17	4	6	10	0	180	3	20	0	0	0	0	0	0	2	0	1
LK 34	1	1	520	0	30	3	30	0	0	0	0	0	0	1	1	4
LK 34	1	2	640	0	60	13	190	3	0	0	0	1	0	0	0	2
LK 34	1	3	10	0	10	3	60	0	0	0	0	0	0	1	0	3
LK 34	2	1	640	0	570	0	0	0	0	0	0	0	0	0	0	2
LK 34	2	2	50	0	0	0	10	0	0	0	0	0	0	0	0	0
LK 34	3	1	210	0	0	0	10	0	0	0	0	0	0	0	0	0
LK 34	3	2	1510	0	0	0	0	0	0	0	0	0	0	0	0	2
LK 49	1	1	495	0	1285	5	60	5	0	0	0	3	1	3	2	3
LK 49	1	2	956	0	3660	7	188	11	0	0	0	3	0	0	0	4
LK 49	1	3	395	0	562	5	69	7	0	1	0	1	0	2	0	1
LK 49	1	4	1035	0	355	5	80	33	0	1	0	1	0	3	0	0
LK 49	1	5	1295	0	0	0	0	17	0	0	0	0	0	0	0	3
LK 51	1	1	2994	1508	9999	18	272	7	293	0	0	3	0	5	1	42
LK 51	1	2	4234	2300	9999	16	475	6	20	2	0	23	2	41	0	61
LK 51	1	3	602	155	5452	6	133	4	0	0	0	7	0	12	0	47
LK 51	1	4	497	423	4155	15	198	6	0	3	0	16	0	26	1	78
LK 51	1	5	104	24	871	4	34	1	0	1	0	6	0	15	0	54
LK 51	1	6	310	187	157	0	1	1	0	0	0	0	0	0	0	0
LK 51	1	7	165	51	926	2	17	1	0	0	0	0	0	6	1	17
LK 51	1	8	293	200	705	0	1	6	0	0	0	0	0	0	0	0
LK 51	1	9	274	0	421	0	21	10	0	0	0	1	0	4	0	12
LK 51	1	10	810	56	1818	0	10	16	0	0	0	2	0	3	0	2
LK 51	1	11	290	501	1210	2	51	24	0	0	0	0	0	6	0	10
LK 51	1	12	12	0	0	0	0	2	0	0	0	0	0	0	0	0
LK 51	2	1	145	79	33	4	30	1	0	0	0	1	0	1	0	6
LK 51	2	2	1698	39	2347	28	272	2	0	0	0	3	0	10	1	28
LK 51	2	3	1140	1586	660	27	276	1	0	0	0	9	0	14	1	55
LK 51	2	4	2061	1500	1789	2	26	1	0	0	0	3	0	4	0	3
LK 51	2	5	48	298	558	2	33	1	1	0	0	7	0	8	0	21
LK 51	2	6	35	0	1	0	14	1	0	0	0	2	0	3	0	3
LK 51	2	7	413	0	145	0	16	3	0	0	0	3	0	5	0	11
LK 51	2	8	1	0	22	0	0	1	0	0	0	1	0	3	0	19
LK 51	2	9	64	0	28	3	68	3	0	0	0	4	0	7	0	9
LK 51	2	10	28	0	0	1	1	1	0	0	0	0	0	0	0	0
LK 51	2	11	23	0	1	0	0	1	0	0	0	0	0	1	0	0
LK 51	2	12	46	2923	1900	1	23	20	0	0	0	2	0	3	0	4
LK 51	3	1	2222	1426	7365	47	1344	20	54	1	0	23	0	26	0	45
LK 51	3	2	1669	2513	7146	69	3145	84	84	4	0	9	1	28	1	33
LK 51	3	3	1276	2104	5793	43	1425	85	130	1	0	9	0	13	0	32
LK 51	3	4	1052	1128	3523	15	585	25	1	0	0	7	0	6	0	17
LK 51	3	5	5456	177	5931	34	1075	44	0	0	0	8	0	10	0	19
LK 51	3	6	9778	1092	9999	29	451	41	1	0	0	8	1	19	1	43
LK 51	3	7	8544	0	9999	7	396	147	1	0	0	0	0	0	0	0
LK 51	3	8	5450	5197	9904	14	295	76	0	2	0	21	2	60	0	111
LK 51	3	9	4953	289	7804	13	330	88	0	1	0	10	0	12	0	45
LK 51	3	10	4099	1611	9993	16	578	53	0	1	0	16	0	36	0	63
LK 51	3	11	2087	3447	5245	13	492	64	0	0	0	0	0	0	0	1
LK 51	3	12	6940	162	1462	16	325	76	0	1	0	13	0	21	0	55
LK 53	1	1	18	0	218	0	0	0	0	0	0	4	1	0	0	7
LK 53	1	2	124	0	301	0	0	0	0	1	0	2	0	3	1	15
LK 53	1	3	99	0	2051	5	48	1	0	0	0	6	1	9	1	60
LK 53	1	4	0	0	5896	5	194	5	0	2	0	5	0	10	0	54
LK 53	1	5	85	29	1566	19	36	5	0	2	0	17	1	46	1	164
LK 53	1	6	1	0	800	13	121	4	0	0	0	2	0	6	0	24
LK 53	1	7	57	0	1827	5	46	3	0	1	0	0	0	1	0	17
LK 53	1	8	0	0	1	1	1	2	0	0	0	0	0	0	0	3
LK 53	2	1	77	0	3220	2	40	3	0	0	0	3	2	5	0	10
LK 53	2	2	2670	0	5050	1	20	20	40	0	0	7	2	6	0	25
LK 53	2	3	1020	0	5180	7	190	24	2	0	0	2	1	9	0	13
LK 53	2	4	3000	0	3810	4	80	22	2	0	0	5	3	4	0	8
LK 53	2	5	990	0	4690	2	20	15	0	0	0	0	0	2	0	3
LK 53	2	6	2510	0	5410	9	125	61	0	0	0	4	1	14	2	28
LK 53	2	7	3210	0	7480	2	60	55	2	1	0	7	2	11	2	22
LK 53	2	8	65	1965	5215	7	100	63	0	0	0	8	1	15	1	14
LK 53	2	9	1000	40	4275	1	6	25	0	1	0	8	0	27	0	41
LK 53	2	10	0	2010	1845	6	235	43	0	0	0	11	2	18	1	27
LK 53	2	11	0	0	1630	0	35	39	0	0	0	0	0	9	0	17
LK 53	3	1	0	0	73	0	0	0	0	0	0	0	0	0	0	0
LK 53	3	2	383	0	1801	6	133	20	0	0	0	1	0	0	0	15
LK 53	3	3	17	251	1458	0	0	0	0	0	0	5	0	1	0	11
LK 53	3	4	66	465	3879	1	1	0	0	2	0	9	1	7	2	58
LK 53	3	5	0	0	279	0	1	0	50	0	0	1	0	2	0	14
LK 53	3	6	35	0	295	2	10	0	0	0	0	1	0	3	0	29
LK 53	3	7	0	0	45	2	1	0	0	0	0	1	0	4	1	8
LK 74	1	1	0	330	7950	7	80	0	0	3	0	26	0	22	0	29
LK 74	1	2	80	1970	9999	12	200	0	0	1	0	23	1	26	0	25
LK 74	1	3	0	0	1210	3	20	0	0	0	0	1	0	3	0	3
LK 74	1	4	180	0	140	0	10	0	0	0	0	3	0	1	0	1
LK 74	1	5	0	0	30	1	10	0	0	0	0	0	0	0	0	1
LK 74	2	1	400	510	6760	15	140	0	0	2	0	24	1	2	0	65

TABLE 33. (continued)

SITE	TP	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
LK 74	2	2	1320	650	6030	32	0	7	0	1	0	41	2	58	1	72
LK 74	2	3	180	180	1810	11	180	5	0	2	0	12	1	22	1	20
LK 74	2	4	0	0	310	2	20	0	0	0	0	3	0	4	0	1
LK 74	3	1	0	630	2800	0	5	0	0	0	0	14	0	25	0	69
LK 74	3	2	0	230	3250	0	0	0	0	1	0	13	0	8	0	35
LK 74	3	3	0	1130	2240	0	0	0	0	1	0	11	0	21	0	37
LK 74	3	4	0	0	25	0	0	0	0	0	0	1	0	3	0	4
LK 74	4	1	490	0	3705	4	195	0	5	0	0	2	0	4	0	3
LK 74	4	2	1665	675	6200	17	360	5	255	0	0	5	1	12	0	30
LK 74	4	3	195	180	8225	13	350	15	110	1	0	7	0	7	0	5
LK 74	4	4	400	1550	9999	10	290	22	600	0	0	2	0	7	0	9
LK 74	4	5	0	670	6595	3	210	13	55	0	0	2	0	1	0	2
LK 74	4	6	220	1050	4210	7	360	13	0	0	0	1	0	4	0	0
LK 77	1	1	0	0	1750	4	30	0	0	1	0	11	3	2	0	6
LK 77	1	2	0	0	10	2	20	0	0	0	0	0	0	3	0	3
LK 77	2	1	0	50	40	8	60	2	0	0	0	2	1	1	0	1
LK 77	2	2	0	0	10	7	80	1	0	0	0	0	0	0	0	0
LK 77	3	1	0	0	180	22	600	8	0	0	0	1	0	1	1	2
LK 77	3	2	0	0	0	3	210	5	0	0	0	0	0	0	0	0
LK 85	1	1	219	57	928	1	1	1	0	0	0	0	0	2	0	5
LK 85	1	2	4520	932	685	28	1205	3	0	0	0	4	0	2	0	9
LK 85	1	3	2707	1958	1096	13	687	6	1	0	0	2	0	5	0	4
LK 85	1	4	631	574	1618	8	117	4	0	0	0	4	0	3	0	14
LK 85	1	5	1192	840	3205	12	311	15	0	0	0	3	0	2	0	6
LK 85	1	6	128	683	1377	6	87	4	0	0	0	0	0	0	0	2
LK 85	1	7	9999	3728	9908	1	15	5	0	0	0	0	0	1	0	7
LK 85	2	1	62	62	1724	3	36	0	0	0	0	4	0	7	0	16
LK 85	2	2	485	173	2861	45	1621	1	41	1	0	9	0	8	1	45
LK 85	2	3	721	230	1904	29	1087	5	0	0	0	10	0	9	0	26
LK 85	2	4	810	137	3412	39	1545	29	0	0	0	8	0	11	0	36
LK 85	2	5	510	277	2496	13	487	25	0	0	0	3	0	8	1	16
LK 85	2	6	87	34	331	10	224	19	1	0	0	1	0	4	0	6
LK 85	2	7	138	0	293	10	281	10	0	0	0	2	0	1	0	1
LK 85	2	8	0	0	356	5	52	6	0	1	0	1	0	0	0	0
LK 85	2	9	49	0	256	10	102	10	0	0	0	0	0	0	0	0
LK 85	2	10	40	108	0	34	511	16	0	0	0	0	0	0	0	5
LK 85	2	11	0	0	0	0	1	1	0	0	0	0	0	0	0	0
LK 85	2	12	0	0	0	3	37	2	0	0	0	0	0	0	0	0
LK 87	1	1	534	756	9999	30	1176	27	0	2	0	17	2	21	0	42
LK 87	1	2	1179	2828	9999	71	4203	109	0	0	0	9	1	12	1	33
LK 87	1	3	158	279	8655	8	431	48	0	1	0	4	0	2	0	16
LK 87	1	4	874	703	8696	5	365	91	0	3	0	7	0	13	0	27
LK 87	1	5	767	716	3946	8	98	60	0	0	0	6	0	4	0	21
LK 87	1	6	129	28	2512	2	103	23	0	0	0	2	0	0	0	4
LK 87	1	7	180	28	1761	1	17	20	0	0	0	1	0	1	0	1
LK 87	1	8	0	23	0	2	14	13	0	0	0	0	0	1	0	2
LK 87	1	9	74	967	0	0	0	12	0	1	0	4	0	2	0	6
LK 87	1	10	11	14	174	0	0	1	0	0	0	0	0	0	0	0
LK 87	2	1	1180	139	8592	22	738	64	0	0	0	3	0	6	0	19
LK 87	2	2	740	1428	6965	14	1375	68	0	0	0	4	0	3	0	9
LK 87	2	3	932	326	9999	8	410	105	1	1	0	8	0	2	0	10
LK 87	2	4	154	450	9999	2	237	137	0	0	0	8	1	8	0	7
LK 87	2	5	375	9	5203	6	91	127	0	1	0	5	1	3	0	16
LK 87	2	6	0	919	1184	2	148	47	0	2	0	2	0	3	0	8
LK 87	2	7	0	447	0	0	0	20	0	0	0	2	1	0	0	4
LK 88	1	1	394	293	3621	3	52	3	0	0	0	2	1	4	0	7
LK 88	1	2	1	79	3746	4	51	15	0	0	0	8	0	4	0	13
LK 88	1	3	470	0	109	0	1	1	0	1	0	0	0	1	0	2
LK 88	1	4	0	0	0	1	82	0	0	0	0	0	0	0	0	0
LK 88	2	1	0	0	162	0	1	1	0	0	0	1	0	1	0	1
LK 88	2	2	11	258	0	12	162	1	0	0	0	0	0	2	0	1
LK 88	2	3	0	0	21	1	15	3	0	0	0	1	0	0	0	3
LK 88	2	4	0	0	14	1	1	2	0	0	0	0	0	0	0	0
LK 91	1	1	7350	0	3110	60	690	7	0	2	0	32	5	41	2	74
LK 91	1	2	5000	0	530	61	1270	26	0	1	0	17	1	42	2	71
LK 91	1	3	1730	0	140	27	500	11	0	0	0	11	1	14	0	22
LK 91	1	4	40	0	10	1	20	1	0	0	0	0	0	2	0	0
LK 91	2	1	6260	0	5460	35	60	13	0	3	0	35	5	40	5	92
LK 91	2	2	7480	0	3810	15	240	22	0	0	0	10	0	18	0	33
LK 91	2	3	9999	0	9999	21	450	23	0	1	0	6	1	14	1	16
LK 91	2	4	5850	0	1270	10	280	19	0	0	0	10	0	9	0	12
LK 91	2	5	350	0	1880	4	50	7	0	0	0	1	1	1	0	3
LK 94	1	1	784	39	383	6	153	1	1	0	0	1	0	2	0	7
LK 94	1	2	219	85	80	2	71	3	1	0	0	3	0	1	0	1
LK 94	1	3	1343	652	616	8	183	25	1	0	0	1	0	2	0	6
LK 94	1	4	6407	5984	739	15	734	115	245	0	0	4	0	4	0	2
LK 94	1	5	83	187	725	5	202	45	19	0	0	2	0	1	0	2
LK 94	1	6	3604	3016	1	7	166	23	15	0	0	0	0	0	0	0
LK 94	1	7	14	14	631	7	202	12	45	0	0	0	0	0	0	2
LK 94	1	8	1739	1	0	38	0	6	23	0	0	0	0	0	0	0
LK 94	1	9	94	0	0	0	0	5	1	0	0	0	0	0	0	1
LK 94	1	10	1	10	0	1	18	1	0	0	0	0	0	0	0	0
LK 94	2	1	560	871	2640	22	362	40	0	0	0	8	1	9	0	13
LK 94	2	2	3800	48	2638	22	574	236	0	0	0	7	0	13	0	26
LK 94	2	3	419	77	1590	25	357	15	0	0	0	5	0	6	0	7
LK 94	2	4	102	340	74	5	147	6	0	0	0	2	0	2	0	5
LK 94	2	5	301	10	68	6	77	1	0	0	0	2	0	0	0	3
LK 94	2	6	0	0	309	0	0	1	0	0	0	1	0	0	0	0
LK 201	1	1	50	700	740	8	170	2	0	0	0	2	0	3	0	5
LK 201	1	2	800	110	480	14	400	16	2	0	0	5	2	9	1	6
LK 201	1	3	30	50	320	22	620	15	8	0	0	3	0	6	0	5
LK 201	1	4	1150	0	320	23	810	17	20	0	0	2	0	5	0	4
LK 201	1	5	1800	0	660	32	1310	12	13	0	0	4	0	2	0	6
LK 201	1	6	2610	0	1110	28	1110	93	14	0	0	2	0	5	0	6
LK 201	1	7	430	0	240	22	700	36	20	2	0	2	0	1	0	6
LK 201	1	8	1770	2200	170	6	150	20	35	0	0	0	0	2	0	3
LK 201	1	9	3330	540	2580	4	120	22	30	0	0	4	0	0	0	6
LK 201	1	10	4230	710	240	3	150	16	15	0	0	3	2	14	0	3
LK 201	1	11	1720	0	1350	0	10	32	18	1	0	6	0	3	0	29
LK 201	1	12	3710	1790	750	1	220	82	3	1	0	1	0	8	0	9
LK 201	1	13	3070	0	220	2	50	54	7	0	0	2	0	14	0	6
LK 201	1	14	1090	0	610	0	10	39	3	0	0	1	0	5	0	6
LK 201	1	15	550	0	1540	1	2	14	0	0	0	0	0	0	0	0
LK 201	1	16	0	0	0	1	5	5	0	0	0	1	0	0	0	3
LK 201	1	17	0	0	0	0	0	4	0	0	0	0	0	0	0	0
LK 201	1	18	0	0	0	0	0	2	0	0	0	0	0	0	0	1
LK 201	2	1	0	30	150	9	630	10	990	0	0	26	4	18	2	52
LK 201	2	2	790	10	830	20	2180	110	2950	3	0	44	5	106	2	149
LK 201	2	3	240	50	20	10	420	37	60	1	0	7	3	15	0	20
LK 201	2	4	70	1050	190	15	1020	52	31	0	0	5	1	7	0	3
LK 201	2	5	120	20	50	7	420	29	0	0	0	1	0	1	0	2
LK 201	2	6	0	0	230	0	0	1	0	0	0	1	0	0	0	1
LK 201	2	7	0	0	0	1	180	4	9	1	0	1	0	1	0	2
LK 201	2	8	0	200	660	0	10	10	0	0	0	4	0	1	0	2
LK 201	2	9	50	0	120	3	70	14	3	1	0	1	0	5	0	5
LK 201	2	10	1950	230	260	4	80	19	7	0	0	4	0	4	0	3
LK 201	2	11	630	10	220	3	130	5	3	0	0	4	0	1	0	0
LK 201	2	12	1490	280	1420	2	80	9	2	0	0	2	0	5	0	2
LK 201	2	13	1370	0	570	3	40	14	0	0	0	0	0	1	0	2

