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## Contents

Coal-Oil Canyon Revisited: History of Investigations, 1955-1996  
by Janice A. McLean

Coal-Oil Canyon (14LO401): Progress Report, Area 7  
by Peter W. Bowman

An Apachean Pottery Vessel from Coal-Oil Canyon  
by Donna C. Roper

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## CONTENTS

Preface .....	Janice A. McLean	ii
Coal-Oil Canyon Revisited: History of Investigations, 1955-1996 .....	Janice A. McLean	01
Coal-Oil Canyon (14LO401): Progress Report, Area 7 .....	Peter W. Bowman	33
An Apachean Pottery Vessel from Coal-Oil Canyon .....	Donna C. Roper	63
Book Reviews .....		70
About the Authors .....		74
1996 Kansas Anthropological Association Members .....		75

## PREFACE

In 1960 the Kansas Anthropological Association launched its bulletin series with a publication by Peter W. Bowman entitled *Coal-Oil Canyon (14LO1): Report on Preliminary Investigations*. Thirty-six years later this issue of *The Kansas Anthropologist* initiates the much needed follow-up to an invaluable amateur investigation in western Kansas. During the intervening time the Coal-Oil Canyon site has been redesignated 14LO401 in recognition that the discovery of the Twelve Mile Creek site (14LO2) preceded it.

Work at Coal-Oil was conducted from 1955 to 1961 by a small group of local amateurs, which eventually became known as the Ft. Wallace Dornic Club, under the ad hoc direction of Peter W. Bowman. The investigation consisted of two phases: preliminary testing and excavation. While the bulletin contains a wealth of information about the testing phase, sections of the document are in need of clarification while it is still possible to do so with the help of people who worked at the site. The first paper, "Coal-Oil Canyon Revisited: History of Investigations, 1955-1996," by Janice A. McLean presents new information about each site area investigated during the testing and excavation phases in a standardized format. Information for this paper has been obtained by cataloguing the site collection, corresponding with Peter Bowman, researching the unpublished site documentation, and interviewing Jerome Bussen, who found the site and functioned as Bowman's "right-hand man" during the investigations. The new data is intended to supplement information given in the bulletin and in Bowman's manuscript on the Area 7 excavations, published for the first time in this volume. The site collections, catalogue, and extant documents are curated by the University of Kansas Museum of Anthropology and form the basis of ongoing research, which is discussed in the final section of the paper.

The second paper in this volume, "Coal-Oil Canyon (14LO401): Progress Report, Area 7" by Peter W. Bowman, was intended as the follow-up to the first KAA Bulletin. Written in 1961 and never before published, the paper contains detailed methodological, stratigraphic, and interpretive information about the Area 7 excavations. Bowman's work stands out as an example of excellence in amateur archeology and should prove to be a lasting contribution to High Plains archeology.

Donna C. Roper's paper, "An Apachean Pottery Vessel from Coal-Oil Canyon," rounds out the volume with an update on the cultural affiliation and approximate temporal range of Vessel 25. Roper agrees with Bowman that all the micaceous sherds from Coal-Oil are fragments of the same vessel. She identifies its type as Ocate Micaceous, a Jicarilla Apache variety of the Sangre de Cristo ware, which dates circa A.D. 1675-1725. She notes that the absence of indigenous Dismal River Grey pottery from Coal-Oil suggests that it would be incorrect to assume that the site has a Dismal River component. Roper's discussion of Vessel 25 in relation to the rest of the Coal-Oil ceramic assemblage raises some intriguing questions about Middle and Late Ceramic settlement patterns on the High Plains, as well as some insight into inter-regional trade during those time periods.

Coal-Oil Canyon is a complex and unique site with much yet to add to our knowledge of High Plains prehistory. Other sites in western Kansas, many of which were discovered and investigated by the Ft. Wallace Dornic Club and other members of the fledgling KAA, are awaiting rediscovery and fresh interpretations in county museums, private collections, and site reports filed at the Kansas State Historical Society. Bowman's final report on Coal-Oil Canyon is hardly the last word but, it is hoped, a fresh beginning.

Janice A. McLean

## COAL-OIL CANYON REVISITED: HISTORY OF INVESTIGATIONS, 1955-1996

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*The Kansas Anthropologist* 17(2), 1996, pp. 1-32

*Avocational archeologists published the results of their preliminary testing of the Coal-Oil Canyon site (14LO401), Logan County, Kansas, in the first Bulletin of the Kansas Anthropological Association. Ambiguities in the published report, combined with the lack of a subsequent publication covering the excavation phase of the 1955-1960 investigation, have limited recognition of Coal-Oil Canyon as a key site in a relatively unknown archeological region. A history of work conducted at the site, new information about the site investigations, recommendations for future work, and updated artifact inventories are included in this report.*

Archeology in the High Plains of Kansas has suffered from both minimal professional attention and limited acknowledgment of important amateur work in the region. One of the major exceptions to this pattern is the Coal-Oil Canyon site (recently redesignated 14LO401), which was first discovered on December 30, 1955, by Jerome Bussen and Kenneth Bohm of Wallace, Kansas (Bowman 1960:1). Coal-Oil's discovery came at an exciting time in Kansas archeology. The fledgling Kansas Anthropological Association (KAA) had been founded in May 1955 in nearby Hays, Kansas, and enthusiasm for locating sites in the far western part of the state was at an all-time high. Peter Bowman's report on the preliminary (i.e., testing) investigations at the site rode this wave of enthusiasm to publication as the first KAA bulletin in 1960. However, despite such an auspicious beginning, Coal-Oil Canyon has not achieved the full recognition it deserves as a critical site for understanding the prehistory of western Kansas.

Coal-Oil Canyon's research potential has been limited by a variety of factors. Bowman, who was the driving force behind the excavations at Coal-Oil, abandoned archeology without publishing his follow-up studies at Coal-Oil or any of the additional reports he wrote on field work he conducted in western Kansas and eastern Colorado.<sup>1</sup> After a brief stint working for Waldo Wedel at the Smithsonian as a curatorial assistant processing artifacts from the Lamb Springs excavations, Bowman moved to Pueblo, Colorado, to pursue interests outside of archeology. Until 1991, when Jerome Bussen sought and gained permission to put some of the artifacts from Coal-Oil on display at the Ft. Wallace Memorial Museum, Bowman's archeological collections and records remained in an abandoned house in Wallace, Kansas. In May 1995 Bussen, after consulting with Bowman

and receiving written permission, donated the Coal-Oil collection and associated documentation to the University of Kansas Museum of Anthropology (KUMA). Until arriving at KUMA, the Coal-Oil collection was inaccessible, with few individuals even aware that a portion of it was displayed at the Ft. Wallace Memorial Museum (Donna Roper, personal communication 1994). With no access to the collection, only a thin report based on preliminary results for reference, and no radiocarbon dates, few professional archeologists have found reason to incorporate Coal-Oil into discussions of High Plains Woodland or Upper Republican archeology. Metcalf (1959), Eighmy (1994), and Roper (1995) are notable exceptions.

Unfortunately, specific problems associated with the 1960 bulletin also affected how professionals interpreted Coal-Oil, further limiting its incorporation into the literature. Organization of the report made it difficult to find basic information concerning the testing phase excavations, which were unevenly reported. Some of Bowman's investigative units, or areas, were barely discussed at all, while others had rich descriptions. There was no map that situated the site within Logan County, which made it impossible to include the site in distribution studies of Upper Republican and Woodland sites on the High Plains. Determining locations and dimensions of the actual excavations at Coal-Oil was also problematic, making it difficult to compare the volume of excavation to the quantity of artifacts recovered. Artifact counts were not presented in a consistent fashion, and some artifact categories were not well defined; these factors made it difficult to make intersite comparisons using artifact counts. While these criticisms target general problems with the bulletin, they are not problems with the site data or how it was collected.

Despite some problems, Bowman's bulletin contained much excellent information about his work at Coal-Oil, much of it equal to what was typical in "professional" reports prepared during the same period. The intent of this paper is to clarify some ambiguities in Bowman's report and supplement it with recently discovered unpublished information. This includes material that complements Bowman's (herein) Area 7 Progress Report, in addition to data derived from interviews and recent research on the site and its collections (McLean 1995, 1996; Roper herein). Utilizing this archival information is important since Coal-Oil's potential for elucidating regional dynamics has clearly not been realized, and funds for additional field work at the site are not readily available. It is hoped that the information from this volume will contribute to a more complete understanding of the Coal-Oil Canyon site and renew interest in researching important amateur investigations in the history of Kansas archeology.

The fact that this reassessment of Coal-Oil Canyon archeology has even been possible is a testament to the quality of field work and research conducted at the site by Bowman and his co-workers. It is also an example of the importance of cooperative research between avocational and professional archeologists, the need for continued investigation of previously reported sites, and the critical nature of curation of materials and records for future researchers. Without Bowman's work Coal-Oil Canyon would not be an important light in the "black-hole" of western Kansas archeology.

## ORGANIZATION

The goal of this paper is to supplement Bowman's accounts of work at Coal-Oil by updating his discussions of field methodology, revising artifact counts, presenting new maps of the site excavations, and providing recommendations for future research at the site. A brief summary of research conducted at Coal-Oil from 1955 to 1996 is provided under the heading History of Investigations. In order to supplement Bowman's (1960, herein) published Coal-Oil references, this paper draws from and incorporates unpublished documentation from the site excavations, correspondence with Bowman, interviews with Jerome Bussen, and information derived from cataloguing the site collection. More specific details about the unpublished reference materials used in this paper can be found under the heading Sources. General information pertaining to the site investigations is organized in the Background Information section and can be considered applicable to all 17 areas unless noted otherwise. New

information pertaining to the areas discussed in the bulletin (Bowman 1960) and area-specific research recommendations are provided under the heading Area Synopses. The Recommendations section provides a general outline of future research goals for the site. Appendix 1 contains a brief discussion of the reasons for reinventorying the site collection, definitions of artifact categories, and tables condensing artifact counts, weights, and descriptive comments by area.

## HISTORY OF INVESTIGATIONS

The testing phase of investigations at 14LO401 lasted from 1955 to 1957 and encompassed test units of varying sizes dug in Areas 1 through 17 (Bowman 1960). The 1957-1960 excavation phase concentrated on a single trench in Area 7 (Bowman herein). To date, no additional systematic excavations have taken place in the Canyon since Bowman stopped excavating in Area 7 in 1960. A few years later Jimmy Allaman of Goodland, Kansas, returned to the site and recovered a portion of a cord-roughened vessel, eroding out of Area 16 (McLean 1996; see Area 16 synopsis for additional information). Since 1960 Jerome Bussen has periodically visited the site and informally surface collected artifacts in order to reduce the visibility of artifact concentrations that might attract looters to the site. He also reports surveying other nearby canyons below their Ogallala caprock rims but never finding any other sites like Coal-Oil (McLean 1996). In July 1993 the University of Kansas/Kansas State University Archaeological Field School visited Coal-Oil and collected a small bag of surface artifacts, which have since been incorporated into 1955-1960 collection.

Since September 1995 three expeditions to the site have completed several tasks in preparation for future work at the site. Mapping of the largely still visible 1955-1960 excavations was initiated in 1995 by Donna Roper, Janice McLean, and Robert Conard and finished in November 1996. Permanent datums have been established in Areas 7 and 8, and the location of the Area 8 datum was located relative to United States Geological Survey Benchmark 3471 on the Wallace/Logan County line, as shown on the Twin Butte Quadrangle, Kans. 7.5' Series 1969. Global Positioning System (GPS) coordinates for all three reference positions are also available. New topographic maps for Areas 4, 7, 8, 13, 15, and 17 have been generated as a result of this field work. In April 1996 Roper and McLean began collecting small artifacts eroding out of Areas 1, 4, and 16. This material has since been integrated into the 1955-1960 collection. Margaret Beck has collected, and is currently attempting to characterize, the local clay

sources for eventual comparisons to ceramic vessels excavated from the site.

In addition to the papers contained in this volume, recent research on Coal-Oil includes three papers presented at anthropological conferences. Donna Roper presented a paper entitled "The Pottery of the Coal-Oil Canyon Site, Logan County, Kansas" at the 53rd Annual Plains Conference in Laramie, Wyoming, in October 1995. Janice McLean presented "History of Investigations at the Coal-Oil Canyon Site, Logan County, Kansas" at that same conference and at the KAA Annual Meeting in Topeka on April 20, 1996. Roper is currently continuing her research on the Coal-Oil ceramics, and McLean is working on a lithic analysis for the site.

### SOURCES

Many of the questions that instigated this paper were formulated in the spring of 1994, while processing a portion of the Coal-Oil collection for a preliminary lithic analysis.<sup>2</sup> It became clear from the provenience information written on the artifact boxes that the field methodology section in the 1960 bulletin did not tell the whole story about what had been recovered from the site or how it had been recovered. In May 1994 the author went to document the part of the collection on display at the Ft. Wallace Memorial

Museum and to ask Jerome Bussen questions about some of the puzzling provenience information. Bussen took the author to the site, walked her through the excavation areas, and showed her a large trench scar in Area 7, which was not described in the bulletin (Figure 1). As it turned out, the confusing provenience information referred to materials excavated from the trench. It was not until Bussen wrote to Peter Bowman, asking permission to donate the collection to KUMA, that it was learned that Bowman (herein) had written a separate paper about the Area 7 trench excavation. This paper and documentation included with the donation constitute the primary sources used in this paper. The additional documentary materials specifically include two early drafts of Bowman's 1960 bulletin, which contain several unpublished excavation maps and profiles from the testing phase; detailed field notes for the 1957-1960 Area 7 trench excavation; the Area 7 Progress Report and excavation profiles, completed in 1961 and first published in this volume; Area 7 artifact and faunal remain catalogues; and copies of George Metcalf's field notes and photographs taken during his 1957 visit to the site. Jerome Bussen has been instrumental in recovering and arranging for the donation of this documentation to KUMA. While these materials answered many of the author's initial questions about the Coal-Oil excavations, they also raised new ones.



Figure 1. Recent photograph of Jerome Bussen standing in the Area 7 trench.

Jerome Bussen has provided invaluable assistance in answering questions not covered by the site documentation. His firsthand knowledge of how the site was excavated and where excavations were located and his uncanny ability to recall details about events that happened over 30 years ago have once again "been the mainstay of the project" (Bowman 1960:i). Peter Bowman's response to written queries has also been extremely helpful in reconstructing critical details about the site investigations. Site documentation only provides part of the information needed to reconstruct an investigation; the significance of the help that the author has received from these two individuals cannot be underestimated. Without their assistance this paper would not have been possible.

### BACKGROUND INFORMATION

The purpose of this section is to discuss problems and issues that apply to the testing phase of the site investigations in general. Each subsection addresses a specific problem with Bowman's 1960 bulletin.

#### LOCATION OF 14LO401

Bowman (1960:11) stated that the goal of the initial testing was to briefly describe the site locality, the artifacts, and the conditions under which they were found, "since the site is in an archaeologically little-known region." Given the objectives of the study, the most immediate ambiguity associated with the report is the lack of a map or directions to the site; even the master site files at the Kansas State Historical Society (KSHS) did not contain a legal description of the site location.

Figure 2 shows the approximate location of 14LO401. A complete legal description has now been included with the 14LO401 archival materials at KUMA and in the KSHS files in Topeka. Additionally, the site has been tied to the nearest bench mark, using

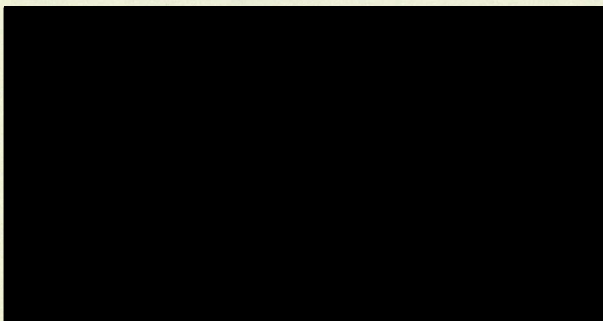


Figure 2. Map of Kansas showing the location of 14LO401.

both transit, survey, and later downloading GPS coordinates for the two site datums.

### SITE MAPS

Bowman's (1960:Figure 1) published site map was accurate with respect to the canyon in which the site is located, but it lacked important details about the archeological work conducted inside the canyon. The dimensions of the testing phase excavations were not included on the site map or consistently reported in the text, making it difficult to reconstruct where or how much testing actually occurred. During the project horizontal provenience localities of varying dimensions located within or adjacent to the canyon were called "areas." However, Areas 9 and 14 were not included on Bowman's site map at all. Recent field reconnaissance suggests that the locations of the less conspicuous areas, located among the boulders of the south end of the canyon, may never be precisely defined. Fortunately, the test units in Areas 7, 8, 15, and 17 were not backfilled and are still visible today, although erosion—noticeable in all areas and particularly severe in Area 15—has somewhat disturbed them. Jerome Bussen assisted with the relocation of Areas 4 and 13.

The remapping project mentioned earlier was initiated in order to create excavation maps for these areas and to layer the dimensions of the tested areas onto Bowman's site map. The new area site maps are included with their respective synopsis sections; Figure 3 is the recently revised site map, showing the locations of Areas 4, 7, 8, 13, 15, and 17 in relation to major topography, which appeared in Bowman's (1960) Figure 1.

### SAMPLING STRATEGY

Bowman (1960:11) indicated that 17 of the "most likely Areas" were investigated during the testing phase for evidence of cultural remains, particularly houses. The tests were not situated within an independent grid system covering the entire site, although some area features, such as the small fireplace found in Area 2, were described with references to fixed points within the canyon, such as boulders or ledges (Bowman 1960:15). However, this type of information is misleading because it is not always possible to match the reference points in the text to actual points on the landscape.

Bowman's (1960:11-20) discussion of the testing suggested that an intentional effort was made to sample different physical locations within the site, such as along the canyon rim, among the large mortar-bed

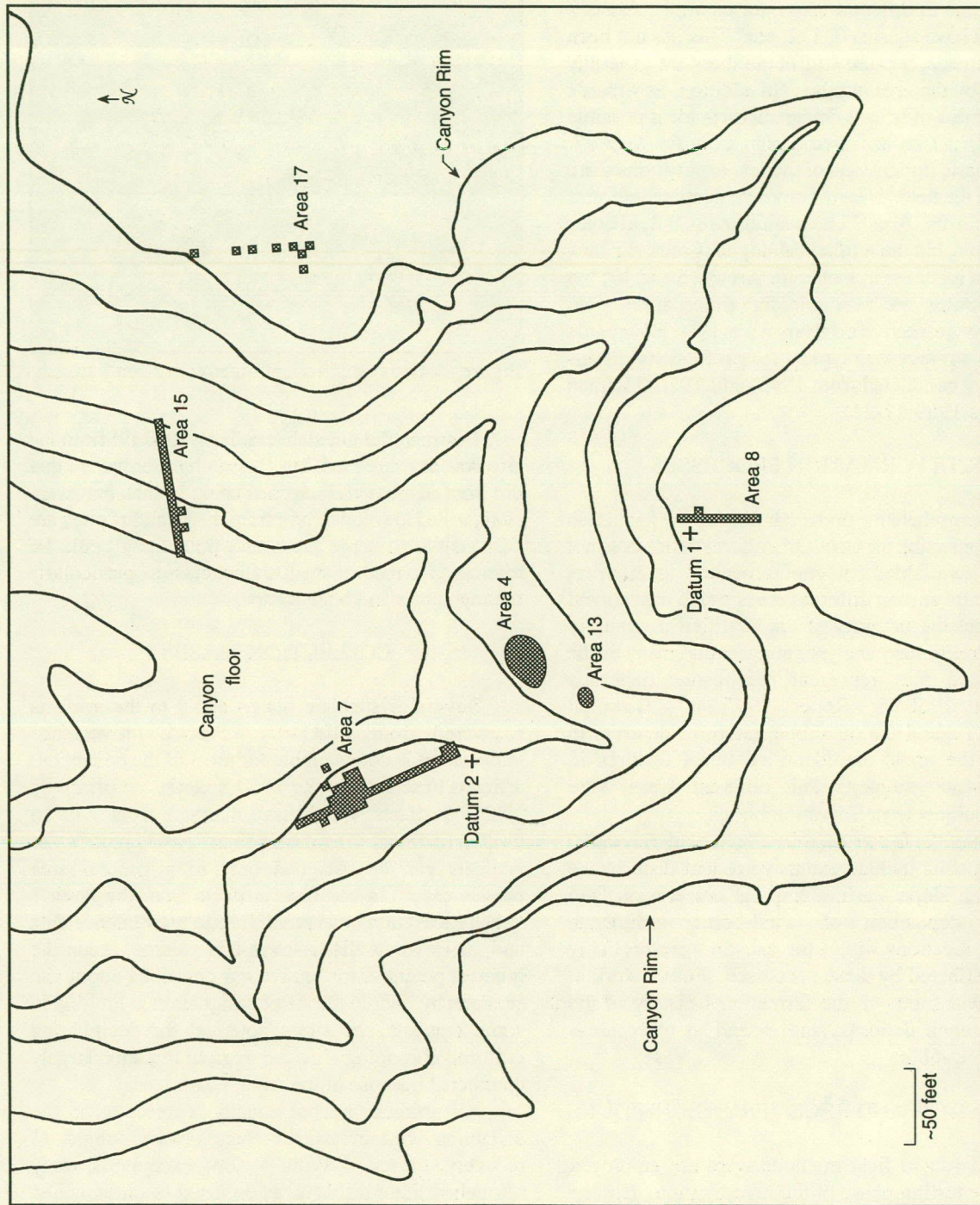


Figure 3. Revised base map of Coal-Oil Canyon, showing the locations of Areas 4, 7, 8, 13, 15, and 17. Contour interval is 10 ft. The map is adapted from Bowman (1960:Figure 1) and supplemented with data collected during September 1995, April 1996, and November 1996 surveys. The Datum 1 elevation is 100,000 m; the relative elevation of Datum 2 is 87,426 m.

blocks, on the talus slopes, and on level terraces, but no attempt was made to standardize the tests by size for comparative purposes. The trench excavations in Areas 7, 8, 15, and 17, which consisted of 5-ft squares, were the exceptions. Bowman reused the same square designations in different areas; for example, Areas 7 and 8 both have squares 0, 1, 2, etc. This has not been too problematic, because artifact numbers are generally preceded by the area number. In addition, Bowman's consistent use of square designations made it possible to reconstruct an excavation plan view for Areas 7, once the basic dimensions of the test excavations were verified in the field. Nearly complete documentation is available for the Area 7 excavation; Area 8 field notes are available, but the artifact catalogue is missing; new excavation maps are available for Areas 15 and 17, but no field notes are available for either area. (No artifacts were recovered from Area 17.) Bowman's sampling strategy was typical for professional Plains archeology conducted from 1945 until 1970 (Hofman and Hayes 1989:17-22).

#### SITE FORMATION PROCESSES

A comprehensive understanding of the formation processes affecting the Coal-Oil cultural deposits is not currently available, but one is needed to interpret artifact refits among different areas of the canyon and to evaluate the integrity of the stratified deposits in Area 7. Preliminary analyses suggest that many of the areas tested may represent redeposited materials (Bowman 1960:68; Roper 1995:2). Bowman (1960:13) noted the disturbed nature of deposits in some of the areas but identified intact features in others, which suggests that different areas were variably subject to preservation biases.

Some of the factors complicating the interpretation of the deposits include extensive rodent disturbance (Figure 4), slope wash, slumping, net erosion, and sporadic deposition of wind-borne sediments. Different locations within the canyon were probably variably affected by these processes. Future work at the site will focus on the formational history of the Area 7 trench deposits, and extend to other areas wherever feasible.

#### EXCAVATION AND RECOVERY TECHNIQUES

Standardized field methods were not employed during the testing phase of the investigation. Bussen has confirmed that both shovel testing and trowel excavation were used during the testing, but he has no recollection of when or where either method was employed.

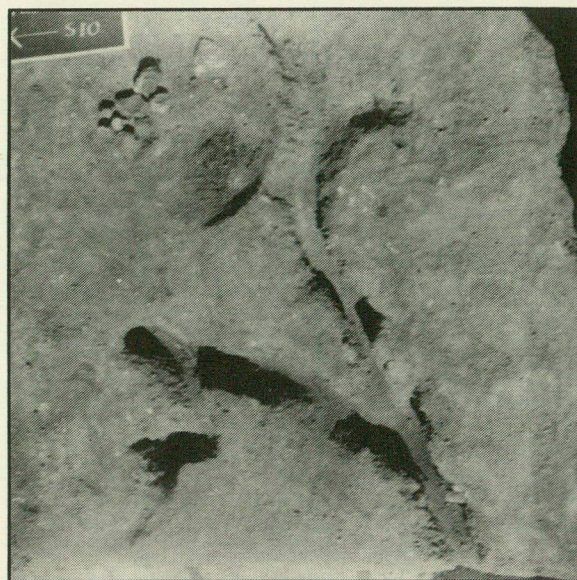


Figure 4. Excavated rodent burrow in Area 7 trench.

Bowman did not state explicitly that fill from the site was dry screened, but Bussen has confirmed that dirt from all areas was screened using ¼-inch hardware cloth, nailed to wooden box frames. Backdirt piles are still visible in some areas and potentially could be rescreened to recover small artifact classes, particularly flaking debris and bone scraps.

#### COLLECTION BIASES

Several systematic biases apply to the artifacts recovered from 14LO401. Precise provenience information is not available for most of the collection; artifacts described in the 1960 bulletin are primarily "APO" artifacts, which have numbers from 1 to 16 written on them. The designation "APO" means that artifacts can be assigned only to a general area provenience. In contrast, artifacts from the Area 7 trench excavation have more precise provenience data and, as Bowman discusses in this volume, retain the greatest potential for unraveling questions about site stratigraphy. While the APO designation is limiting in some respects, the site's potential for deciphering cultural chronology in the region remains largely unaffected because of the Area 7 data.

All artifacts are not equally represented in the collection; certain artifact classes were subject to recovery biases. With a few exceptions, only retouched lithic artifacts, as opposed to unretouched chips, flakes, or cores, were saved (Bowman 1960:62). The author's review of the collection has confirmed that these artifact types generally were not saved from the test excavations but that they were consistently

saved from the Area 7 trench. The potential for recovering these artifact classes is high, because they generally were discarded in the same backdirt piles where dry screening took place. Faunal remains from the testing phase that did not pass through the ¼-inch screen originally were collected for analysis, but some of the remains were discarded later by a third party not associated with the 1955-1960 site investigation. The bones missing from the KUMA donation were predominately bison bone fragments. Bussen estimates that the total amount of bone discarded would have filled an 8-gallon washtub (McLean 1996). The quantity of bone fragments that were encountered during excavation but not collected remains unknown. The faunal remains still present in the collection are included in the Appendix 1 area inventories. No attempt was made to systematically recover plant remains from the site; a single hand-picked *Prunus* pit from Area 8 and a few wood charcoal samples represent the macrobotanical remains from the site. Future investigations will need to target these artifact classes in order to address subsistence strategies from the Coal-Oil perspective.

Artifact counts cannot be expected to correspond exactly to figures presented in the 1960 bulletin. Roper (herein:63-64) notes a discrepancy of 17 sherds between the Vessel 25 reconstruction and the published sherd count for this vessel (Bowman 1960:47). When questioned about the collection, Bowman cautioned, "... since the CO [Coal-Oil] stuff was rubbernecked by hundreds of people ... your counts pretty certainly will be lower than mine, particularly in points, most particularly in the showier types" (Peter Bowman to Janice McLean, letter, 16 June 1995, Lawrence). Appendix 1 is intended to clarify what is present in the collection for future researchers.

### AREA SYNOPSES

The following synopses are intended to supplement, not replace, previously published descriptions of testing and excavations conducted at 14LO401 (Bowman 1960). New information is not uniformly available for all of the 17 areas; areas for which new information is unavailable are identified below.

#### AREA 1

Surface artifacts are currently present in Area 1, although Bowman's comment that "... there was no observable stratigraphy within the artifact-bearing zone" and its location directly below the caprock ledge

suggests that materials collected from this area may have been redeposited from Area 8, where intact cultural deposits have been documented (Bowman 1960:12, 19; McLean 1996). A refit analysis, involving artifacts from across the site, may help resolve the issue of redeposition. Ceramic refits have already been found between Areas 2 and 8, which suggests that the potential for deposits being washed or tossed over the ledge is high (Bowman 1960:13; Donna Roper, personal communication November 1996). Area 2 is also located beneath the ledge, approximately 20 to 30 ft southwest of Area 1.

Multiple pieces of the "Questionable Ceramic Material" were found in Area 1 (Bowman 1960:12). This material was later described by Bowman as being related to ocher processing (Peter Bowman to Jerome Bussen, letter, 22 April 1995, Wallace). The Thunderbird egg, an artifact found at Coal-Oil in Area 4, is a piece of baked, clay-wrapped ocher, presumably wrapped and fired to dehydrate the ocher to turn it red. After publication of the bulletin, the baked clay fragments from Area 2 were reinterpreted as discarded ocher wrappings (Bowman 1971:108-109). An alternative explanation for the questionable ceramic material is that it may represent several failed attempts at making pottery from unsuitable local clays (Margaret Beck, personal communication November 1996).