SITE	TP	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
LK201	2	14	3700	100	4340	46	2080	106	34	0	0	6	2	5	1	1
LK201	2	15	9650	720	3530	18	240	51	0	0	0	0	0	2	0	6
LK201	2	16	2570	550	430	4	110	180	0	0	0	0	0	5	0	3
LK201	2	17	148	260	350	0	10	46	0	1	0	2	0	2	0	4
LK201	2	18	4770	20	1180	2	50	239	0	0	0	14	0	41	0	66
LK201	2	19	140	0	20	0	5	74	0	0	0	4	1	2	0	4
LK201	2	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LK201	2	21	10	0	160	0	0	13	4	0	0	0	0	0	0	0
LK201	3	1	0	0	0	2	130	1	1	0	0	1	0	1	0	1
LK201	3	2	0	0	190	3	130	21	30	0	0	0	0	1	1	0
LK201	3	3	30	0	60	2	220	70	1	1	0	2	0	3	0	2
LK201	3	4	10	130	90	8	440	38	10	1	0	0	0	3	0	6
LK201	3	5	0	0	20	4	210	52	590	0	0	4	0	3	0	4
LK201	3	6	30	0	1760	0	0	19	360	0	0	1	0	1	0	0
LK201	3	7	510	660	0	3	60	20	250	1	0	4	0	2	0	3
LK201	3	8	0	0	30	2	50	8	1	0	0	6	1	2	0	3
LK201	3	9	270	0	0	2	60	1	1	0	0	0	0	0	0	0
LK201	3	10	880	340	70	8	340	0	250	0	0	6	1	7	1	16
LK201	3	11	6100	0	0	13	610	32	40	1	0	19	3	18	3	22
LK201	3	12	1810	0	0	33	890	20	40	2	0	11	0	18	0	17
LK201	3	13	0	0	1590	3	20	4	10	0	0	3	0	5	0	0
LK201	3	14	1210	0	0	0	0	10	0	0	0	0	0	0	0	0
LK201	3	15	0	0	940	0	0	12	0	0	0	0	0	0	0	0
LK201	3	16	9900	0	2260	6	290	12	220	1	0	1	0	3	0	0
LK201	3	17	1080	0	430	0	30	4	1250	0	0	0	0	0	0	0
LK201	3	18	970	0	1630	0	0	4	15	1	0	2	0	1	0	4
LK201	3	19	970	0	300	0	0	6	60	0	0	0	0	0	0	0
LK201	3	20	350	0	0	4	140	2	90	0	0	0	0	0	0	0
MC 9	1	1	0	2780	1860	26	470	1	0	0	0	11	3	17	0	22
MC 9	1	2	0	1090	570	12	160	4	0	0	0	1	0	3	0	18
MC 9	2	1	0	530	920	5	150	4	0	0	0	5	0	10	0	15
MC 9	2	2	710	830	1780	12	330	7	0	0	0	6	0	7	0	21
MC 13	1	1	0	110	1030	8	520	3	0	0	0	2	0	4	0	11
MC 13	1	2	0	560	10	10	4500	10	0	1	0	0	0	3	0	2
MC 13	1	3	0	3940	30	7	430	28	0	0	0	4	0	3	0	8
MC 13	1	4	0	60	60	2	190	13	0	0	0	2	0	4	0	1
MC 13	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 13	2	1	0	0	520	7	140	7	0	0	0	2	0	3	1	16
MC 13	2	2	0	0	940	15	400	31	0	0	0	3	0	3	0	14
MC 13	2	3	0	180	120	13	520	14	0	0	0	3	0	2	0	5
MC 13	2	4	0	1220	190	11	590	13	0	0	0	1	0	5	0	4
MC 13	2	5	0	140	1650	1	110	14	0	0	0	7	0	7	0	21
MC 13	2	6	0	10	250	1	150	10	0	1	0	3	0	5	0	21
MC 13	2	7	0	300	640	4	170	2	0	0	0	7	0	12	0	18
MC 13	3	1	170	550	2870	6	450	4	0	1	0	7	1	21	0	50
MC 13	3	2	0	50	610	2	60	15	0	0	0	6	0	6	0	15
MC 13	3	3	10	0	90	0	10	1	0	0	0	0	0	1	0	0
MC 13	3	4	0	0	0	0	0	701	0	0	0	0	0	0	0	0
MC 13	3	5	10	0	0	0	0	1	0	0	0	0	0	0	0	0
MC 13	3	6	0	0	0	0	10	1	0	0	0	0	0	0	0	0
MC 13	3	7	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MC 13	3	8	0	0	0	0	1	1	0	0	0	1	0	0	0	2
MC 15	1	1	0	7700	1260	28	990	69	7	0	0	6	0	17	0	18
MC 15	1	2	0	8390	2100	5	430	127	0	0	0	11	0	10	1	19
MC 15	1	3	0	8310	1700	8	490	87	0	0	0	7	1	17	0	15
MC 15	1	4	0	9999	1120	5	110	86	0	0	0	4	0	7	0	15
MC 15	1	5	0	9640	2970	6	300	106	5	0	0	4	0	4	0	17
MC 15	1	6	0	530	730	4	200	30	0	1	1	1	1	1	0	1
MC 15	2	1	0	450	270	5	200	57	0	0	0	10	2	9	0	11
MC 15	2	2	0	1080	60	1	50	57	0	0	0	7	1	7	1	14
MC 15	2	3	0	5860	830	7	240	92	0	1	0	5	2	9	3	15
MC 15	2	4	0	3090	1100	14	260	48	0	0	0	3	0	8	0	15
MC 15	2	5	0	6910	110	8	80	49	0	1	0	5	1	7	0	18
MC 15	2	6	0	3950	1240	1	30	21	0	0	0	9	1	6	0	4
MC 15	3	1	0	6350	370	17	400	22	0	0	0	16	0	43	0	65
MC 15	3	2	0	9999	40	17	380	18	0	1	0	6	0	12	0	28
MC 15	3	3	0	9999	490	7	130	34	0	0	0	8	0	6	0	13
MC 15	3	4	0	9999	100	29	530	18	0	0	0	2	0	12	0	19
MC 15	3	5	0	690	90	20	540	21	0	0	0	4	0	7	0	15
MC 15	3	6	0	410	100	6	160	16	0	0	0	3	1	3	0	3
MC 15	4	1	0	3210	640	9	160	42	0	0	0	3	0	4	0	17
MC 15	4	2	0	4500	1370	16	270	79	0	0	0	1	1	8	2	11
MC 15	4	3	0	4200	1020	5	230	77	0	0	0	6	0	8	0	20
MC 15	4	4	0	9999	1680	17	490	125	0	0	0	9	2	12	1	16
MC 15	4	5	0	6690	530	9	170	157	0	0	0	4	0	7	0	8
MC 15	4	6	0	3160	430	15	290	103	0	0	0	3	0	7	0	15
MC 15	4	7	0	2270	40	21	370	50	0	0	0	0	1	16	0	38
MC 15	4	8	0	80	0	8	180	15	0	0	0	3	0	4	0	9
MC 15	5	1	0	660	30	5	130	8	0	0	0	3	1	5	0	6
MC 15	5	2	0	10	1110	77	5390	8	0	0	0	0	0	1	0	2
MC 15	5	3	0	10	60	40	1660	11	10	0	0	0	0	1	0	3
MC 15	5	4	0	150	10	13	410	10	10	0	0	0	0	0	0	0
MC 15	6	1	0	1060	340	4	50	1	0	1	0	0	0	4	0	8
MC 15	6	2	0	340	320	1	60	7	0	0	0	3	0	6	1	20
MC 15	6	3	0	910	270	2	30	19	0	0	0	3	0	7	1	18
MC 15	6	4	0	2440	390	0	10	14	0	0	0	3	2	11	1	11
MC 15	6	5	0	9999	70	0	10	10	0	0	0	3	1	6	1	8
MC 15	6	6	0	9999	1240	4	90	12	0	0	0	2	0	8	0	13
MC 15	6	7	0	350	420	2	100	12	0	0	0	2	0	3	0	6
MC 15	6	3	0	500	470	2	40	13	0	0	0	0	0	3	0	9
MC 15	7	1	0	270	1370	2	10	7	0	1	0	4	1	6	0	14
MC 15	7	2	0	420	870	2	10	12	0	0	0	9	0	6	0	17
MC 15	7	3	0	30	70	0	10	0	0	0	0	3	1	3	1	3
MC 15	7	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MC 15	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 17	1	1	0	3020	1230	13	220	17	0	0	0	6	0	25	0	38
MC 17	1	2	0	8050	1010	38	830	43	0	0	0	9	0	16	1	45
MC 17	1	3	0	9999	540	22	800	47	0	0	0	16	0	13	0	23
MC 17	1	4	0	9999	720	17	400	67	0	0	0	19	0	33	2	46
MC 17	1	5	0	9999	470	16	320	30	0	1	0	11	1	28	1	27
MC 17	1	6	0	6590	450	21	410	39	0	1	0	11	2	30	1	19
MC 17	1	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 17	2	1	0	2260	410	20	540	35	0	2	0	8	1	15	2	21
MC 17	2	2	0	6100	290	20	830	93	0	0	0	17	3	14	1	11
MC 17	2	3	0	9999	120	9	320	57	0	0	0	7	0	15	0	12
MC 17	2	4	0	0	210	10	230	24	40	1	0	9	0	13	0	14
MC 17	2	5	0	3520	90	7	150	22	0	0	0	4	0	4	0	7
MC 19	1	1	0	1280	800	0	0	0	0	0	0	0	0	0	0	0
MC 19	1	2	0	3880	4060	31	620	121	0	0	0	39	4	68	3	98
MC 19	1	3	0	5130	2750	22	580	125	0	0	0	25	2	25	0	38
MC 19	1	4	0	4670	3380	13	410	94	0	3	0	20	1	23	1	42
MC 19	1	5	0	2420	4990	24	1050	62	0	2	0	20	3	41	2	53
MC 19	1	6	0	370	210	11	190	40	0	0	0	1	0	18	1	8
MC 19	1	7	0	130	140	7	260	27	0	1	0	5	0	14	0	10
MC 19	1	3	0	0	270	6	100	12	0	0	0	0	0	5	0	6
MC 19	2	1	0	610	2640	5	150	21	0	0	0	5	0	17	0	39
MC 19	2	2	0	750	3620	7	120	24	0	0	0	4	0	14	0	22
MC 19	2	3	0	980	5230	3	110	32	0	0	0	9	1	24	0	24
MC 19	2	4	0	2180	4060	9	100	11	0	0	0	5	1	7	0	17
MC 19	2	5	0	80	1170	2	90	20	0	2	0	5	0	8	0	0
MC 19	2	6	0	20	940	0	10	15	0	0	0	2	0	6	0	5
MC 19	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 33. (continued)