#### AREA 2

Curated charcoal from the fireplace in Area 2 represents one of the few opportunities still available for obtaining chronometric dates on materials from the 1955-1960 work at Coal-Oil. Approximately 1 liter of fill from the fireplace is available for a radiocarbon assay or paleoethnobotanical study (Bowman 1960:15), although a preliminary scan of the 2 mm and 1 mm size grades revealed no charred seed remains (Mary Adair, personal communication October 1996). Sufficient wood charcoal is present for a conventional radiocarbon date; however, since the sample was stored with a paper tag, it may be too contaminated to yield a reliable date. Further assessment of the sample is needed before it can be submitted.

Dating the fireplace would be helpful because the typological identification of Vessels 4 and 19, fragments of which were found in the fireplace matrix, has not yet been determined. Bowman (1960:34) described Vessels 4 and 19 as similar to Dry Creek focus from Fall River County, South Dakota. Ann Johnson has suggested similarities to Middle Missouri tradition ceramics from western South Dakota, although Donna Roper (personal communication April

1996) maintains that they are not outside the range of variability present in the Central Plains tradition. Absolute dates on the charcoal associated with these two vessels would shed some light on their chronological placement and perhaps on their potential cultural affiliation. Understanding what "types" are present at Coal-Oil is an interesting endeavor in itself, but the questions raised about why they are there and what they mean are even more interesting.

#### AREA 3

New information is unavailable for Area 3 at this time.

#### AREA 4

The greatest artifact density encountered in the 1955-1957 testing was in Area 4. Known as the "clobber hole," this area was one of the first investigated. Figure 3 shows the relative position of Area 4 to Areas 7, 8, 13, 15, and 17. No field notes are available for the investigation, but Jerome Bussen recalls taking the area down to bedrock and observing some stratigraphy. The area is fairly well bounded by a ring of mortar-bed boulders, and it was relocated with the assistance of Jerome Bussen for the remapping project. Backdirt piles from ¼-inch dry screening are present on the slope below the west edge of Area 4. Debitage and bone scraps are actively eroding out of the backdirt (McLean 1996).

In the bulletin and in an unpublished report on the Herl Site, 14GL401, Bowman (1960, 1971) discussed evidence for ocher processing at Coal-Oil. Bowman believed that Zone 9 (Clayey) above Zone 10 (Lower Black) in the Area 7 trench excavation was backdirt, resulting from mining out a vein of ocher in the Tertiary Clay (Bowman herein:42). An Area 4 artifact called the Thunderbird egg, also discussed in the Area 1 synopsis, indicates that some of the occupants of the site were certainly interested in ocher. Experiments conducted by Bowman failed to exactly replicate the artifact, probably because the Thunderbird egg appears to have been buried and baked over a longer period of time. Ocher is present at Coal-Oil in exposed outcrops of the Pierre Shale, but whether the occupants of the site were coming to Coal-Oil for the purpose of obtaining it remains to be evaluated.

#### AREA 5

Area 5 artifacts are difficult to distinguish from surface artifacts, which are identified by the letter "S." Counts for both proveniences are uncertain, and Area

5 should perhaps be excluded from any provenience-based analysis.

#### AREA 6

New information is unavailable for Area 6 at this time.

#### AREA 7

##### Testing Phase

Area 7 is the most intensively investigated area at the site. It was tested prior to publication of the bulletin but was mentioned explicitly in that report only once in the Methods and Discoveries section (Bowman 1960:13). Two additional statements in the bulletin obliquely referred to Area 7. In the first Bowman (1960:1-2) stated, "Systematic excavation of the areas which testing showed to be most promising has begun and it is hoped that this work will place some of the present material in its proper sequential context as well as providing a larger artifact inventory and additional information for a more valuable report." Considering that the only published reference for Coal-Oil is the preliminary report, this statement has only generated confusion. A visit to the site revealed the presence of a large trench in Area 7 that was not discussed in the bulletin, so it seemed plausible that the follow-up excavations were located in that area. However, this suspicion was not confirmed until Bussen wrote to Bowman to ask for permission to donate the Coal-Oil collection to KUMA, and Bowman's reply indicated that he had written a second report about the Area 7 excavations at Coal-Oil (McLean 1995). Bowman's contribution to this volume consists of a slightly revised version of that report.

The second ambiguous statement suggested that cultural materials were encountered "at depths well below the Woodland level" (Bowman 1960:68), a statement that is supported by Metcalf's (1959:119) brief reference to a pre-pottery horizon at Coal-Oil. Bowman's Area 7 report confirms that the area referred to is in fact Area 7. It is the only area test that could be described as deep (Figure 5), and a stemmed scraper recovered from square 0 was found prior to the publication of the bulletin. While the scraper itself, a reworked dart point, is not diagnostic of a particular time period or cultural complex, its approximate provenience was stratigraphically below pottery-bearing levels (for the stratigraphic position, see Bowman herein:Figure 2; for a discussion of the artifact's provenience, see Bowman herein:40). Possible hearths, burned rock, charcoal, debitage, and



Figure 5. South wall profile of square 1 in Area 7 trench. Scale is in feet.

bone scraps also present below these levels suggest the possibility of a pre-Woodland, or pre-pottery, occupation, but typological analysis of the projectile points recovered from Area 7 is needed to confirm this assertion.

There are no notes available for the Area 7 tests, although the excavation documentation contained information that is applicable to the testing phase. The artifacts from the testing phase can be easily identified; testing artifacts are identified solely by area, while artifacts recovered during excavation received catalogue numbers (Bowman herein:37; McLean 1996). The approximate locations of the Area 7 tests are identified on the Area 7 east and west trench wall profiles as "previously excavated" (Bowman herein: Figures 1 and 2). These tests were relatively shallow compared to the later excavations. Tests were concentrated in squares S4, S5, S6, 0, and N1 (Figure 6). All the micaceous sherds discussed in Roper (herein) were recovered from these previously excavated areas. The east-west extent of the tests is unknown, although it is unlikely to have exceeded the 5-ft width of the later trench excavation, since erosion in the tested portions is largely in line with erosion along the untested portions (McLean 1996). Other testing artifacts, including shotgun shells and cow bones, found in thin eolian deposits, substantiate the relatively young age and shallowness of the test deposits.

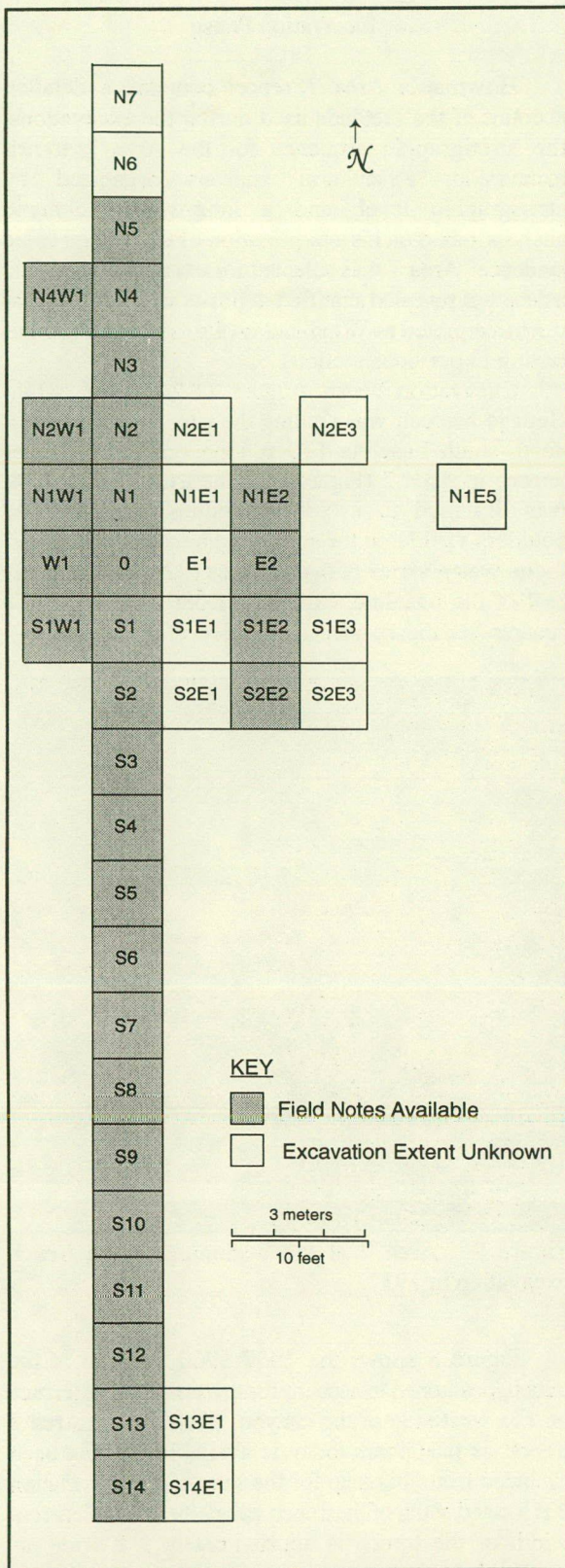


Figure 6. Horizontal plan view map of Area 7 trench excavation, 1957-1960, reconstructed using Bowman's field notes and profiles.

## Excavation Phase

Bowman's Area 7 report contains a detailed account of the methods used during the excavations, the stratigraphic sequence for the Area 7 trench excavation, a cultural analysis organized by stratigraphic level, and a long-winded climatic analysis, based on his interpretation of the stratigraphic evidence. Area 7 was selected for excavation because a deep test revealed stratified deposits well below what were interpreted as Woodland levels (see discussion of testing in previous section).

Excavation began August 24-26, 1957, while George Metcalf was visiting the site, by laying out a north-south baseline 110 ft long on a fairly level terrace in Area 7 (Figure 7). The trench orientation was designed to avoid intercepting several large boulders visible on the surface. The main excavation focus was a series of 5-ft squares (22 total), laid out east of the baseline, extending from the S14 to N7 squares (see Figure 6 for the location of these squares).



Figure 7. Area 7 at the beginning of the trench excavation in 1957.

Figure 8 shows the 1957-1960 location of the trench, positioned to account for erosion, on the terrace on the west side of the canyon. Data on the Area 7 trench as it appears today is available but has been excluded from this map for the sake of clarity. Datum 2 is located south of the trench excavation. The current width of the trench is approximately 9 ft wide, as opposed to 5 ft wide when Bowman profiled it. Erosion, as viewed from the vicinity of squares S9 and S10, has been more severe on the west side (about 4 ft)

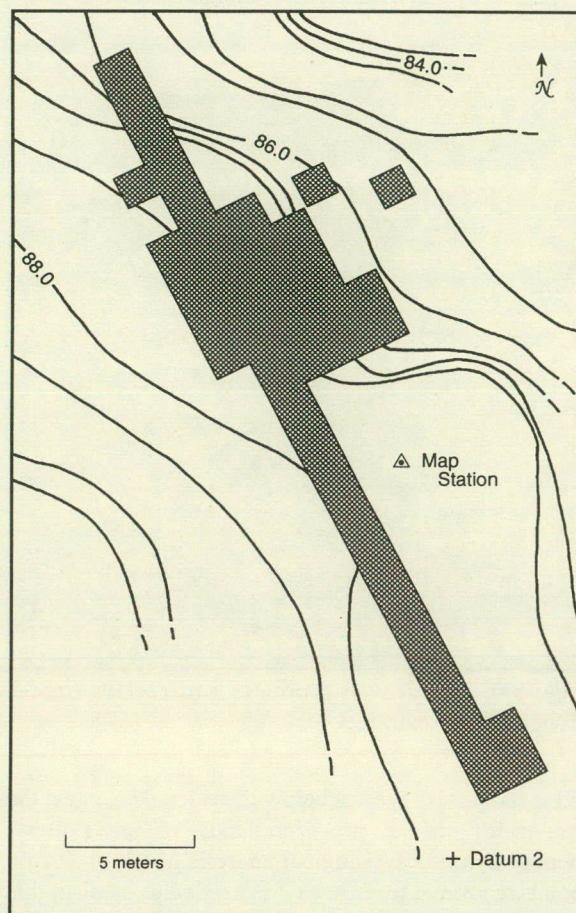


Figure 8. Map of the Area 7 excavations. Contour intervals of 50 cm are based on a Datum 1 elevation of 100.000 m. The elevation of Datum 2 is 87.426 m.

than on the east side (about 2 ft) of the trench, possibly due to slumping. The current depth at this same point is approximately 3.5 ft, and in general the trench is much deeper at the north end than at the south. The south end is basically intact, while the north end has almost completely eroded away (Figure 9).

Backdirt piles, extending along the northern half, eastern margin, and below the large mortar-bed blocks on the southeastern end of the trench, could be profitably rescreened, using a different recovery technique to increase the smaller artifact classes missed during excavation. Flakes are eroding out along the margin of the trench (McLean 1996).

The excavation procedure for Area 7 incorporated both piece plotting of specific finds and 1/4-in dry screening. Objects found in situ were piece plotted by measuring depth below surface from a level "floating datum," positioned at ground surface, and measuring the distance east and north from the number stake in the northwest corner of the square. Provenience for



Figure 9. Recent view of erosion in Area 7 from an Area 8 perspective, looking northwest. Note the backdirt piles along the northern end of the trench and below the large boulder in the center of the photograph.

objects found in the screen were recorded by the generalized locus from which the screen load of dirt was taken (Bowman herein:37). Once the stratigraphy was defined, finds were no longer plotted by depth only and were instead recorded by their general stratigraphic context within the appropriate squares. A total of 260 out of 303 chipped stone artifacts from the trench excavations have precise stratigraphic and square provenience. Those artifacts that are not assigned to a stratigraphic zone typically have northing, easting, and depth measurements and are from squares offset from the main trench. Artifact proveniences were recorded in one catalogue, while unmodified faunal remains were recorded in a separate catalogue.

Figure 6 is a plan view map reconstructed using Bowman's unpublished field notes and artifact proveniences. Detailed field notes (a total of 71 typed, single-spaced pages) describe excavations in 29 out of 42 squares. Bowman's (herein:33) Area 7 report and the extant field notes indicate that some of the squares without field notes, as well as squares in the E2 and W1 lines, were not completely excavated, either because large mortar-bed blocks prevented further excavation or because the squares were needed to gain access to deeper portions of the trench. The field notes provide important information about stratigraphy, excavation levels (which were not standardized), provenience anomalies, artifact finds, features, and

miscellaneous conditions, such as rodent disturbances, etc. Used in conjunction with the Area 7 profiles for the main trench excavation (Bowman herein:Figures 1 and 2), the field notes are extremely helpful for interpreting the trench stratigraphy and help clarify the original context of piece-plotted artifacts beyond the general stratigraphic zones to which they were assigned.

Descriptions in the field notes suggest the Area 7 stratigraphy is extremely complex. Bowman (herein:48) identified talus accumulation, eolian silt, and slope wash as the three main factors affecting deposition. He identified 18 stratigraphic zones during excavation and associated 12 of the zones with cultural material. The north-south profiles from the east and west trench walls provide us with an excellent record of the stratigraphy as it was profiled during excavation (see Bowman herein:Figures 1 and 2). Artifacts on the profiles are not piece plotted per se; instead they represent approximate locations generalized from the appropriate square halves onto the east or west walls. This method of artifact back-plotting commonly was used prior to the invention of three-dimensional computer-aided programs. Bowman associated Zone 6 (Upper Black) and below with Woodland or earlier components, and he assigned the levels above, particularly Zone 5 (Upper Gray), to Middle and Late Ceramic affiliations. Cursory observations on

assemblages from different levels suggest that the deposit in Area 7 is culturally stratified, although the magnitude of the stratification is currently unknown. Roper has observed both Upper Republican and Woodland sherds with Zone 5 proveniences, suggesting that mixing of other cultural materials is to be expected within general stratigraphic zones and perhaps between them (Donna Roper, personal communication November 1996). Depth may also account for the apparent "mixing" of cultural materials within zones; some of Bowman's stratigraphic zones were large enough that internal microstratigraphy could be present. This possibility will be explored in future artifact analyses, utilizing three-dimensional back-plots of excavated materials, as well as in additional excavations planned for Area 7.

Detailed spatial analyses of excavated materials would not be possible without the information provided by thorough documentation of the stratigraphy in field notes, profiles, and the precise artifact provenience data provided by the artifact catalogues. Bowman's work in Area 7, as his report in this volume clearly demonstrates, deserves to be commended for its quality and attention to detail.

#### AREA 8

There are several unresolved discrepancies concerning the Area 8 trench documentation and the new Area 8 map (Figure 10). One concerns the reported length of the Area 8 trench. Bowman (1960:19) stated in the bulletin that the Area 8 trench was 50 ft (15.24 m) long, but the trench was mapped as 55 ft (16.76 m) long in September 1995 and again in April 1996. In addition, the August 20-22, 1957, descriptions for Features 1, 2, and 3 in Metcalf's (1957:1) field notes do not correspond to the location of these same features as they appear in Metcalf's August 22, 1957, photograph of the Area 8 trench (Figure 11). The discrepancy between the documented positions of Features 1, 2, and 3 and the photograph makes it impossible to determine how the squares should be numbered. Paradoxically, knowing how the squares were numbered would resolve which features are present in the photograph. Even though the field notes described the numbering procedure, they did not indicate if numbering started from the northern or southern end of the trench. It is possible that either Metcalf's field notes or the photograph caption are in error, but the discrepancies are unlikely to ever be resolved. Why the length of the Area 8 trench is 55 ft instead of 50 ft as reported is another unsolved

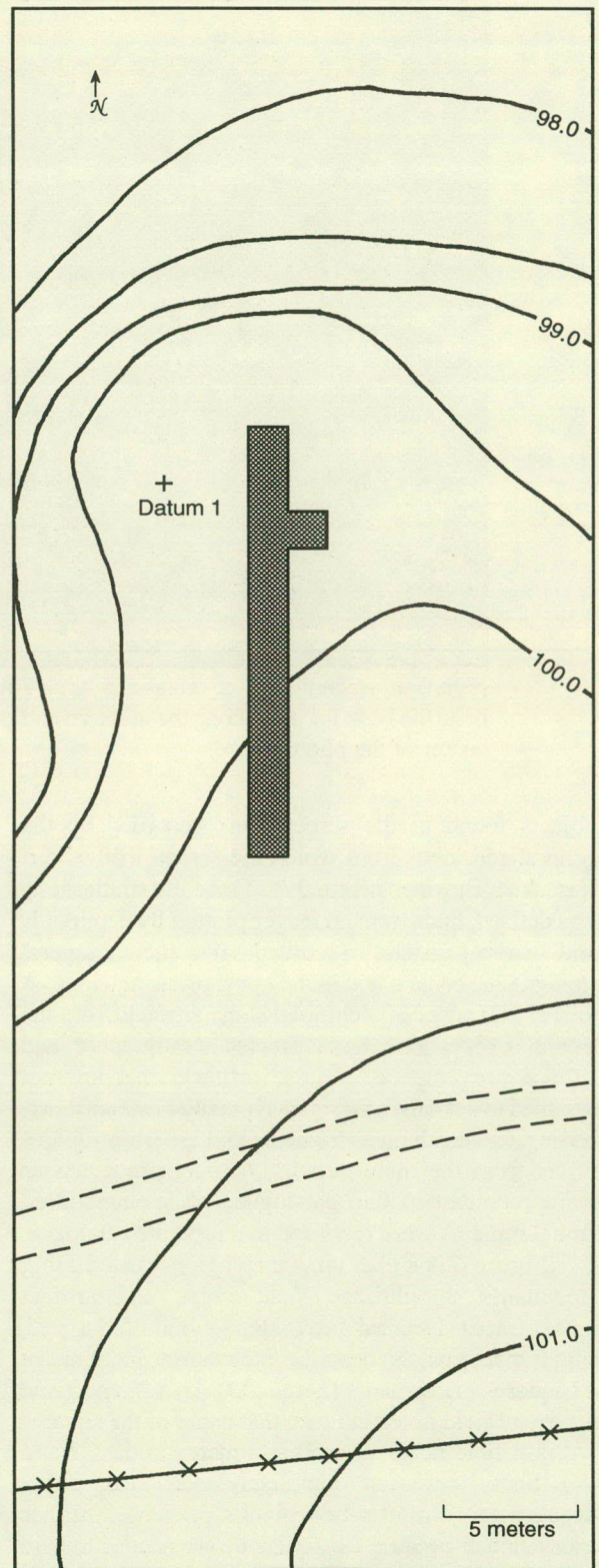


Figure 10. Map of the Area 8 test trench. Contour intervals of 50 cm are based on a Datum 1 elevation of 100.000 m.

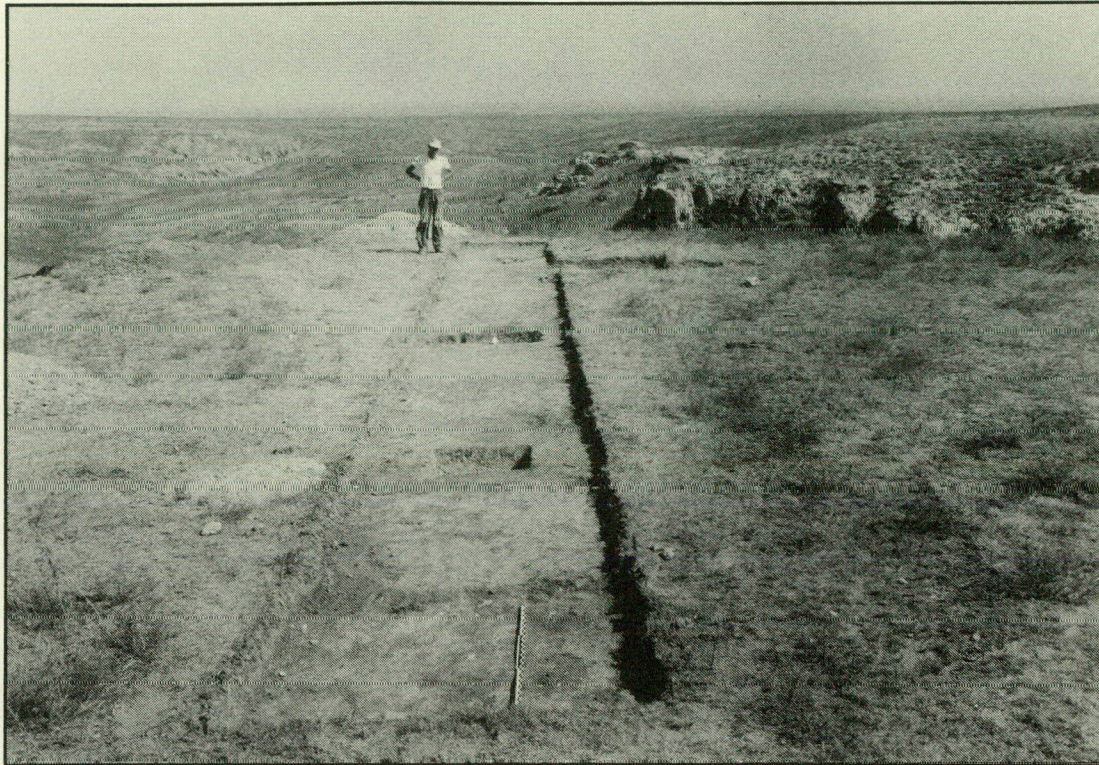


Figure 11. George Metcalf's August 22, 1957, photograph of Peter Bowman standing at the north end of the Area 8 test.

mystery, although the excavation of an additional square, square 0, may account for the added length.

More information on the four Area 8 features is available in Metcalf's (1957) field notes, which are on file at KUMA. The features appear to be associated with an Upper Republican occupation, although the possibility that Woodland materials are also present has yet to be assessed. Woodland sherds, found in a test just south of the fence in Area 9, suggest that Woodland materials may also be present in Area 8.

Datum 1 is located in Area 8 at 38°50'42" N latitude/101°28'31" W longitude. The datum coordinates were generated by a Magellan 2000 GPS hand-held receiver. The elevation of Datum 1 was arbitrarily designated 100.000 m, and all contours for the area maps presented in this report were calculated with respect to this elevation. The elevation of Datum 2 in Area 7 is 87.426 m relative to Datum 1.

Area 8 artifacts have catalogue numbers written on them, but the catalogue is missing. This loss of information is unfortunate, but there is some hope that the catalogue may eventually be recovered. Most of Bowman's documentation for the site was stored in an abandoned house in Wallace, Kansas, prior to the KUMA donation. Closer inspection of items remaining in the house may eventually produce

additional documents related to Coal-Oil and Bowman's other archeological investigations.

#### AREA 9

Burned rock concentrations and hearths arranged in semi-circular patterns were found south of the fence adjacent to Area 8, which is shown in Figure 10. The area behind the fence was designated Area 9 in the bulletin text, but its location was omitted from the site map (Bowman 1960:19, Figure 1). Testing included both shovel tests and surface collections. The boundaries of the surface collection area are undetermined, but several possible features located south of the fence in a cultivated field were included on Bowman's (1960:Figure 1) site map. There are several Keith focus Woodland sherds with Area 9 proveniences present in the collection. Bowman (1960:19) did not state explicitly that diagnostics were recovered during the Area 9 tests, but he alluded to a little cultural material recovered from one test near the fence south of Area 8. The sherds may be from this test instead of the surface collections made in the cultivated area where "no other artifacts were located" (Bowman 1960:20).

## AREAS 10, 11, and 12

New information is unavailable for Areas 10, 11, and 12 at this time.

### AREA 13

The previously unpublished plan view and profiles of the Area 13 test are included here to demonstrate how Bowman recorded intact features. Figure 12 is an idealized plan view map of the Area 13 test, and Figures 13 and 14 are profiles of the same area. Area 13 received the most attention in the bulletin; its description included an artifact inventory and discussion of the relatively intact stratigraphy (Bowman 1960:18). It is not possible to correlate Bowman's discussion of the stratigraphy with Area 7 because different terms were used to describe each area.

The excellent documentation for Area 13 is perhaps indicative of the overall quality of work done during the testing phase, but it stands out in comparison to how the rest of the field work was described in the bulletin. The variable nature of documentation in the report is one of the major sources of confusion about the site. For example, a comparison of the number of pages of the generally excellent artifact descriptions to pages devoted to the description of field methods yields a ratio of approximately 7:1. If documentation of the field work had been more consistent with the standards applied to the artifact descriptions and the methods used to excavate the site made more explicit, the report would be much more valuable to researchers today.

### AREA 14

Bowman's map of 14LO401 excluded two areas, 9 and 14. Area 14 has turned out to be part of a lithic cache of 136 flakes and tools, described in the bulletin as the "Flintpile" (Bowman 1960:14). Bowman never explicitly identified the Flintpile as Area 14, but all of the "better-made artifacts" matching the inventory in the bulletin carry the area designation 14. A box of flakes labeled "Flintpile," but not labeled Area 14, also matches the inventory.

Attempts to exactly relocate Area 14 have thus far been unsuccessful, despite fairly concise directions included in the bulletin. The confusion stems from trying to identify the boulder where the "RV 1 sherds were located" among several likely candidates (Bowman 1960:14). This problem is by no means isolated to this area; it has not been possible to map any areas for which new information is currently

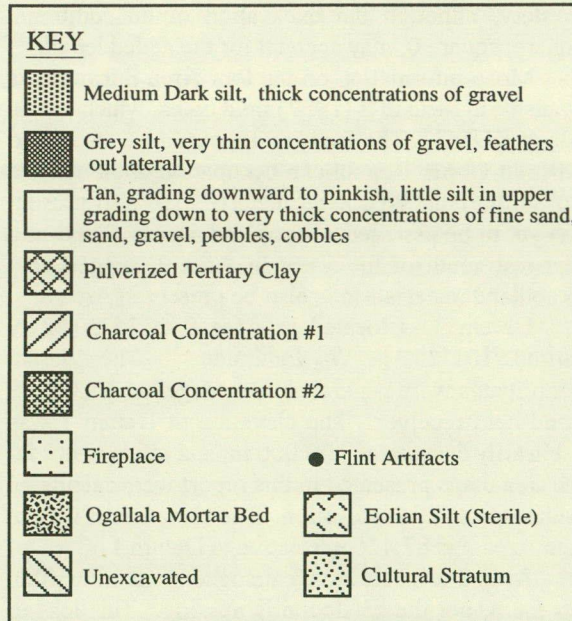
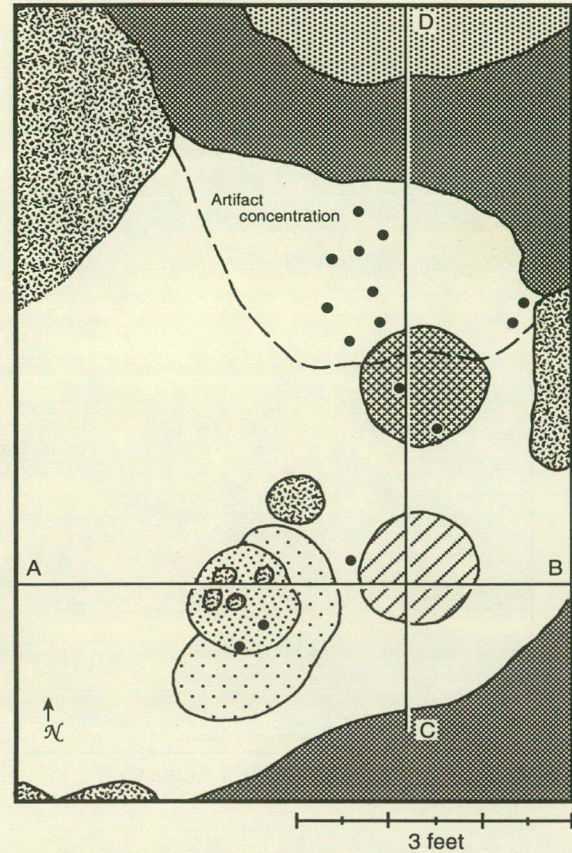


Figure 12. Horizontal plan view of the Area 13 test adapted from Bowman's original. Note that the plan view is not level since the profiles in Figures 13 and 14 are not level. No north arrow was present on the original, but the orientation of the Area 13 profiles made it possible to locate north on the plan view.

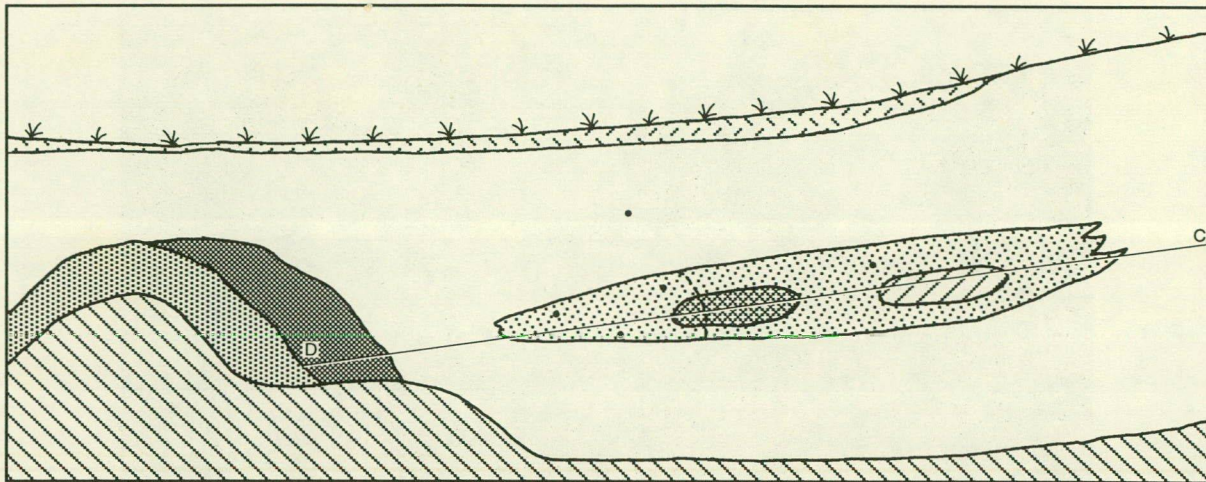


Figure 13. North-south cross section of east wall in Area 13.

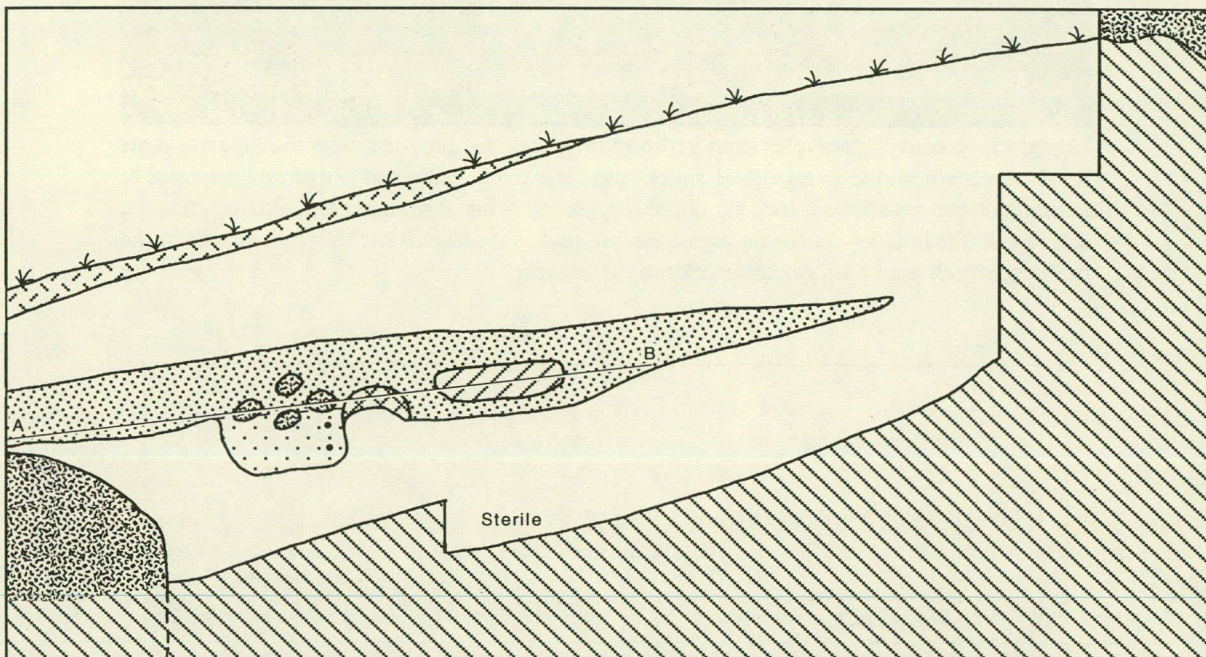


Figure 14. West-east cross section of north wall in Area 13. Note that these adjacent cross section profiles are not level but appear to follow the slope of the ground surface. The Figure 12 key also describes Figures 13 and 14.

unavailable because of problems encountered in trying to differentiate between boulders as they are drawn on the bulletin site map and how they appear in the field. Figure 15 illustrates the confusion of the canyon's south end. Further attempts to redefine the "missing" areas of the south end are planned, but it may not be possible to confidently relocate all or any of them.

#### AREA 15

Area 15 is a 110-ft (33.528-m) trench consisting of 22, 5-ft squares, located on the east wall of the

canyon (Figure 16). Starting with 1 and numbering from the bottom (west) part of the trench, 2 additional 5-ft squares were dug adjacent to trench squares 3 and 5. Severe erosion has almost obliterated the outline of the trench, but enough of the east end was present to justify mapping its approximate location. Figure 17 is an idealized representation of the trench, based on a projection off a few solid shots on the east end and along the south wall of the trench. The north wall and west end have been completely eroded away, which is not surprising considering that the change in elevation or gradient along the slope where Area 15 is located is

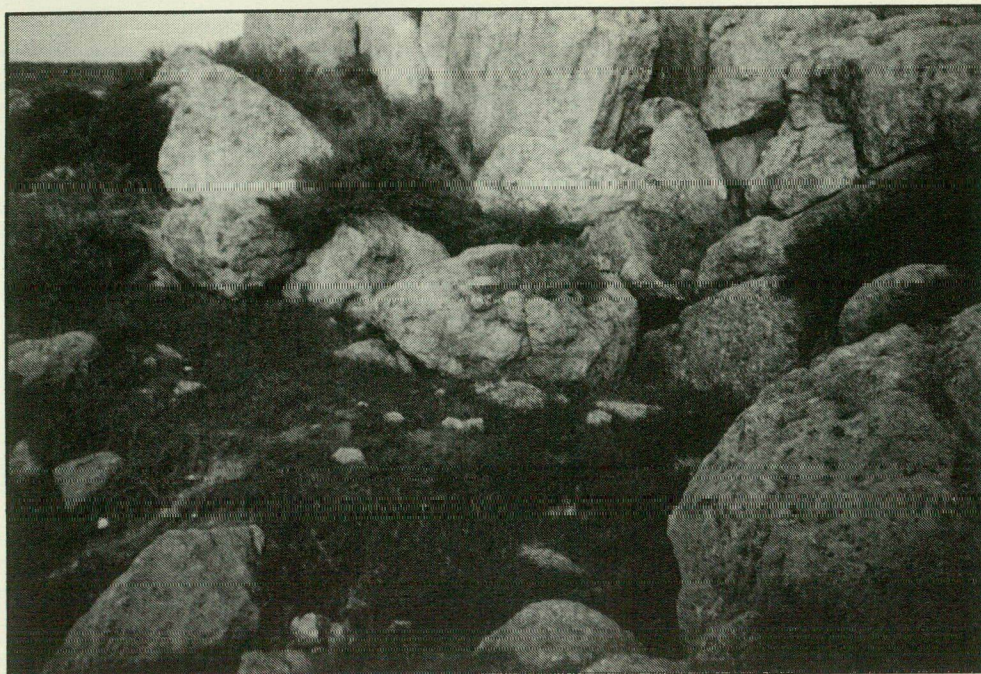


Figure 15. Recent photograph, taken in the south end of the canyon below the ledge in Area 8. Compare how the perspective shifts when standing inside the canyon as opposed to standing on the rim above it looking down (Figure 9). This shift in perspective, or what the author calls the boulder confusion phenomenon, makes it difficult to follow directions in the bulletin, which are based on landmarks in the canyon.

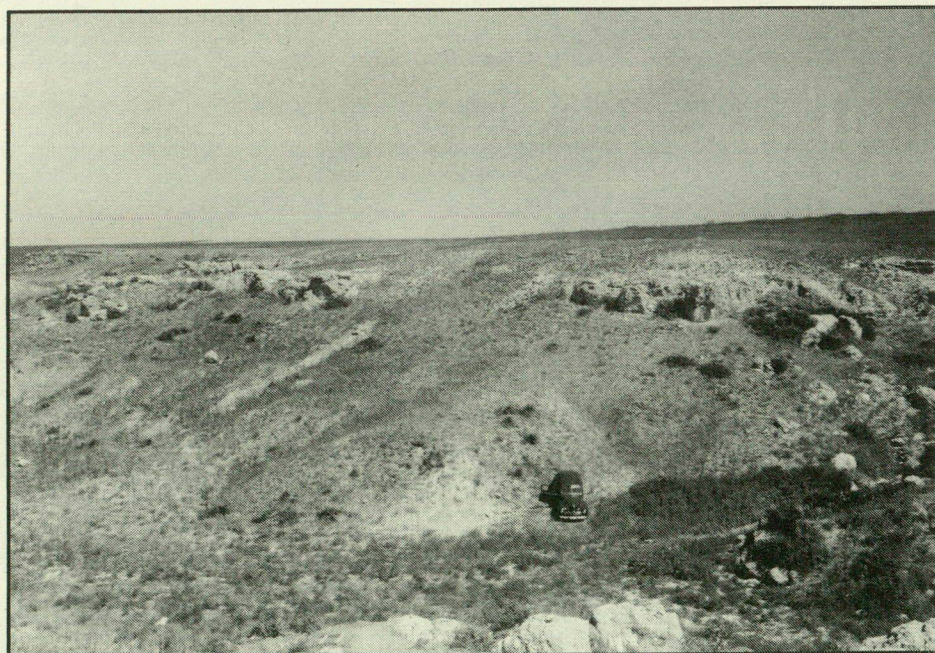


Figure 16. View looking east from Area 7 toward the Area 15 test trench, located on the east wall of the canyon. The trench is the lighter line located in the center-left of the photograph. Area 17 is located on the canyon rim above the ledge in the center-right of the photograph.

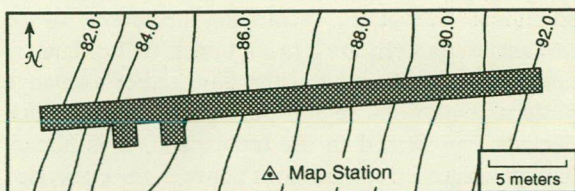


Figure 17. Map of the Area 15 test trench, corrected for vertical distortion using a slope angle of  $18^{\circ}3'$ . The location is approximate, based on only a few good shots of the west end of the trench. The 100-cm contour intervals are based on a Datum 1 elevation of 100.000 m.

approximately 40 ft (12.2 m). The Area 15 map is less accurate than the other area maps presented in this volume, but even an approximation of the trench location was deemed more informative than no trench location at all.

Area 15 is the most obvious example of redeposition of materials from the canyon rim into the canyon. While testing in nearby Area 17 failed to recover any evidence of in situ cultural materials along the eastern rim, relatively rich deposits in Area 8 along the south rim suggest more extensive erosion may have removed any deposits from the east rim and redeposited them along the canyon wall. A similar pattern appears to be occurring on the west side of the canyon, with materials in Area 16 being redeposited from a higher elevation. The west rim has not been tested. While slope and differential erosion may account for most of the variability in artifact distribution along sections of the canyon rim, further testing is needed to verify this interpretation.

#### AREA 16

Soon after Bowman stopped working at Coal-Oil, Jimmy Allaman returned to the site to dig in Area 16 and found part of a cord-roughened vessel. Sherds and bone scraps are still actively eroding out of a cow path, which bisects Area 16 (McLean 1996). It is not known if the materials are eroding out of in situ deposits or being transported down the path from elsewhere, although the vertical orientation of several artifacts observed in situ suggests transport from a higher context.

#### AREA 17

No cultural materials were recovered from the 7, 5-ft test squares excavated to bedrock, a mere 6 in below surface, in Area 17 (McLean 1996). Figure 18 shows the location of the Area 17 tests on the east rim

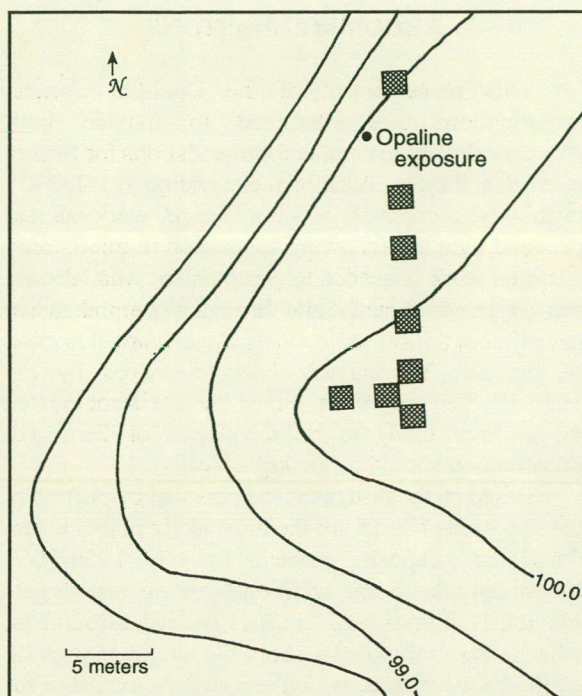


Figure 18. Map of the Area 17 test excavations and the location of the Ogallala chert outcrop (labeled "opaline exposure"). The 50-cm contour intervals are based on a Datum 1 elevation of 100.000 m.

of the canyon. The tests were easy to relocate because they were never backfilled, and erosion has only minimally altered their original outlines.

During the remapping of Area 17, an isolated outcrop of Ogallala chert, which grades into chalcedony, was identified in that area. A sample has been collected and included in the KUMA Lithic Raw Material Comparative Collection. UTM coordinates (14 285 885E / 4302 479N) for the outcrop were generated by a Magellan GPS hand-held receiver. The location of the outcrop is also indicated on Figure 18. This lithic raw material is well represented in the Coal-Oil lithic assemblage and has been observed by the author in surface collections from both Wallace and Logan counties. While the material is poor quality compared to other lithic raw materials, such as Alibates agatized dolomite, it was used at Coal-Oil for the production of a variety of tool types, including projectile points. Future research on raw material use at Coal-Oil will help to identify broad temporal patterns in prehistoric technology, territoriality, and economics on a site specific scale. The ultimate goal of the raw material analysis, through comparisons with other sites in the area, is to gain an understanding of how these patterns changed through time on a regional scale.

## RECOMMENDATIONS

This reassessment of the Coal-Oil Canyon investigations has attempted to include both area-specific and general recommendations for further research at the site. Additional excavation at 14LO401 is highly recommended, but future work should proceed with the following suggestion in mind: only minimal work is needed to complement what already can be learned about the site through a comprehensive reanalysis of the site collections. A substantial portion of the site has already been destroyed by the 1955-1960 investigations. Since the site is not located in an area likely to be developed or damaged, preservation should be the key objective.

Based on the field notes and personal inspection of the site, Areas 7 and 8 are the most likely places to test for intact deposits related to the 1955-1960 investigations. Some additional testing that targets previously investigated areas is needed to build on what is currently known about the site or to provide context for artifacts, which are already available for study. Significant deposits are still likely to be present in and adjacent to Area 7, where artifacts are currently eroding out of the exposed trench walls. Obtaining charcoal for a series of radiocarbon dates from secure stratigraphic contexts is a worthwhile goal. Radiocarbon assays would make the Area 7 excavation artifacts much more valuable in terms of their current research potential, as well as provide a much needed chronological framework for the site and for the region. Minimal testing in Area 8 yielded four intact features and a large number of diagnostic artifacts, tentatively assigned to an Upper Republican affiliation. Additional testing is recommended for Area 8 because a substantial amount of the area was left intact for future work. Dating isolated components, particularly the Upper Republican occupation, is a high priority because of the potential for increased understanding of how this portion of the High Plains functioned in the settlement patterns of different groups through time. Untested areas in the canyon could also be profitably investigated, but highest priority should be given to selectively adding to what is already known about the site before destroying additional portions of it.

In addition to selective testing, other relatively nonintrusive investigative approaches could add to an understanding of the site. Repeated systematic surface collections and rescreening of backdirt piles by area would substantially increase the biased lithic sample size, particularly in the almost nonexistent debitage category. A larger debitage sample would help answer questions about reduction strategies for the different raw material types from the site without requiring any

additional excavation. Identifying the sources of the raw materials from the Area 7 trench will ultimately help unravel mobility, territoriality, and/or exchange patterns within the region during the different time periods represented in the trench and, it is hoped, through controlled comparisons between the excavated and tested materials, to the site as a whole. Linking raw material data to radiocarbon dates would make this analysis more useful, but the basic stratigraphic sequence in Area 7 can already provide a relative sequence of change through time.

Geomorphological evaluation of the site is needed to determine the potential for intact deposits, test hypotheses about site formation processes, evaluate Bowman's interpretation of the Area 7 stratigraphy, and correlate stratigraphy between areas. Geomorphological investigation is also required to determine if a viable water source, besides the shale seep that gives Coal-Oil its name, was located in the canyon during prehistoric times. Paleoecological studies coordinated with the geomorphological work would be useful for unraveling the climate in the immediate vicinity of the site, although recent work at other sites may be applicable to Coal-Oil in general, limiting the need for a site-specific analysis.

Current and future studies must recognize the limitations of the assemblages generated during the testing phase. Diagnostics are limited in number, many of the artifact types present overlap in both time and space, and the original contexts of diagnostics recovered during the testing phase are often unknown. An interpretive framework developed from intensive study of the Area 7 excavated materials, combined with radiocarbon dates, should help to narrow cultural affiliations and the temporal sequence for the site as a whole. However, questions about the typological affiliations of some diagnostics are already causing a great deal of frustration. Sites located on the edge of known cultural traditions tend to slip through the cracks because they are not easily pigeon holed. Coal-Oil is no exception. It presents a challenge in terms of understanding what is happening at the site and in the region and how the region relates to the rest of the Plains. A fundamental reevaluation of how Plains material culture is ordered through time and space is not likely to happen because of problems associated with the analysis of materials from Coal-Oil. Nevertheless the nagging issue of how to assign cultural affiliations to materials that do not comfortably fit established typological categories will certainly have to be addressed in any future analysis of the Coal-Oil artifacts.

The ongoing analyses of the current artifact assemblages are providing data to address questions

about settlement and subsistence in the region, contributing to the Upper Republican village hunter versus local forager dialogue, evaluating the site's function through time, establishing a baseline for interpreting large surface collections from the region, and broadening the understanding of prehistoric lifeways in an archeologically little understood region of the High Plains. The recommendations presented here are specifically intended to further these research goals, while recognizing that funding is limited and full scale reexcavation is not needed to build on the strong foundation that is already available.

### CONCLUSIONS

Archeology in the 1990s, like many things, is experiencing a downsizing trend. As costs continue to rise, funding for large scale excavation decreases. A number of professionals and organizations have noted this trend and advocated reanalyzing old collections and archival records as a way to maximize the potential of the rapidly disappearing archeological record. Dr. Christopher Lintz (1986:126) writes: "The utilization of archival information saves time, money and energy, and prevents the loss of context disrupted during the excavation of new sites in order to retrieve information which may already be available in curated form." "Curated form" is a curious expression. By definition curation implies managed care, typically by museum personnel. In contrast to what the term implies, Lintz' work on Antelope Creek archival materials suggests that many important documents remained in the possession of private individuals, who did not always recognize their significance. This state of affairs can create numerous problems for archeologists interested in reinvestigating previously excavated sites, particularly if the original investigation was sponsored by private individuals rather than public institutions. While problems can and do arise, working with old collections "curated" by private individuals can add significantly to the archeological database and should be pursued whenever feasible.

In the case of Coal-Oil Canyon, reinvestigation efforts already have yielded far more than was expected from the site. The "rediscovery" of a potentially stratified upland aceramic/ceramic site in western Kansas holds potential for addressing a number of questions about regional dynamics, the function of "hunting camps" on the High Plains, upland site formation processes, and cultural chronology. This presentation represents a first step toward reestablishing the Coal-Oil Canyon site as an important part of the archeological landscape. If Coal-Oil's stratigraphic record proves to be intact, it will provide

much needed data about temporal variation in a little known and even less understood region. If not, reinvestigating the site will still provide clues that will help us unravel patterns on a regional scale, in addition to providing data for more specific questions.

Much of what happened during the testing phase of Bowman's investigation can be reconstructed and any remaining problems should be viewed within their proper context. With very little training and even less guidance, a small group of amateurs produced what is arguably two of the best amateur site reports available for a Kansas site (Bowman 1960; herein). This paper merely supplements or clarifies information already available in the reports, largely using the same supporting documentation that was used to write them. Peter Bowman acknowledged George Metcalf, Waldo Wedel's field director, for his role in formulating the Area 7 excavations, but Peter Bowman and the Ft. Wallace Dornic Club deserve the credit for the actual execution of those plans. Bowman and his crew kept field notes, drew stratigraphic profiles, collected soil samples, piece plotted in situ artifacts and recorded locational data for artifacts found during ¼-in dry screening, produced artifact catalogues, took photographs, wrote a final report that described field methods in detail, and developed an interpretation of what had happened at the site. The usefulness of the Area 7 excavation data 30 years after curation in an abandoned house attests to the professional quality of the amateur work conducted at Coal-Oil. The previous work at Coal-Oil deserves to be commended for its contribution to Kansas archeology, but, as Bowman (herein:60) himself notes, "Much has been done but a great deal remains to be accomplished."

*Acknowledgments.* Jerome "Pete" Bussen has my eternal gratitude for patiently enduring my many questions about Coal-Oil since 1994 and for sharing his knowledge of Coal-Oil and western Kansas archeology in general. Raymond and Shirley Bussen have hosted several expeditions to Coal-Oil; their kind and generous hospitality is gratefully acknowledged here. Thelma Jennings, Curator, Edith Benish, and Rosie Hill of the Ft. Wallace Memorial Museum have hosted several weeks of research at the museum since 1994; their cooperation is greatly appreciated. Peter W. Bowman deserves recognition for providing a solid foundation for future research at Coal-Oil with his meticulous documentation of his investigations. Bowman's contributions will continue to add to our understanding of western Kansas archeology in the years to come.

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## APPENDIX: ARTIFACT INVENTORIES

Appendix 1 provides a tabular account of what materials are currently present in the Coal-Oil Canyon collection. This update is necessary because Bowman's (1960, herein) artifact inventories frequently conflict with inventories derived from the KUMA collection. Inventory discrepancies are readily explained by attrition due to the unmanaged long term storage of the collection at Wallace, and incomplete provenience data for some artifacts. In addition, it is difficult to derive artifact counts from Bowman's reports because some materials, such as flakes and cores, were never quantified, and his artifact types are not always clearly defined.

The collection itself is heavily skewed in favor of ceramics and formal lithic tools. Table 7 is the best representation of what was actually recovered during excavation since all potentially cultural materials encountered during the excavation of Area 7 were kept. Area 14 was a lithic cache, consisting of Niobrara jasper, one tested chert cobble, and one quartzite flake knife. All other areas are biased with respect to faunal remains and informal lithic tools.

### SORTING PROCEDURE

Artifact counts and weights are arranged by class and subclass. The sherd count includes both rim and body sherds and is subject to revision with further analysis.

Debitage is divided into flake and non-flake categories. Non-flakes include all shatter and blocky debris that lack clear ventral surfaces and platforms. The flake tool subclasses are functionally and

morphologically defined. All flake tools exhibit continuous retouching along one or more margins. No attempt was made to identify incidental use wear because previous storage of the collection has rendered such determinations unreliable.

The three scraper subclasses incorporate the location and edge angle (greater than 45 degrees) of the wear. The proximal ends, or hafted portions, of planoconvex end scrapers were consistently included in the end/side scraper category because these artifacts generally exhibited continuous retouch along end and side margins. Flake knives were defined by the presence of a retouched edge with an edge angle of less than 45 degrees. Composite flake tools include any combination of end scraper, side scraper, knife, graver, or notch with the exception of end/side scraper. Early and Intermediate stage bifaces include bifacial roughouts, bifacially edged flakes, and bifacial blanks. Late stage bifaces include bifacial knives and projectile point preforms. Projectile points were divided into three categories: complete/nearly complete, proximal fragments, and distal fragments. Proximal projectile point fragment types include bases, split bases, bases with blades, and bases with stems. Distal projectile point fragments include tips, midsections, blades, blades with stems, and split bases with stems.

Bone was separated into bison and non-bison categories and further coded as burned or unburned, modified or unmodified. No attempt was made here to identify the non-bison bone to the species level. The comments column includes any unusual information about a particular specimen or group of specimens.