SITE	TP	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
MC 19	3	1	0	50	920	1	40	8	5	0	0	4	0	12	0	29
MC 19	3	2	0	0	860	4	100	57	0	1	0	16	1	29	2	64
MC 19	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 19	3	4	0	230	240	2	60	25	0	0	0	6	0	13	0	22
MC 19	3	5	0	60	800	3	60	11	0	1	0	6	0	11	0	23
MC 19	3	6	0	0	70	2	10	1	0	0	0	3	0	3	0	2
MC 19	4	1	0	0	520	3	40	31	0	0	0	5	0	6	0	10
MC 19	4	2	0	640	1320	4	130	10	0	0	0	0	2	6	0	7
MC 19	4	3	0	50	1040	11	280	18	0	0	0	5	2	7	0	14
MC 19	4	4	0	1580	2390	2	60	13	0	0	0	4	0	11	0	13
MC 19	4	5	0	220	430	2	30	14	0	0	0	1	0	11	0	6
MC 19	4	6	0	0	40	4	100	50	0	0	0	3	0	6	0	5
MC 24	1	1	0	0	320	10	170	2	0	0	0	0	0	2	0	6
MC 24	1	2	0	30	720	33	800	10	0	0	0	5	0	5	0	16
MC 24	1	3	0	5010	280	48	1280	25	0	0	0	0	0	5	0	6
MC 24	1	4	0	2740	1990	102	3630	43	0	0	0	8	0	15	0	23
MC 24	1	5	0	500	1390	15	760	11	0	0	0	0	0	1	0	5
MC 24	2	1	0	0	10	3	40	3	0	0	0	1	0	0	0	0
MC 24	2	2	0	340	370	5	130	7	0	0	0	0	0	0	0	1
MC 25	1	1	0	20	0	0	10	0	0	0	0	0	0	2	0	0
MC 25	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0
MC 25	1	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0
MC 25	1	4	0	30	0	0	0	15	0	0	0	1	0	0	0	0
MC 25	1	5	0	0	0	0	0	8	0	0	0	1	0	0	0	0
MC 26	1	1	0	0	0	0	0	2	10	0	0	0	0	0	0	0
MC 26	1	2	0	0	0	0	0	13	30	0	0	0	0	0	0	0
MC 26	1	3	0	0	0	0	0	9	5	0	0	0	0	0	0	0
MC 29	1	1	0	30	40	1	40	0	0	0	0	2	1	3	0	3
MC 29	1	2	0	220	40	3	140	0	0	0	0	1	0	6	0	3
MC 29	1	3	0	1020	40	9	430	4	0	0	0	0	0	0	0	0
MC 29	1	4	0	9999	370	4	90	15	0	0	0	2	0	2	0	0
MC 29	1	5	0	2340	290	1	220	4	0	0	0	0	0	1	0	2
MC 29	1	6	0	2170	140	1	1	19	0	1	0	0	0	0	0	0
MC 29	2	1	0	540	165	4	70	0	0	0	0	7	0	24	0	27
MC 29	2	2	0	310	375	7	3250	0	35	0	0	13	0	38	0	52
MC 29	2	3	0	110	335	9	420	1	0	0	0	10	0	37	1	40
MC 29	2	4	0	1190	10	4	280	0	0	0	0	2	0	6	0	11
MC 29	2	5	0	0	0	1	35	1	0	0	0	0	0	0	0	2
MC 29	2	6	265	2420	45	6	230	1	0	0	0	0	0	4	0	6
MC 29	3	1	0	925	340	1	25	1	0	0	0	1	0	6	0	16
MC 29	3	2	5	1305	130	3	120	3	0	0	0	1	0	4	0	4
MC 29	3	3	0	1550	80	7	265	6	10	0	0	0	0	3	0	0
MC 29	3	4	0	4640	430	3	60	18	45	0	0	0	0	4	0	0
MC 29	3	5	0	2640	270	4	75	3	0	0	0	0	0	0	0	1
MC 29	3	6	0	535	510	0	10	10	0	0	0	1	0	1	0	3
MC 30	1	1	0	2680	4550	150	2940	1	0	1	0	19	3	18	2	24
MC 30	1	2	0	1250	5640	137	3960	15	0	1	0	8	0	11	0	21
MC 30	1	3	0	4440	1210	74	2050	21	0	0	0	5	0	9	0	4
MC 30	1	4	0	1250	850	33	1060	31	0	0	0	8	0	6	0	8
MC 30	1	5	0	440	50	54	2180	12	0	0	0	0	0	0	0	0
MC 30	1	6	0	0	110	12	390	5	0	0	0	0	0	0	0	2
MC 30	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 30	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 30	3	1	0	940	2800	3	40	0	0	0	0	0	0	6	0	8
MC 30	3	2	0	180	1250	11	180	2	0	0	0	1	0	2	0	2
MC 30	3	3	0	1170	2330	29	870	3	0	0	0	5	0	1	0	3
MC 30	3	4	30	570	1330	14	360	9	0	0	0	1	0	0	0	3
MC 31	1	1	0	265	45	7	120	0	0	0	0	2	1	1	0	4
MC 31	1	2	0	935	0	3	360	10	0	0	0	0	0	4	0	7
MC 31	1	3	0	1865	5	2	75	5	5	0	0	0	0	2	0	8
MC 31	1	4	0	35	20	2	125	11	5	0	0	0	0	2	0	1
MC 31	1	5	0	55	0	0	15	2	0	0	0	0	0	3	0	0
MC 31	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 31	2	2	0	370	280	94	5955	9	0	0	0	0	0	2	0	4
MC 31	2	3	0	335	0	12	1345	21	0	0	0	1	0	0	0	0
MC 31	2	4	0	255	0	6	250	14	0	0	0	0	0	1	0	1
MC 31	3	1	0	155	40	0	90	0	0	0	0	2	0	1	0	4
MC 31	3	2	0	55	715	4	95	0	0	0	0	0	0	2	0	3
MC 31	3	3	0	5	100	3	135	0	0	0	0	0	0	1	0	0
MC 31	3	4	0	0	0	2	70	3	0	0	0	0	0	0	0	0
MC 31	3	5	0	0	0	2	25	3	0	0	0	0	0	0	0	0
MC 39	1	1	0	220	3190	4	80	3	0	0	0	6	1	9	0	22
MC 39	1	2	0	930	3950	9	110	7	0	0	0	7	1	6	0	20
MC 39	1	3	180	30	3350	13	240	2	0	0	0	3	0	8	0	12
MC 39	1	4	0	3780	4280	13	650	35	0	0	0	5	1	15	1	17
MC 39	1	5	0	2350	8180	2	110	10	0	1	0	6	0	20	0	23
MC 39	1	6	0	2790	8170	1	60	30	0	0	0	13	1	23	0	40
MC 39	1	7	0	1940	6110	16	170	49	0	0	0	18	0	29	0	57
MC 39	1	8	0	170	380	1	20	16	0	0	0	1	0	1	0	12
MC 39	2	1	0	30	690	1	10	0	0	0	0	3	0	4	0	5
MC 39	2	2	0	560	2080	0	10	2	0	0	0	2	0	2	0	8
MC 39	2	3	0	360	380	0	10	1	0	0	0	4	0	2	0	3
MC 39	2	4	0	370	1220	6	70	2	0	2	0	5	0	5	0	9
MC 39	2	5	720	1440	3760	11	230	8	0	2	0	17	0	13	0	22
MC 39	2	6	0	550	2200	4	55	6	0	0	0	4	0	12	0	25
MC 39	2	7	0	1000	2260	7	85	18	0	0	0	7	0	27	0	36
MC 39	2	8	0	290	1010	4	20	4	0	0	0	3	0	11	0	27
MC 39	2	9	0	105	170	0	5	4	0	0	0	4	0	10	0	9
MC 39	3	1	0	75	35	0	5	0	0	0	0	0	0	0	0	0
MC 39	3	2	5	95	790	0	0	8	0	0	0	2	0	1	0	1
MC 39	3	3	50	0	165	1	5	11	0	0	0	2	0	2	0	5
MC 39	3	4	210	0	155	0	5	5	0	0	0	2	0	2	0	0
MC 39	3	5	0	1410	680	2	110	13	0	0	0	1	0	4	0	7
MC 39	3	6	1810	4535	5470	0	0	0	150	0	0	1	0	4	0	8
MC 39	3	7	0	890	1690	1	35	6	0	0	0	5	0	3	0	3
MC 39	3	8	0	0	60	0	5	0	0	0	0	0	0	0	0	1
MC 39	3	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 55	1	1	0	220	530	8	780	3	175	1	0	6	0	8	0	35
MC 55	1	2	0	120	70	0	10	0	5	0	0	11	2	8	0	15
MC 55	1	3	0	2620	1890	2	130	2	5	0	0	3	0	6	0	1
MC 55	1	4	0	930	10	5	330	4	0	0	0	0	0	2	0	1
MC 55	1	5	0	760	0	1	30	6	5	0	0	0	0	0	0	0
MC 55	1	7	0	1480	100	3	150	5	0	0	0	0	0	5	0	4
MC 55	1	8	0	4600	1	2	200	11	5	0	0	0	0	1	0	6
MC 55	1	9	0	70	0	5	90	11	0	0	0	1	0	0	0	0
MC 55	2	1	0	0	370	1	35	2	20	0	0	4	2	7	0	0
MC 55	2	2	0	20	930	0	275	4	180	1	0	23	4	59	1	160
MC 55	2	3	0	0	40	2	85	4	0	0	0	5	0	3	0	1
MC 55	2	4	0	0	0	0	45	1	15	0	0	2	0	0	0	3
MC 55	2	5	0	345	0	3	95	0	20	1	0	1	0	1	0	0
MC 55	2	6	0	675	50	0	190	2	0	0	0	2	0	1	0	2
MC 55	2	7	0	140	5	0	3	3	0	0	0	2	0	1	0	6
MC 55	2	8	2705	2635	0	0	0	17	0	0	0	2	0	6	0	10
MC 55	2	9	15	5660	0	1	40	14	0	0	0	2	0	13	0	23
MC 55	2	10	10	35	20	9	170	5	0	0	0	2	0	0	0	3
MC 55	3	1	0	0	1	1	20	0	5	0	0	0	0	4	0	2
MC 55	3	2	0	0	760	15	560	2	115	0	0	8	0	13	0	47
MC 55	3	3	0	20	30	11	250	3	0	0	0	0	0	1	0	2
MC 55	3	4	0	70	0	0	40	4	5	0	0	0	0	1	0	1

TABLE 33. (continued)

SITE	TP	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
MC 55	3	5	0	0	0	0	20	0	0	0	0	0	0	0	0	0
MC 55	3	6	0	0	0	3	300	2	0	0	0	0	0	0	0	1
MC 55	3	7	0	420	0	1	100	6	0	0	0	1	0	0	0	0
MC 75	1	1	0	715	435	0	35	0	0	1	0	14	0	10	1	13
MC 75	1	2	0	1295	5	1	5	9	0	0	0	3	0	7	0	8
MC 75	1	3	0	670	5	0	0	295	0	0	0	4	0	4	0	4
MC 75	1	4	0	0	5	0	0	17	0	0	0	1	0	4	0	5
MC 75	1	5	0	4250	60	0	0	3	0	0	0	5	0	12	0	11
MC 75	1	6	0	1755	25	2	30	2	0	2	0	3	0	4	0	9
MC 75	1	7	0	0	0	0	5	0	0	0	0	0	0	0	0	1
MC 75	2	1	0	6900	2050	1	10	2	0	2	0	13	1	20	1	25
MC 75	2	2	0	510	50	0	10	1	0	3	0	5	0	15	1	24
MC 75	2	3	0	145	20	2	20	16	0	1	0	1	0	2	0	6
MC 75	2	4	0	2880	50	2	80	12	0	0	0	4	0	3	0	1
MC 75	2	5	0	517	420	0	0	9	0	0	0	3	0	2	0	1
MC 75	2	6	0	1920	0	0	0	1	0	0	0	0	0	0	0	0
MC 75	2	7	0	590	100	1	10	1	0	0	0	4	0	4	0	7
MC 75	2	8	0	242	160	11	260	0	0	6	0	7	1	9	1	39
MC 75	2	9	0	130	80	4	20	14	0	0	0	0	0	1	0	4
MC 84	1	1	0	1420	9999	5	120	11	0	1	0	4	0	17	1	25
MC 84	1	2	0	480	4530	4	50	16	1	0	0	9	0	7	0	22
MC 84	1	3	0	1630	9999	19	300	16	0	2	0	15	1	17	0	24
MC 84	1	4	0	3650	7210	39	490	14	0	1	0	16	1	25	0	40
MC 84	1	5	0	560	770	0	0	2	0	0	0	2	0	1	0	8
MC 84	2	1	0	80	740	2	40	1	0	0	0	4	0	10	0	10
MC 84	2	2	0	20	380	4	70	1	0	0	0	6	3	2	0	12
MC 84	2	3	0	10	1170	4	25	2	0	0	0	3	0	4	0	5
MC 84	2	4	0	70	1875	29	305	5	0	3	0	25	0	27	0	41
MC 84	2	5	0	5	640	17	310	0	0	2	0	17	0	18	0	39
MC 86	1	1	240	0	60	1	10	5	0	0	0	5	2	4	1	2
MC 86	1	2	0	1645	230	6	85	15	0	0	0	2	0	4	0	6
MC 86	1	3	0	3210	295	1	90	20	0	0	0	3	0	6	0	16
MC 86	1	4	0	3345	55	8	190	39	0	0	0	4	0	13	0	18
MC 86	1	5	0	3985	45	1	100	33	0	0	0	3	0	5	2	7
MC 86	1	6	0	3970	140	1	15	17	0	0	0	3	0	1	0	5
MC 86	1	7	0	965	60	2	45	29	0	0	0	1	0	5	0	3
MC 86	2	1	0	495	155	3	105	56	0	0	0	4	0	3	0	8
MC 86	2	2	0	480	885	7	470	55	0	0	0	8	1	12	1	16
MC 86	2	3	0	2220	1160	11	715	75	0	0	0	5	0	11	0	0
MC 86	2	4	0	3220	850	6	130	74	0	0	0	5	0	10	0	15
MC 86	2	5	0	4310	120	0	30	27	0	0	0	3	0	3	0	3
MC 177	1	1	0	0	2600	0	0	4	0	0	0	1	0	0	0	3
MC 177	1	2	0	210	2700	0	10	3	0	1	0	2	0	9	0	5
MC 177	1	3	0	1010	2370	0	10	4	0	0	0	0	0	4	0	7
MC 177	1	4	0	640	1190	0	0	1	0	0	0	3	1	2	0	1
MC 177	1	5	0	1580	2930	0	0	2	0	0	0	1	0	1	0	0
MC 177	1	6	0	10	2100	0	0	10	0	0	0	0	0	1	0	5
MC 177	1	7	0	0	530	0	0	3	0	0	0	0	0	1	0	5
MC 177	2	1	0	290	600	0	0	12	0	1	0	1	0	0	0	3
MC 177	2	2	0	140	1910	1	10	9	0	0	0	2	0	1	0	0
MC 177	2	3	0	110	3640	1	10	5	0	0	0	0	0	1	0	4
MC 177	2	4	0	220	3410	0	10	4	0	0	0	0	0	2	0	5
MC 177	2	5	0	970	2830	0	0	4	0	1	0	2	0	1	0	4
MC 177	2	6	0	2600	9870	0	0	2	0	0	0	1	0	4	0	5
MC 177	2	7	0	7790	8780	3	50	7	0	0	0	1	0	0	0	4
MC 177	2	8	0	100	2350	0	0	6	0	0	0	2	0	4	0	3

SITE	NORTH	EAST	LEV	A	B	C	D	E	F	G	H	I	J	K	L	M	N
MC 222	98.00	87.00	1	0	20	10	0	10	0	10	0	0	2	0	1	0	2
MC 222	98.00	87.00	2	0	680	20	0	10	2	1910	1	0	2	0	5	0	3
MC 222	98.00	87.00	3	20	0	360	0	0	15	2600	3	0	17	1	82	0	117
MC 222	98.00	88.00	1	0	10	10	0	0	19	230	0	0	3	0	1	0	4
MC 222	98.00	88.00	2	30	0	1	0	1	2	345	0	0	1	0	2	0	4
MC 222	98.00	88.00	3	0	3610	180	0	10	5	325	0	0	12	0	40	0	57
MC 222	98.00	89.00	1	100	1070	140	1	10	15	75	0	0	6	0	12	0	21
MC 222	98.00	89.00	2	40	0	220	1	20	3	50	0	0	6	0	5	0	24
MC 222	98.00	89.00	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 222	99.00	87.00	1	0	50	10	0	0	0	360	0	0	0	0	4	0	6
MC 222	99.00	87.00	2	0	130	40	1	10	6	3670	0	0	2	0	6	0	2
MC 222	99.00	87.00	3	0	0	0	0	0	0	0	0	0	25	0	34	0	45
MC 222	99.00	88.00	1	0	30	60	1	4	21	110	0	0	2	0	3	0	3
MC 222	99.00	88.00	2	0	70	50	3	120	10	1100	0	0	4	0	3	0	3
MC 222	99.00	88.00	3	0	0	480	5	60	17	170	0	0	7	3	17	0	26
MC 222	100.00	87.00	1	120	7150	360	8	440	63	2150	1	0	6	0	9	0	16
0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MC 222	100.00	88.00	1	12	420	400	11	360	17	2630	0	0	12	0	15	0	9
MC 222	104.00	88.00	1	0	3330	70	8	260	25	260	0	0	9	0	20	0	8
MC 222	104.00	88.00	2	0	340	10	19	1140	39	20	0	0	3	2	5	0	5
MC 222	104.00	88.00	3	0	2030	670	54	2490	210	60	0	0	12	2	14	1	10
MC 222	104.00	89.00	1	0	170	0	0	0	1	5	0	0	0	0	3	0	8
MC 222	104.00	89.00	2	0	2045	5	4	295	58	90	0	0	4	0	8	0	7
MC 222	104.00	89.00	3	0	8680	155	79	4780	415	365	0	0	7	0	7	0	16
MC 222	105.00	88.00	1	50	0	530	7	130	12	0	0	0	0	0	1	0	6
MC 222	105.00	88.00	2	0	2420	450	36	2320	85	555	0	0	3	0	7	0	8
MC 222	105.00	88.00	3	80	7205	150	46	2120	231	555	1	0	4	0	11	0	21
MC 222	105.00	89.00	1	30	170	230	7	165	13	260	0	0	6	0	7	0	5
MC 222	105.00	89.00	2	120	1120	1840	99	590	250	162	0	0	7	0	20	0	15
MC 222	105.00	89.00	3	40	620	80	14	76	91	60	0	0	6	0	10	0	9

DEBITAGE TABLES

In the following table, debitage recovered from sites tested during Phase I excavations is broken down into the 53 units used in the debitage analysis. Each debitage category is represented in the table by a code number. Code numbers are presented below:

Code	
53	Primary Flakes - Total
54	Cortex Platform
55	Modified
56	Trimmed
57	Single Facet Platform
58	Modified
59	Trimmed
60	Other Platform Types
61	Modified
62	Trimmed
63	Secondary Flakes - Total
64	Cortex Platform
65	Modified
66	Trimmed
67	Single Facet Platform
68	Modified
69	Trimmed
70	Small Multiple Facet Platform
71	Modified
72	Trimmed
73	Large Multiple Facet Platform
74	Modified
75	Trimmed
76	Lipped
77	Modified
78	Trimmed
79	Tertiary Flakes - Total
80	Single Facet Platform
81	Modified
82	Trimmed
83	Small Multiple Facet Platform
84	Modified
85	Trimmed
86	Large Multiple Facet Platform
87	Modified
88	Trimmed
89	Lipped
90	Modified
91	Trimmed
92	Chips - Total
93	Cortex
94	Modified
95	Trimmed
96	Partial Cortex
97	Modified
98	Trimmed
99	No Cortex
100	Modified
101	Trimmed
102	Chunks - Total
103	Cortex
104	Partial Cortex
105	No Cortex

The debitage totals from each site are given without reference to recovery unit (test pit). Instead, the debitage collections have been grouped into "horizon" assemblages suggested to reflect more realistically the successive periods of cultural activity resulting in accumulation of debitage at each site. At certain sites where not all of the test pits yielded collections in which "horizons" could be recognized, debitage totals are presented in a column headed "undifferentiated." At sites where collections from all test pits are "undifferentiated," only a site total is given. Horizons were defined based on the vertical distribution of materials as shown in the Material Analysis Records, Table 33. Horizons consist of one or more vertical excavation levels (in most cases 10-cm thick) yielding markedly greater amounts of cultural residues than levels immediately above or below. At sites where two distinct horizons were recognized, "Upper" and "Lower" designations are assigned. At sites with three horizons, an additional "Middle" horizon is defined. Site 41 LK 201 contained five horizons, the uppermost being called the "1st horizon" and the deepest the "5th horizon." Table 34 shows level groupings for horizons.

TABLE 34. LEVEL GROUPINGS FOR HORIZONS

SITE	TEST PIT	UPPER	MIDDLE	LOWER	UNDIFFERENTIATED
41 LK 8	1				1-6
	2	1	2-7	8-9	
	3	1-2	3-9	10-13	
	4				1-6
41 LK 13	1				1-2
41 LK 14	1	1-4		5-8	
	2	1-4		5-7	
	3	1-4		5-7	
	4	1-4		5-9	
41 LK 15	1	1-5		6-9	
	2	1-4		5-9	
	3	1-3			
	4	1-4		5-8	
	5	1-4		5-7	
41 LK 17	1	1-4		5-9	
	2	1-4			
	3	1-4		5-7	
	4	1-3		4-6	
41 LK 34	1				1-3
	2				1-2
	3				1-2
41 LK 41	N1114-17 E1400-02	1-2		3-9	
	N1135-36 E1441-42				1-2
	N1144-45 E1474-76	1-2		3-5	

TABLE 34. (continued)

SITE	TEST PIT	UPPER	MIDDLE	LOWER	UNDIFFER-ENTIATED
41 LK 49	1	1-2		3-5	
41 LK 51	1	1-4	5-8	9-12	
	2	1-4	5-8	9-12	
	3	1-4	5-8	9-12	
41 LK 53	1	1-4		5-8	
	2	1-5		6-11	
	3	1-4		5-7	
41 LK 59	N954-58 E555-56	1-3		4-6	
	N981-83 E823-27				1-4
	N1010 E857				1-4
	N1010 E949				1-5
41 LK 74	1	1-2		3-5	
	2	1-2		3-4	
	3	1-2		3-4	
	4	1-4		5-6	
41 LK 77	1				1-2
	2				1-2
	3				1-2
41 LK 85	1	1-4		5-7	
	2	1-5	6-8	9-12	
41 LK 87	1	1-5		6-10	
	2	1-5		6-7	
41 LK 88	1				1-4
	2				1-4

TABLE 34. (continued)

SITE	TEST PIT	UPPER	MIDDLE	LOWER	UNDIFFER-ENTIATED
41 LK 91	1				1-4
	2				1-5
41 LK 94	1				1-10
	2				1-5
41 LK 201	SEE BELOW				
41 MC 9	1				1-2
	2				1-2
41 MC 13	1				1-5
	2	1-4		5-7	
	3	1-4		5-8	
41 MC 15	1	1-3		4-6	
	2	1-3		4-6	
	3	1-3		4-6	
	4	1-4		5-8	
	5				1-4
	6	1-4		5-8	
	7	1-3		4-5	
41 MC 17	1				1-7
	2				1-5
41 MC 19	1	1-4		5-8	
	2	1-3		4-7	
	3	1-3		4-6	
	4	1-3		4-6	
41 MC 24	1	1-3		4-5	
	2				1-2
41 MC 25	1				1-5
41 MC 26	1				1-3

TABLE 34. (continued)

SITE	TEST PIT	UPPER	MIDDLE	LOWER	UNDIFFER-ENTIATED
41 MC 29	1	1-3		4-6	
	2	1-3		4-6	
	3	1-3		4-6	
41 MC 30	1	1-2		3-6	
	2				1-2
	3				1-4
41 MC 31	1	1-2		3-5	
	2	1-2		3-4	
	3	1-3		4-5	
41 MC 39	1	1-4		5-8	
	2	1-4		5-9	
	3	1-4		5-9	
41 MC 55	1	1-3	4-6	7-9	
	2	1-3	4-7	8-10	
	3	1-3	4-7		
41 MC 75	1				1-7
	2	1-4		5-9	
41 MC 84	1	1-2		3-5	
	2	1-3		4-5	
41 MC 86	1				1-7
	2				1-5
41 MC 177	1	1-3		4-7	
	2	1-4		5-8	
41 MC 222	ALL UNITS		UNDIFFERENTIATED		

		1st	2nd	3rd	4th	5th
41 LK 201	1	1-4	5-11	12-15	16-18	
	2	1-5	6-9	10-13	14-18	19-21
	3	1-5	6-10	11-15	16-20	

TABLE 34. (continued)

CODE	41 LK 8 Upper Horizon	Middle Horizon	Lower Horizon	Undiffer-entiated	SITE TOTAL	41 LK 13 SITE TOTAL	41 LK 14 Upper Horizon	Lower Horizon	SITE TOTAL
53	5	15	4	16	40	1	27	7	34
54	1	2	1	8	12	0	4	3	7
55	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	3	12	3	7	25	1	19	4	23
58	0	0	0	0	0	0	0	1	1
59	0	0	0	0	0	0	0	0	0
60	1	1	0	1	3	0	4	0	4
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	41	199	51	157	448	1	260	78	338
64	11	80	16	74	181	0	116	34	150
65	1	11	2	9	23	0	23	14	37
66	0	1	0	1	2	0	0	0	0
67	24	91	28	66	209	1	108	31	139
68	2	7	4	7	20	0	20	10	30
69	0	0	1	0	1	0	0	0	0
70	2	3	0	3	8	0	8	4	12
71	0	0	0	0	0	0	2	1	3
72	0	0	0	0	0	0	0	0	0
73	4	11	0	3	18	0	8	2	10
74	0	1	0	0	1	0	1	1	1
75	0	0	0	0	0	0	0	0	0
76	0	12	7	13	32	0	18	6	24
77	0	2	2	0	4	0	8	4	12
78	0	0	0	0	0	0	0	0	0
79	92	318	69	262	741	2	338	112	450
80	64	229	51	188	532	0	212	69	281
81	5	18	6	9	38	0	25	6	31
82	0	0	0	1	1	0	1	0	1
83	14	28	4	17	63	0	31	8	39
84	1	1	0	0	2	0	2	0	2
85	0	0	0	0	0	0	0	0	0
86	4	22	4	12	42	0	12	5	17
87	0	5	0	2	7	0	2	2	4
88	0	0	0	0	0	0	0	0	0
89	10	47	10	46	113	2	76	30	106
90	0	2	2	0	4	1	9	0	9
91	0	0	0	2	2	0	0	0	0
92	20	252	87	240	599	4	825	279	1104
93	0	3	2	7	12	0	33	9	42
94	0	0	0	0	0	0	0	0	0
95	0	1	0	0	1	0	0	1	1
96	2	47	27	39	115	2	187	58	245
97	0	1	2	0	3	0	15	4	19
98	0	0	2	2	4	0	1	0	1
99	18	202	58	194	472	2	585	212	797
100	3	12	2	1	18	1	23	8	31
101	0	0	0	0	0	0	0	0	0
102	2	56	12	31	101	0	44	13	57
103	0	5	0	1	6	0	2	2	4
104	1	16	6	12	35	0	25	3	28
105	1	35	6	18	60	0	17	8	25

TABLE 34. (continued)

CODE	41 LK 15 Upper Horizon	41 LK 15 Lower Horizon	41 LK 15 SITE TOTAL	41 LK 17 Upper Horizon	41 LK 17 Lower Horizon	41 LK 17 SITE TOTAL	41 LK 34 SITE TOTAL
53	18	6	24	0	4	4	0
54	8	2	10	0	1	1	0
55	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0
57	7	4	11	0	3	3	0
58	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0
60	3	0	3	0	0	0	0
61	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0
63	122	19	141	11	41	52	1
64	55	9	64	4	15	19	0
65	11	3	14	0	3	3	0
66	1	0	1	0	0	0	0
67	51	4	55	3	22	25	1
68	8	1	9	0	4	4	0
69	0	0	0	0	0	0	0
70	3	0	3	0	0	0	0
71	1	0	1	0	0	0	0
72	0	0	0	0	0	0	0
73	2	0	2	1	2	3	0
74	1	0	1	0	0	0	0
75	0	0	0	0	0	0	0
76	11	6	17	3	2	5	0
77	2	1	3	1	0	1	0
78	0	0	0	0	0	0	0
79	196	31	227	14	55	69	2
80	123	12	135	8	28	36	2
81	7	2	9	0	1	1	1
82	0	0	0	0	0	0	0
83	21	0	21	2	5	7	0
84	3	0	3	0	0	0	0
85	0	0	0	0	0	0	0
86	3	1	4	2	6	8	0
87	0	1	1	1	1	2	0
88	0	0	0	0	0	0	0
89	49	10	59	2	14	16	0
90	5	1	6	1	4	5	0
91	0	0	0	0	0	0	0
92	495	110	605	27	138	165	11
93	18	5	23	0	5	5	1
94	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0
96	133	44	177	10	41	51	6
97	7	5	12	1	2	3	1
98	1	0	1	0	0	0	0
99	344	92	436	17	93	110	4
100	12	4	16	1	3	4	1
101	0	0	0	1	0	1	0
102	6	0	6	0	15	15	2
103	2	0	2	0	0	0	1
104	3	0	3	0	7	7	1
105	1	0	1	0	8	8	1

TABLE 34. (continued)