Table 1. Area 1 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		169	296.5	
<b>Flake Tools</b>		36	218.4	
	End scrapers	2	27.9	
	Side scrapers	1	19.2	
	End/side scrapers	28	162.0	
	Knives	5	9.3	
<b>Bifaces</b>		20	244.3	
	Early & Intermediate Stage	13	187.3	
	Late Stage	7	57.0	
<b>Projectile Points</b>		40	49.8	
	Complete/Nearly Complete	14	24.2	
	Proximal fragments	4	2.4	
	Distal fragments	22	23.2	
<b>Bone</b>		3	18.3	
	Bone Tools, Bison	1	3.1	Bison scapula pendant
	Unmodified Bone, Bison	1	14.6	
	Unmodified Bone, Non-bison	1	0.6	
<b>Groundstone</b>		3	59.1	
	Metate	1	13.7	
	Abraders	2	45.4	

Table 2. Area 2 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		225	580.9	
<b>Flakes</b>		3	5.1	
<b>Flake Tools</b>		57	465.7	
	End scrapers	2	8.2	
	Side scrapers	6	208.6	
	End/side scrapers	29	158.1	
	Knives	16	70.2	
	Gravers	1	1.6	
	Composite tools	3	19.0	
<b>Bifaces</b>		29	189.3	
	Early & Intermediate Stage	8	99.1	
	Late Stage	21	90.2	
<b>Drills</b>		4	11.2	
<b>Projectile Points</b>		91	88.7	
	Complete/Nearly Complete	36	43.2	
	Proximal	31	29.0	
	Distal	24	16.5	
<b>Soil Samples</b>		1	NA	
<b>Charcoal Samples</b>		1	NA	unsorted fireplace fill
<b>Ferrous Oxide</b>		26	124.9	

Table 3. Area 3 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		34	160.9	
<b>Flake Tools</b>		6	32.9	
	Side scrapers	3	16.4	
	Knives	2	16.0	
	Composite tools	1	0.5	knife/scraper
<b>Bifaces</b>		3	19.2	
	Early & Intermediate Stage	2	12.0	
	Late Stage	1	7.2	
<b>Projectile Points</b>	Complete/Nearly Complete	3	2.6	
<b>Bone</b>		7	89.6	
	Bone Tools, Non-bison	1	3.0	
	Unmodified Bone, Non-bison	6	86.6	Canid
<b>Groundstone</b>	Metate	1	17.4	

Table 4. Area 4 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		452	1168.5	
<b>Flakes</b>		18	28.1	
<b>Nonflake debris</b>		3	26.0	
<b>Flake Tools</b>		86	578.9	
	End scrapers	5	22.4	
	Side scrapers	7	95.3	
	End/side scrapers	62	367.4	
	Knives	11	84.8	
	Composite tools	1	9.0	
<b>Bifaces</b>		97	627.1	
	Early & Intermediate Stage	42	240.8	
	Late Stage	55	386.3	
<b>Drills</b>		21	21.4	n=12 are reworked projectile points
<b>Projectile Points</b>		291	265.3	
	Complete/Nearly Complete	123	136.6	
	Proximal	74	59.2	
	Distal	94	69.5	
<b>Bone</b>		12	48.7	
	Bone Tools, Bison	1	13.7	
	Bone Tools, Non-bison	6	15.5	
	Unmodified Bone, Non-bison	5	19.5	
<b>Groundstone</b>	Abraders	1	58.4	
<b>Ferrous Oxide</b>		2	3.0	

Table 5. Area 5 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		108	367.0	
<b>Flake Tools</b>		18	120.5	Area 5 lithic counts are based on my ability to distinguish between 5, for Area 5, and S, for surface. These counts are extremely conservative.
	Side scrapers	3	9.9	
	End/side scrapers	5	59.8	
	Knives	6	19.2	
	Composite tools	4	31.6	
<b>Bifaces</b>		13	153.5	
	Early & Intermediate Stage	9	130.6	
	Late Stage	4	22.9	
<b>Projectile Points</b>		38	31.7	
	Complete/Nearly Complete	16	15.7	
	Proximal	9	6.6	
	Distal	13	9.4	
<b>Bone</b>		7	7.9	
	Bone Tools, Bison	5	5.4	
	Unmodified Bone, Non-bison	2	2.5	
<b>Groundstone</b>	Mano	1	58.1	

Table 6. Area 6 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Sherds</b>		51	137.8
<b>Flake Tools</b>		4	49.0
	Side scrapers	1	7.1
	End/side scrapers	2	15.4
	Composite tools	1	26.5
<b>Bifaces</b>		2	19.7
	Early & Intermediate Stage	1	3.6
	Late Stage	1	6.5
<b>Projectile Points</b>		6	4.8
	Complete/Nearly Complete	2	2.0
	Proximal	2	0.7
	Distal	2	2.1
<b>Bone</b>	Unmodified Bone, Non-bison	3	32.2

Table 7. Area 7 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		451	804.2	
<b>Flakes</b>		101	92.2	
<b>Nonflake debris</b>		4	2.5	
<b>Cores, Tested cobbles</b>		11	968.3	
<b>Flake Tools</b>		62	870.4	
	End scrapers	5	176.5	
	Side scrapers	8	205.4	
	End/side scrapers	33	322.2	
	Knives	7	119.2	
	Gravers	2	1.0	
	Notches	1	1.1	
	Composite tools	6	45.0	
<b>Bifaces</b>		55	672.8	
	Early & Intermediate Stage	27	456.7	
	Late Stage	27	168.1	n=3 alternate bevel knives
	Axe/Celt	1	48.0	Niobrara Jasper
<b>Drills</b>		1	1.5	
<b>Projectile Points</b>		70	77.9	
	Complete/Nearly Complete	24	34.3	
	Proximal	19	25.9	
	Distal	27	17.7	
<b>Bone</b>		160	2556.6	
	Bone Tools, Bison	1	18.7	# 7/116
	Bone Tools, Non-bison	3	5.5	
	Unmodified Bone, Bison	68	2015.0	
	Unmodified Bone, Non-bison	84	514.4	
	Burned Bone, Non-bison	4	3.0	
<b>Groundstone</b>		12	1041.6	
	Mano	3	298.6	
	Metate	3	663.1	
	Abraders	1	42.7	
	Carved Stone	2	37.2	
	Hammerstones	3	NA	N=2 are also cores
<b>Shell</b>	Modified	1	9.3	
<b>Ferrous Oxide</b>		208	978.7	
<b>Unworked Stone</b>		21	228.4	
<b>Soil Samples</b>		5	NA	
<b>Miscellaneous</b>	(1) Shotgun shell, (2) .22 cartridges	3	9.7	

Table 8. Area 8 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		275	170.6	
<b>Flakes</b>		37	34.1	
<b>Flake Tools</b>		20	91.9	
	End scrapers	2	4.2	
	Side scrapers	4	32.0	
	End/side scrapers	6	37.6	
	Knives	5	10.7	
	Gravers	1	1.3	
	Composite tools	2	6.1	
<b>Bifaces</b>		9	33.6	
	Early & Intermediate Stage	7	30.2	
	Late Stage	2	3.4	
<b>Drills</b>		4	6.9	
<b>Projectile Points</b>		18	18.1	
	Complete/Nearly Complete	9	10.5	
	Proximal	4	3.7	
	Distal	5	3.9	
<b>Bone</b>		630	614.2	
	Unmodified Bone, Bison	25	37.3	
	Unmodified Bone, Non-bison	9	18.0	
	Burned Bone, Bison	2	0.5	
	Burned Bone, Non-bison	594	558.4	from Feature III
<b>Shell</b>	Unmodified	2	0.4	
<b>Ferrous Oxide</b>		22	24.0	
<b>Unworked Stone</b>		1	6.2	
<b>Charcoal Sample</b>		1	NA	unsorted, from Sq. 0
<b>Miscellaneous</b>		4	0.1	

Table 9. Area 9 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Sherds</b>		22	38.9
<b>Bone</b>	Unmodified Bone, Non-bison	1	0.6

Note: No lithic artifacts were identified for Area 9. They may be mixed with general surface artifacts.

Table 10. Area 10 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Sherds</b>		3	4.2
<b>Flake Tools</b>		4	21.3
	Side scrapers	1	3.6
	End/side scrapers	1	2.7
	Knives	2	15.0
<b>Bifaces</b>	Late Stage	2	23.4
<b>Projectile Points</b>		12	9.4
	Complete/Nearly Complete	6	4.3
	Proximal	3	3.4
	Distal	3	1.7

Table 11. Area 11 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Sherds</b>		18	56.8
<b>Bifaces</b>	Early & Intermediate Stage	2	33.3
<b>Projectile Points</b>		3	3.1
	Complete/Nearly Complete	1	1.8
	Proximal	1	0.6
	Distal	1	0.7
<b>Bone</b>	Bone Tools, Bison	3	44.0

Table 12. Area 12 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Sherds</b>		11	41.7
<b>Cores, Tested cobbles</b>		1	64.8
<b>Flake Tools</b>		32	194.9
	Side scrapers	6	73.2
	End/side scrapers	17	104.0
	Knives	6	8.7
	Composite tools	3	9.0
<b>Bifaces</b>		42	378.5
	Early & Intermediate Stage	19	184.8
	Late Stage	23	193.7
<b>Drills</b>		1	1.4
<b>Projectile Points</b>		37	31.0
	Complete/Nearly Complete	11	10.7
	Proximal	15	15.0
	Distal	11	5.3
<b>Bone</b>		15	70.5
	Bone Tools, Non-bison	2	3.7
	Unmodified Bone, Non-bison	13	66.8

Table 13. Area 13 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Sherds</b>		10	30.2
<b>Flakes</b>		1	14.3
<b>Flake Tools</b>	End/side scrapers	3	29.9
<b>Bifaces</b>	Late Stage	4	36.1
<b>Drills</b>		1	5.4
<b>Projectile Points</b>		10	7.1
	Complete/Nearly Complete	4	4.4
	Distal	6	2.7
<b>Bone</b>		7	82.5
	Bone Tools, Bison	1	56.7
	Bone Tools, Non-bison	1	5.7
	Unmodified Bone, Non-bison	5	20.1
<b>Groundstone</b>		7	2215.5
	Metate	1	1496.0
	Abraders	6	719.5

Table 14. Area 14 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Flakes</b>		85	679.8
<b>Cores, Tested cobbles</b>		1	14.8
<b>Flake Tools</b>		38	392.1
	Side scrapers	9	101.5
	End/side scrapers	10	117.7
	Knives	9	70.7
	Gravers	1	3.2
	Notches	1	2.2
	Composite tools	8	96.8
<b>Bifaces</b>		11	226.3
	Early & Intermediate Stage	6	108.6
	Late Stage	5	117.7

Table 15. Area 15 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Sherds</b>		122	459.5
<b>Flakes</b>		18	21.0
<b>Flake Tools</b>		9	55.2
	Side scrapers	1	4.4
	End/side scrapers	7	40.0
	Knives	1	10.8
<b>Bifaces</b>		12	88.3
	Early & Intermediate Stage	8	74.0
	Late Stage	4	14.3
<b>Projectile Points</b>		17	18.0
	Complete/Nearly Complete	6	7.3
	Proximal	3	2.4
	Distal	8	8.3
<b>Bone</b>		28	321.1
	Bone Tools, Non-bison	7	29.3
	Unmodified Bone, Bison	6	193.0
	Unmodified Bone, Non-bison	13	97.8
	Burned Bone, Non-bison	2	1.0
<b>Ferrous Oxide</b>		7	39.9

Table 16. Area 16 Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		100	315.9	
<b>Flakes</b>		1	0.6	surface find
<b>Nonflake debris</b>		1	0.2	surface find
<b>Cores, Tested cobbles</b>		1	121.2	surface find
<b>Flake Tools</b>		14	45.4	
	End scrapers	1	2.9	
	Side scrapers	1	1.7	
	End/side scrapers	11	39.8	
	Knives	1	1.0	
<b>Bifaces</b>		10	26.8	
	Early & Intermediate Stage	8	17.5	
	Late Stage	2	9.3	one is a surface find
<b>Projectile Points</b>		12	5.1	
	Complete/Nearly Complete	3	2.5	
	Proximal	3	2.6	
	Distal	6	~2.8	one is a surface find
<b>Bone</b>		1	3.9	
	Unmodified Bone, Modern	8	15.2	cow bone
	Unmodified Bone, Non-bison	1	3.9	
<b>Ferrous Oxide</b>		1	0.9	

Table 17. General Surface Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>
<b>Flakes</b>		5	8.6
<b>Cores, Tested cobbles</b>		7	680.3
<b>Flake Tools</b>		27	
	Side scrapers	5	153.2
	End/side scrapers	18	189.8
	Notches	1	48.7
	Composite tools	3	69.1
<b>Bifaces</b>		29	524.9
	Early & Intermediate Stage	21	487.2
	Late Stage	8	37.7
<b>Projectile Points</b>		5	7.1
	Complete/Nearly Complete	1	2.1
	Proximal	2	3.9
	Distal	2	1.1
<b>Groundstone</b>		2	43.3
	Metate	1	6.5
	Abraders	1	36.8

Table 18. Provenience Uncertain Artifact Inventory.

<i>Artifact Class</i>	<i>Artifact Subclass</i>	<i>Count</i>	<i>Weight (g)</i>	<i>Comments</i>
<b>Sherds</b>		352	514.5	
<b>Flakes</b>		4	25.8	
<b>Flake Tools</b>		13	152.3	
	Side scrapers	2	38.6	
	End/side scrapers	8	48.2	
	Knives	2	40.8	
	Composite tools	1	24.7	
<b>Bifaces</b>		10	49.0	
	Early & Intermediate Stage	9	48.0	
	Late Stage	1	1.0	
<b>Projectile Points</b>		6	6.4	
	Proximal	4	3.9	
	Distal	2	2.5	
<b>Bone</b>		7	10.3	
	Unmodified Bone, Non-bison	4	6.2	
	Burned Bone, Non-bison	3	4.1	
<b>Groundstone</b>	Mano	1	223.0	(Bowman 1960:Plate16j)
<b>Shell</b>	Unmodified	1	0.9	
<b>Ferrous Oxide</b>		7	27.6	
<b>Unworked Stone</b>		3	11.1	
<b>Miscellaneous</b>		2	7.2	

## NOTES

<sup>1</sup> Bowman's other archeological work included a salvage excavation at the Herl Site, 14GL401, a Plains Archaic burial/Woodland site located in extreme northern Greeley County, Kansas. Bowman wrote two drafts of a report on 14GL401, neither report was published. Copies of both reports, the extant site collection and associated documentation, and a computerized artifact inventory are available at KUMA. These materials were donated to KUMA by Jerome Bussen in September 1995. Bowman also conducted an eastern Colorado survey, designed to investigate Woodland settlement patterns in the High Plains region between the Arkansas and Smoky Hill rivers. KUMA possesses Bowman's original survey field notes, which include precise locational information, comments on site setting, and brief descriptions of artifact types recovered from each site.

Additional field work conducted by the Ft. Wallace Dornic Club includes a survey of sites in Wallace County, Kansas. Sites were assigned a sequential number, completely surface collected, and mapped on a county road map. This collection is currently housed in the storage portion of the "Old Train Depot" at the Ft. Wallace Memorial Museum in Wallace, Kansas. Jerome Bussen used the Wallace survey data in an unpublished paper he wrote in an attempt to tie the location of known water resources in the county to the archeological resources. Copies of Bussen's paper and the Wallace County survey map are available from KUMA.

<sup>2</sup> Jerome Bussen loaned part of the Coal-Oil collection to Dr. Jack Hofman of the University of Kansas in July 1993. In May 1994 and again in August, the author went to the Ft. Wallace Memorial Museum for a total of 11 days to examine the lithic artifacts still on display. In October 1994 the rest of the collection was loaned to KUMA for further research, but the collection and the site documentation were not formally donated to KUMA until May of 1995. Bussen arranged for the site documentation to be removed from the abandoned house in Wallace where it was stored, and Bowman sent his 52-page Area 7 manuscript and profile at Bussen's request (Peter Bowman to Jerome Bussen, letter, 22 April 1995, Wallace).

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## Coal-Oil Canyon (14L4O1)<sup>1</sup>: Progress Report, Area 7

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*As a follow-up to the preliminary testing of the Coal-Oil Canyon site in Logan County, Kansas, reported in Bulletin Number 1 of the Kansas Anthropological Association (Bowman 1960), excavation of a test trench in Area 7 was undertaken by amateur archeologists in August 1957 and continued into 1961. This paper, completed January 23, 1961, contains detailed methodological, stratigraphic, and interpretive information about the Area 7 excavations.*

### METHODS

The excavation was planned as a test trench, running laterally across the talus slope that was designated during the preliminary testing as Area 7. Work was started on August 24, 1957, with Jerome Bussen, Richard Bussen, Kenneth Bohm, George Metcalf, and the author present. Originally a baseline 65 ft long was established, oriented with the terrain and with a view toward avoiding the large boulders on the surface. A series of 5-ft squares was laid out along the east side of this line.<sup>2</sup> As established, the baseline ran approximately north-south (ca. [redacted] degrees magnetic), so the squares were designated in accordance with cardinal directions and by numbers beginning at the arbitrarily established starting point at the north end of the baseline: 1, S1, S2, S3, etc.; thus, the number stake was at the northwest corner of each square. The east edge of the trench was designated the E1 line, with the stakes numbered E1, S1E1, S2E1, etc. Squares 0 and S12 were started first. Work in 0 indicated that the strata extended to such a depth that a wheelbarrow outlet would be needed through the slope to the north, so the lines were extended 35 ft to the north. S12 showed that the trench might be profitably extended to the south, so the trench ended up 110 ft long, from N7 through S14.

Squares were dug in an order that best facilitated the handling of backdirt. When 0 reached an impractical depth, work started on N7 and progressed southward until prohibitive conditions were encountered in S4, whereupon operations were resumed at the south end, working north. At times alternate squares were dug in order to permit digging in two squares simultaneously without losing a profile and also occasionally to allow an open wall to "cure out" before being profiled. Four squares in the E2 line (N1E2, E2, S1E2, and S2E2) were partially dug, and in two instances it was necessary to dig part of squares

adjoining the baseline trench in order to remove boulders hanging precariously in the walls. These squares were not completely profiled, but where provenience is certain, the cultural material from them is included in this report. In the early spring of 1960, rapid melting of an unusually heavy snowfall caused considerable slumping of the west wall of the trench, and several squares in the W1 line were dug to prevent further slumping. Some information from these squares is also used here.

All material was sifted through a ¼-in screen, and at first excavation was by arbitrary levels, with find spots recorded mainly by depth. It soon became apparent, however, that the strata in most squares sloped so sharply that an arbitrary level often cut across more than one layer and, therefore, depth measurements alone would not be enough to correlate find spots with strata. The location of larger objects found in place could be pinpointed within a square by lateral and vertical measurements and plotted on the profile of the nearest wall with reasonable accuracy, but smaller materials—chips, bone scraps, small artifacts, etc.—most often found on the screen presented a problem, and different methods were tried in dealing with them. What was needed was a means of determining and preserving the stratigraphic identity of all material that went to the screen. Obviously the best method would be to peel the layers in the reverse order in which they were deposited, screen the soil as it came out, and record any cultural material by its location within the layers. It was found, however, that the stratification in Area 7 is not often conducive to this method. A few soil layers are fairly distinct with relatively sharp contacts at top and bottom, but many are not, and some are very difficult to follow. They may gradually vary in either color or composition from square to square and pinch out laterally to be replaced by something entirely different. None of them are continuous throughout the entire length of the trench.

Vertically they may be separated by a sharp contact or merge imperceptibly. Peeling is further complicated by the presence of numerous rocks and boulders of all shapes and sizes and by the fact that layers sometimes slope downward several feet within the limits of a square, making for very cramped working quarters.

In practice, methods of excavation and control have of necessity varied from square to square and from layer to layer, according to the exigencies of the situation. The aim has been to find cultural objects in place and record their exact proveniences. Where strata could be recognized and followed with assurance, the peeling method was used. Where the ground was unfamiliar or uncertain, any method or combination of methods that could be devised to provide adequate control under the existing conditions was used. Often control was maintained by digging small sections of a square at a time and screening the dirt separately. The main consideration was that the digger should "know where he is" at all times and know where each wheelbarrow load of dirt came from. It might be from a half-inch layer over the entire floor or from a pocket a foot deep in the northwest corner, when the rest of the square is full of boulders.

Soil profiles were made of each 5-ft section between stakes, both north-south and east-west, using a "floating datum" method, devised for the purpose. Strata lines were traced out with a trowel and measured from a board resting on ground surface at the highest end of the section, leveled with a carpenter's level and supported at the other end by whatever object came handy. Measurements were made in feet and tenths and taken at 1-ft intervals unless closer intervals were required. Each section was drawn on a separate sheet of standard graph paper, the small squares representing 1/10 ft both vertically and horizontally. Later by matching the strata lines at the number stakes, these "floating wall" sections were combined into a master profile with an improvised datum line (Figures 1 and 2, Appendix). The cultural material recorded from each square was then plotted on this profile.

### THE STRATA

At first an attempt was made to designate the various strata by numbers more or less in order of position. As work progressed and new layers were found, this practice resulted in some confusion, so simple descriptive names were substituted for the numbers. This proved to be most convenient and the same terms will be used in this report.<sup>3</sup>

The two major geologic formations are described first, followed by the strata found in Area 7 from bottom to top.

### CLAY

The Clay is weathered Pierre shale, originally Late Cretaceous in age but markedly altered by weathering during Tertiary times. For convenience it is called Tertiary Clay, a term that would no doubt be slow to gain acceptance among geologists. It is greenish to bluish gray, pastel blue, or cream to straw colored with or without thin streaks and partings of bright red and/or yellow. Invariably damp until exposed, the Clay is moderately to extremely unctuous, soggy, and very difficult to dig. Because of its very high drying-shrinkage, it develops large cracks as it dries after being exposed and breaks up into small angular bits. It contains occasional large limey concretions with and without ocher, also (rarely) veins of soft pure red ocher up to ½ in thick, and also (more rarely) thin streaks and partings of "black ocher," a soft, waxy, very black material that in isolated bits superficially resembles charcoal.

### OGALLALA (MORTAR-BED)

The upper part of the Kimball member, Ogallala formation, is Late Pliocene in age. Occasional pebbles, much gravel, sand, and fine sand are in a matrix of silt, cemented by calcium carbonate and, the author suspects, by secondary silica locally in Area 7. The Ogallala varies in hardness from fairly tough to approximately the consistency of good concrete except for the lower 1 to 3 ft, which is poorly consolidated. This may have resulted from the calcium carbonate cement having been decomposed by carbonic acids, carried by ground water, moving along the top of the relatively impervious clay. Fresh surfaces are pinkish to pinkish tan; weathered surfaces are light gray, speckled with a blackish patina. It outcrops as a nearly continuous ledge in the site area. Maximum thickness of the present ledge is about 20 ft at the west edge of Area 7, where it has developed cracks from top to bottom, allowing huge blocks to settle more or less straight down for 2 to 5 ft.

### WEATHERED CLAY

This Tertiary Clay, contains small amounts of pinkish grit (silt, sand, and gravel) and calcium carbonate. The grit may occur as small pockets, narrow, mostly vertical streaks, or thinly scattered throughout; the calcium carbonate may occur as narrow veins or lumps, the latter often rather hard and containing bits of clay and gravel. The bedding planes (marked by streaks of red and yellow) of this material are parallel, usually more or less horizontal. The

author considers it to be Tertiary Clay that was cracked and somewhat broken up by exposure just before the Ogallala sediments came in, allowing grit and calcium carbonate to work into it as they were deposited. The Weathered Clay is Late Pliocene in time.

#### PROTO-OGALLALA

This material is roughly contemporaneous with the Weathered Clay and similar to it in content, but the Proto-Ogallala usually contains more pinkish grit and many more accumulations of calcium carbonate. Also, there is evidence of much disturbance. The clay may occur as angular bits, interspersed in pinkish grit, or as large relatively pure lumps with bedding planes at a sharp angle from the horizontal. This disturbance, which seems to be the result of wash, distinguishes the Proto-Ogallala from the Weathered Clay. The author considers it as resulting from clay particles and lumps, eroding from the bare pre-Ogallala slopes and mixing with the Ogallala sediments building up below. Some of the disturbance may have been caused much later by blocks of Ogallala skidding down the slope. The Proto-Ogallala and Weathered Clay are often difficult to distinguish and may be confused on the profiles, but as both are archeological bedrock, the confusion is not likely to have repercussions. The main value of these two beds is as a marker of the base of the Ogallala, from which the original thickness of the layer can be computed and an estimate made of the rate of disintegration.

#### ZONE 14 (CLAYEY TAN)

Also, a mixture of clay, grit, and calcium carbonate, Zone 14 is distinguished from the Tertiary deposits by the presence of Ogallala fragments. It seems to be the Recent equivalent of the Proto-Ogallala. As the Ogallala blocks slumped from the ledge, areas of Clay, Weathered Clay, and Proto-Ogallala were exposed to erosion, and material from these exposures mixed with the grit disintegrating from the ledge and fallen blocks. It is not a chronologically continuous layer, at least as it appears on the profiles. The lower part, where it rests directly on the Tertiary deposits, is probably all contemporaneous, but it seems to have interfingered back and forth with Zone 13 during later times.

It may consist mostly of pinkish tan grit with a few clay bits or mostly of clay with some grit. In the latter cases it can be fiendishly difficult to distinguish from the Weathered Clay. (The only dependable criterion is the presence of Ogallala cobbles, and these can be scarce.) Mistaken identity here can cause troubles.

For instance, in S8 where the Clay drops off abruptly from west to east, the author was digging Zone 13 in a space 1 to 2 ft wide and narrowing rapidly, trying to find bottom. Some clayey material was finally encountered, and with a sigh of relief it was pronounced Weathered Clay and profiled as such. Later in S7, where there was a bit more work room, the author found that what he had hit along the east line in S8 had been Zone 14 and that there was considerable Zone 13 below it yet. By then the east side of S8 had been filed in with rock, so it will have to be cleaned out again if the profile is to be completed.

#### ZONE 13 (ROCKY TAN)

Zone 13 consists largely of Ogallala fragments, ranging in size from fine up to boulders, but it has considerable silt, some sand and gravel, and occasional pebbles. It is distinctly gritty textured and highly calcareous and pinkish tan through tan to (rarely) light brownish in color. There are rare streaks and small pockets of nearly pure silt, which are brownish in color, but in general there is little or no humus apparent. This material is beyond question disintegrated Ogallala that has been only slightly weathered after deposition.

#### ZONE 12 (BROWN)

This layer is among the most disconcerting in Area 7. Although among the most readily recognizable, both during excavation and on the walls, its composition is variable and rather puzzling. Its position in the section is consistent, and the color, a medium brown when damp and grayish brown when dry, is unique in Area 7 and reasonably uniform. Where it occurs in the baseline trench, it appears to be appreciably siltier than Zone 13 and contains less small Ogallala material. It has as many or more fragments of fist size and larger. In places Zone 12 consists of a mass of small boulders with a little rocky silt in the cracks between. In the E2 squares, however, Zone 12 is much less rocky and looks like a relatively well weathered soil. Without the rocks and sand it is very similar in color and texture to the average topsoil, formed in the loess of the uplands of Wallace and Logan counties.

Zone 13 grades imperceptibly upward into Zone 12, gradually becoming less gritty, more silty, and darker in color. There is usually an intermediate zone between the two, averaging a foot or more in thickness. This zone was more or less readily recognizable during excavation and in the notes was referred to as the Transition. On the walls, however, it was no easier to

draw a line between the Transition and Zone 13 or the Transition and Zone 12 than between Zone 13 and Zone 12, so the author attempted to divide them by a line drawn as nearly as possible halfway between "good" Zone 13 and "good" Zone 12. Where the author has succeeded, the line is the approximate middle of the Transition.

In places the contact between Zone 12 and the overlying layers shows evidence of an erosional unconformity. There is probability that a nondepositional and erosional hiatus occurred at the end of Zone 12 time.

#### ZONE 11 (LOWER GRAY)

This seems to be a continuous layer where it occurs but is somewhat of a mixture. For the most part it is grayish tan in color with a fair amount of silt and considerable pea to walnut size Ogallala fragments. In the lower part in S5 and throughout S4, however, there are irregular thick streaks, pockets, and vague blotches of medium-dark gray loose silt with Ogallala fragments, mostly walnut to fist size. During excavation these darker, siltier patches and streaks seemed to interfinger with the lighter colored, rockier material, but they were not distinct enough on the walls to be drawn on the profiles. Beginning at about S5, Zone 11 became progressively lighter in color, especially in the upper part, and finally blended into Zone 8 to the south. The line between the two at the top was fairly distinct, being drawn to exclude all the darker material.

#### ZONE 10 (LOWER BLACK)

This very dark loose silt contains varying amounts of Ogallala fragments of varying size. In the baseline trench Zone 10 occurred almost entirely in a gully, eroded into Zone 12, originating in N2W1 and angling sharply across N2, N1, and 0. In the deepest part of this gully, Zone 10 consisted of a mass of Ogallala fragments, averaging about fist size, with the dark silt loosely filling the spaces between. In the upper and shallower parts of the gully, it contained more and smaller Ogallala fragments, and the silt was somewhat less dark and often a bit more compact. In the E2 squares the layer was more uniform, with the silt darker and loose and less Ogallala material. In several places, mostly in the upper part of the layer, a network of minute stringers and veins of calcium were found.

The dark silt, which characterizes Zone 10, is obviously very heavily laden with humus and is easily the blackest material so far found anywhere at the site. It is fully as dark as most of the dirty pulverized

charcoal fill found in the fireplaces and much darker than most of the topsoil in western Kansas with which the author is familiar. In fact, the only soil that approaches it in color and consistency is that which occurs in the bottoms of "lagoons" and other low spots with poor drainage, where eroded topsoil accumulates and vegetation is relatively heavy.

#### ZONE 9 (CLAYEY)

For convenience this layer will be described with the natural strata, although the evidence indicates it is probably a cultural feature. It consists mainly of bits of Tertiary Clay, mixed with various amounts of brownish silt and small Ogallala material. In general the lower half or so is appreciably more clayey and less dirty, and the contact at bottom is fairly sharp and even. In the upper part and also where it thins out laterally, it contains more dirt than clay, and the upper contact is less well defined and often highly uneven with minor humps and pockets that showed more plainly on the floor than on the walls. It also contains numerous flecks of charcoal, rarely more than ¼ inch in size, which seem to occur in inverse proportion to the amount of dirt—where there is more clay, there is also more charcoal.

The fact that this layer is man-deposited is indicated by several factors. It could not conceivably have been wind-laid, and the fact that it runs uphill away from any possible source of the Clay precludes deposition by water. Also, it seems unlikely that small bits of charcoal could have survived transportation by natural means in such a matrix in the amounts found, and the microlocal irregularity of the upper surface has an unnatural appearance. Also, the material occurs both in the bottom and on the bank of an apparent erosional disconformity (see vicinity of E1 on Figure 1), a condition that could not be expected to result from natural deposition. This latter feature indicates that Zone 10 underwent considerable erosion prior to Zone 9 time.

#### ZONE 8 (MIXED TAN)

North of the clay bank (S8) this is a relatively homogeneous layer, compact light grayish tan in color with some silt but characterized by large amounts of Ogallala fragments of pea size and smaller. It is similar in color and composition to the Transition between Zone 13 and Zone 12, except for having considerably less large Ogallala. South of the clay bank, however, where it was first encountered and named, it often shows more or less numerous small pockets and blotches of medium to dark gray or

brownish material. Some of these may be rat runs, but many definitely are not and appear to be the result of mixing by slope wash. Starting afresh on unfamiliar ground at the south end of the trench and digging alternate squares caused some difficulty in following the strata, but there seems little doubt that Zone 8 is a stratigraphically continuous layer.

#### ZONE 7 (FINE BROWN)

So far this material has been recognized only in a small patch in the vicinity of S4. In content it resembles Zone 6—a mixture of loose silt and mostly large Ogallala fragments—but differs markedly in color, being a light brown when damp. While it may be an oddball continuation of either Zone 8 or Zone 6, it seems appreciably different from either and may prove to be more widespread west of the baseline.

#### ZONE 6 (UPPER BLACK)

Zone 6 is also a mixture of very dark silt and Ogallala fragments. In its "classic" occurrences—in most of the E2 squares and in the baseline trench roughly between N2 and S1 (where it is thickest) and again south of the clay bank between S10 and S12—the silt is loose and nearly as black as the classic Zone 10, and the Ogallala is mostly fist size and larger. As seems to be the case with other strata in Area 7, as it thins out laterally, it changes gradually in color and content, becoming lighter in color and somewhat more compact and containing more and smaller Ogallala detritus.

#### ZONE 5 (UPPER GRAY)

This layer is the most extensive and among the most homogeneous and readily recognizable in Area 7. It contains considerable Ogallala detritus, mostly smaller than fist size. When dry, it is a medium-dark gray and extremely compact; when damp, it is a medium-dark brown and—to use a farmer's term—"mellow" or rather soft and easily worked. There is a good deal of silt in Zone 5, but in general it has a much grainier, more "mealy" texture than the loose floury stuff in Zones 6 and 10. Zone 5 is fairly easily distinguishable from the classic Zone 6, but in places the latter grades laterally into material resembling Zone 5, making the distinction rather difficult.