	41 LK 41			41 LK 49			41 LK 51			
CODE	Upper Horizon	Lower Horizon	SITE TOTAL	Horizon	Horizon	SITE TOTAL	Upper Horizon	Middle Horizon	Lower Horizon	SITE TOTAL
53	7	5	12	0	2	2	11	1	5	17
54	2	0	2	0	0	0	0	2	3	5
55	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0
57	5	4	9	0	2	2	6	0	2	8
58	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0
60	0	1	1	0	0	0	3	1	1	5
61	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0
63	89	26	115	6	2	8	106	42	69	217
64	32	10	42	2	0	2	38	19	29	86
65	7	2	9	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0
67	42	11	53	4	2	6	19	9	29	57
68	7	4	11	1	0	1	2	0	2	4
69	2	0	2	0	0	0	1	0	0	1
70	4	1	5	0	0	0	10	5	8	23
71	2	0	2	0	0	0	1	0	0	1
72	0	0	0	0	0	0	0	0	0	0
73	5	2	7	0	0	0	6	1	2	9
74	2	1	3	0	0	0	0	1	0	1
75	1	0	1	0	0	0	0	0	0	0
76	6	4	10	0	0	0	33	19	18	70
77	0	3	3	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0

	41 LK 41			41 LK 49			41 LK 51			
CODE	Upper Horizon	Lower Horizon	SITE TOTAL	Upper Horizon	Lower Horizon	SITE TOTAL	Upper Horizon	Middle Horizon	Lower Horizon	SITE TOTAL
79	115	48	153	3	5	8	180	75	156	411
80	67	23	90	2	2	4	50	17	48	115
81	6	3	9	2	0	2	1	0	0	1
82	1	0	1	0	0	0	0	1	0	1
83	14	4	18	0	0	0	32	30	27	89
84	2	2	4	0	0	0	0	0	0	0
85	2	0	2	0	0	0	0	0	0	0
86	8	1	9	1	1	2	6	2	11	19
87	1	1	2	0	0	0	1	1	0	2
88	1	0	1	0	0	0	0	0	0	0
89	26	9	35	0	2	2	74	46	124	244
90	5	1	6	0	0	0	3	1	0	4
91	0	0	0	0	0	0	0	1	1	2
92	315	95	410	7	4	11	426	204	313	943
93	17	9	26	0	0	0	7	11	5	23
94	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0
96	110	30	140	4	1	5	101	57	100	258
97	11	9	20	0	0	0	2	0	2	4
98	2	0	2	1	0	1	0	0	2	2
99	192	55	247	3	3	6	318	184	280	782
100	10	3	13	0	0	0	2	0	3	5
101	1	0	1	0	0	0	0	1	3	4
102	15	6	21	0	0	0	3	1	3	7
103	0	1	1	0	0	0	0	1	0	1
104	6	4	10	0	0	0	3	1	4	8
105	5	2	7	0	0	0	3	0	1	4

TABLE 34. (continued)

CODE	41 LK 53 Upper Horizon	41 LK 53 Lower Horizon	41 LK 53 SITE TOTAL	41 LK 59 Upper Horizon	41 LK 59 Lower Horizon	41 LK 59 SITE TOTAL	41 LK 74 Upper Horizon	41 LK 74 Lower Horizon	41 LK 74 SITE TOTAL
53	5	5	10	28	6	34	9	3	12
54	1	2	3	6	2	8	4	2	6
55	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	3	3	6	19	4	23	4	1	5
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	1	0	1	2	0	2	1	0	1
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	49	60	109	255	74	329	157	34	191
64	25	23	48	99	33	132	85	19	104
65	7	2	9	15	5	20	4	0	4
66	0	0	0	2	0	2	0	0	0
67	15	24	39	124	23	147	43	9	52
68	3	4	7	24	2	26	1	0	1
69	0	0	0	5	0	5	0	0	0
70	1	3	4	2	3	5	3	1	4
71	0	0	0	1	0	1	0	0	0
72	0	0	0	0	0	0	0	0	0
73	0	2	2	11	8	19	0	1	1
74	0	1	1	2	1	3	0	0	0
75	0	0	0	2	0	2	0	0	0
76	8	8	16	19	0	19	21	4	25
77	1	0	1	2	3	5	0	1	1
78	0	0	0	1	0	1	0	0	0

CODE	41 LK 53 Upper Horizon	41 LK 53 Lower Horizon	41 LK 53 SITE TOTAL	41 LK 59 Upper Horizon	41 LK 59 Lower Horizon	41 LK 59 SITE TOTAL	41 LK 74 Upper Horizon	41 LK 74 Lower Horizon	41 LK 74 SITE TOTAL
79	56	156	212	450	64	514	171	59	230
80	35	92	127	270	46	316	102	26	128
81	1	5	6	21	3	24	1	0	1
82	0	0	0	3	1	4	0	1	1
83	6	10	16	17	5	22	6	3	9
84	0	0	0	4	2	6	0	0	0
85	0	0	0	0	0	0	0	0	0
86	2	8	10	20	3	23	7	3	10
87	0	1	1	4	1	5	0	1	1
88	0	0	0	0	0	0	0	0	0
89	13	46	59	147	0	147	96	27	123
90	1	2	3	11	0	11	0	0	0
91	0	0	0	5	0	5	2	0	2
92	258	393	651	661	83	744	340	69	409
93	10	12	22	29	4	33	6	3	9
94	0	0	0	4	0	4	0	0	0
95	0	0	0	0	0	0	0	0	0
96	72	88	160	171	25	196	92	17	109
97	3	5	8	6	3	9	1	0	1
98	0	0	0	1	0	1	4	1	5
99	173	292	465	469	61	530	242	49	291
100	11	10	21	32	1	33	1	0	1
101	0	0	0	8	0	8	2	0	2
102	6	7	13	60	4	64	1	0	1
103	0	2	2	8	0	8	0	0	0
104	0	2	2	16	2	18	1	0	1
105	3	2	5	36	2	38	0	0	0

TABLE 34. (continued)

	41 LK 77	41 LK 85				41 LK 87			41 LK 88
CODE	SITE TOTAL	Upper Horizon	Middle Horizon	Lower Horizon	SITE TOTAL	Upper Horizon	Lower Horizon	SITE TOTAL	SITE TOTAL
53	1	1	1	0	2	8	3	11	1
54	1	0	0	0	0	4	2	6	1
55	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	0	1	0	0	1	1	1	2	0
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	0	0	1	0	1	3	0	3	0
61	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0
63	14	44	4	3	51	71	11	82	12
64	1	15	1	0	16	33	6	39	6
65	0	0	0	0	0	2	0	2	0
66	0	0	0	0	0	2	0	2	0
67	1	17	1	1	19	24	5	29	3
68	1	0	0	0	0	3	1	4	1
69	0	0	0	0	0	0	0	0	0
70	0	4	1	0	5	2	0	2	1
71	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0
73	0	1	1	1	3	5	0	5	0
74	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0
76	12	7	0	1	8	7	0	7	2
77	3	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0
79	7	55	5	3	63	74	7	81	12
80	2	30	3	1	34	30	3	33	9
81	1	0	0	0	0	0	0	0	0
82	0	0	0	0	0	2	0	2	0
83	0	5	0	0	5	5	1	6	0
84	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0
86	0	2	1	0	3	2	1	3	1
87	0	1	0	0	1	0	0	0	0
88	0	0	0	0	0	0	0	0	0
89	5	18	1	2	21	37	2	39	2
90	0	1	0	0	1	1	0	1	0
91	0	0	0	0	0	0	0	0	0
92	11	171	7	20	198	196	25	221	27
93	2	6	0	0	6	12	0	12	2
94	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0
96	3	44	2	5	51	55	8	63	5
97	0	0	0	0	0	1	0	1	0
98	0	0	0	0	0	1	0	1	0
99	6	121	5	15	141	100	17	117	20
100	1	0	0	0	0	3	0	3	0
101	0	0	0	0	0	0	0	0	0
102	0	4	0	0	4	4	2	6	0
103	0	0	0	0	0	0	1	1	0
104	0	4	0	0	4	2	1	3	0
105	0	0	0	0	0	2	0	2	0

TABLE 34. (continued)

	41 LK 91	41 LK 94					41 MC 9
CODE	SITE TOTAL	Upper Horizon	Middle Horizon	Lower Horizon	Undiffer-entiated	SITE TOTAL	SITE TOTAL
53	7	0	0	0	0	0	0
54	4	0	0	0	0	0	0
55	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0
57	1	0	0	0	0	0	0
58	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0
60	1	0	0	0	0	0	0
61	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0
63	122	5	6	0	24	35	23
64	44	1	3	0	9	13	7
65	3	0	0	0	0	0	0
66	0	0	0	0	0	0	0
67	13	0	3	0	8	11	3
68	0	0	0	0	0	0	2
69	0	0	0	0	0	0	0
70	2	3	0	0	1	4	0
71	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0
73	5	0	0	0	3	3	0
74	0	0	0	0	1	1	0
75	0	0	0	0	0	0	0
76	57	1	0	0	3	4	13
77	5	0	0	0	0	0	1
78	6	0	0	0	0	0	0

	41 LK 91	41 LK 94					41 MC 9
CODE	SITE TOTAL	Upper Horizon	Middle Horizon	Lower Horizon	Undiffer-entiated	SITE TOTAL	SITE TOTAL
79	181	5	5	0	30	40	37
80	61	4	1	0	18	23	5
81	4	0	0	0	0	0	0
82	2	0	0	0	0	0	0
83	8	0	1	0	1	2	0
84	2	0	0	0	0	0	0
85	0	0	0	0	0	0	0
86	2	0	2	0	1	3	0
87	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0
89	110	1	1	0	10	12	32
90	4	0	0	0	0	0	0
91	3	0	0	0	0	0	0
92	319	14	4	3	54	75	76
93	6	0	0	0	1	1	3
94	2	0	0	0	0	0	0
95	0	0	0	0	0	0	0
96	84	4	0	0	11	15	15
97	1	0	0	0	0	0	0
98	0	0	0	0	0	0	0
99	249	10	4	3	42	59	58
100	1	0	0	0	0	0	0
101	1	0	0	0	0	0	1
102	4	1	0	1	0	2	1
103	0	0	0	0	0	0	0
104	2	0	0	1	0	1	1
105	2	1	0	0	0	1	0

TABLE 34. (continued)

	41 MC 24			41 MC 25	41 MC 26	41 MC 29		
CODE	Upper Horizon	Lower Horizon	SITE TOTAL	SITE TOTAL	SITE TOTAL	Upper Horizon	Lower Horizon	SITE TOTAL
53	0	0	0	0	0	0	1	1
54	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	1	1
58	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0
63	6	8	14	4	0	35	5	40
64	2	1	3	3	0	9	4	13
65	0	0	0	0	0	1	0	1
66	0	0	0	0	0	1	0	1
67	1	0	1	1	0	17	1	18
68	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0
73	0	0	0	0	0	1	0	1
74	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0
76	3	7	10	0	0	8	0	8
77	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0

	41 MC 24			41 MC 25	41 MC 26	41 MC 29		
CODE	Upper Horizon	Lower Horizon	SITE TOTAL	SITE TOTAL	SITE TOTAL	Upper Horizon	Lower Horizon	SITE TOTAL
79	12	16	28	2	31	121	18	139
80	0	2	2	2	5	35	5	40
81	0	0	0	0	0	0	0	0
82	0	0	0	0	1	0	0	0
83	0	0	0	0	0	6	0	6
84	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0
86	0	0	0	0	1	2	3	5
87	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0
89	12	14	26	0	25	68	10	78
90	0	0	0	0	0	1	0	1
91	0	0	0	0	0	1	0	1
92	29	28	57	0	54	145	24	169
93	0	0	0	0	0	4	0	4
94	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0
96	13	7	20	0	17	31	7	38
97	0	0	0	0	0	0	1	1
98	0	0	0	0	0	0	0	0
99	16	21	37	0	37	110	17	127
100	0	0	0	0	0	0	0	0
101	0	0	0	0	0	1	0	1
102	0	0	0	0	0	1	2	3
103	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0
105	0	0	0	0	0	1	2	3

TABLE 34. (continued)

	41 MC 30				41 MC 31			41 MC 39		
CODE	Upper Horizon	Lower Horizon	Undiffer- entiated	SITE TOTAL	Upper Horizon	Lower Horizon	SITE TOTAL	Upper Horizon	Lower Horizon	SITE TOTAL
53	2	0	0	2	0	0	0	2	3	5
54	2	0	0	2	0	0	0	1	1	2
55	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	1	2	3
58	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0
63	27	13	7	47	4	1	5	41	80	121
64	17	5	3	25	2	0	2	13	35	48
65	3	0	0	3	1	0	1	1	0	1
66	0	0	0	0	0	0	0	0	2	2
67	9	7	0	16	1	2	3	8	15	23
68	0	0	0	0	0	0	0	1	0	1
69	0	0	0	0	0	0	0	0	0	0
70	0	0	1	1	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	1	0	1
74	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0
76	1	1	3	5	0	0	0	19	30	49
77	0	0	0	0	0	0	0	1	1	2
78	0	0	0	0	0	0	0	0	0	0
79	29	15	9	53	11	8	19	56	157	213
80	26	13	0	39	4	1	5	16	42	58
81	2	0	0	2	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	1	1
84	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	1	6	7
87	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	1	1
89	3	2	9	14	7	7	14	39	109	148
90	0	0	0	0	0	0	0	1	0	1
91	0	0	0	0	0	0	0	0	1	1
92	43	14	16	73	21	10	31	101	266	367
93	0	0	0	0	0	0	0	0	8	8
94	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0
96	10	1	7	18	5	2	7	25	56	81
97	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0
99	33	13	9	55	16	8	24	76	202	278
100	2	0	0	2	1	0	1	1	4	5
101	0	0	0	0	0	0	0	1	2	3
102	3	0	1	4	0	1	1	4	2	6
103	0	0	0	0	0	0	0	0	0	0
104	1	0	1	2	0	0	0	0	1	1
105	2	0	0	2	1	0	1	2	1	3

TABLE 34. (continued)

CODE	41 MC 55 Upper Horizon	41 MC 55 Middle Horizon	41 MC 55 Lower Horizon	41 MC 55 SITE TOTAL	41 MC 75 Upper Horizon	41 MC 75 Lower Horizon	41 MC 75 Undiffer-entiated	41 MC 75 SITE TOTAL
53	2	1	0	3	6	6	3	15
54	0	0	0	0	3	2	0	5
55	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0
57	2	1	0	3	0	4	3	7
58	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0
60	0	0	0	0	3	0	0	3
61	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0
63	60	8	7	75	23	14	30	67
64	18	4	5	27	4	2	18	24
65	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	1	1
67	14	2	0	16	4	2	10	16
68	2	0	0	2	0	0	0	0
69	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0
73	0	0	0	0	0	2	0	2
74	0	0	0	0	0	1	0	1
75	0	0	0	0	0	0	0	0
76	28	2	2	32	15	6	2	23
77	4	0	0	4	1	0	0	1
78	1	0	0	1	0	0	0	0
79	109	6	25	140	40	16	41	97
80	19	0	2	21	6	4	16	26
81	0	0	0	0	0	0	1	1
82	0	0	0	0	0	0	0	0
83	0	0	0	0	1	0	1	2
84	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0
86	1	0	1	2	1	0	1	2
87	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0
89	89	6	22	117	32	12	23	67
90	1	0	0	1	2	1	0	3
91	2	0	0	2	1	0	0	1
92	258	14	43	315	52	51	49	152
93	9	0	2	11	2	1	0	3
94	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0
96	57	3	10	70	16	11	12	39
97	0	0	0	0	3	0	1	4
98	1	0	0	1	0	0	0	0
99	209	11	31	251	34	38	37	109
100	5	0	3	8	1	0	1	2
101	4	0	0	4	1	0	0	1
102	1	1	0	2	2	1	0	3
103	0	0	0	0	0	0	0	0
104	1	1	0	2	2	1	0	3
105	0	0	0	0	0	0	0	0

TABLE 34. (continued)

CODE	41 MC 84 Upper Horizon	41 MC 84 Lower Horizon	41 MC 84 SITE TOTAL	41 MC 86 SITE TOTAL	41 MC 177 Upper Horizon	41 MC 177 Lower Horizon	41 MC 177 SITE TOTAL	41 MC 222 SITE TOTAL
53	1	8	9	0	2	1	3	6
54	0	2	2	0	1	1	2	3
55	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0
57	0	2	2	0	0	0	0	2
58	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	1
60	1	4	5	0	1	0	1	1
61	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0
63	26	75	101	46	6	10	16	162
64	14	37	51	21	1	4	5	57
65	2	0	2	2	0	1	1	3
66	0	1	1	0	0	0	0	0
67	8	18	26	12	0	0	0	32
68	1	1	2	1	0	0	0	2
69	0	0	0	0	0	0	0	1
70	0	0	0	0	0	0	0	4
71	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0
73	0	2	2	0	0	0	0	1
74	0	0	0	0	0	0	0	1
75	0	0	0	0	0	0	0	0
76	4	18	22	13	5	6	11	68
77	0	1	1	0	0	0	0	1
78	0	0	0	0	0	0	0	1
79	40	88	128	77	17	14	31	341
80	14	25	39	21	2	3	5	108
81	0	0	0	1	0	0	0	0
82	0	1	1	0	1	0	1	1
83	0	2	2	0	0	0	0	9
84	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0
86	0	0	0	5	1	0	1	7
87	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0
89	26	61	87	51	14	11	25	217
90	1	0	1	3	0	0	0	1
91	0	1	1	0	0	0	0	1
92	74	151	225	99	27	27	54	451
93	3	5	8	2	0	0	0	9
94	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0
96	21	44	65	18	9	8	17	99
97	0	1	1	0	0	0	0	0
98	1	0	1	0	0	0	0	0
99	50	102	152	101	18	19	37	343
100	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	3
102	0	0	0	0	0	0	0	6
103	0	0	0	0	0	0	0	1
104	0	0	0	0	0	0	0	2
105	0	0	0	0	0	0	0	3

SPECIES IDENTIFICATION LIST

armadillo	*Dasypus novemcinctus*
cotton rat	*Sigmodon hispidus*
cottontail rabbit	*Sylvilagus floridanus*
cow/bison	*Bos/Bison* sp.
freshwater drum	*Aplodinotus grunniens*
ground squirrel	*Citellus* sp.
jackrabbit	*Lepus californicus*
killdeer	*Charadrius vociferus*
mallard	*Anos platyrhynchos*
Mexican ground squirrel	*Citellus mexican*
mottled duck	*Anos fulvigula*
mourning dove	*Zenaidura macroura*
pig	*Sus* sp.
pond slider	*Chrysemys* sp.
pronghorn antelope	*Antilocapra americana*
rabbit	*Sylvilagus* sp.
rock squirrel	*Citellus variegatus*
sheep/goat	*Ovis/Capra* sp.
softshell turtle	*Trionyx* sp.
South Texas pocket gopher	*Geomys personatus*
Texas softshell turtle	*Trionys spiniferus*
white-footed mouse	*Peromyscus* sp.
white-tailed deer	*Odocoileus virginianus*
wild turkey	*Meleagris gallopavo*
wood rat	*Neotoma* sp.

TABLE 35. FAUNAL IDENTIFICATION, NUECES RIVER PROJECT

Site	Unit-Level	Unidentifiable*		Identifiable		
		Unburned	Burned	Species	Element	Remarks
41 LK 8	TP 2-Lv. 1	.2				
	TP 3-Lv. 1	.3				
	TP 3-Lv. 9			freshwater drum	otolith	medium size
41 LK 14	**PTM 25		3.8			bone #25
	TP 2-Lv. 4			freshwater drum	otolith	
41 LK 15	TP 1-Lv. 2			Mexican ground squirrel	left mandible	adult
	TP 1-Lv. 4		.2			
	TP 1-Lv. 5			freshwater drum	otolith	very large
41 LK 31/32	N1002/E790-surface	3.0	5.8	Texas softshell turtle	carapace	fragmentary
				unknown mussel frags., possibly *Proptera purpurata*		
	hist. comp., Area C, Unit VI-Lv. 2	1.4		cow/bison	left metacarpal	juvenile, complete
				unknown mussel umbo, possibly *Quadrula undata-trigona*		
	hist. comp., surface	6.0				
	TTU 108, surf.	.5		dog size	rib	fragmentary
	N1056 E863-Lv. 1	.1				
	N1056 E863-Lv. 9	2.9		deer/goat/pig size	phalanx	fragmentary
	N1057 E861-Lv. 16			armadillo	carapace	fragmentary
	N1057 E865-Lv. 2			freshwater drum	otoliths (2)	complete
	N1058 E864-Lv. 2	.1				
	N1059 E861-Lv. 6		3.3			
	N1059 E861-Lv. 13	1.3				
	N1059 E865-Lv. 9	.3				
	N1059 E865-Lv. 11		1.6			
	N1059 E865-Lv. 13	19.9				
	N1060 E861-Lv. 8	.4				
	N1062 E875-Lv. 2	6.5				
	N1062 E875-Lv. 9	2.3				
	N1063 E873-Lv. 8	.4				
	N1064 E876-Zone 2, feature 10			rabbit	phalanx	adult, complete
	unit B-Lv. 1	17.2	.4	cow size	rib	fragmentary
	N1065 E873-Lv. 1	.5				
	N1065 E875-Lv. 1	1.1				
	N1083 E1108-Lv. 1	.4				
	N1083 E1108-Lv. 8			freshwater drum	otolith	complete
	N1083 E1108-Lv. 10	1.3				
	N1084 E1108-Lv. 11	.3				
	N1094 E998-Lv. 1			killdeer	left humerus	proximal
	N1094 E999-Lv. 1			mourning dove	humerus, right proximal	
	N1116 E998-Lv. 7	.7	.9			
	surface			freshwater drum	otolith	large
41 LK 41	N1114 E1400-Lv. 1	1.9	.8	ground squirrel	left distal tibia	

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable* Unburned	Burned	Identifiable Species	Element	Remarks
41 LK 41 (cont.)	N1114 E1400-Lv. 2	.6	.9	rabbit	left mandible	medial section
				unidentifiable snake	vertebra	
	N1114 E1400-Lv. 3	2.7	.5	rabbit	molar	adult
				unidentifiable snake	vertebra	
	N1114 E1400-Lv. 4	.8	.1	white-tailed deer	molar	old adult
				" " "	first phalanx, distal	adult
				rabbit	left tibia epiphysis, proximal end	juvenile
				unidentifiable snake	vertabrae (2)	
				wood rat	right proximal femur	adult
				white-footed mouse	left tibia	adult
	N1114 E1400-Lv. 5	1.0		white-tailed deer	left upper M1 or M2	old adult
		.1	.2	pond slider	carapace frags.	1 burned
				rabbit	left distal humerus	juvenile
	N1114 E1401-Lv. 2	19.2		white-tailed deer	metapodial	possible exhausted tool or tool debris
				rabbit	right tibia, distal	adult
				"	right distal humerus	adult
				South Texas pocket gopher	left proximal femur	adult
				pond slider	carapace	
	N1114 E1401-Lv. 4			rabbit	right pelvis	medial section
				white-tailed deer/ pronghorn antelope	right scaphoid	eroded
	N1114 E1401-Lv. 5	2.7				
	N1114 E1402-Lv. 2	.9	.1	rabbit	left proximal femur	adult
				wood rat	right pelvis fragment	medial section
				" "	left proximal tibia	juvenile
				" "	left distal humerus	adult
				" "	right distal humerus	adult
				" "	left proximal humerus	juvenile
	N1114 E1402-Lv. 3	4.5		unidentifiable snake	vertebra	
	N1114 E1402-Lv. 5	.7	.2	rabbit	left mandible with 1 inciser	adult
	N1115 E1400-Lv. 2	2.2	.3	unidentifiable snake	vertebrae (2)	
	N1115 E1400-Lv. 4	5.5		unidentifiable snake	vertebra	
				unidentifiable rodent	mandible fragment	
	N1115 E1400-Lv. 5	8.7		rabbit	right distal humerus	adult
				"	right pelvis fragment	adult
				wood rat	right mandible	
	N1115 E1400-Lv. 6	4.1		South Texas pocket gopher	right mandible	no teeth
				ground squirrel	right distal humerus	adult
	N1115 E1400-Lv. 7	5.3		wood rat	left mandible with 1 tooth, medial section	adult
				" "	right pelvis fragment	

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable*		Identifiable		
		Unburned	Burned	Species	Element	Remarks
41 LK 41 (cont.)	N1115 E1400-Lv. 7 (cont.)			ground squirrel	right distal humerus	adult
				" "	incisor	
	N1115 E1400-Lv. 8			wood rat	left cheek tooth, incisor	
	N1115 E1400-Lv. 10	2.6				
	N1115 E1401-Lv. 4	2.1		unidentifiable snake	vertebrae (2)	
	N1115 E1402-Lv. 2	.4	.6	unidentifiable snake	vertebrae (2)	
				cf. jackrabbit	phalanx	adult
	N1115 E1402-Lv. 3	.9		unidentifiable snake	vertebra	
	N1115 E1402-Lv. 4	.9		wood rat	left proximal ulna	juvenile
				" "	left proximal femur	juvenile
	N1115 E1402-Lv. 5	3.8	.1	rabbit	left calcaneus	juvenile
				"	left mandible	
				pond slider	carapace frags. (3)	
	N1116 E1400-Lv. 1			unidentifiable snake	vertebra	
	N1116 E1400-Lv. 2	10.9		wood rat	left femur	juvenile
				cotton rat	right mandible	adult
				cf. cotton rat	upper incisors (2)	
				rock squirrel	right proximal femur	adult
				" "	right distal scapula	adult
				" "	left distal femur	adult
	N1116 E1400-Lv. 3	2.2	2.6	wood rat	right tibia	juvenile
				unidentifiable turtle	carapace fragments	
	N1116 E1400-Lv. 4	1.0		pond slider	carapace fragment	
				white-tailed deer/ pronghorn antelope	metapodial	possible tool
	N1116 E1400-Lv. 4 (cont.)			rabbit	right distal humerus	adult
				South Texas pocket gopher	right mandible with teeth	adult
	N1116 E1400-Lv. 5	.8	.1	rabbit	left distal humerus	adult
				"	molar	
				rock squirrel	right distal humerus	adult
				unidentifiable *Canis*	distal phalanx	
	N1116 E1401-Lv. 2	1.9	1.1	wood rat	right tibia	juvenile
				unidentifiable rodent	mandible fragment	
	N1116 E1401-Lv. 3	1.1		wood rat	right mandible with 2 cheek teeth	adult
				" "	right proximal femur	adult
	N1116 E1401-Lv. 4	1.3		wood rat	left proximal ulna	
	N1116 E1401-Lv. 5	4.0		rabbit	left distal tibia	adult
				"	right calcaneus	adult
				"	right astragulus	adult
	N1116 E1402-Lv. 2	17.9		South Texas pocket gopher	left mandible with teeth	adult
	N1116 E1402-Lv. 3	.6				
	N1116 E1402-Lv. 4	2.1		unidentifiable rodent	left mandible	no teeth
				unidentifiable deer/ *Canis*-size	scapula fragment	
	N1117 E1400-Lv. 2	1.2		rabbit	left maxilla	no teeth
	N1117 E1400-Lv. 3	3.9				
	N1117 E1400-Lv. 5	.1		pond slider	carapace frags. (3)	

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable*		Identifiable		
		Unburned	Burned	Species	Element	Remarks
41 LK 41 (cont.)	N1117 E1400-Lv. 6	1.5		South Texas pocket gopher	right scapula, distal	
	N1117 E1400-Lv. 7	.8		rabbit	left distal humerus	adult
	N1117 E1401-Lv. 1	.6	.5	mottled duck/mallard	right carpometa-carpus	winter range
	N1117 E1401-Lv. 2	2.0				
	N1117 E1401-Lv. 4	.5		jackrabbit	left calcaneus	adult
				cf. cottontail rabbit	right mandible	
	N1117 E1401-Lv. 5	7.2				
	N1117 E1402-Lv. 1	.1	.1	wood rat	right distal humerus	adult
	N1117 E1402-Lv. 2			ground squirrel	right mandible with teeth	adult
	N1144 E1475-Lv. 1	3.7				
	N1144 E1475-Lv. 2	3.9	.1			
	N1144 E1475-Lv. 3	67.6		white-tailed deer	mandible with M3	adult
				" " "	isolated molar	adult
				white-tailed deer/ pronghorn antelope	distal first phalanx	adult
	N1144 E1475-Lv. 4	26.2	.6	cf. cow/bison	rib fragment	
	N1145 E1474-Lv. 1			cf. wood rat	lumbar vertebra	
	N1145 E1474-Lv. 2	8.9		cow/bison	first phalanx	adult
	N1145 E1474-Lv. 3	2.3		rabbit	right calcaneus	adult
				"	left tibia	adult
	N1145 E1474-Lv. 5			white-tailed deer	right metatarsal	adult
	N1145/E1475-Lv. 2	58.3		bison/cow-sized	long bone	fragmented
	N1145/E1475-Lv. 3	1.4		wood rat	right maxilla	medial section with 1 molar
				jackrabbit	phalanx	adult
				white-tailed deer	calcaneus, right	adult
				cf. cow/bison	proximal rib	
	N1145/E1475-Lv. 4	1.3		unidentifiable turtle	carapace frags. (2)	
	N1153/E1469-Lv. 1	1.1				
41 LK 51	uncontrolled surface collection			freshwater drum	otolith	very large
	TP 3-Lv. 8			human	tooth	3rd upper left molar
41 LK 53	TP 2-Lv. 3	.5				
	TP 2-Lv. 4			rabbit	right calcaneus	adult
	TP 2-Lv. 7	.8		unidentifiable fish	otolith	
	TP 3-Lv. 5		5.2			
	no provenience	2.8	.4			
41 LK 59	N954/E556-Lv. 5		.6	unidentifiable turtle	carapace fragment	
	N954/E558-Lv. 1			freshwater drum	otolith	small
	N957/E556-Lv. 4			cf. Mexican ground squirrel	left scapula	
41 LK 67	N846/E1057-Lv. 2			freshwater drum	otolith	medium size
	N902/E1007-Lv. 1			wood rat	right distal humerus	adult
	N904/E1008-Lv. 2			freshwater drum	otolith	very large
	N905/E1007-Lv. 6			freshwater drum	otolith	medium size