#### ZONE 4 (LOWER THIN BLACK)

This is lowest of the four thin layers that mantle the central part of Area 7. Zone 4 resembles Zone 5 in

composition and texture—silty but with considerable small Ogallala detritus and compact when dry—but resembles Zone 6 in color. In S3 there were small thin patches of black silt with little or no Ogallala detritus, surrounded by material essentially the same color but more rocky.

#### ZONE 3 (THIN GRAY)

Zone 3 is very similar to Zone 5. It differs in being a bit lighter in color on the average and in having possibly somewhat more small Ogallala material. It is very compact when dry and softer and medium brown when damp.

#### ZONE 2 (UPPER THIN BLACK)

Nearly identical with Zone 4, Zone 3 is possibly a shade lighter in color. Where only one of the Thin Blacks was present on a wall, it could be identified only by tracing it out to where both were present. The contact between Zones 2 and 3 is not as sharp as that between Zones 3 and 4.

#### ZONE 1 (BLOWDIRT)

Gray tan, loose, floury silt, containing little or no Ogallala detritus, makes up Zone 1. There is a very sharp contact at the bottom. The author has bounced a tractor over too many piles of this stuff to be uncertain of its identity. It is eolian silt—in High Plains parlance, "blowdirt." In squares where this layer was thickest, there was sometimes a thin line approximately through the middle, containing much fine Ogallala detritus and/or partly decayed vegetation.

### CULTURAL ANALYSIS

#### GENERAL

The provenience of cultural material within each square was recorded in various ways. Objects of importance (artifacts, identifiable bone, etc.) found in place were "pinpointed" by measuring their depths and distances east and north of the number stakes. Such objects found on the screen were recorded by the locus from which the screen load of dirt was taken, e.g., "Upper 2 inches of Upper Gray, west ½"; "7.1 to 7.6 deep, northwest ¼ (Rocky Tan-Transition?)." These objects were placed in numbered envelopes or boxes, and the locations were entered in a field notebook. After being washed, they received a permanent number, and the provenience and a brief description were recorded in a permanent catalogue.

Objects of less importance (chips, bone scraps, etc.), whether found in place or on the screen, were recorded in the field notes, either by position within a known stratum or, where this was uncertain, by a description of the locus relative to the number stake. Occasionally these were counted, but more often they were estimated.

In plotting the cultural material on the master profiles (Figures 1 and 2), symbols were used to identify the various objects.<sup>4</sup> Potsherds are indicated by Xs of a color denoting cultural affiliation, and the other objects are indicated by number. While all the materials are considered to be possible indicators of human occupation, in general the smaller the number, the better the indication. Artifacts, chips, flakes, and cores are, of course, positive indicators. Ocher requires two categories. Since the material is found naturally in the Clay, any ocher from a zone containing clay is suspect as a cultural indicator; otherwise, it is a reliable indicator. Bone scraps and identifiable bone, like isolated bits of charcoal, are only possible indicators. Though bits of charcoal may or may not be the results of natural fires, the author seriously doubts if there has ever been enough vegetation in Area 7 to support a fire of sufficient heat and duration to thoroughly char a piece of bone or to blacken a piece of Ogallala throughout. Concentrations of charcoal bits were often found, occasionally in a matrix of dirty pulverized charcoal, but more often not. A few of these were pretty definitely disturbed remnants of fireplaces, but more were indefinite, so they are all plotted merely as concentrations of charcoal. Obviously, in such cases the symbols are highly relative numerically, since the exigencies of small-scale mapping preclude accuracy. In a few spots this also applies more or less to chips and bone scraps, but in general the symbols are quantitatively accurate. Objects within each square were plotted on the profile of the wall nearest to the spot where they were found. In the case of material from the middle of a square, accuracy of lateral position was sacrificed where necessary in favor of accuracy of position relative to the strata.

There were instances, fortunately not common, where material recorded in the field notes could not be located on the profiles. These instances occurred in two situations: in the early stages of the project, when material was recorded by depth only, and in the squares where the thin upper layers were not peeled. These layers are so thin that only by peeling or pinpointing can objects be assigned to them safely. In these instances where stratigraphic provenience was doubtful, the material was not plotted. No artifacts were involved, but in the squares that show no or very

little cultural material in the thin upper layers, "this ain't necessarily so."

Objects considered migratory are circled on the profiles. These fall into two general classes: those found in or near rat runs or in loose dirt next to large boulders and those obviously grossly out of context, even when the cause is not readily apparent. Admittedly, this latter practice can get to be arbitrary, reflecting "the analyst's preconceptions," but fortunately little material is involved.

Rodent activity was observed in all strata (they apparently dug into everything except the pure clay and the Ogallala blocks) and was much more frequent on the end slopes. In some squares it seemed that rat runs were more numerous where cultural material was heaviest, particularly in the upper third of Zone 6. The fill in the runs was almost invariably loose, and where it seemed necessary or feasible, the runs were cleaned by hand. Cultural material was very rarely found in the loose run fill cleaned in this manner, but objects from the vicinity of the runs were viewed with suspicion, particularly if found on the screen.

Migration through boulder cracks is often a thornier problem. The space between closely adjoining large blocks is usually filled with loose, more or less dark soil that occasionally contains cultural material, including artifacts obviously out of place. A few of the more isolated blocks show a band of loose off-color dirt a few inches wide around one or more sides, indicating shifting. Even open cracks have been found around boulders, though rarely. Many of the blocks appear not to have moved, being still tightly surrounded by their matrix. In fact, considering the near ideal conditions conducive to lubricated creep, there seems to have been remarkably little shifting of the blocks. Probably this is due largely to the huge blocks at the base of the slope, which seem to be firmly imbedded and serve as a retaining wall. Some minor shifting has occurred, and since it can sometimes be difficult to detect, it is good procedure to dig carefully around the boulders and be alert to the possibility of migrating material.

#### ZONE 14 (CLAYEY TAN)

Other than a few small nondescript bone scraps, the only evidence of human occupation in Zone 14 were two small burned pieces of Ogallala. Both were thoroughly blackened throughout and sooty on the outside. One was found in place and pinpointed in the upper few inches of the layer (N2 west wall). The other from one of the interfinger layers (S5 north wall) was found on the screen. Provenience within the layer was considered reasonably certain in both cases.

### ZONE 13 (ROCKY TAN)

Although very thinly scattered, possible indicators of occupation were appreciably more numerous in Zone 13: about two dozen each of bone scraps and burned rocks, two chips, two burned bones, one piece of red ocher, four flecks of charcoal, and one artifact. The latter, from S8, is a small thin flake of nearly transparent chalcedony, showing fine retouching on one edge. In several instances bone, burned rocks, and charcoal bits occurred at or within an inch of the Zone 14-Zone 13 contact. The material appeared to be somewhat more plentiful in the north half of the trench, but in general distribution was sparse and random, both vertically and laterally. Six fragments of bone from the layer are more or less identifiable: one humerus of bison, one femur and one humerus of a small rodent, one ulna of jackrabbit, and one neural spine from a smallish mammal—probably from dog to deer in size. The last piece is mammal but otherwise stumped the author.

Much the same conditions prevailed in the Transition into Zone 12 except for somewhat more numerous bits of charcoal in a few squares and the accumulation of material in the northeast quarter of S4. Here in a space roughly 2 ft across (S4E1 west wall and S4 north wall), bounded on the south and partly on the east and north by large boulders and scattered throughout a "depth" of about 2 ft, were found over a dozen well burned pieces of Ogallala, ranging from pea size up to about 3 in across; one fleck of charcoal; one burned bone; three bone scraps, one complete first phalanx, one fragmentary metapodial, and one femur head, all of bison. While these objects were obviously not "in place," there is no reason to believe they were far out of stratigraphic context. Migration from above through boulder cracks could be definitely discounted, since the material in which they occurred was identical to the Transition elsewhere in the trench and was tightly packed around the boulders in place at the time of deposition. Many of the objects were located up to a foot from the boulders, and all had obviously been deposited along with the rocky soil in which they were imbedded.

The author considers the burned rocks, bone, and charcoal as the remnants of a fire, probably of fair size and duration, built on a Transition surface and later disturbed, perhaps obliterated, by wash. Since this disturbance could have taken place in a relatively short time and since the objects obviously postdate the boulders imbedded in Zone 13 and predate those imbedded in Zone 12, they are considered acceptable as evidence of an occupation during Transition time. One chip was found in the Transition, but no artifacts

were present. In addition to the identifiable bone previously mentioned, the following came from the Transition: one second phalanx of bison, one short section of long bone shaft from a mammal approximately the size of a large deer, one pelvis and one femur of rabbit, apparently identical to our modern blacktail jacks. The latter might possibly be assignable to the lower part of Zone 12.

### ZONE 12 (BROWN)

Bone scraps, burned rocks, and an occasional chip were present in Zone 12, but in general cultural material seemed even sparser than below. Pieces of red ocher were somewhat more numerous than in the lower layers. The impression one gets, both from digging and from plotting the finds, is that evidence of occupation occurs almost entirely in the upper and lower thirds of the layer. With cultural material so scanty and erosion so prevalent, this occupational hiatus in the middle may very well be more apparent than real, but it seems to be reinforced by somewhat more substantial evidence. In the E2 squares the remnants of two fireplaces were found, probably in the top few inches of Zone 12. One was merely an irregular patch of very dark soil, roughly 15 in across and 8-10 in deep, containing a few bits of charcoal and several small pieces of Ogallala, stained by the dark material but not burned. There was no cultural material in association, but a few burned rocks were found 2 to 3 ft away in the same zone. The other feature was a bit more definite, though badly disturbed by rodent burrows and somewhat by erosion. The burned earth and pulverized charcoal averaged 18 to 20 inches in diameter, but no accurate estimate of depth could be made. There was some slight indication of reddening in the adjacent soil, the first the author has encountered in a fireplace—not only at Coal-Oil but anywhere in western Kansas. Chips and burned bone but no artifacts were associated with this feature.

In the extreme southeast corner of S3, next to the large boulder in the south and east walls, a patch of soil was found containing three bits of charcoal and numerous flecks, veins, and partings of a peculiar bluish white material. A thin coating of this bluish white stuff also occurred on the adjacent boulder at the same level as the soil patch, and a layer about  $\frac{3}{4}$  in thick flaked off the boulder as dirt was peeled away from it at this spot. The author has noticed veins of this bluish white stuff on thoroughly burned pieces of Ogallala and has an unsubstantiated feeling that it represents a chemical reaction, resulting from heat on calcium carbonate or some other mineral in the rock.

The patch of soil was little or no darker than the surrounding material, but two burned rocks were found in the vicinity and may indicate a fireplace obliterated by erosion. If this feature is the remains of a fireplace, it indicates an occupation in the lowest part of Zone 12, since it postdates the large boulder but was covered by the smaller one, lying at only a slightly higher level (S3E1 west wall). A similar feature was found about 7 ft due north at the same level: an area approximately 1 ft in diameter, containing numerous veins and minute flecks of the bluish white material and several tiny bits of charcoal. None of the Ogallala cobbles in the vicinity showed signs of blackening, but several within the feature showed a thin bluish white coating. If this bluish white material is to be accepted as an indication of heat, some explanation must be found as to why some Ogallala fragments are found thoroughly blackened but without the bluish white, some with a bluish white coating but no blackening, and some blackened and with bluish white veining. Perhaps the answer lies in the "firing atmosphere"—a more intense heat with less smoke may produce the bluish white effect and less heat and more smoke produce the blackened pieces—but this is pure speculation.

Only one artifact is assignable to Zone 12. It came from 0 square and was found, as luck and carelessness would have it, in backdirt—the only few shovelfuls of dirt from the trench not screened. A reasonably accurate depth measurement could be made, but on the profiles this depth includes all of Zone 12, all of Zone 10, and the lower part of Zone 9. However, the author was on the shovel at the time and is certain that all the unscreened material was light in color and contained no clay. The author feels sure that the artifact came from Zone 12, almost certainly from the upper half and most probably the upper third as it appears on the profile. It was plotted as a square on the 0 west wall profile in the location considered most likely from the evidence available (Figure 2).

The artifact is made of light gray chalcedony with pinkish banding and speckling and suggests a stemmed and barbed scraper. Both barbs and a small corner of the stem are missing. The stem is 9 mm long and in width expands from 12 mm at the blade to an estimated 20 mm at the base. Total length is 38 mm. Maximum width, undoubtedly across the barbs at or below the stem-blade juncture, can be only roughly estimated but was at least 38 mm and possibly as much as 44 mm, with 40 mm being the best guess. Maximum thickness in the vicinity of the stem-blade juncture is about 6 mm. In outline the blade is gently rounded to nearly circular with a very blunt rounded end. Both sides show shallow flake scars, but one side is a bit flatter than the other, giving it a very slight and irregular

planoconvex appearance in longitudinal cross section. A single flake scar occupies nearly a third of the "flat" side, and this seems to be an original surface of the parent flake. A broad relatively deep scar on the "convex" side resulted in a wide notch on the edge to one side of the otherwise blunt end. Both sides show fine retouching around the edge of the blade, but the fact that most of this was done on the "convex" side adds somewhat to the planoconvex impression. This is particularly true of the blunt end, where little or no retouching was done on the "flat" side. Here the edge has been worked from the "convex" side to an abrupt face, 4 mm thick with the other side somewhat cupped, very reminiscent of a planoconvex end scraper. Elsewhere the edges are relatively thin and sharp. The base has been thinned by longitudinal flaking to a thin sharp edge and definitely was not ground. It is very slightly concave. In its present form this object would have served poorly as a projectile tip but admirably for scraping on the end and cutting on one side. Whether or not it was reworked from a broken point is conjectural. An appreciable amount of minute irregular fracturing and checking on the blunt end indicates considerable use in its present form.

A buckshot Upper Republican sherd was found in upper Zone 12. From the lower third one metatarsal of bison and one humerus of small rodent were recovered. From the upper third came one first phalanx of bison and one femur of cottontail rabbit. There was no material from the middle third.

#### ZONE 11 (LOWER GRAY)

Evidence of occupation was very sparse here. A few lumps of red ocher, a speck of charcoal, a burned rock, and a bone scrap, all confined to the bottom few inches, complete the inventory. A femur from a small rodent was the only identifiable bone.

#### ZONE 10 (LOWER BLACK)

There definitely was an occupation in this layer, characterized by two phenomena: (1) cultural material invariably occurred only in the top 2 to 4 in; (2) when the layer pinched out, the evidence of occupation abruptly ended with it. This last was especially notable in N2W1, where Zone 10 occurred only as fill in a deep narrow gully cut into Zone 12. Evidence of occupation, though sparse, was found in the upper few inches of the black material, but the corresponding levels of Zone 12 were completely sterile. The occupation layer was also notable for the occurrence of numerous bits of charcoal, mostly smaller than a match head but rarely (in N1) up to ½ inch in size.

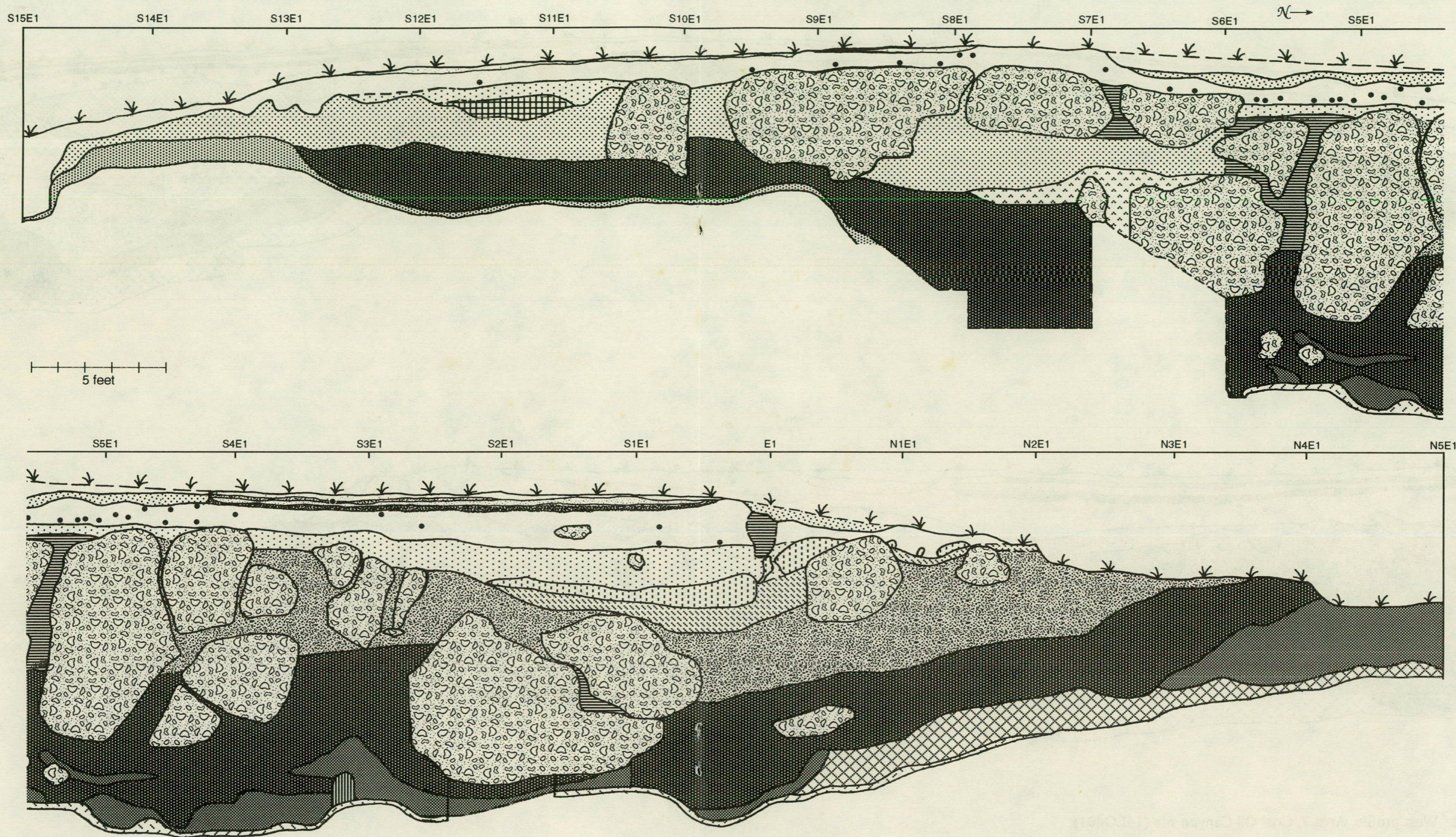


Figure 1. East profile, Area 7, Coal Oil Canyon site (14LO401).

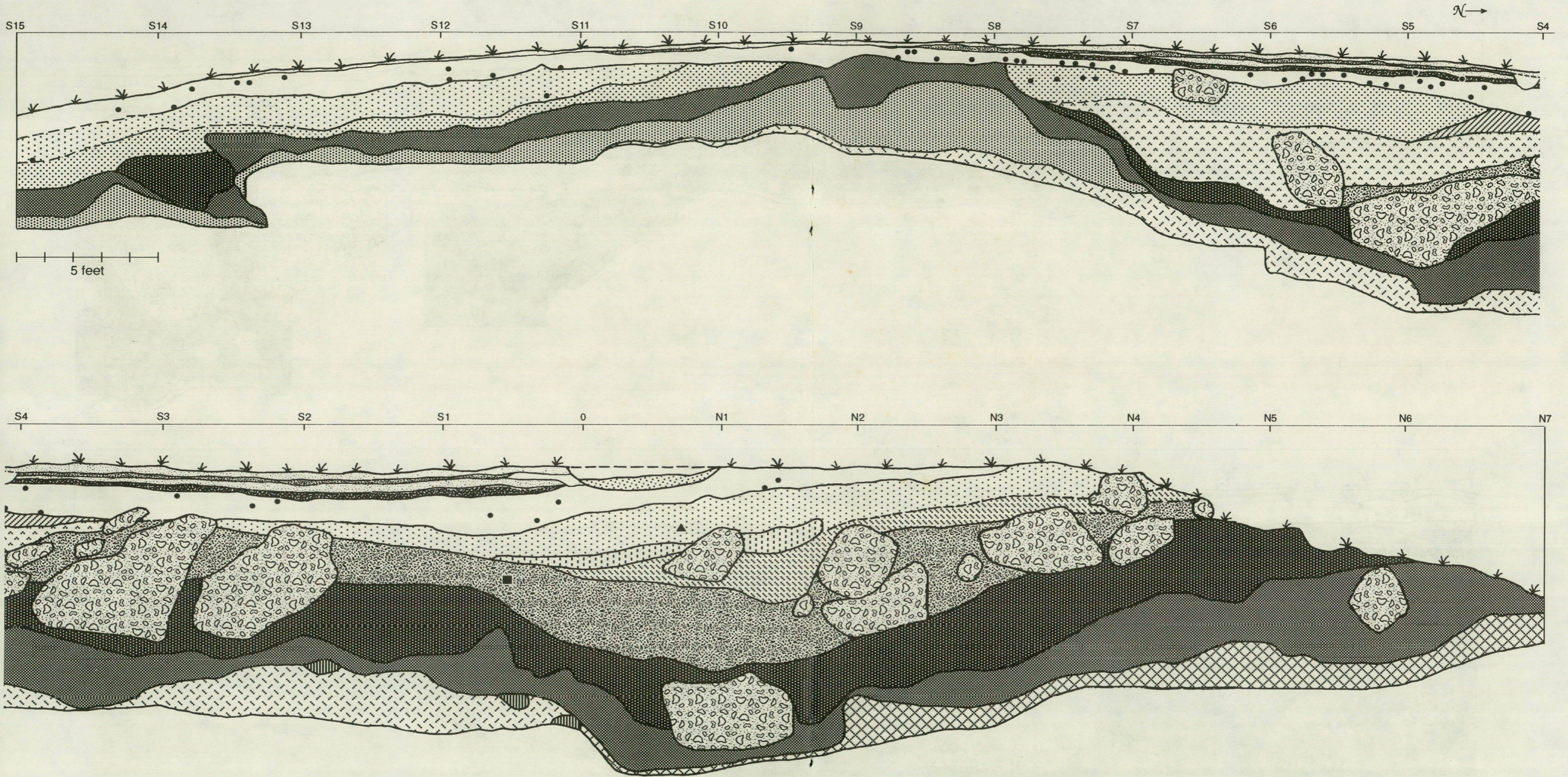


Figure 2. West profile, Area 7, Coal Oil Canyon site (14LO401).

In the baseline trench cultural material was fairly common but not abundant. Most numerous were pieces of red ocher, occurring mainly in N1. No bone scraps and few chips were found. The only artifact was a basalt scraper, measuring 6.5 by 3.2 cm, rather thick and crude, showing flaking all around on one side.

Evidence was much more plentiful in the E2 squares, however. Chips and bone scraps were numerous, burned bone was common, and the charcoal bits were more plentiful. Here, when slight elevations in the layer showed up in Zone 9 as the floors were taken down, the very black charcoal-speckled soil might be mistaken for a fireplace. In the E2 line five artifacts—one of chipped stone, three of bone, and one of antler—were found definitely in the upper 2 to 4 in of Zone 10. The former is a complete projectile point, basically triangular with slightly convex edges and very slightly convex base, measuring 40 mm long and 25 mm wide. The corner angles are neatly bisected by straight-sided notches exactly 4 mm deep and 2 mm wide. Maximum thickness, just above the base, is about 4 mm. It is made of flawless light brown chalcedony. The symmetry of the point approaches perfection, and in general the flaking is exceptional, marred only by one somewhat larger and deeper flake scar near the middle of one side. Scars across the midsection of the other side are very shallow, usually longer than wide and more often oblique than transverse. Flaking along the margins is neatly done, mostly at right angles to the edges, both of which are straight and sharp. The basal edge was thinned by longitudinal flaking and is nearly as sharp as the lateral edges. Though it is difficult to be certain on such a thin edge, the base appears to have been ground. It has a very smooth feel compared to the slightly jagged feel of the lateral edges. It is worth mentioning here that a point very similar in outline and workmanship and with a definitely ground basal edge was found in a blowout in the sand hills of Yuma County, Colorado, several years ago by Jimmy Allaman of Wallace. Though this point is much larger (64 by 29 mm), typological similarity suggests that both points represent the same complex.

The bone artifacts are two tubular beads and an awl. The beads are 31 and 27 mm long, respectively, and average about 2 mm in diameter. The shafts are thin walled and lack cancellous material but are triangular to squarish in cross section, and they are tentatively identified as small rodent rather than bird. They show considerable polish, and the ends appear to have been scored all around and snapped. The awl, a very well made tool, measures 6.2 cm long. It is 4 mm thick and for about half the length is 8 mm wide; from here it tapers gradually to a remarkably sharp point. It

appears to have been made from a long bone of a medium size mammal, possibly a metapodial of deer or antelope. The posterior half of one side shows what seems to be a short arc of the original central cavity, and the other side is gently convex. Grinding striations are much in evidence along the edges and around the point. The butt was ground, rounding to angular. It shows little or no polish, and the condition of the point indicates that it has not been used since sharpening. No other identifiable bone came from Zone 10 in the baseline trench. In N1E2 there was a canine tooth from a carnivore, probably about the size of a large house cat. N2W1 produced a first phalanx of deer or antelope.

The piece of antler is a short section probably from near the tip, broken at both ends. It is about 20 mm long, and it tapers in diameter from 8 mm at one end to 5 mm at the other. It shows considerable polish and possible evidence of fire hardening but is otherwise unmodified.

#### ZONE 9 (CLAYEY)

No artifacts and only an occasional chip and bone scrap were found in Zone 9. As previously mentioned, small bits of charcoal were numerous, particularly where the layer contained more clay and less dirt. A concentration of pieces of red ocher was found in N1, scattered throughout the layer. These were small, rarely over an inch long and ranging down to pea size. Fifty-six were saved, and several small ones were clobbered and discarded.

In the bottom of 0 and S1, it was necessary to dig out some Clay along the west side to level off a wheelbarrow track. This work uncovered a lenticular zone in the Clay that was unusually rich in ferric oxide. For the most part this material occurred as an amorphous permeant, coloring the Clay a dull reddish rust, but in the lower part of the zone there was a vein up to ½-in thick of relatively pure soft ocher. This vein was not extensive and had been mostly disturbed, probably by wash in Proto-Ogallala time, leaving numerous pieces of ocher scattered through the clay in the immediate vicinity. Eighty-eight of these were saved for a comparative sample. A few are small and shapeless, but most are flat and more or less rectangular, ranging from ¼ to ½ in thick and rarely more than 2 in long or 1 in wide. Color ranges from yellow through red orange and red to dull red brown. Purity varies somewhat, but there are many pieces of good pure red stuff. When found, all of it was damp and soft enough to be easily scratched with a fingernail, but it probably picked up a point or two on Mohs'

scale since drying. These pieces are indistinguishable from most of those found in Area 7 occupation zones.

For reasons previously set forth, it appears certain that the Zone 9 layer was not naturally deposited. It seems best explained as aboriginal backdirt from diggings in the Tertiary Clay. In view of the quantity of ocher found in Zone 9 in N1, it is probable that a vein of ocher similar to that in the bottom of 0 was present in a clay bank to the west of N1 and that it was extensively mined by one, and possibly less extensively by more, of the groups occupying Area 7. The numerous bits of charcoal present in Zone 9 are also explainable by this hypothesis. When covered, the Clay is invariably damp, very soggy, and extremely difficult to dig. A sharp shovel will bounce off it, and a pick merely punches holes. A primitive miner equipped with tools of stone or bone would find following a vein of ocher covered by any amount of damp clay overburden a formidable task indeed. It shrinks on drying, however, developing wide vertical cracks and breaking along the numerous horizontal bedding planes. In this condition large blocks of it can be pried out quite easily, sometimes with the fingers. Even under very dry atmospheric conditions, it takes several weeks for a damp clay bank to dry to a depth of a few inches. It is possible that slow fires built against a clay bank would hasten the drying without unduly baking the clay, thereby permitting more ocher to be mined in a shorter time with less effort. Some of the overburden was apparently hauled away and spread out to the east, and it would not be surprising if charcoal from such fires got mixed with this material.

#### ZONE 8 (MIXED TAN)

In the upper few inches of this layer in S6 and S7, there were a number of chips and bone scraps and seven small Upper Republican sherds (six of them from the "blue-cored pot," described in the Zone 5 section below). The contact between Zone 5 and Zone 8 is blurred here with considerable mixing, and the line, drawn to exclude all light colored material from Zone 5, may well be too high. Some of the sherds, though, seemed definitely to be in Zone 8, and this is the only known instance in Area 7 in which an occupation has "crossed" a soil line (Figure 2). A possible explanation for this will be discussed in the final section.

Three other blue-cored sherds and a small barbed arrowpoint were also found in S7, a foot or more into Zone 8, but these were obviously boulder-crack migrants. In the east part of S6, a small micaceous sherd was found about 2 ft into Zone 8. This was in loose dirt when first seen, within a few inches of a rat

run and near the base of a boulder with loose dirt around its sides. It was obviously migratory, since identical micaceous sherds were found during the preliminary testing only in the top few inches dug (the "previous excavation" between S4E1 and S7E1).

Elsewhere in Zone 8 cultural material was mostly sparse and random, but along the east line of S8 and S7 good evidence of occupation was found. In the northeast corner of S8, there was a small patch of dark soil containing several flecks of charcoal and a burned rock. This material continued into S8E1, and since the location in S8 does not appear favorable for a fireplace (less than a foot below the overhang of an Ogallala block), it seems likely that the material was washed from a fireplace somewhat to the east. Two more burned rocks, three bone scraps, a large basalt flake, the distal end of a deer humerus, and a complete metapodial of deer or antelope came from essentially the same level immediately to the north along the east wall of S7 and were undoubtedly associated with this feature. The humerus and metapodial were the only identifiable bone from Zone 8.

The three possible artifacts from Zone 8 all came from the south end of the trench, where slope wash and rodent activity were prevalent. All are nondiagnostic, and two are arguable as artifacts. One, in the shape of a large point tip, is a flake of the local chert-opal of such poor grade and so flawed as to be nearly unchippable, and the flaking on it is problematical. A flat slab of tough limestone, probably from a concretion in the Pierre shale, measuring roughly 6.5 by 5.5 cm and from 1 to 1.5 cm thick, shows a V-shaped notch 3 cm long and up to 3 mm deep, beginning at one edge. This notch seems to have been chipped out. Although the stone is rather smooth textured, the chipped surface of the notch is rough and might have served as a point-sharpening abrader. The one definite artifact is a drill, fairly well chipped from light colored chalcedony. It measures 45 mm long and 9 mm at widest and is basically lanceolate with slightly bulging sides, tapering to a fairly sharp point. Two broad shallow notches near the base have resulted in slight rounded shoulders and a short expanding stem. The base, originally about 8 mm wide, is markedly concave with "ears" at the corners, one of which is missing. It is diamond shaped in transverse cross section with pronounced, somewhat sinuous median ridges and measures about 5 mm thick.

#### ZONE 7 (FINE BROWN)

In S3 faint evidence of a fire in the form of bluish white veining in the soil and a thin concentration of charcoal bits is assignable to this layer. The small

patch of it that occurs in the trench was otherwise sterile.

#### ZONE 6 (UPPER BLACK)

Cultural material in Zone 6 ranged from sparse to abundant. It was definitely more plentiful where the layer was thicker, looser, and darker—the typical stuff. Where it thinned out and became more mixed and compact, evidence of occupation was much scarcer. As with Zone 10, evidence of occupation during Zone 6 time appeared to be strictly confined within the limits of the layer; where it pinched out, the adjoining layer was either sterile or contained material diagnostic of another occupation. Sometimes where material was sparse and diagnostic objects absent, it was obviously impossible to be certain of this, but as yet nothing definitely diagnostic of a Zone 6 occupation has been found outside that layer, except where obviously migratory. This highly peculiar situation, which is not easily explained and one might hope does not prevail throughout Area 7, will be discussed in the final section.

There is some evidence that the cultural material is more abundant in the upper and lower thirds of the layer and a good possibility that two separate periods of occupation are represented, particularly where the layer is thickest. Therefore, the few artifacts from Zone 6 have been divided into groups, according to position within the layer, and the material will be described by zones.

#### Zone 6c (Lower Upper Black)

Roughly between N2 and S2 cultural material was abundant in the foot or so immediately above Zone 9, the lower part of Zone 6. The material mostly appeared to be scattered at random; occasional concentrations were found, but in general there were no sharply defined occupation surface and no cultural features. Chips and bone scraps were numerous, several pieces of burned bone were found, and just above Zone 9 in N1 there were a number of pieces of red ocher. Six artifacts of stone and one of shell are assignable to Zone 6c.

One small chopper or pecking stone, crudely flaked with dull sinuous edges, shows some battering. One of two scrapers, measuring 74 by 32 mm and thickly planoconvex, is crudely fashioned. The other scraper, 38 by 25 mm, is flaked on both sides with some retouching on most edges and is fairly well made.

One projectile point may have been broken in an early stage of manufacture. This specimen shows only a small amount of flaking but has the shape of a

stemmed and shouldered point. It is broken just above the shoulders. It is too fragmentary and unfinished to give much idea of the intended shape beyond the fact that it would have been shouldered, not barbed, probably with an expanding stem, extending about 10 mm from the blade. The base is 16 mm wide, and it would have been no more than 22 mm across the shoulders. Total length is a pure guess, but it could hardly have been less than 35 mm and probably no more than 50 mm. One large point of basalt is broken across 4 cm from the tip, where it measures 35 mm wide and 4 mm thick. For a poor grade of basalt, this is very well chipped and symmetrical; edges are sharp and only slightly sinuous, rounding to a fairly sharp point. Considering the quality of the raw material, the workmanship on this fragment is reminiscent of that on the point from Zone 10.

One piece of a boatstone or atlatl weight was found in place in N1 and is shown as a triangle on the N1 west wall profile (Figure 2). Another piece was found loose in wall cavings from N1W1. The two pieces do not fit but are beyond doubt diagonally opposed quarters of the same object. The material is a smooth textured aphanitic stone, light gray in color with mottlings of darker gray. It fizzes strongly in cold dilute hydrochloric acid but is at least 4 in hardness. The author would guess that it is somewhere on the calcareous side of a dolomite series. The surfaces show faint irregular markings, reminiscent of termite activity on wood surface but much fainter. These marks occur on both broken and unbroken surfaces of both pieces and are due to post-breakage factors. The transverse cross section is about three-quarters of a circle, bulging slightly and flat across the bottom. The artifact measures 17 mm at the thickest part. In longitudinal cross section it most probably was elongate-elliptical with moderately sharp but rounded off points at both ends. The upper (transversely rounding) surface slopes more sharply at the ends than does the lower, so that the points occur slightly below the longitudinal midline. In outline it appears to have been narrowly elliptical with moderately sharp pointed ends, probably with good bilateral symmetry. Grinding striations on the flat side (bottom) indicate the probable method of shaping. The rounded surfaces are well polished and show a slight luster not apparent on the broken surfaces. Since the pieces do not fit, outline dimensions can only be estimated, and the author is not too confident of accuracy, particularly in length. Though both points are present, both pieces are broken lengthwise as well as across (at least two pieces of the object are missing), and the precise relationship of the two is a pure guess. There is one possible clue to length. On the largest piece there are several

discontinuous shallow "saw marks" on the rounded side, running transversely and essentially parallel, located from 50 to 54 mm from the pointed end. On the side at the point of maximum bulge, there is a broad very shallow indentation. This begins at about 53 mm from the point and, though it is terminated by the break at 58 mm, seems to center out at 55 mm. On the other piece the opposite side extends 51 mm from the pointed end but shows no sign of grooving. Assuming that the object was fastened to an atlatl and that the shallow indentation was a lashing groove, two possibilities come to mind: (1) a single lashing at or near the center; (2) two or more lashings, with the outer ones spaced at about equal distances from the ends. In the latter case an estimate of length on present evidence would be impossible, since the middle interval or intervals would be totally unguessable, except for the possibility that two lashings were spaced at equal intervals, in which case the total length might be in the neighborhood of 16.5 cm. In the case of a single lashing at center, the length should be close to 11 cm. In estimating width the author feels a bit more confident. Assuming bilateral symmetry in the larger piece, its width would be 24 mm, and there is nothing about the smaller one to indicate that this is out of line. Assuming a length of 11 cm and projecting the outline of the larger quarter around the whole perimeter gives a width of 26 mm.

The Type 11 atlatl weight, described by Butler and Osborne (1959:217, Figure 1g-j), is similar to this object in outline but is notched close to the ends. Dimensions of the Type 11 weights average 10.6 cm in length, 2.1 cm in width, and 2.2 cm in height. The author is inclined to think that the Area 7 weight had a single center groove and was in the neighborhood of 11 cm long but is not prepared to discount the possibility that it was longer than this by half.

One shell pendant, 7 by 4.1 cm, was made from the right valve of a fresh water mussel. It is beautifully fashioned; bilateral symmetry is good, and lateral curvature is uniform along the long axis. The edges and part of the hinge thickening on the interior are neatly ground. It is elongate-oval in outline with rounded ends. A very neat hole, 3 mm in diameter, centered 8 mm from the narrower, thinner end, is almost perfectly circular and very slightly conical from both sides. Since the thicker hinge area is at the bottom, the pendant is well balanced and "hangs" nicely.

A bone artifact, assignable to either Zone 10 or Zone 6, may as well be described here. It was found in N1E2 at the edge of the slope, where wash and slumping had obliterated all soil lines. By depth, however, its position was below Zone 9 as last

recognized, and since Zone 6 crops out at the surface here, it seems probable that the artifact belongs to one of the Black zones. It was badly clobbered by a maladroit shovelhand,<sup>5</sup> but all the pieces were saved, and it has been accurately restored. It measures 9.7 cm long, 1.1 cm wide, and about 2 mm thick. It is straight sided for most of its length, then tapers very gradually to a blunt rounded end. This end has been ground to a thin edge, shows considerable use polish, and is somewhat ragged, resembling a well chewed clarinet reed. Prior to discovery the butt end had been broken across a small hole, drilled at such a flat angle that it begins near the middle on one side and comes out near the edge on the other. The hole is markedly conical from one side and is extremely difficult to measure but seems to be about 1 or 2 mm across. A shallow, V-bottomed groove 4 mm wide begins at the hole on the conical side, narrows progressively, and ends at about the middle of the tool. On the other side a shallow round-bottomed groove, 2 mm wide, begins about 8 mm from the butt end and ends at about midpoint. It appears to have been ground from a section of fairly thick mammal bone, but identification is impossible. The present hole seems too small and eccentric to have served as a needle eye. Perhaps the tool was used in weaving.

It seems probable that most of the cultural material found in Zone 6 south of the clay bank belongs to the upper occupation zone. However, a few bits of charcoal and burned bone, concentrated at the bottom of the layer in S11, may be assignable to the Zone 6c. A blue-cored sherd, found in this vicinity, is undoubtedly migratory.

There were three identifiable bones from the lower zone: one complete metatarsal of bison, one complete astragalus of deer or antelope that was badly rodent-gnawed, and the distal half of an unfused metapodial of deer or antelope.

#### Zone 6b (Middle Upper Black)

In some squares where Zone 6 was thicker, the middle third was nearly or completely sterile, and in general cultural material was less prevalent than above or below. The only artifact assignable to the middle third is a crude chopper, possibly a core, of the local chert-opal material. There was no identifiable bone except for a vertebra fragment, probably of bison.

#### Zone 6a (Upper Upper Black)

In the upper part of Zone 6, cultural material in the form of chips, bone scraps (a few burned), artifacts, etc. was also scattered at random and seemed

somewhat less plentiful than in the lower part. In the northwest quarter of S10, disturbed remnants of a fireplace were found. The dirty pulverized charcoal fill, containing a few bits of pure charcoal, was irregular in outline and badly churned up. About 20 burned pieces of Ogallala were scattered through the fill. Rat runs occurred at the same level, but none could be traced into the fireplace or its immediate vicinity. Also, the disturbance did not appear to be the work of rodents. Small isolated pockets of clean dirt occurred in the black fill, and around the edges pockets of black material were found completely surrounded by clean dirt.<sup>6</sup> The feature was located at the point where Zone 6 pinches out against Zone 8. Tiny bits of red ocher were numerous around the feature, and two small matching pieces of a sandstone grinding slab were found in the fill. These were 17 to 24 mm thick and showed considerable wear on one face but are too small to give any idea of the size or shape of the original slab. They were stained black but showed no sign of burning.

Six other artifacts were found in the upper part of Zone 6. One sherd, about 25 mm long and 11 mm thick, is heavily tempered with sand, fine to granule in size, according to the Wentworth scale. The interior is poorly evened but well smoothed and is very light gray in color. The exterior shows broad, shallow, closely spaced cord impressions and is tan, shading to medium gray. It is unmistakably Woodland.

Of two projectile points, one of basalt has the tip and stem missing but definitely was stemmed and barbed. The blade is very well chipped, triangular in outline with straight sides. Projection of the sides to a sharp point gives an estimated blade length of 32 mm. It is 25 mm wide at stem-blade juncture. The other point of gray quartzite is also triangular but with somewhat curving sides. It is very well chipped on both sides. One corner has been "notched," producing a 3-mm-wide shoulder and one side of a slightly expanding stem 5 mm long. The opposite corner was finely retouched all around and shows no attempt at notching. It is 27 mm long and 16 mm wide across the "shoulder." If this is a finished point, it would have to be described as half stemmed, a type with which the author is unfamiliar. If unfinished, it indicates that the method of manufacture was to retouch the edges all around before chipping out the stem.

Two end scrapers were present. One of brown chalcedony is broken but appears to be of the common planoconvex variety. The working edge is well chipped but only moderately sloping and markedly

rounded in outline. Except for the edge there is little or no flaking on the convex surface. The other of a red banded flint is also planoconvex but somewhat oddball. It is irregular in outline, and the bulb of percussion is located at one side, making the unworked "plane" surface markedly convex. The top surface shows overall flaking and fine chipping around the working edge, but the latter is much thinner than the base. It is 26 mm long, and the rounded working edge is 22 mm wide. One side scraper, 8.6 cm long and 4.2 cm wide, made of a coarse-textured brown stone, was shaped mainly by primary flaking, which produced a scraping edge nearly all around. It is nearly symmetrical in outline but has a crude appearance.

Five identifiable bones, all of bison, were found in Zone 6a: one metatarsal and two tarsals, probably from the same individual; one ulna fragment; and one caudal vertebra.

#### Zone 6 (Upper Black), General

A Woodland sherd, identical to the one described above, was found in the ratted area near the fireplace in S10 and was considered slightly migratory from Zone 6. In the preliminary testing in Area 7, a number of Woodland sherds, both sand and calcite tempered, were found in dark loose soil (Bowman 1960:26-29). Where the trenches cross sectioned these test holes, it was apparent that they did not reach below the middle of Zone 6, and it seems probable that the Woodland sherds found were in the upper half of that layer. In the E2 trench a number of small stemmed and shouldered or barbed points were found in Zone 6, and although they are not as yet closely assignable, there is a good probability that they were in the upper zone. All in all, it seems safe to conclude that the cultural material in Zone 6a indicates Plains Woodland occupation. Whether or not the two kinds of pottery tempering represent two separate groups is problematical, and from present evidence the author gravely doubts if the stratigraphy in Area 7 is anywhere tight enough to positively settle the question.

The artifact inventories provide no positive means of distinguishing between cultural groups in the upper and lower zones. Too small a percentage of Area 7 has been dug to put much faith in negative evidence, such as the lack of pottery in the lower zone. However, on geomorphological grounds to be discussed later, the author believes there is a possibility that the material in the lower part was separated from the Woodland occupation above by an appreciable time interval and, therefore, may belong to the preceramic period.

## ZONE 5 (UPPER GRAY)

Cultural material ranged from sparse to abundant throughout Zone 5, and in general this seems to have been the most intensive occupation of Area 7. Most of the material appeared to be scattered at random, both vertically and horizontally. Vertically thin concentrations were found occasionally, but these never extended more than a few feet in any direction and occurred at various depths within the layer. There was no consistent concentration at any depth. In some squares the lower part of the layer might be the richest; in others, nearly sterile. In general this held true throughout the layer. A few scattered bits of charcoal and burned rocks were found but nothing that could be regarded as the remains of a fireplace.

Artifacts were relatively numerous. The possibility of stratigraphy within the layer was tested by grouping the artifacts according to location in the upper, middle, and lower thirds. No typological variation was discernible, however, and quantitative differences were inconsistent, so all the material will be described together.

### Pottery

Five rim sherds and 114 body sherds were found in Zone 5, all of which can be held in one hand. The largest sherd is not quite 2 in long, few are more than 1 in, and most are under ½ in. A few that were found in place undoubtedly would have gone through the screen.

Three of the rim sherds are merely bits of lip. They are gray in color and apparently untempered. Two of these show deep diagonal impressions on the lip, and all seem to belong to Vessel 3 (Bowman 1960:31-32), though none fit that assembly. One very small rim sherd is undoubtedly from a miniature vessel with a straight or possibly slightly incurving rim. The sand temper is very sparse. Interior and exterior color is reddish buff; color of the core, dark gray. Faint smoothed-over cord impressions are visible on the exterior. The largest rim sherd, nearly 2 in long, is collared with notched lower border. It was probably about 1 in high with an undecorated collar ½ in wide. The lip is markedly flattened but narrow and undecorated. Color is medium gray throughout. It is moderately tempered with sand.

All the body sherds are tempered with sand, and all that are large enough show cord impressions on the exterior. Thickness ranges from 3 to 6 mm; color, from nearly black through gray to reddish buff and (rarely) red orange. None show characteristics outside the range of Upper Republican ceramic technique. At

least seven vessels, and possibly twice that many, are represented.

Forty-one of the body sherds are definitely from the same vessel—the blue-cored pot. They are characterized by a paper-thin pinkish buff coloring on both interior and exterior and a pastel blue core. Paste texture is very fine, smooth, compact, and flaky. Tempering is rather sparse, consisting of Ogallala bits and rounded sand, the former slightly more numerous. Particle size is mostly 1 to 3 mm with rare pieces up to 4 mm. Bits of red ocher are fairly common in the paste. Sherd thickness is 5 to 7 mm. The interior surface is rather poorly smoothed, while the exterior is cord roughened. The marks are mostly shallow and faint, apparently rather broad and carelessly applied with no clear pattern. A few sherds show evidence of popping and occasionally the pinkish buff coloring extends across broken edges, indicating cracks during firing. The author feels certain this pot was made of local Tertiary Clay and would guess that it was a firing failure. Blue-cored sherds were more numerous in the lower third of Zone 5 but were found from the very top to the very bottom of the layer and also as migrants into lower layers (Figures 1 and 2).

### Work in Stone and Bone

Sixteen broken arrowpoints were recovered. All are triangular with straight to slightly curving sides. Eight are merely tips. Of the others five show side notches, two with base notches as well; the other three are unnotched. Workmanship varies from poor to excellent.

One object may be the base of a drill. Five specimens are classifiable as knives. All are fragmentary and hence non-diagnostic.

Five small planoconvex end scrapers were found. Three are broken, but all can be grouped according to Lehmer's (1954:57-59) classification: two are Group 1, one is Group 3, one is Group 4, and one is Group 5. Of five side scrapers, only one is complete. It is well shaped, flaked on both sides and around all edges where necessary, subrectangular in outline, 6.5 cm long, 4 cm wide, and about 1 cm thick.

Five objects seem to have been used for chopping. All are small and basically subrectangular to ovoid in outline with coarsely flaked, more or less sinuous edges. The four that are more irregularly shaped range in size from 4.6 by 3.7 cm to 5.9 by 4.4 cm. The other specimen shows more careful workmanship and has been shaped by overall flaking to a neat "axe shape." The poll expands slightly in width from 2.4 to 2.8 cm in a distance of about 3 cm. From here expansion is more marked to a maximum of 5.2 cm across the

rounded bit. It is 6.3 cm long and 2.7 cm at maximum thickness. It may well have been hafted. The bit shows considerable battering. It is made of a brown somewhat banded flint. Beginning at the poll end and extending nearly to the bit, there is a thin band of yellowish material that is chalk-like in appearance. It is fairly hard but highly calcareous. The author has found flint similar to this in detritus weathered from the Smoky Hill chalk member of the Niobrara formation but has never found it definitely in the chalk.

Two pieces of sandstone were collected. One light colored and broken piece shows wear on one face but is too fragmentary to tell if it was from a mano or a metate. The other is a relatively large section of a grinding slab. The sandstone is dark brown, hard, and rather fine grained. The outer edge seems to have been shaped mostly by pecking but possibly also by breaking an already thin slab. There is evidence of considerable grinding on one side. It is about 2.5 cm thick at the outer margin and 1.4 cm thick at what appears to have been the bottom of the basin.

Two pieces of bone show possible signs of human modification. One is merely a scrap of thin mammal bone, scored and snapped off at one end. The other is part of the diastema section of a mandible, probably bison. It is about 8.5 cm long, and the proximal end is jaggedly broken. The distal end was broken off at a slight angle and shows some smoothing, possibly from wear.

One small object has mystified the author. It is 24 mm long and rectangular in outline with the ends neatly squared off, apparently by cutting and/or grinding since they show minute parallel striations. In cross section it was originally round to somewhat squarish with a diameter of 7 mm, but an arc of the circumference is missing, leaving a 5-mm-wide rough flat area on one side. The author is uncertain of the identity of the material. It is soft and nearly pure white. On the smooth rounded sides it is almost identical to chalk; on the squared ends a core is apparent in the center, 3 to 4 mm in diameter, concentric with the circumference. The flat side shows a sort of cellular structure, somewhat reminiscent of cancellous bone, but this does not show on the ends. Under a 10X lens the rough flat side shows minute, shallow, round-bottomed marks, discontinuous but running essentially parallel with the sides. These are less than .5 mm wide and appear to have been intentionally scratched into the soft chalky material. It is not calcareous, which definitely rules out the best guess, based on appearance, that it might be from one of the stringers or "rootlets" of calcium carbonate that are numerous in some beds of the Ogallala formation. It might be thoroughly calcined bone, but the author's experiments in calcining bone

have resulted in much harder material. The author has to give up on this one, both as to identity of material and purpose of modification.

In S8 a small isolated pocket of Zone 5, which shows only on the north wall of that square, contained numerous chips and bone scraps, a small piece of sandstone probably from a grinding slab, and the following identifiable bone, all bison: one radius, one humerus, one olecranon process of an ulna, one tibia, one caudal vertebra, and four podials. There were no diagnostic artifacts. Whether this pocket was excavated or eroded into Zone 8 is uncertain. It was not recognized in S7, but drainage to the north here was steep, and gullies around fallen blocks are likely to have formed. In any case it seems to have been used as a dump during Zone 5 time.

In addition to the above, seven identifiable bones came from Zone 5. They were one ungual phalanx of a small dog or coyote and the following elements of bison: one first phalanx, one vertebra centrum, one ulna, one radius, and two podials.

#### ZONES 2 (UPPER THIN BLACK), 3 (THIN GRAY), AND 4 (UPPER THIN BLACK)

Zones 4, 3, and 2 occur in less than half of the squares in the baseline trench and were only belatedly recognized where they do occur. These layers were meticulously peeled only in S3 and S4, and since this is the only way in which their contents can be determined with confidence, information on them is scarce and subject to confirmation. Cultural material was generally sparse, but there was some evidence of concentration at or near the Zone 4-Zone 3 contact and possibly another near the Zone 3-Zone 2 line. The only artifacts found were a small worked flake from the upper third of Zone 4 and the base of an arrowpoint, possibly side notched, probably from somewhere in Zone 3. Also, a few buckshot sherds, most probably Upper Republican, were found in place in these layers, at least one sherd in each. These sherds were so very small as to be easily migratory through any of several agencies and are considered to be out of stratigraphic context. However, if these sherds were transported by sheet wash from a source higher up the slope, there is a possibility that all or part of the cultural material in Zones 2, 3, and 4 was secondarily deposited.

During the preliminary testing a number of mica-tempered sherds were found in the top few inches in an area east of S4 through S7. It seems probably that they were in one of the Zone 2, 3, or 4 layers, but until some are found in place, exact provenience is unknown. The only identifiable bone from these three layers is a second phalanx of bison from Zone 3.

## ZONE 1 (BLOWDIRT)

Zone 1 was invariably found to be sterile of aboriginal cultural material. At the bottom of the layer in S9, there were two .22 caliber short cartridge cases, rimfire, marked "H" on the cap. In S8 the brass from a shotgun shell was found in the bottom of Zone 1, lying directly on the surface of Zone 2. This is marked "REM-UMC No. 12 NITRO CLUB" on the cap and "REMINGTON-UMC" around the case.

Several whole or fragmentary bovid molars, found at the bottom of the layer, are assignable to modern cattle. Most of the left half of a deer mandible was found just below surface in S8. This is small and has but four of the six cheek teeth erupted, so it is undoubtedly from a young individual.

## CLIMATIC ANALYSIS

The possible sources of soil material in Area 7 are limited by its rather unique topographic location. There can be little doubt that most of the material making up the stratification is disintegrated Ogallala, and there seems to be but two other possible sources: deposition by wind and deposition by sheet wash from above the ledge. The drainage system above the ledge west of Area 7, however, is such that at present little material is being washed over, and it seems unlikely that conditions were greatly different in the Recent past. While this source cannot be completely discounted, its contribution was most probably relatively negligible in Area 7 as compared with the other two. Since both eolian deposition and weathering of the Ogallala are undoubtedly controlled by climatic conditions, the possibility that climate might be reflected in the soil zones should be worth looking into.

Considerations that must be taken into account in attacking the problem of climate include the origins of the material, the rate of deposition of the taluvium<sup>7</sup> (including the possibility of erosional and/or nondepositional hiatus, either differential or coincidental), the kind of climate conducive to the deposition and formation of a distinctive soil zone, and the possibilities of mixing of materials. The clues offered by the various soils include color, composition, compactness, and stratigraphic position. Since all the possible parent materials are light in color—the Ogallala is pinkish tan, and the upland Wisconsinan loesses are buff tan—it is safe to conclude that the dark coloring of some of the zones is due to the humus of decayed vegetation. Composition would depend upon three factors: the lithology of the parent material, the degree of weathering during and after deposition, and

the amount of mixing with previously deposited materials. Compactness is dependent on too many variables (e.g., moisture content at the time of excavation) and too difficult to define adequately to be consistently of value, but it has been the author's experience that wind-laid silts are in general less compact than water-laid silts. Also, compactness at Area 7 seems to depend somewhat on the presence of amorphous calcium carbonate and thus may be an indication of origin.

In the problem of origin, the difficulties lie in distinguishing between products of eolian and taluvial deposition. Since silt is the only available material transportable by wind, the problem in theory would seem to be a simple one: if a zone contains material too large to have been carried by wind, it was not eolian in origin. In practice, however, it is not at all that simple. A brief study of the baseline and E1 profiles will show that the geomorphology of Area 7 is exceedingly complex with differential deposition, erosion and redeposition, and a strong probability of mixed materials in some zones. With some more or less consistent variations in size and quantity, fragments of Ogallala occur in every zone except the Tertiary beds; nonetheless some of them appear to contain material of eolian origin. All available data must be considered in dealing with the problem.

Fortunately there are two layers in Area 7 that can be used for comparison, since their origin is obvious. Zone 1 is unquestionably eolian, and Zone 13 is unquestionably disintegrated Ogallala with comparatively little weathering for the most part. In comparing the characteristics of these layers with those of other layers, some apparent inconsistencies arise. The silts of Zones 6 and 10 are often as loose and floury as Zone 1, but their unusually high humus content is hard to equate with a drouth. Zone 5 contains considerable humus, but here the texture is much more compact and grainy with more small Ogallala detritus. Clearly, the readily apparent characteristics of a soil zone are not always enough to determine its origin. The solution would seem to be in an accurate method of determining whether a majority of the silt in a given layer came from the Ogallala ledge or from the Wisconsinan loesses, i.e., whether it is eolian or taluvial.

Two such methods have occurred to the author: a particle size analysis and a petrographic or chemical analysis of the silts. The Wisconsinan loesses that mantle most of the Central Plains (the Bignell and Peoria silt members and the Brady soil of the Sanborn formation) are remarkably uniform in chemical content throughout northern Kansas (Frye et al. 1949:55, Table 1). The possibility of a significant and diagnostic

variation in content between these silts and that in the Ogallala ledge above Area 7 should be worth checking into. Since weathering has an effect on the chemical content, the Brady soil, formed in the top of the Peoria silt, would probably be best for comparison. In four samples from three northwest Kansas counties (Logan, Cheyenne, and Norton), the silica content of the Brady soil varied only 1 percent (from 69.62 to 70.62); alumina, 2.12 percent (11.91 to 14.03); iron, 1.17 percent (3.07 to 4.24); magnesia, .39 percent (1.28 to 1.67); and potash, .43 percent (2.88 to 3.31) (Frye et al. 1949: Table 1). If an analysis of the silt in the local Ogallala showed appreciable differences with the Brady soil, an analysis of the soil zones in Area 7 might provide clues as to their origin.

A particle size analysis would be based on the fact that the local Ogallala, while composed largely of silt, also contains considerable amounts of sand, gravel, and pebbles. Any soil developed in the Ogallala taluvium would of necessity contain the clastic material of the parent bed, as well as fragments not completely disintegrated. Water sorting, which might separate the clastic material into various size groups, is not to be expected in talus material, and in fact little or no evidence of sorting has been found in Area 7.

To test the feasibility and possible value of a particle size analysis, the author ran a homespun

experiment on some of the Area 7 soils. Nine samples were collected from eight of the most common layers. These were taken from the walls of the trench in places considered most representative of the "classic" occurrence of each layer. Two samples were taken of Zone 11: Zone 11a is the darkest material that could be found in the layer on the walls, and Zone 11b is the lightest. The samples were screened through "dockage pans," designed to test grain for percentage of foreign material, borrowed from the local grain elevator. Each sample was first run through a pan with round holes, measuring approximately 4 mm in diameter. Then 500 grams of this material went through screens approximately 2 mm and 1 mm in diameter, which divided each sample into 3 lots: 2 to 4 mm, 1 to 2 mm, and less than 1 mm. Each lot was then weighed on a scale, graduated in percentages of a 500-gram sample. The author then attempted to sort out the original clastic particles (the "quartz" sand and gravel) from the bits of Ogallala. This could be done easily and accurately (if somewhat tediously) by hand in the case of the 2 to 4 mm lots but proved to be impossible with the finer material. The data from this experiment are tabulated in Table 1. Temporarily disregarding the Wentworth scale for convenience, the author has called 2 to 4 mm "Coarse," 1 to 2 mm "Medium," and less than 1 mm "Fine."