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable* Unburned	Burned	Identifiable Species	Element	Remarks
41 LK 67 (cont.)	N906 E1006-Lv. 3			freshwater drum	otolith	large
	N907 E999-Lv. 4			freshwater drum	otolith	small
	N907 E1003-Lv. 6			freshwater drum	otolith	small
	N907 E1006-Lv. 5	.2				
	N907 E1007-Lv. 6			freshwater drum	otolith	medium size
	N908 E997-Lv. 4			freshwater drum	otolith	medium size
	N909 E997-Lv. 2			freshwater drum	otolith	medium size
	N909 E997-Lv. 5			freshwater drum	otolith	small
	N909 E1002-Lv. 1	.3				
	N909 E1005-Lv. 1	.1				
	N910 E1003-Lv. 1			rabbit	right proximal tibia	adult
	N910 E1005-Lv. 6			freshwater drum	otolith	large
	N910 E1007-Lv. 4	1.5				
41 LK 69	surface	2.2				
41 LK 74	TP 4-Lv. 2	25.7		cow/bison size fragments		
	TP 4-Lv. 3	3.8		cow/bison unidentifiable rodent	proximal phalanx pelvis fragment	adult
	TP 4-Lv. 4			cow/bison	metapodial, distal	adult
	TP 4-Lv. 5	5.3				
41 LK 87	surface			freshwater drum	otolith	very large
41 LK 201	TP 1-Lv. 2	.2				
	TP 1-Lv. 3	.1	.2	jackrabbit	right calcaneus	adult
	TP 1-Lv. 4		1.8			
	TP 1-Lv. 5	.1	.7	jackrabbit	right distal humerus	
	TP 1-Lv. 6	.2	1.0			
	TP 1-Lv. 7	1.5	.1			
	TP 1-Lv. 8		4.0			
	TP 1-Lv. 9	3.0		rabbit	right pelvis fragment	
	TP 1-Lv. 10	.2	1.3			
	TP 1-Lv. 11	.1	1.4			
	TP 1-Lv. 12	.1				
	TP 1-Lv. 13	.4		unidentifiable turtle	carapace frags. (2)	
	TP 1-Lv. 14			jackrabbit	left distal humerus	
	TP 2-Lv. 1	91.7	.3	softshell turtle white-tailed deer rabbit cow/bison size unidentifiable fish	carapace frags. (7) second phalanx left distal scapula long bone frag. epihyal (?)	 adult adult
	TP 2-Lv. 2	177.0	3.4	cow/bison cf. cow/bison softshell turtle " " " " jackrabbit rabbit unidentifiable snake	first phalanx rib fragments carapace frags. (9) femora (2) shoulder girdle left proximal femur left distal scapula vertebrae (2)	adult complete right adult adult

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable* Unburned	Burned	Identifiable Species	Element	Remarks
41 LK 201 (cont.)	TP 2-Lv. 2 (cont.)			gar	scales (8)	
				pond slider	left proximal humerus	
				" "	carapace fragments (21)	
				white-tailed deer/ pronghorn antelope	metacarpal	
				wild turkey	left scapula	
				freshwater drum	otolith	
	TP 2-Lv. 3	3.0		gar	scales (2)	
				rabbit	maxilla with teeth	adult
	TP 2-Lv. 4	1.7	.2	unidentifiable fish	vertebra	
				unidentifiable turtle	carapace frags. (2)	
	TP 2-Lv. 7	.7	.3			
	TP 2-Lv. 9		.9			
	TP 2-Lv. 10	.3	.2			
	TP 2-Lv. 11		.1	rabbit	right distal humerus	adult, burned
	TP 2-Lv. 12	.6				
	TP 2-Lv. 14	3.2				
	TP 2-Lv. 21	.3				
	TP 3-Lv. 1	1.7				
	TP 3-Lv. 2	3.2				
	TP 3-Lv. 3	.1				
	TP 3-Lv. 4	1.4	.1			
	TP 3-Lv. 5	59.8	1.0	rabbit	left pelvis fragment	adult, burned
	TP 3-Lv. 5 (cont.)			rabbit	phalanx	adult
				deer/antelope size	vertebrae and scapula frags.	
	TP 3-Lv. 6	18.7		white-tailed deer	atlas vertebra	adult
	TP 3-Lv. 7	4.2	.4	white-tailed deer	left maxilla, orbit, and most of left dentition	adult
				jackrabbit	right distal humerus	adult, burned
				rabbit	right proximal calcaneus	adult
				unidentifiable snake	vertebra	
				white-tailed deer/ pronghorn antelope	phalanx (?)	possible tool, cut on both ends
	TP 3-Lv. 8	.4		unidentifiable snake	vertebra	
	TP 3-Lv. 9	.2				
	TP 3-Lv. 10	5.0	1.9	white-tailed deer	upper P2 - M3, right	adult
				rabbit	left proximal femur	adult
				"	left distal humerus	adult, burned
				"	right distal scapula	adult
				"	metapodial, distal	
				"	incisor	
				gopher-size, unidentifiable	humerus frags. (2)	
	TP 3-Lv. 11	2.1	.3	rabbit	left mandible	
				"	left femur epiphysis	juvenile

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable* Unburned	Unidentifiable* Burned	Identifiable Species	Identifiable Element	Identifiable Remarks
41 LK 201 (cont.)	TP 3-Lv. 11 (cont.)			rabbit	left distal humerus	juvenile
				wood rat	right proximal femur	adult
	TP 3-Lv. 12			white-tailed deer/ pronghorn antelope	rib	
	TP 3-Lv. 16	7.2	10.0	unidentifiable snake	vertebra	
				jackrabbit	molar fragment	adult
				"	metapodial, proximal	adult
				"	femur, proximal	adult
				white-tailed deer/ pronghorn antelope	unciform, left	adult
				" "	third phalanx	juvenile
	TP 3-Lv. 17	73.6				
	TP 3-Lv. 17	4.8	1.4	jackrabbit	left proximal calcaneus	adult
				white-tailed deer/ pronghorn antelope	right scaphoid	adult
				" "	left magnum	adult
				wood rat	right maxilla	
				rabbit	molar fragments	
				"	right distal humerus	adult
				"	left calcaneus	adult
				"	right calcaneus	adult
				"	left astragulus	adult
				"	left ulnae (2)	adult
				"	right ulna	adult
				"	phalanges (7)	adult
				"	metapodial fragments (3)	
	TP 3-Lv. 17 (feature 2)			white-tailed deer/ pronghorn antelope	lunate, left	adult
				" "	left cuniform	adult
	TP 3-Lv. 18	.3	.3	rabbit	left mandible	adult
				"	lumbar vertebra	adult
	TP 3-Lv. 19	3.5	.6	jackrabbit	right proximal calcaneus	
	TP 3-Lv. 20	5.7	1.5	jackrabbit	left calcaneus, proximal	adult
				cf. jackrabbit	phalanges (4)	adult
				" "	lumbar vertebra	
	TP 3-below Lv. 20	1.8				
	†BHT 1	36.7		white-tailed deer/ pronghorn antelope	right pelvis	adult
				cf. white-tailed deer/ pronghorn antelope	thoracic vertebra	
				cow/bison	left proximal femur	adult
	†BHT 2	20.8		cow/bison	first phalanx	adult
				cf. coyote	left calcaneus	adult
	†BHT 3	16.3				
	**PTM 23	91.3		cow/bison size	long bone frag. #23	"cow kill," surface
	**PTM 54	7.4		cow/bison size	long bone frag. #54	"cow kill," surface
	**PTM 55	35.9		cow/bison size	long bone frag. #55	"cow kill," surface
	**PTM 58	10.3		cow/bison size	long bone frag. #58	"cow kill," surface
	**PTM 59	37.1		cow/bison size	long bone frag. #59	"cow kill," surface

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable*		Identifiable		
		Unburned	Burned	Species	Element	Remarks
41 LK 201 (cont.)	**PTM 60	23.0		cow/bison size	long bone frag. #60	"cow kill," surface
	**PTM 63	60.9		cow/bison size	long bone frag. #63	"cow kill," surface
	**PTM 65			cow/bison	molar/premolar fragments	"cow kill," surface,
	**PTM 66			cow/bison	upper molar #66	"cow kill," surface, adult
	**PTM 68			cow/bison	upper premolar #68	"cow kill," surface, adult
	**PTM 73			cow/bison	upper molar #73	"cow kill," surface, adult
	**PTM 78			cow/bison	upper molar #78	"cow kill," surface, adult
	surface	34.5		cow/bison	molar frags. (3)	juvenile
	surface			cow/bison size	long bones	
	surface	15.3		cow/bison size	misc. frags.	
41 LK 202	N1004 E997, Area A	288.3		pig	1st phalanx	complete, adult
				"	distal meta-tarsal, lateral	adult
				goat/sheep	astragulas, left	complete, adult
				cow/bison$^{\nabla}$	unciform, left	fragment, adult
				cow/bison$^{\nabla}$	carpal	fragment
				goat/sheep	1st phalanx	fragment
				pig	2nd phalanx	complete, adult
				cow/bison$^{\nabla}$	lower premolar, left	complete, young adult
				cow/bison$^{\nabla}$	cuniform, left	fragment, adult
				cow/bison$^{\nabla}$	unciform, right	fragment, adult
				cow sized	carpal and phalange	fragments
	S. wall W. of N1004/E997	15.3				
	N1006 E997, Area B	20.3				
	N1008-1112 E997	4.1				
	N1013 E997, Area D	63.6	1.4	sheep/goat	tibia, left distal	juvenile
				" "	astragulas, right proximal	
				cf. sheep/goat	humerus, right distal	
				" " "	naviculo-cuboid, left	complete

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable* Unburned	Unidentifiable* Burned	Identifiable Species	Identifiable Element	Identifiable Remarks
41 LK 202 (cont.)	N1014 E993-Lv. 1, unit C	335.9	10.3	cow/bison	metacarpal, left	complete, adult
				" "	lower incisor	fragment, adult
				cf. deer/antelope	femur, left medial	juvenile
				wild turkey	tarsometatarsus, right distal	
				" "	tibiotarsus, right distal	juvenile
				Texas softshell turtle	humerus, left	complete
				" "	vertebra	fragment
				" "	tibia, distal	
				cow size	rib	fragments
				deer/pig/goat-size	rib and vertebra	fragments
	N1014 E993, Area G	28.7	7.3			
	N1014 E993-Lv. 2	31.4	6.6	rabbit	pelvis, left medial	
				cf. rabbit	metapodial, distal	
				" "	phalanx, distal	juvenile
				deer/pig/juvenile cow	distal fragment	unidentifiable
	N1014 E993-Lv. 2-3	24.3	6.3	unknown artiodactyl	humerus	fragment
				unknown snake	vertebra	fragment
	Area C-11	.3				
	fireplace	82.7		cow size	rib	fragments
				canine	unidentifiable	fragment
	E. of N. fireplace wall	6.9		cow/bison	2nd phalanx	complete, adult
	W. of N. chimney foundation	4.3		Texas softshell turtle	plastron	fragment
	N. wall W. of fireplace	33.0		cow/bison	lower P3, left	fragment, adult
				" "	lower P2, left	fragment, juvenile
				unknown deer/goat	phalanx, proximal	adult
	S. wall, west 1/2	17.0				
	S. wall, E. corner	17.0		sheep/goat	astragulas, left	complete, adult
				woodrat	incisor, right proximal	adult
41 MC 15	TP 1-Lv. 1	.5	.2	rabbit	left distal tibia	adult
	TP 1-Lv. 2	1.2				
	TP 5-Lv. 3			unidentifiable snake	vertebra	
	TP 5-Lv. 4			unidentifiable snake	vertebrae (2)	
41 MC 17	TP 2-Lv. 4		3.7			
41 MC 19	TP 3-Lv. 1	.2		unidentifiable fish		fragment
41 MC 22	surface		2.1	wild turkey	left distal humerus	burned
41 MC 26	TP 1-Lv. 1	2.6				
	TP 1-Lv. 2	4.2				
	TP 1-Lv. 3	.4		wood rat	left proximal femur	adult
41 MC 29	TP 2-Lv. 2		3.3	jackrabbit	left distal scapula	adult, burned

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable* Unburned	Burned	Identifiable Species	Element	Remarks
41 MC 29 (cont.)	TP 3-Lv. 3		1.1	unidentifiable turtle	carapace fragments (5)	burned
	TP 3-Lv. 4	.2	2.1	South Texas pocket gopher	upper incisors (2)	
				" " "	right mandible	
				" " "	premaxilla	
				" " "	right distal humerus	adult
				" " "	right zygomatic arch	
				" " "	left proximal femur	adult
				" " "	right proximal ulna	adult
				" " "	left and right auditory bullae	
				unidentifiable turtle	carapace fragments	
41 MC 31	TP 1-Lv. 3		.6			
	TP 1-Lv. 4		.2			
41 MC 39	TP 2-Lv. 1		2.1			
	TP 3-Lv. 6		17.4			
41 MC 42	surface	2.9		rabbit	right pelvis	adult
41 MC 44	surface	.1		unidentifiable lizard	dentary	
41 MC 55	TP 1-Lv. 1	10.5	7.3	unidentifiable artiodactyle	distal metapodial fragment	
	TP 1-Lv. 2		.5			
	TP 1-Lv. 5	.2				
	TP 1-Lv. 8	.1				
	TP 2-Lv. 1		2.1			
	TP 2-Lv. 2	11.8	4.7			
	TP 2-Lv. 4	1.2				
	TP 2-Lv. 5	1.8				
	TP 3-Lv. 1	.3				
	TP 3-Lv. 2	6.6	4.7			
	TP 3-Lv. 4	.5				
41 MC 64	N500 E500, surface		1.4			
	N505 E510, surface		.9			
	N505 E515, surface			armadillo	right distal femur	adult
	N510 E510, surface			armadillo	right tibia and fibula	juvenile
	N530 E500, surface		.7			
41 MC 65	PTM 131		1.3			
41 MC 84	TP 1-Lv. 2			wood rat	left mandible	
41 MC 94	PTM 141			cow/bison	lower molar and premolar, #141	adult
41 MC 222	N98 E87-Lv. 1	1.6				
	N98 E87-Lv. 2	12.4		cow/bison	right naviculo-cuboid, #1	adult
				" "	right fibula, #2	adult
				" "	right magnum, #3	adult