Table 1. Particle Size Analysis.

	% Coarse			% Medium	% Fine
	All	Gravel	Ogallala		
Zone 1	2.5	0.4	2.1	4.5	93.0
Zone 5	6.5	2.0	4.5	12.5	81.0
Zone 6	6.0	1.0	5.0	13.0	81.0
Zone 8	16.0	1.4	14.6	20.0	64.0
Zone 10	9.0	1.0	8.0	12.0	79.0
Zone 11a	15.0	3.0	12.0	19.0	66.0
Zone 11b	16.5	1.6	14.9	21.5	62.0
Zone 12	11.0	2.0	9.0	14.5	74.5
Zone 13	26.0	3.5	22.5	24.0	50.0

There is a pattern of sorts apparent in these figures. As expected, Zone 1 runs highest in Fine material and lowest in Coarse and Medium. Equally anticipated, Zone 13 is lowest in Fine and highest in

Coarse and Medium. Also, the lighter colored, more rocky layers—Zones 8, 11a, 11b, and 12—are fairly well grouped, being generally low in Fine and high in Coarse and Medium. Obviously they are more closely

related to Zone 13 than to Zone 1. The raw data, however, fail to explain the differences in texture and gross composition so obvious in the darker layers—Zones 5, 6, and 10. All contain large amounts of humus, but Zone 5 is compact and mealy in texture with many fragments of Ogallala from walnut to pea size, while Zones 6 and 10 contain fewer and larger pieces of Ogallala, and the silt is often very loose and floury.

While dark humus layers can generally be accepted as representing periods of increased rainfall and relatively heavy vegetation, in contexts such as Area 7 it is not impossible that they represent exactly the opposite conditions. Dark humus topsoils have developed in the Wisconsin loesses that mantle the Central Plains, and with the protective vegetation destroyed temporarily by drouth, this topsoil is subject to wind erosion and is apt to be redeposited in topographically favorable localities. Depending on local circumstances, rates of accumulation can be extremely variable. The author has seen 100 acres of relatively level clean farmland in Wallace County completely blanketed by 2 to 3 in of windblown silt in less than 4 hours.

The three darker layers show similarity in all three particle size lots; all are relatively high in Fine material and relatively low in Coarse and Medium. These characteristics might be expected to result from either of two situations: (1) a prolonged weathering of taluvium reduced most of the material to its constituent clastic particles of silt, sand, and gravel; (2) wind-laid silt was mixed by slope wash with previously deposited taluvium. The key to the problem would seem to lie in the relative amounts of sand and gravel. Eolian silt might conceivably pick up small amounts of sand by mixing, but in the absence of water sorting, a soil developed in taluvium could hardly lose its native materials. It occurred to the author that the ratio between the percentage of Fine material and the percentage of Coarse Gravel found in the particle size analysis might serve as an "index of origin," applicable to all the layers in Area 7. These ratios are listed in Table 2.

There are two significant breaks in this column. By far the greatest one is, of course, that which separates the almost completely unmixed Zone 1 from the rest. Perhaps the most significant is the one between Zone 10 and Zone 8. Excepting Zone 1, this break is more than twice as great as that between any other two layers and would seem to be the dividing line between soils developed in taluvium and those composed mostly of eolian silt. In general this division is compatible with all observed characteristics of the eight soils.

Table 2. Indices of Origin  
(% of Fine/% of Coarse Gravel).

Zone 1	232.5
Zone 6	81.0
Zone 10	79.0
Zone 8	45.7
Zone 5	40.5
Zone 11b	38.8
Zone 12	37.2
Zone 11a	22.0
Zone 13	14.3

While these indices seem to serve as indicators of origin, they are not necessarily acceptable as showing a precise mathematical relationship between the layers. For instance, the characteristics of Zone 8 indicate a much closer relationship to Zone 13 than do those of Zone 5. This suggests that clues to the rate of weathering of the taluvial soils might be found in the data from the particle size analysis. It seems reasonable to assume that a slow rate of deposition and prolonged exposure to weathering would result in a relatively more complete breakdown of the Ogallala fragments, while a faster rate of deposition with less weathering of the partly disintegrated material would produce a coarser textured, more rocky soil. Therefore, the ratio between the percentage of Coarse Ogallala particles and the percentage of Fine material in a taluvial layer might be taken as an "index of weathering" (Table 3).

Table 3. Indices of Weathering  
(% of Fine/% of Coarse Ogallala).

Zone 5	18.0
Zone 8	4.4
Zone 11a	5.5
Zone 11b	4.2
Zone 12	8.3
Zone 13	2.2

The reassuring thing about this list is that it reflects almost precisely the differences in color among the layers. Zone 5, which has by far the highest weathering index, also is much the darkest; Zone 13, which has the lowest index, has the least humus, and the others are in almost exact order. Since relatively slow deposition, in addition to being conducive to weathering, would allow more time for vegetation to color the soil, these indices would seem to be reliable indicators of the rate of deposition. The one discrepancy is that Zone 11 is darker than Zone 8 in general, but the difference between Zone 11b and Zone 8 indices is slight.

There is a temptation here to take the indices as precise mathematical relationships between the soils and to assume, for example, that Zone 13 was laid down exactly 8.2 times as fast as Zone 5. While this may well have been the case, the indices are not acceptable as proof for several reasons. For one, since there is some variation in composition in the Ogallala ledge and the possibility, however slight, of mechanical sorting during deposition cannot be discounted, no one sample of any layer can be considered perfectly representative. While the author has not checked this, he feels certain that some variation between samples is to be expected. Also, the indices do not take into consideration such factors as proximity of source. Mathematical verities, however, are neither expected or necessary in dealing with such problems. What is needed are workable tools, and these indices may be such tools. The author feels certain Zone 13 was laid down at a much faster rate than Zone 5 and that the other taluvial layers lie somewhere in between.

The origin and rate of deposition of the soils have little value as climatic indicators unless the effects of climatic variations on their parent beds can be determined. There can be little doubt that Recent wind-laid beds of any thickness in the High Plains region, regardless of color, represent drouths of sufficient intensity and duration to destroy the protective vegetation on the loess-mantled interfluves, so the problem in Area 7 centers on the Ogallala ledge. A study of the situation at 14LO401 suggests that destruction of the ledge has been accomplished primarily by slumping, in which pieces, from small size up to huge blocks, fall from the ledge and accumulate on the talus slopes, and secondarily by disintegration, in which the fallen blocks and pieces, as well as the face of the ledge, are weathered into progressively smaller particles.

Probably both mechanical disintegration and chemical decomposition have played a part in breaking down the Ogallala. The latter has most likely contributed to slumping by softening the lower few feet

of the bed in the manner previously described. Frost-wedging must be considered as a factor in slumping, as well as such imponderables as earth tremors, lightning, etc. Although acids associated with humus, aided by the mechanical action of roots, would hasten the soil-building process after it had started, it seems unlikely that chemical action has played a major role in the initial disintegration of the face of the ledge or the fallen blocks. In an experiment 4 teaspoons of undiluted hydrochloric acid decomposed no more than two-thirds of a fragment of Ogallala approximately 1 in<sup>3</sup> in volume, so it would seem that the amount of acids necessary to decompose several thousand cubic yards of Ogallala is somewhat out of proportion to that conceivably available in the time span indicated. Also, all the soil zones in Area 7, particularly the lighter colored, coarser textured ones, are highly calcareous, which would not be expected if any amount of chemical decomposition had occurred.

It seems certain that, in one manner or another, water has played the most important part in the reduction of the ledge. In order to determine the susceptibility of the Ogallala to frost-wedging, the author performed another experiment. Although rather poorly controlled, it produced interesting results. From among the hundreds littering the site area, an approximately round fragment about 4 inches in diameter was selected. It was first soaked in hot water continuously for three weeks to thoroughly saturate it. This had no noticeable effect on it. It was then kept in the freezer for several days at a temperature of about -15 degrees Fahrenheit, then taken out and soaked in hot water again for several hours. After three such operations less than ½ teaspoon of material had scaled off the surface, and the cobble seemed as solid as ever. So the author changed tactics. The fragment was placed in a waxed cardboard container (milk carton), covered with water, and kept in the freezer until the water was solidly frozen. This time after thawing there was a marked difference: the bottom of the carton was covered with small particles, and the entire surface of the cobble was covered with fine cracks and material on the verge of falling away. After half a dozen of these treatments, it was half disintegrated.

The experiment was continued for nearly a year. The freezing intervals varied considerably in length. Usually the cobble was in the freezer for three days to a week, but during the summer the author forgot about it, and it stayed in for three months. However, after the first 8 or 10 freezings (which did not include the three-month session), there seemed to be little further action, and after 16 or 18 freezings the experiment was concluded, and the material was dried for examination. There were 6 fragments ranging from 20 to 30 mm in

size; the rest of the particles were mostly under 5 mm, and the majority were under 3 mm. Two of the large pieces could be easily crumbled with the fingers, one resisted such efforts, and the other three were intermediate in hardness. In color the material was indistinguishable from Zone 13, and with one rather unexpected difference, composition also seemed identical to Zone 13. There were a few pebbles and considerable sand and gravel but practically no silt at all. However, by lightly abrading the particles in the palm of the hand, they were easily reduced to sandy silt. Apparently frost-wedging had dislodged the larger clastic particles from the silt matrix but had not disintegrated the matrix itself. The author would say that two conclusions are permissible on the basis of this experiment: (1) some of the Ogallala at least is highly susceptible to frost-wedging under ideal circumstances; (2) while frost-wedging will initiate disintegration, abrasion and/or other kinds of weathering are probably needed to complete it.

There seems to be considerable variation in resistance to disintegration among the fallen boulders. While this may be due in part to the accidents of microlocal environment, it seems in most cases to reflect variation in the innate toughness of the Ogallala. During excavation of the trench, it was necessary to break up dozens of boulders into pieces small enough to be wheeled out. This was monotonous drudgery but also an opportunity to study the composition of the rock. There was considerable difference in toughness. For instance the boulder in the east walls of S8 and S9 was badly broken in the upper half and relatively easy to remove, while the one in the east wall of S5 was extremely tough, requiring several days and much effort to break it up. Both boulders seem to have been in place for roughly the same length of time and exposed to similar environmental conditions. Although it is impossible to be certain through macroscopic inspection, the author suspects that in places the calcium carbonate cement of the Ogallala has been reinforced, or replaced, by a tougher substance, possibly silica.

A few other observations are pertinent to the problem of the effect of climate on the Ogallala. Using a "direct-historic approach," the author can personally testify that there has been no slumping whatsoever at the site in the last five years. A fairly large mass on the face of the ledge above Area 7 is badly cracked and has perennially seemed on the verge of falling but has not done so. There is no sign anywhere of recent slumping. The faces of the ledge and the surfaces of most of the fallen blocks are more or less heavily patinated. While the length of time and conditions required for this patination are unknown, it does not

seem to be a rapid process. Rock surfaces freshly exposed five years ago do not show the faintest sign of it as yet. Also, there is evidence in Areas 1, 2, and 3 that the most recently fallen blocks were in place an appreciable length of time before the Upper Republican occupations (Bowman 1960:12-13). All in all, it seems reasonably safe to conclude that there has been comparatively little slumping and no inordinate amount of disintegration at the site in the past several centuries.

The data presently available seem adequate to more or less roughly correlate the Area 7 soils with climatic variations. Zone 13 with little humus and the lowest weathering index obviously was the most rapidly deposited and must represent one extreme of the climatic conditions reflected in the zones. It seems safe to assume that climate during Zone 13 time was grossly different from that of the past few centuries. The freezing experiment indicates that frost-wedging is the agency most likely to produce material like Zone 13. Therefore, it is probable that the history of Area 7 began in a period much more cold and wet than at present. The gradually increasing amounts of humus through the Transition and the high weathering index of Zone 12 indicate moderating climate with a slowing rate of deposition, allowing more time for weathering and accumulation of decayed vegetation. The trend here seems toward warmer and dryer.

Zone 12 shows signs of considerable erosion between S2 and N2 and is not present at all in the south half of the trench. While its absence could be due to nondeposition here, it seems more likely that it was eroded away. Apparently the deposition of Zone 12 was followed by a nondepositional-erosional hiatus. If the assumption that cold-wet conditions are conducive to the most rapid deposition is correct, then it would follow that the opposite conditions would result in little or no deposition. In the absence or near absence of moisture, the author can think of no method by which the Ogallala would be disintegrated. Therefore, since erosion is also ordinarily associated with drouths, it seems likely that the hiatus above Zone 12 represents a dry period, probably the longest, if not the most intense, in the sequence.

By its color and composition Zone 11 appears to be a slope wash mixture. The basic material (Zone 11b) has a low weathering index, which indicates rather rapid deposition. The amount of sand in the darker, more silty material (Zone 11a) rules out the possibility of eolian silt and suggests that it might be redeposited Zone 12. It is significant that the darker streaks occur in the lower part of the layer and where it overlies Zone 12. This mixing of materials gives Zone 11a an artificially high weathering index. Zone

11b, however, is probably fairly representative and indicates cold-wet conditions, though most likely less intense than Zone 13 time.

Zone 11 marks the beginning of what seems to have been differential deposition in Area 7. Apparently two gullies had been eroded into Zone 12—the north one (between N2 and S2) is fairly well defined; the south one (between S3 and S8) is broader and less well defined—and the two seem to have been refilled with different material at different times. Although there is no direct proof that Zone 11 was not deposited in the north gully and later washed away, this seems unlikely. If Zone 10, a material much more susceptible to erosion, could “stick” there in spite of some erosion, it seems probable that some Zone 11 would have remained, if any had been deposited. The author thinks it rather more likely that after the post-Zone 12 erosion, such factors as drainage pattern and proximity of disintegrating material combined to deposit taluvial materials to the south, leaving the north gully to collect wind-laid silts. Also, though the author can find no direct proof in the present data of antecedence between Zone 11 and Zone 10, he has a feeling that Zone 11 came in first.

Since it seems to consist largely of wind-laid silt, Zone 10 most probably represents a drouth. Duration and intensity are difficult to estimate. Since eolian suspension loads are ordinarily deposited as a blanket and the material is notoriously unstable stuff, it is probable that Zone 10 was originally much more extensive and was shifted around after deposition, some accumulating in the north gully, but most being removed entirely. The disconformity, marked by Zone 9 below E1, indicates considerable erosion of Zone 10 in the north gully. The smaller size Ogallala detritus found in the layer can be accounted for by slope wash mixing, and the larger fragments, by gravity. Although disintegration of the Ogallala would be retarded, if not stopped, by dry weather, some occasional slumping might be expected to occur, scattering fragments over the surface. The author has the impression that the Zone 10 drouth was severe and prolonged but of considerably less duration than the post-Zone 12 drouth.

In the absence of direct evidence, the stratigraphic relationship among the Zone 11, Zone 10, and Zone 8 materials is open to question and will be discussed later. The small amounts of humus and low weathering index of Zone 8, however, again indicate rather rapid deposition and seem to reflect cold-wet conditions. Differential deposition apparently continued throughout Zone 8 time, since it does not occur in the north half of the trench.

Zone 6 and Zone 10 are alike in most respects, and their origins and histories are probably closely similar. The more widespread occurrence of the former may be due, at least in part, to the fact that by Zone 6 time the microtopography was somewhat less rugged and sheet wash probably less active.

Zone 5, dark in color, compact, with the highest weathering index and an index of origin definitely on the taluvial side, seems to reflect near optimum climatic conditions for soil development in Ogallala detritus. Since some surface stability is necessary for soil formation, rate of deposition must have been relatively slow, but the amounts of humus indicate fairly heavy vegetation. The author would guess that conditions conducive to this situation would be somewhat wetter and possibly a bit cooler than at present but not nearly as cold or as wet as during Zone 13 or Zone 8 times.

Since no samples were taken of Zones 2, 3, or 4 (the thin layers), their correlation with climatic conditions must be purely speculative and based on comparison of color, gross composition, etc. Zones 2, 3, and 4 are much darker than Zone 5 and appear to be somewhat more silty but contain considerable amounts of small Ogallala detritus. Since there is good archeological and dendrochronological evidence for a drouth following Upper Republican (Zone 5) time and it is difficult to believe that two very dark humus layers could have developed in the time span indicated, it seems probable that Zones 2, 3, and 4 owe their coloring to wind-laid topsoil. Zone 3, very similar in color and composition to Zone 5, suggests a brief relatively wet period. Zone 1 again reflects drouth conditions. The thin line, occasionally found through the middle of the layer containing fine Ogallala detritus and/or decaying vegetation, may indicate a very brief wet spell.

In summary, it would seem that climatic conditions have produced effects in Area 7, particularly in coloration, close to the opposite of what might have been expected. The wettest climate resulted in the lightest colored material, and with one exception the driest produced the darkest. It must be admitted, however, that the situation is peculiar in more ways than one, and each archeological site must be interpreted on its own merits.

## HISTORICAL SYNTHESIS

Area 7 appears to have been intermittently and briefly occupied by relatively small groups of people. The geomorphology is obviously erratic. Therefore, in dealing with the data, the author finds it necessary to make a distinction (apparently not often needed in

archeology) between two stratigraphic conditions. These may be called *occupation surface* and *occupation zone* and defined by the following examples. When a group of people live in one place for any length of time, the evidence of their occupation (refuse, lost or abandoned tools, fireplaces, etc.) will of necessity be left on the ground surface as it existed at that time. If this surface is later buried with little or no disturbance, an *occupation surface* of whatever extent will be preserved more or less intact, marked by a vertically thin concentration of cultural material. Where the terrain is reasonably even, an occupation surface should be essentially parallel with the physical stratification. Where it is uneven and the strata are unconformable, particularly where differential deposition occurs, an occupation surface might be expected to occur on or in two or more different physical strata, depending on what material happened to be on the surface during occupation time and what came in later. If this occupation occurred on uneven ground and the cultural material were disturbed and shifted around by sheet wash before or during burial, it might end up distributed throughout several inches, possibly a foot or more, depending on the unevenness of the terrain, of the original surface soil material. Thus, it might be found neither strictly in place (an occupation surface) nor necessarily so far out of stratigraphic contexts as to be considered secondarily deposited. Such a situation might more properly be called an *occupation zone*.

The two conditions are not necessarily mutually exclusive; depending on slope and severity of sheet wash, either or both may be present in the same stratum. There can be any amount of intergradation between the two, and where cultural material is sparse and laterally scattered, it may be difficult or impossible to distinguish between them. Also, there may be cases where it is difficult to distinguish between an occupation zone and secondary deposition. The criterion would be clear evidence of slope wash mixing with a previously deposited layer, but intergradation and possible confusion might be expected occasionally here as well. In general the author believes the two concepts are valuable and necessary in unraveling the historical tangle in Area 7.

Area 7 was probably covered during most of the Pleistocene by the Ogallala, deposited in late Pliocene time. Since the Smoky Hill River cut through the Ogallala sediments in Wallace and Logan counties during Aftonian and Kansan times (Frye and Leonard 1952:Figures 12 and 13), Coal-Oil Canyon, a tributary of the Smoky Hill, can be considered a post-Kansan feature. The time required to carve out the four miles or so between the mouth of the canyon and 14LO401

is conjectural, but it seems probable that deposition of the present strata in Area 7 began sometime near the close of the last glacial substage of the Wisconsinan.

The original thickness of the Ogallala over Area 7 can be estimated with fair accuracy. The top of the present ledge above Area 7 is near the 60-ft contour line (Bowman 1960:Figure 1), and the base is about 20 ft lower. The ground surface, through which the baseline trench was cut, is approximately on the 25-ft line, and the top of the Proto-Ogallala or Weathered Clay, either of which can be considered the former base of the Ogallala, ranges from 1 to 10 ft below this line. The original thickness of the Ogallala over Area 7, therefore, must have varied from about 20 ft along the line of the present ledge to 45 ft or more in places at the foot of the present talus slope.

The volume of this mass must have been at least 9,000 yd<sup>3</sup>, but the material covering the same area today probably represents no more than 20 percent of post-Zone 12. Some material in the form of wind-laid dust was also added. So it would seem that by far the greatest part of the Ogallala had been disintegrated and washed away before deposition commenced in Area 7. Deposition and, therefore, the "history" of Area 7 probably began when the large boulders, some of which are still present at the base of the slope, rolled into place and formed a barrier against which talus material could accumulate. Since the material deposited after that time represents such a small part of the former bed, the author would guess that the ledge was then located no more than 20 ft and probably less from its present position. Zone 14, the first layer to be deposited, indicates that considerable clay was present on the surface to be mixed with disintegrating Ogallala, and it seems probable that at this time Area 7 was largely a clay bank, littered with boulders and patches of Zone 13, with Zone 14 accumulating at the foot of the slope.

In dating these layers there are two possible clues: (1) Zone 13 evidently represents the coldest and wettest climatic conditions in the history of the site; (2) Zone 13 grades gradually upward into more weathered and humic material, suggesting moderating climate. These conditions, as well as those apparently preceding them, seem to be descriptive of a glacial maximum and recession. The author would guess that Zone 14 and Zone 13 were laid down during the withdrawal of the last glacial substage of the Wisconsinan. Although the evidence of human occupation here is very sparse and mostly of a dubious nature, there is no reason to regard it as being out of stratigraphic context, and there is a good possibility of an Early Hunter occupation in Area 7. The chances of an undisturbed occupation surface in Zone 13 seems rather remote on the basis of present

evidence, but conditions may be somewhat more favorable in the area east of the baseline.

Climatic conditions during Zone 12 time seem to have been less severe than during Zone 13 time but on the average considerably wetter than at present. Since an indeterminable but probably considerable part of upper Zone 12 was removed by erosion in the trench area, it is impossible on present evidence to be certain of the original thickness of the layer or of the climatic conditions throughout the period. Variation in gross composition suggests the possibility of changing climate; in the E2 squares Zone 12 appeared to be a relatively well-weathered soil, as compared with that in the baseline trench. Since the material may have accumulated faster in some places due to minor differential deposition and in the absence of a well-defined upper limit for the layer, it is difficult at present to establish a chronological sequence within Zone 12. In view of the fact that the lower, middle, and upper parts of Zone 12 as it appears on the profiles do not necessarily represent the early, middle, and late periods of Zone 12 time, the median occupational hiatus previously referred to may be more apparent than real. However, there does appear to be an occupation zone in the lower part of Zone 12 and another probably in the upper.

The sequence from Zone 13 through the Transition, Zone 12, and post-Zone 12 hiatus would seem to reflect the following climatic conditions: (1) an extremely cold-wet period, followed by moderating conditions; (2) a period less cold and wet than the preceding but more so than at present, possibly followed by a trend toward warmer-drier; (3) a period of erosion, the most prolonged in the history of Area 7. Therefore, if Zone 13 represents a glacial climate, Zone 12 most probably represents the Anathermal; and the post-Zone 12 erosional period, the Altithermal. Although there was definite, if rather sparse, evidence of occupation in the Transition, no artifacts were found. The only artifact from Zone 12 is not particularly diagnostic, although somewhat suggestive of Plains Archaic.

In the present data there is no direct proof of the order of deposition between the post-Zone 12 hiatus and Zone 6 time. The main problem here is the temporal position of Zone 10, for which there are several possibilities. There is a chance, though somewhat remote, that this problem may be solved stratigraphically elsewhere in Area 7. Also, it may be possible to date Zone 10 by picking enough specks of charcoal from Zone 9 for a radiocarbon assay, although attempts to do this have convinced the author that it will be a formidable task. At present the chronological position of Zone 10 is a matter of conjecture, and none

of the arguments either for or against any of the possibilities seem inordinately convincing.

Both Zone 11 and Zone 8 appear to represent pluvial conditions. In the south gully Zone 11 lies directly on Zone 12 and Zone 13, and there is diagnostic Upper Republican material from the upper few inches of Zone 8. It is obvious, however, that the two do not represent continuous deposition between the Altithermal and Upper Republican time. On the south slope Zone 6 occurs between Zone 8 and Zone 5, and a fireplace was excavated into both Zone 6 and Zone 8, which clearly marks the relationship between the two. Zone 8 and Zone 5 are also separated by a thin layer of Zone 6 in the east part of S5. It seems likely that, following the Altithermal, a large source of taluvium, probably a fallen block of relatively soft Ogallala, came into position not far to the west of the south gully. Drainage patterns were such that accumulation was rapid under pluvial conditions in the south gully, while the north gully was more or less stabilized. That this deposition in the south gully could be interrupted by a drouth and then resumed without leaving a trace of the hiatus is indicated by the fact that there is no sign of Zone 6 between Zone 8 and the Upper Republican occupation in the west part of the trench between S4 and S8. Thus, it would seem that the accidents of geomorphology between Altithermal and Upper Republican times combined to accumulate mostly taluvial material in the south gully and wind-laid dust in the north one. With the pluvials and drouths recorded for the most part in different places, there is a very thorny problem in stratigraphy.

There is a temptation here to insert Zone 10 between Zone 11 and Zone 8, but this would be an oversimplification. Although Zones 11 and 8 appear on the profiles as two distinct zones and are most conveniently described as such, they do not necessarily represent two separate time periods. Zone 11b and Zone 8 are closely similar in color and composition, and the darker patches (Zone 11a) apparently resulted from slope wash mixing with a more weathered taluvial soil previously deposited, probably Zone 12. Therefore, a change from Zone 11 to Zone 8, either laterally or vertically, would indicate only that the darker soil was not available at that time or place. The transition may well have proceeded without interruption and need not have climatic significance. Thus, some of Zone 8 in the vicinity of the south slope may or may not be contemporaneous with some of Zone 11.

The author's best guess on the sequence of events at Area 7 during the Medithermal, based on the present data as far as it goes and supplemented somewhat by "intuition," is as follows. The Altithermal was

followed by a pluvial interval of indeterminate length, during which most or all of Zone 11 and possibly some of Zone 8 were deposited. During this time the north gully, which must have been eroded nearly to grade during the Altithermal (since its bottom slopes only about 6 inches in 15 ft), seems to have been relatively stable, probably grassed over. Since cultural material is very sparse in Zone 11 and occurs only in circumstances suggestive of redeposition from Zone 12, it is probable that Area 7 was not occupied during this period.

The next episode was the Zone 10 drouth. Since it seems almost certain that eolian silt would have been deposited more or less continuously over most of Area 7, the fact that Zone 10 is found only in the north gully indicates that it was moved about after deposition by wind and/or water and suggests the probability that some of it was removed entirely. With its outlet slope nearly graded, the north gully would have been a good spot for the silt to accumulate, both during the original deposition and the later redeposition. Because of these factors, the original thickness of the layer and, therefore, the duration and intensity of the drouth can only be roughly estimated. In 0 square there was evidence of considerable erosion in Zone 10, and it seems probable that the layer was formerly much thicker in the gully. The author would guess that the Zone 10 drouth was much more severe and prolonged than any during historic times but was of considerably shorter duration than the Altithermal.

The cultural material in the upper part of Zone 10 can be regarded as a relatively undisturbed occupation surface; all of it was found within a few inches of the bottom of Zone 9. Since this preservation is almost certainly due to the protection afforded by Zone 9, it serves to tie the latter to the Zone 10 occupation. The author considers it highly probable that the Zone 10 people were responsible for the deposition of Zone 9.

Since Zone 10 by definition is separated from Zone 6 only by Zone 9, the areal extent of Zones 10 and 9 are practically identical. This distinction was made for convenience in mapping and control and in the knowledge that it might prove to be artificial. As it turned out, however, it seems also to have chronological significance. In 0, W1, and N2, Zone 9 lies directly on Zone 12 and nowhere is it laterally separated from Zone 12 by any great interval. This suggests that most, if not all, of Zone 10 had been eroded from the sides of the north gully prior to the Zone 10 occupation and that the Zone 10 silt was largely, if not entirely, a fresh deposition. Since it seems somewhat improbable that the Zone 10 people confined their activities to an area as small as that presently represented by the layer, the question is, how

widespread was the evidence of their occupation and what happened to that part of the occupation surface not protected by Zone 9? As far as the author can see, this question cannot be adequately answered on the basis of present evidence. If, as seems reasonable, Zone 10 peoples continued to occupy Area 7 for a time after dumping the Zone 9 clay, some of their cultural material might have accumulated directly on Zone 9. Also, a little of Zone 6 immediately above Zone 9, where it is relatively level, might actually be redeposited Zone 10 with redeposited cultural material. A little of the lower part of Zone 6 on the south slope of the gully may be remnants of Zone 10 (either undisturbed, redeposited, or both), containing Zone 10 cultural material. Since the south slope is the only possible source of any Zone 10 redeposited above Zone 9 (and it would seem to have been meager there) and since the contours of the north gully had been altered by Zone 9 (sharpening its outlet gradient to 6 inches in about 7 ft), the author doubts if much of the dark material above Zone 9 is redeposited Zone 10, and that possible only in 0 square. In the absence of any sign of erosion, redeposition of Zone 12, or fresh deposition of taluvium, it would appear that the north gully was again stabilized during the Zone 10 occupation and for a time after.