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable*		Identifiable		
		Unburned	Burned	Species	Element	Remarks
41 MC 222 (cont.)	N98 E87-Lv. 2/ N99 E87-Lv. 3	81.5		cow/bison	right distal tibia, #20	adult
				" "	rib fragments, #19	
	N98 E87-Lv. 2&3	7.7				bone #28
	N98 E87-Lv. 3	25.1	.8			
	N98 E88-Lv. 1	13.7	10.0	wood rat	left and right mandibles	no teeth
	N98 E88-Lv. 2	8.8	.4	cf. cow/bison	rib	tool, smoothed and polished
	N98 E88-Lv. 3	9.8	3.0	cow/bison	proximal sesamoid #5	adult
				" "	proximal sesamoid #4	adult
				" "	proximal sesamoid #7	adult
				" "	proximal sesamoid	adult
	N98 E89-Lv. 1		6.6	raccoon	lower left first molar	adult
				"	second phalanx, distal	adult
	N98 E89-Lv. 2	.8	4.2			
	N99 E83-surface	71.7		cow/bison	long bone frags., #16	
	N99 E86-surface	4.2				
	N99 E87-surface	266.3		cow/bison$^{\nabla}$	left proximal femur	adult
				" " $^{\nabla}$	left distal femur	adult
				" "	thoracic vertebra	
				" "	right scaphoid	
				cf. cow/bison	rib fragments	
	N99 E87-Lv. 1	37.2	.4			bone #81
	N99 E87-Lv. 2	4.1		unidentifiable		bone #33
				cf. cow/bison	rib fragments (4) #35	
		76.7	.6	cow/bison	thoracic vertebra #26	
				" "	proximal sesamoid #29	adult
		21.5		cow/bison size	rib fragments	
		17.9		unidentifiable		bone #30
	N99 E87-Lv. 2/ N99 E88-Lv. 2			cow/bison	thoracic vertebra, frags. (16) #27	
	N99 E87-Lv. 2&3	114.5	6.1	deer size	carpal fragments	
				cow/bison size	rib fragments	
				jackrabbit	right distal tibia	adult, burned
				cf. cow/bison	proximal ulna	adult
	N99 E87-Lv. 3	52.7		cow/bison	right distal scapula #16	
				" "	right astragulus #8	
		47.6		cf. cow/bison	rib fragments #17	
		15.7		" " "	vertebra #24	adult
		58.4		cow/bison size	rib fragment	
				cow/bison	thoracic vertebra	
		11.7	1.3	unidentifiable		bone #2
	N99 E87-Lv. 3/ N99 E88-Lv. 2			cow/bison	right proximal radius #21	adult
	N99 E88-Lv. 1	10.1	1.2	unidentifiable		bone #34
	N99 E88-Lv. 2			cow/bison	right cuneiform #9	

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable*		Identifiable		
		Unburned	Burned	Species	Element	Remarks
41 MC 222 (cont.)	N99 E88-Lv. 2 (cont.)			cow/bison	proximal sesamoid #10	adult
				" "	proximal sesamoid #11	adult
				" "	proximal sesamoid #12	adult
				" "	proximal sesamoid #13	adult
		135.6	.2	" "	right proximal ulna #69	adult
		13.0		cf. cow/bison	rib fragment #14	
	N99 E88-Lv. 3	2.7	14.1	unidentifiable		bone #1
	N99 E89-surface	5.4				
	N100 E87-Lv. 1	193.7	1.1	jackrabbit	distal humerus	burned
				cow/bison size	rib fragments	
		49.6		cf. cow/bison	rib fragments #34	
		8.1		unidentifiable		bone #36
	N100 E88-Lv. 1	263.2	2.1	unidentifiable snake	vertebra	
				cf. jackrabbit	left ulna	burned
				" "	left mandible	
				cow/bison size	rib fragments	
	N100 E89-surface	205.4		cow/bison	left distal femur frags. (2)	
	N101 E89-surface	9.4		cf. cow/bison	incisors (2)	old adult, very worn
	N104 E88-Lv. 1	23.5	2.0	rabbit	left proximal femur	
				cow/bison size	fragments	
	N104 E88-Lv. 2	2.9				
	N104 E88-Lv. 3		.6	rabbit	left pelvis	
				"	distal femur	
				cf. white-tailed deer/ pronghorn antelope	second phalanx, proximal	adult
	N104 E89-Lv. 1			wood rat	left tibia	juvenile
	N104 E89-Lv. 2	9.0	.4			
	N104 E89-Lv. 3			unidentifiable		tool
		17.7	2.2	gar	scales (3)	
				rabbit	left mandible with teeth	adult
				jackrabbit	left mandible, maxilla, and teeth	adult
				"	right distal tibia	adult
				"	left distal femur	adult
				white-tailed deer	distal second phalanx	adult
	N105 E88-Lv. 1	1.7	.4			
	N105 E88-Lv. 2	14.3	15.1	white-tailed deer	molar frags. (6)	adult
				Canis	left mandible with teeth	adult
				jackrabbit	right proximal tibia	adult
				bobcat	left proximal radius	adult
				unidentifiable		tool, burned, smoothed, and polished. function unknown.

TABLE 35. (continued)

Site	Unit-Level	Unidentifiable* Unburned	Burned	Identifiable Species	Element	Remarks
41 MC 222 (cont.)	N105 E88-Lv. 3	10.3	5.4	collared peccary	right distal mandible, M1, M2, M3 erupting	juvenile
				" "	molar	old adult
				Canis	canine, right	adult
				rabbit	left mandible	adult
				"	left metatarsal	adult
				"	metacarpal fragments	adult
				jackrabbit	left maxilla	adult
				pocket mouse	left mandible	
				gopher	left distal scapula	
				rabbit	right distal tibia	adult, burned
				"	right distal tibia	adult, different than above
	N105 E89-Lv. 1	.2	26.5			
	N105/E89-Lv. 2	71.9	77.1	cow/bison	rib fragments	
				jackrabbit	molar frags. (3)	adult
				"	left distal humerus	adult
				"	right proximal ulna	adult
				"	right distal radius	adult
				wild turkey	right distal tibiotarsus	
	N105 E89-Lv. 3	2.2	2.6	rabbit	right mandible	no teeth
				"	metapodial	adult
				unidentifiable bird	unknown	
	shovel test #2	7.0				
	no provenience	121.6	2.0	cow/bison	first phalanx	adult

*Weight in grams
**Plane Table Map
†Backhoe Trench
∇Probably same individual

SCIENTIFIC, STANDARD, AND SPANISH NAMES OF WOODY PLANTS IN SOUTH TEXAS

Excerpted from a list prepared by the Rio Bravo Resource Conservation and Development Project, Soil Conservation Service, Rio Grande City, Texas. Spanish names were assembled by Elias J. Guerrero July 1975.

Scientific	Standard	Spanish
Acacia		
amantacea	Blackbrush acacia	Chaparro prieto
berlandier	Guajillo	Guajillo
farnesiana	Huisache	Huisache
greggi	Catclaw acacia	Una de gato
Aloysia ligustrina	Whitebrush	Reventador
Castela texana	Allthorn goatbush	Amargosa
Celtis pallida	Spiny hackberry	Granjeno
Condalia obtusifolia	Lotebush	Clepen
Diospyros texana	Texas persimmon	Chapote
Koeberlinia spinosa	Allthorn	Junco
Leucophyllum frutescens	Cenizo	Cenizo
Parkinsonia aculeata	Retama	Retama
Pithecellobium flexicaule	Texas ebony	Ebano
Porlieria angustifolia	Guayacan	Guayacan
Prosopis juliflora	Common mesquite	Mesquite
Salix sp.	Willow	Sauce
Sophora secundiflora	Mescal bean	Frijolillo
Ulmus crassifolia	Cedar elm	Olmos
Yucca treculeana	Trecul yucca	Pita

TABLE 36. NUECES RIVER PROJECT, RADIOCARBON ASSAYS

SITE	PROVENIENCE	MATERIAL	TX NUMBER	AGE (UNCORRECTED)	AGE CORRECTIONS MASCA* B.P. DATE	MASCA* B.C./A.D. DATE	DENDRO.** B.P. DATE	DENDRO.** B.C./A.D. DATE
	Feature 1	Carbon	2920	4710 ± 80	5330	3380 B.C.	5276	3326 B.C.
	Feature 3	Carbon	2921	4690 ± 80	5300-20	3350-70 B.C.	5246	3296 B.C.
41 LK 31/32	Feature 6	Carbon	2922	3970 ± 160	4290-4310	2340-60 B.C.	4354-85	2404-2435 B.C.
	Feature 2	Mussel	3023	5260 ± 80	5850-70	3900-20 B.C.	5901	3951 B.C.
	Feature 6	Mussel	3026	4640 ± 80	5170-5290	3230-3340 B.C.	5187	3237 B.C.
	Feature 5	Carbon	2909	2600 ± 70	2730	780 B.C.	2629-2659	679-709 B.C.
	N844 E1057	Carbon	2910	2530 ± 70	2610-2680	660-730 B.C.	2570	620 B.C.
41 LK 67	Feature 8	Carbon	2911	2270 ± 830	2350	400 B.C.	2250-2278	300-328 B.C.
	Feature 25	Carbon	3021	3300 ± 60	3470-3540	1520-1590 B.C.	3495-3527	1545-1577 B.C.
	Feature 25	Mussel	3024	2200 ± 60	2160-2320	210-370 B.C.	2165-2193	215-243 B.C.
41 LK 88	Test Pit 2 Level 3	Carbon	3607	1080 ± 60	1010	A.D. 940	1019-42	A.D. 908-931
41 LK 201	Feature 2	Carbon	3022	3090 ± 80	3250	1300 B.C.	3243	1293 B.C.
41 MC 29	Feature 1	Carbon	2873	2240 ± 50	2220-2340	270-390 B.C.	2221	271 B.C.
41 MC 201†	Test Pit 1 Hearth #23	Carbon	3020	2950 ± 70	3060-3090	1110-1140 B.C.	3056-3087	1106-1137 B.C.
	N105 E88 L-2	Carbon	2875	700 ± 150	660-690	A.D. 1260-90	681-703	A.D. 1269-1247
41 MC 222	N105 E88 L-3	Carbon	2876	710 ± 50	660-690	A.D. 1260-90	703	A.D. 1247
	N105 E88 L-3	Mussel	3025	1420 ± 60	1350	A.D. 600	593-615	A.D. 1379-1357

*MASCA corrections after Ralph, Michael, and Han 1973.
**Dendrochronologic corrections after Damon *et al.* 1974.
†Site recorded and tested by the Cultural Resources Institute, Texas Tech University (Thoms, Montgomery, and Portnoy 1981).

TABLE 37. NUECES RIVER PROJECT, IDENTIFIED CARBONIZED WOOD SAMPLES AND CORRESPONDING RADIOCARBON ASSAYS

SITE	PROVENIENCE	TX NUMBER	Radiocarbon age (MASCA Corrected) DATE B.P.	DATE B.C./A.D.	SCIENTIFIC NAME	COMMON NAME
41 LK 31/32	Feature 3	2921	4300-4320	3350-70 B.C.	cf. *Quercus* sp.	Oak
	Feature 6	2922	4290-4310	2340-60 B.C.	*Fraxinus* sp.	Ash
41 LK 67	Feature 5 N903 E1000 (2 samples)	2909	2730	780 B.C.	*Acacia* sp.	Acacia
41 LK 88	Test Pit 2 Level 3	3607	1010	A.D. 940	*Prosopis glandulosa* *Fraxinus* sp. *Acacia* sp.	Mesquite Ash Acacia
41 LK 201	Test Pit 2 Level 20	*	3250	1300 B.C.	*Prosopis glandulosa* Torr.	Mesquite
	Test Pit 3 Feature 2 (4 samples)	3022	3250	1300 B.C.	*Quercus* sp.	Oak
41 MC 29	Test Pits 1&3 Feature 1	2873	2220-2340	270-390 B.C.	*Prosopis glandulosa* *Celtis pallida* *Quercus virginiana* *Juniperus* sp.	Mesquite Spiny Hackberry Live Oak Juniper
41 MC 201†	Test Pit 1 Hearth #23	3020	3060-3090	1110-1140 B.C.	*Prosopis glandulosa* Torr.	Mesquite
41 MC 222	N105 E88	2875	660-690	A.D. 1260-90	*Fraxinus* sp.	Ash
	Levels 2-3	2876	660-690	A.D. 1260-90	*Salix* sp.	Willow

*Date from TX-3022. Samples are from same stratigraphic unit, but different test pits.
†Site recorded and tested by Cultural Resources Institute, Texas Tech University (Thoms, Montgomery, and Portnoy 1981).

TABLE 38. NUECES RIVER PROJECT, IDENTIFIED CARBONIZED WOOD SAMPLES--UNDATED

SITE	PROVENIENCE	DEPTH BELOW SURFACE	ASSOCIATED DIAGNOSTIC ARTIFACTS	SCIENTIFIC NAME	COMMON NAME
41 LK 31/32	N950 E838 Level 1, NE			*Prosopis glandulosa* Torr.	Mesquite
	N117 E998 Level 7, NW			*Acacia* sp.	Acacia
41 MC 17	Test Pit 2 Level 2	10-20 cm	None	*Prosopis glandulosa* Torr.	Mesquite
41 MC 30	Test Pit 1 Level 3	20-30 cm		*Prosopis glandulosa* Torr.	Mesquite

TABLE 39. PERCENTAGE CRUDE PROTEIN AND MINERAL CONTENTS OF FRUITS OF 17 WOODY PLANT AND CACTUS SPECIES FROM SOUTHERN TEXAS*

SPECIES	CRUDE PROTEIN	PHOSPHORUS	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM
Guajillo[1]	17.07	0.28	0.71	0.28	1.09	0.04
Huisache	17.55	0.24	1.19	0.16	1.53	0.08
Granjeno	19.89	0.23	5.12	0.68	2.88	0.07
Texas Persimmon[2]	3.85	0.07	0.32	0.06	1.48	0.01
Prickly Pear Cactus	7.06	0.15	2.43	0.93	3.41	0.02
Texas Ebony[1]	22.18	0.24	0.87	0.34	0.98	0.04
Honey Mesquite	12.53	0.20	0.66	0.40	1.83	0.40
Live Oak	5.67	0.07	0.51	0.11	1.22	0.02

[1]Chemical analyses based only on seed.
[2]Chemical analyses based only on pulp.

*Excerpted from Everitt and Alaniz 1981:303-Table 2.

REFERENCES CITED

Damon, P. E., C. W. Ferguson, A. Long, and E. I. Wallick

1974 Dendrochronologic Calibration of the Radiocarbon Time Scale. *American Antiquity* 39(2):350-366.

Everitt, J. H. and M. A. Alaniz

1981 Nutrient Content of Cactus and Woody Plant Fruits Eaten by Birds and Mammals in South Texas. *The Southwestern Naturalist* 26(3):301-305.

Ralph, E. K., N. H. Michael, and M. C. Han

1973 Radiocarbon Dates and Reality. *MASCA Newsletter* 9(1):1-20.

Thoms, A. V., J. L. Montgomery, and A. W. Portnoy

1981 An Archaeological Survey of a Portion of the Choke Canyon Reservoir Area in McMullen and Live Oak Counties, Texas. *Center for Archaeological Research, The University of Texas at San Antonio, Choke Canyon Series* 3.