Although the artifacts from Zone 10 are few in number, they are of considerable interest. Unquestionably they represent a complex occurring in that little-known gap in High Plains prehistory between the Early Hunter and Plains Woodland manifestations. The data previously available indicates that during this time the region was occupied by nomadic groups of hunter-gatherers, whose subsistence level has been described as bordering on chronic starvation. However, if the artifacts can be considered representative, the Zone 10 people were not only capable of superb craftsmanship in stone and bone but could spare time for such nonessentials as bone beads and ocher. The precise chronological position and cultural relationships of the Zone 10 peoples remain to be worked out. At present there are only enough data to raise some intriguing questions.

The stratification in S5 indicates that much of Zone 8 had been deposited by Zone 6 time, and while there is no direct proof as yet, it is possible that some of Zone 8 represents a pluvial interval between the Zone 10 and Zone 6 drouths. Zone 8, Zone 11, or both may or may not have been accumulating in the south gully during and/or after the Zone 10 occupation. The possibility that the occupation zone in Zone 8 in S7 and S8 is contemporaneous with the Zone 10 occupation cannot be discounted on present evidence. The general scarcity of cultural material in Zone 8 is disconcerting

but may be explainable on the grounds that at most places where it occurs in the baseline trench, the terrain was rough, and boulders and the clay bank left little room for camping places.

Zone 6 was no doubt redeposited under conditions closely similar to those prevailing during Zone 10 time: a layer or layers of eolian silt, deposited under severe drouth conditions, shifted by wind and sheet wash, and finally accumulating in microtopographically favorable places. The fact that Zone 6 is more widespread than Zone 10 might be due to the fact that by Zone 6 time the terrain had become appreciably less rugged and, therefore, less subject to sheet wash. The lack of evidence of surficial erosion might be due to this fact or to the fact that the Zone 6 drouth was less prolonged than the Zone 10 one.

If the author's impressions that there are two occupation zones in Zone 6 proves to be valid, it would strongly suggest temporal and climatic divisions within the layer, something on this order: (1) a drouth, during which Area 7 was mostly, if not entirely, blanketed with dark eolian silt, followed by moderating climate and stabilization in the north gully, during which time the Zone 6 occupation occurred; (2) another drouth, which at first shifted and possibly removed in part the first layer of silt and then deposited another blanket, again followed by moderating climate and stabilization and the Zone 6 Woodland occupation; (3) another drouth, relatively brief and mild, which may or may not have added a little more eolian silt but which shifted somewhat the Zone 6 soil and stirred up the Woodland occupation surface into mostly an occupation zone.

Although there were occasional small areas in both the upper and lower parts of Zone 6 suggestive of undisturbed occupation surfaces, in general the cultural material seemed vertically as well as laterally scattered, sometimes occurring throughout the entire layer. Since the concepts of occupation surface and occupation zone did not occur to the author until midway through the study of the data, the field notes are not often helpful in this respect. These concepts should be kept in mind during further excavation and all evidence of possible undisturbed surfaces more precisely recorded.

There can be little question but that the occupation in the upper part of Zone 6 is Plains Woodland in character, but the cultural affiliations of the material in the lower zone remain doubtful. Since we have had to leave some possible evidence of the Zone 10 occupation unaccounted for, it is possible that some, or even all, of the cultural material in the lower zone of Zone 6 might be remnants of the Zone 10 occupation, lying on the surface beneath the first layer of Zone 6 silt and later mixed with it by slope wash. This, however, is another of the many problems to be

worked out in the future, and the chances of its solution are better than most. In any case it seems probable that the dividing line between Plains Archaic and Plains Woodland runs approximately through the middle of Zone 6, where that layer is the thickest.

That taluvial deposition in the south gully continued into Upper Republican time is indicated by the diagnostic cultural material occurring in the upper few inches of Zone 8 in S7. This situation suggests one or both of two possible conditions: (1) a brief but rather extreme pluvial interval followed the last Zone 6 drouth, rapidly moderating into the somewhat less humid conditions of Zone 5 time; (2) the nearby source of easily disintegrated Ogallala finally ran out.

With Zone 5 there is for the first time in the history of Area 7 a reasonably continuous layer laid down during an interval of roughly determinable duration, and an interesting question is raised. Zone 5 probably represents a time span of no more than 400 years. The soil is appreciably darker than that occurring on the uplands over most of northwest Kansas. In the excavated parts of Area 7, the layer ranges in thickness from .3 ft in S8 to 1.9 ft in W1 and probably averages at least 1 ft thick. Hence the question, are 400 years time enough in western Kansas for decaying vegetation to color a foot of soil as dark as Zone 5? The only data the author has been able to find on the rate of humus accumulation in the region is that on the buried Brady soil, developed in the top of the Peoria loess during the interglacial Bradyan substage of the Wisconsinan and overlain by the Bignell loess, deposited in Caryan and Mankatoan times. In Kansas the depth of the Brady profile ranges from 14 ft at the Iowa Point section in the bluffs along the Missouri in Doniphan County to 1 to 3 ft in various places in the western part of the state (Frye and Leonard 1952:133). Where the author has observed the buried Brady soil in Wallace and Logan counties, the humus zone is approximately the same color as Zone 5 of Area 7 and ranges in depth from somewhat less than 1 ft to about 1½ ft. As for its development, Frye and Leonard state, "The evidence from the character of the Brady soil suggests that the climate under which it developed was much the same as that of the present. The degree of development, when contrasted with the Sangamon and older soils on the one hand and with the modern soil on the other suggests that the Bradyan interval was comparable in duration to Recent time ..." (Frye and Leonard 1952:135).

Thus, it would seem that the average rate of humus accumulation under "average" climatic conditions in western Kansas would be little more than 1 in per 1,000 years. Although the soil-building conditions prevailing in Area 7 are not directly comparable to

those on the loess-mantled divides, some rough comparison is possible. While grass might be expected to be somewhat more sparse on the rocky, boulder-strewn talus slope than on the uplands, the probable presence of the leafy currant bushes, growing in Area 7 at present, would more than make up for this discrepancy in vegetation. Even allowing for 10 times more vegetal material in Area 7 than on the divides—which seems an inordinately generous estimate, even postulating more humid conditions during Zone 5 times—it could not be reasonably expected that in 400 years more than 4 in of soil would be colored as dark as Zone 5. In view of the fact that no evidence of a permanent habitation was found in either the trench or the preliminary testing, it seems unlikely that accumulated human trash contributed much to the coloring of the soil.

It seems probable, therefore, that Zone 5 has also been moved around by sheet wash, eroding from the high spots and accumulating in the low, contributing to the final leveling of the terrain. The occurrence of the cultural material in the layer also suggests disturbance. As previously pointed out, the blue-cored sherds, unquestionably all from the same vessel, were found scattered throughout all levels of the layer, and most of the rest of the material gives the impression of being similarly scattered.

Since only the faintest traces of fires were found in the vicinity of the trench and the amounts of pottery indicate a certain amount of culinary activity, it is possible that the Upper Republican living areas were located further up the slope in Area 7, possibly in temporary shelters of some sort, built against the face of the ledge or among the fallen blocks at its base. If this is true, some stratigraphy within the aspect may have been preserved there, but it seems that Zone 5 in the vicinity of the baseline is merely an occupation zone. There is evidence of occasional remnants of undisturbed surfaces, but these would be difficult to correlate chronologically.

The thin Zones 2, 3, and 4 above Zone 5 are susceptible of two generalized interpretations. The first, most obvious, and therefore probably overly simplified, is that following Zone 5 time the climatic "cycles" were of shorter duration and less severe. While the Area 7 strata do appear to show a trend in that direction, the second possibility must be considered. As the terrain became progressively more level and less subject to sheet wash, the stratification would be more capable of reflecting smaller variations in climate. For example, had any or all of the upper thin layers been laid down during Zone 12 time, they might possibly have been obliterated and "averaged in" by sheet wash.

Whether the very dark color of Zones 2, 3, and 4 represents very wet conditions or very dry is still conjectural. In view of the frequency and duration of drouths believed to have occurred after the Upper Republican occupation of the west-central Plains (Wedel 1941:25, 1959:Figure 106), it seems unlikely that there were humid periods long enough for vegetation growing in Area 7 to have so colored the soil. More probably this coloring is due to the deposition of relatively small amounts of wind-laid topsoil. In this case it would seem that the Upper Republican occupation was followed by a drouth (Zone 4) of appreciably less duration than either the Zone 6 or Zone 10 drouths. Judging from the color, composition, and thickness of Zone 3, the next interval may have been somewhat more humid than Zone 6 time but considerably shorter. This was apparently followed by a dry period (Zone 2), comparable to the post-Upper Republican drouth.

The cultural material in Zones 2, 3, and 4 is something of a problem. Obviously, sheet wash was less active here, but just as obviously in such thin layers, less would be necessary to blur the stratigraphy. With little or no deposition between temporally separate occupations, the least shifting of surface material would be apt to result in mixing. Area 7 seems to have been occupied during part of this time, but whether sufficiently distinct occupation surfaces have been preserved remains to be seen.

The occurrence of the cartridge cases and cow teeth directly on the contact between Zone 2 and Zone 1 provides a fairly definite time marker.<sup>8</sup> The merger of Remington Arms and Union Metallic Cartridge (ca. 1915?) should serve as an outside date for the deposition of Zone 1. This dating coincides with the widespread destruction of the native vegetative cover throughout western Kansas by modern farming activities, which undoubtedly was the main cause of the deposition of Zone 1. Plowing started in the region in the last two decades of the nineteenth century, accelerated during and after World War I, and by 1930 probably equaled or exceeded its present extent. This activity undoubtedly accounts for the fact that Zone 1 is much lighter in color than the eolian silt deposited during the prehistoric drouths. Plowing not only subjects the soil to increased wind and water erosion but continually mixes the dark topsoil (probably already thinned in many places by erosion during the prehistoric drouths) with the lighter colored subsoil.

It seems virtually certain, therefore, that Zone 1 represents the only two periods in modern time when soil blowing was common and widespread in western Kansas: the drouths of the 1930s and 1950s. There is some evidence that the two might be distinguished.

The very thin line of Ogallala detritus, which occurs sporadically approximately midway in Zone 1, may represent the period 1938 through 1951, when rainfall averaged well above "normal." Also, since there is general agreement locally that there were no deer on the south fork of the Smoky Hill River during the 1930s, the deer mandible found in the top of Zone 1 would date that material in the 1950s.

Starting from the present and working back, a comparison of the weather records and other pertinent observations with the Area 7 data provides some insight into the effects of short-term climatic variations on the microtopography. The drouth from 1952 through 1956, the driest 5 consecutive years in the 90-year records for Wallace County, did not kill the grass in the area (nor on the uplands) and apparently caused little if any erosion of Zone 1, deposited in the 1930s. The drouth in the 1930s was, for reasons not clear, much harder on the grass, but there was relatively little soil movement on the unbroken grasslands. Therefore, it seems highly probable that, if the region had still been entirely in grass, there would have been neither erosion nor deposition of consequence in Area 7 during the drouths of the 1930s and 1950s. The relatively humid period from 1938 through 1951 is reflected very faintly at best in the strata. Working back from 1930, the records show a series of alternating wet and dry intervals of less than three years duration until the period 1901 through 1906, when six abnormally wet years occurred in succession. Any change in the strata caused by this historically unique phenomenon might be expected to show between Zone 1 and Zone 2, but the author can see no evidence of it in the baseline trench. Only 3 of the 12 years between 1889 and 1901 were above average in rainfall, and the period as a whole averaged about 88 percent of "normal." Many of the newly arrived settlers in western Kansas were compelled to move out by this drouth. There were a few bad dust storms at times, but the grass apparently suffered no lasting damage, since 1,700 head of cattle were wintered at the ranch on grass with no supplemental feeding in 1903-1904, a rather unusual occurrence in western Kansas. Probably any eolian silt deposited in Area 7 during this period would have blended into Zone 2.

All in all, the evidence seems to indicate that except for man's intervention in plowing up the sod cover, there would have been comparatively little deposition in Area 7 during the last century or so and probably little or no erosion. Since climatic conditions during this period, in which rainfall averaged about 17 in annually, apparently were conducive to surficial stability in Area 7, it follows that the strata reflect only more or less extreme climatic departures from this

norm. If little or no eolian silt would have been naturally deposited during the modern drouths, the combined duration and intensity of the post-Upper Republican drouths must have been appreciably more severe and those reflected by Zone 6 and Zone 10 considerably more so. Similarly, if 90 years with an average annual rainfall of 17 in produced no appreciable taluvial deposition, then the 3 or 4 centuries of Zone 5 time must have averaged somewhat more humid, and the Zone 8 and Zone 13 intervals must have been much wetter yet and very probably colder. Since periods of surficial stability would leave no trace in the strata, particularly if followed by a resumption of the same climatic conditions previously prevailing, there is no way to determine the possible occurrence or duration of such periods within or between any of the depositional intervals. For instance, either or both Zones 2 and 4 may represent one continued drouth or several shorter ones, interrupted by intervals of somewhat less severe conditions. In general it would seem that throughout most of the 8 or 10 millennia represented in Area 7, climate has been either much wetter or much drier than at present, from which it would follow that "normal rainfall," as presently defined, is an arbitrary concept not applicable to all of Recent time.

The climatic record in Area 7 probably has a number of erosional and nondepositional gaps and could not be considered comparable to a dendrochronological sequence. In a region where dendrochronology may not be possible, the combined archeological and geomorphological evidence here may provide some valuable data on prehistoric High Plains climate and human ecology.

## EPILOGUE

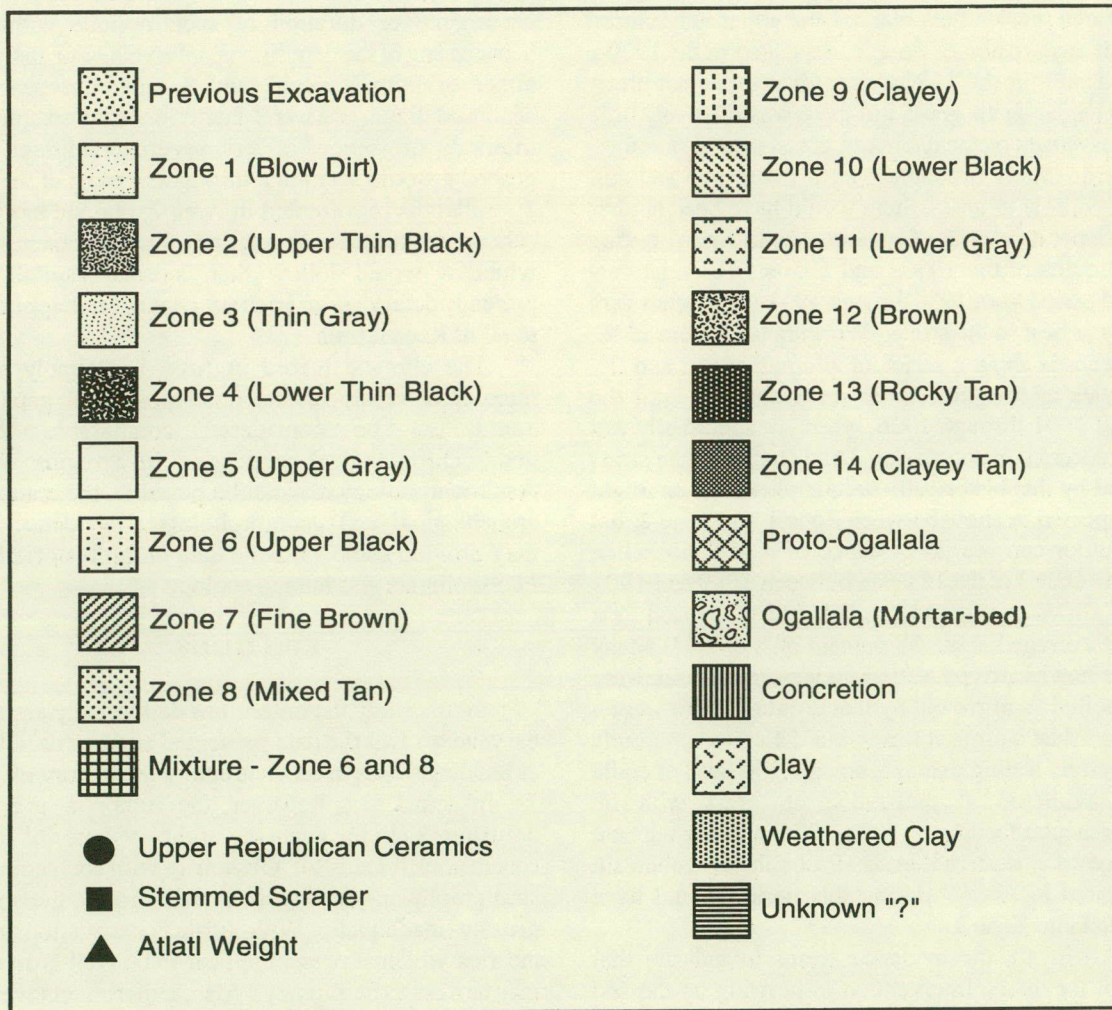
In this study the author has deliberately assumed the validity of all the data presented and has used them as building stones in reconstructing the history of Area 7. In actual fact, however, the author is under no delusions as to the accuracy of the evidence or of the conclusions it leads to. Obviously with such complex stratigraphy one transverse trench through the area is grossly inadequate. With further excavation some theories, which at present appear to be well grounded, may turn out to be illusory. Also, experiments were of necessity poorly controlled and must be verified by more competent workers with more accurate equipment.

The study was started as a check on the effectiveness of the methods of excavation and control, to determine where they might be improved, and ended up as a probing into the possibilities presented by the

data. The value of conclusions reached on the basis of such incomplete evidence lies not so much in the development of a working hypothesis as in the suggestion of possible future avenues of attack.

“Much has been done, but a great deal remains to be accomplished.”

#### APPENDIX: KEY FOR FIGURES 1 AND 2



Note: East and West Profiles, Area 7, Coal Oil Canyon site (14LO401) are inserted in the middle of this volume.

Linda Greatorex drew the major lines for the profile, scanned them into a PowerMac 7200 computer, using OFOTO software and an Apple OneScan scanner, and finally filled the profile segments and added text using Macromedia Freehand v.5.0.

## NOTES

<sup>1</sup> [Editor's note: Bowman's references to the Coal-Oil Canyon site as 14LO1 have been changed to conform to the new site number (14LO401), assigned by McLean.]

<sup>2</sup> [Editor's note: Throughout this paper measurements are expressed in whatever system Bowman used originally; in general, field work was conducted using the English system, and both metric and English systems were employed for artifact analysis. No conversions have been attempted.]

<sup>3</sup> [Editor's note: While Bowman found descriptive names less confusing in the field, the terminology proved cumbersome during the reassessment of the data. Therefore, McLean once again assigned zone numbers to the cultural strata (see table below). In the description headings, Bowman's original descriptive names follow in parentheses McLean's zone designations; thereafter, only the zone numbers are used. Bowman's geologic formation names have been retained with the exception of the "Mortar-bed," which has been termed "Ogallala" by McLean.]

Bowman's Terms	McLean's Terms
Blowdirt	Zone 1
Upper Thin Black	Zone 2
Thin Gray	Zone 3
Lower Thin Black	Zone 4
Upper Gray	Zone 5
Upper Black	Zone 6
Upper Upper Black	Zone 6a
Middle Upper Black	Zone 6b
Lower Upper Black	Zone 6c
Fine Brown	Zone 7
Mixed Tan	Zone 8
Clayey	Zone 9
Lower Black	Zone 10
Lower Gray	Zone 11
Brown	Zone 12

Rocky Tan	Zone 13
Clayey Tan	Zone 14
Proto-Ogallala	Proto-Ogallala
Weathered Clay	Weathered Clay
Mortar-bed	Ogallala
Clay	Clay

<sup>4</sup> [Editor's note: The profiles in Figures 1 and 2, inserted in the middle of this volume, and the key in the Appendix have been redrafted under McLean's direction. The various types of artifacts, which Bowman had plotted on his profiles, were omitted, since they were not piece-plotted artifacts but represented approximate locations and concentrations of materials found within the vertical provenience within the appropriate half of each 5-ft square. The stratigraphy is shown as it originally was profiled in the field.]

<sup>5</sup> Note to G.M. [George Metcalf]: You may recall the profanity that ensued when I hit it.

<sup>6</sup> Of the several dozen fireplaces the author has examined at half a dozen open sites in northwest Kansas, nearly all have been more or less identically disturbed. There is never any clear cut evidence of animal activity, and it seems highly unlikely that erosion could cause such mixing. Could it have been common practice in prehistoric times (as it is now) in a dry grassland region to always "make sure the fire it out?"

<sup>7</sup> Composed of talus material. I may be coining something here but need a good descriptive noun and adjective for this stuff and couldn't find any.

<sup>8</sup> The shotgun shell may have been fired by my paternal grandfather, who was foreman of the ranch on which the site is located between 1903 and 1939. He owned a 12 gauge double-barrel and favored Remington ammunition.

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## An Apachean Pottery Vessel from Coal-Oil Canyon

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*A partially reconstructed micaceous pottery vessel from the Coal-Oil Canyon site is described. It is identified to the type Ocate Micaceous and is considered a vessel imported from the Jicarilla Apache homeland in northern New Mexico. Some implications of this assignment are discussed.*

Coal-Oil Canyon (14LO401), on a tributary of the Smoky Hill River in Logan County (Figure 1), is a key site for developing the regional culture history of western Kansas. In part this is because during investigations conducted in the 1950s, about 2,400 pottery sherds representing over 40 vessels were recovered, and a substantial number of them can be sorted into general ware groups and sometimes even identified to a formally defined type. Peter Bowman (1960, herein), who led and reported the investigations, expended considerable effort in grouping sherds by individual vessel, physically reconstructing pots or portions of pots when feasible, and identifying vessels as specifically as possible with the aid of the then-extant comparative literature. Not surprisingly, however, a substantial body of newer data now allow more detailed comparisons of the pottery than were possible 35 years ago. A renewed study of the ceramics, therefore, is leading to a more detailed understanding of the history of human occupation in western Kansas during the Ceramic period.

This paper considers a single vessel that is unique within the pottery collection, presenting descriptive information of use to other researchers and reflecting on this vessel's implications for western Kansas prehistory. Bowman (1960:47) assigned the number V 25 to this vessel; his vessel designations are being retained in the renewed study of the Coal-Oil Canyon site pottery. Coal-Oil Canyon vessel V 25 (Figure 2) is comprised of over 100 individual sherds, some of which are refitted to form a partial rim, neck, and upper body section of a moderate-sized pot. An outstanding characteristic of the vessel is the presence of mica flakes as either temper or a natural inclusion in the source clay. As Bowman (1960:49) noted, however, "there is no mica, micaceous clay or comparable micaceous sand in this part of the country so it seems probable that V 25 was carried in from some distance." He was quite correct in this supposition, for the vessel is of Jicarilla Apache

manufacture and represents a trade piece from northeast New Mexico.

### THE VESSEL

Bowman (1960:47-49) described V 25 in some detail in his report of preliminary investigations at Coal-Oil Canyon. The following description is not intended to supersede that treatment, but rather to place on record a description in terms that are more comparable with recent literature and, therefore, will support the type identification offered below.

### SAMPLE

A total of 127 sherds, including 4 rim sherds (for this purpose, rim sherds are those pieces retaining a portion of the lip) and 123 body sherds. The sherds are small. A few are about the size of a quarter, many are about the size of a nickel or dime, and some pieces are even smaller. The upper part of the vessel is reconstructed from 40 of these sherds, including all 4 rim sherds; there is no reason to doubt that the remaining 87 sherds are correctly assigned to this same vessel.

Bowman (1960:47) reported that this vessel was comprised of 8 rim sherds and 136 body sherds. It is probable that he counted as rim sherds four pieces in the reconstructed section that retain no portion of the lip but are nevertheless from above the neck. This usage is common but is not followed in this instance because nothing about sherds without lips otherwise distinguish them as coming from the rim. Thus, it is a logical possibility that some of the non-conjoining sherds also were from the rim. It is not so easy to account for the discrepancy in the total sherd count. These sherds certainly are distinct within this collection, and it is not possible that some have been overlooked or assigned to the wrong vessel. The collection as it now exists, however, does not contain quite all the objects that Bowman enumerated in his

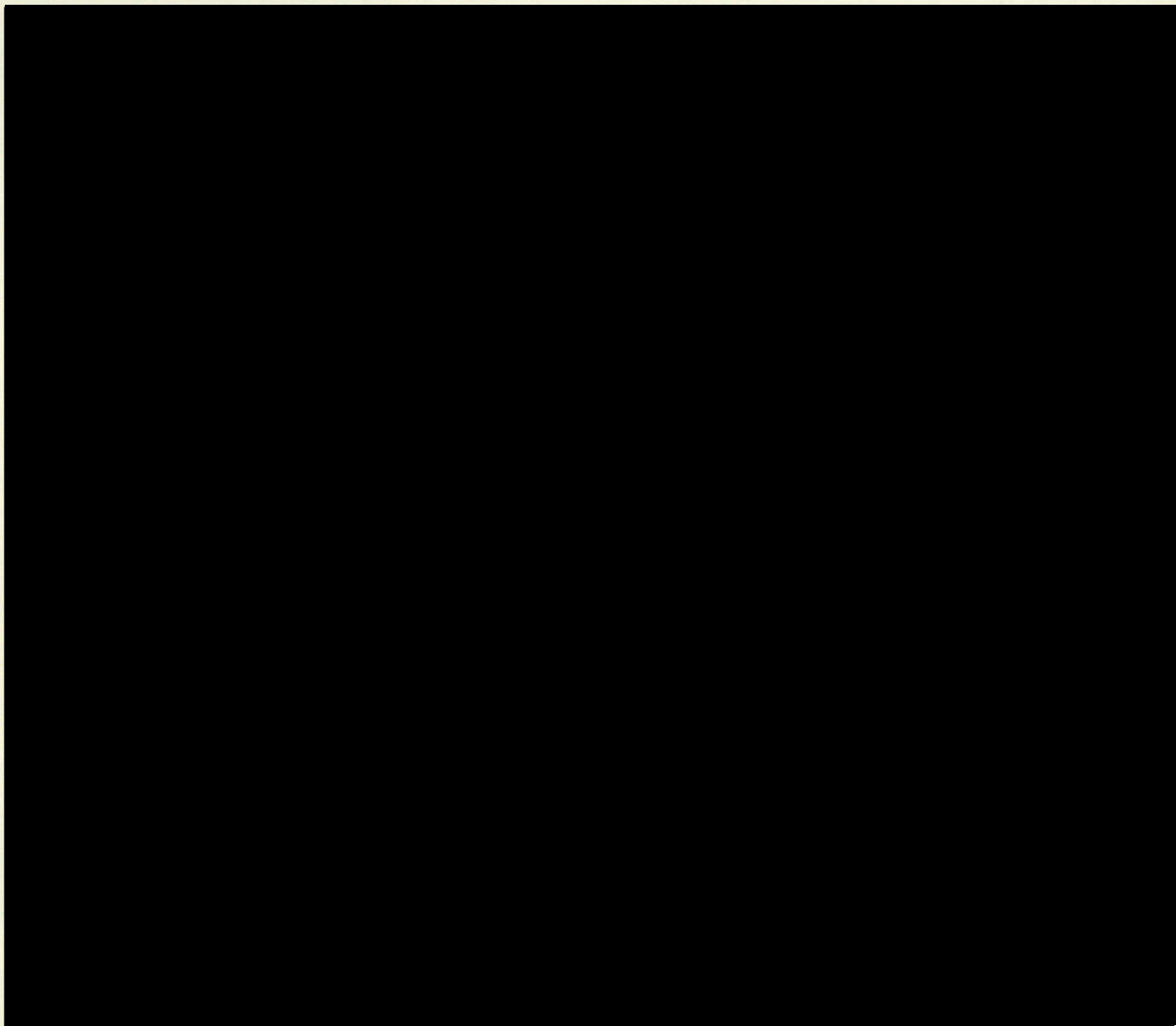


Figure 1. The High Plains, showing sites mentioned in the text and the route (after Gunnerson 1992) of Ulibarri's 1706 expedition to El Cuartelejo.

reports. It is likely that 17 loose body sherds simply have disappeared over the last 35 years.

#### PASTE AND TEMPER

The paste is fine and appears finely laminated. The vessel was well-fired, resulting in a pot that is hard but especially brittle. No firing core appears, nor is there any evidence of spalling or surface erosion. The exterior color is pale brown (10YR6/3) to very dark gray (10YR3/1), but abrupt color changes at sherd joins show that color variation is partially conditioned by the disposition of individual sherds in the soil and not entirely by paste and firing characteristics. A small quantity of fine grit or sand may be temper, or it may be a natural inclusion in the source clay. Far more prominent as an inclusion are finely broken (< 1 mm in

diameter) flakes of mica. Comparison with a chart developed for such purposes (Orton et al. 1993:238) suggests that the mica flakes may comprise as much as 20 percent of the paste.

#### SURFACE TREATMENT

The exterior is smooth with no trace of cord-roughening, simple-stamping, or other surface treatment common on Central Plains pottery. Some fine striations appear, however, and undoubtedly were produced by using a corncob to smooth the pot's surface (Opler 1971:31). They are most noticeable on the rim and may also appear on some individual sherds from an undetermined part of the vessel. Orientation is inconsistent, although striations generally are oblique at some angle. The vessel interior is smooth.

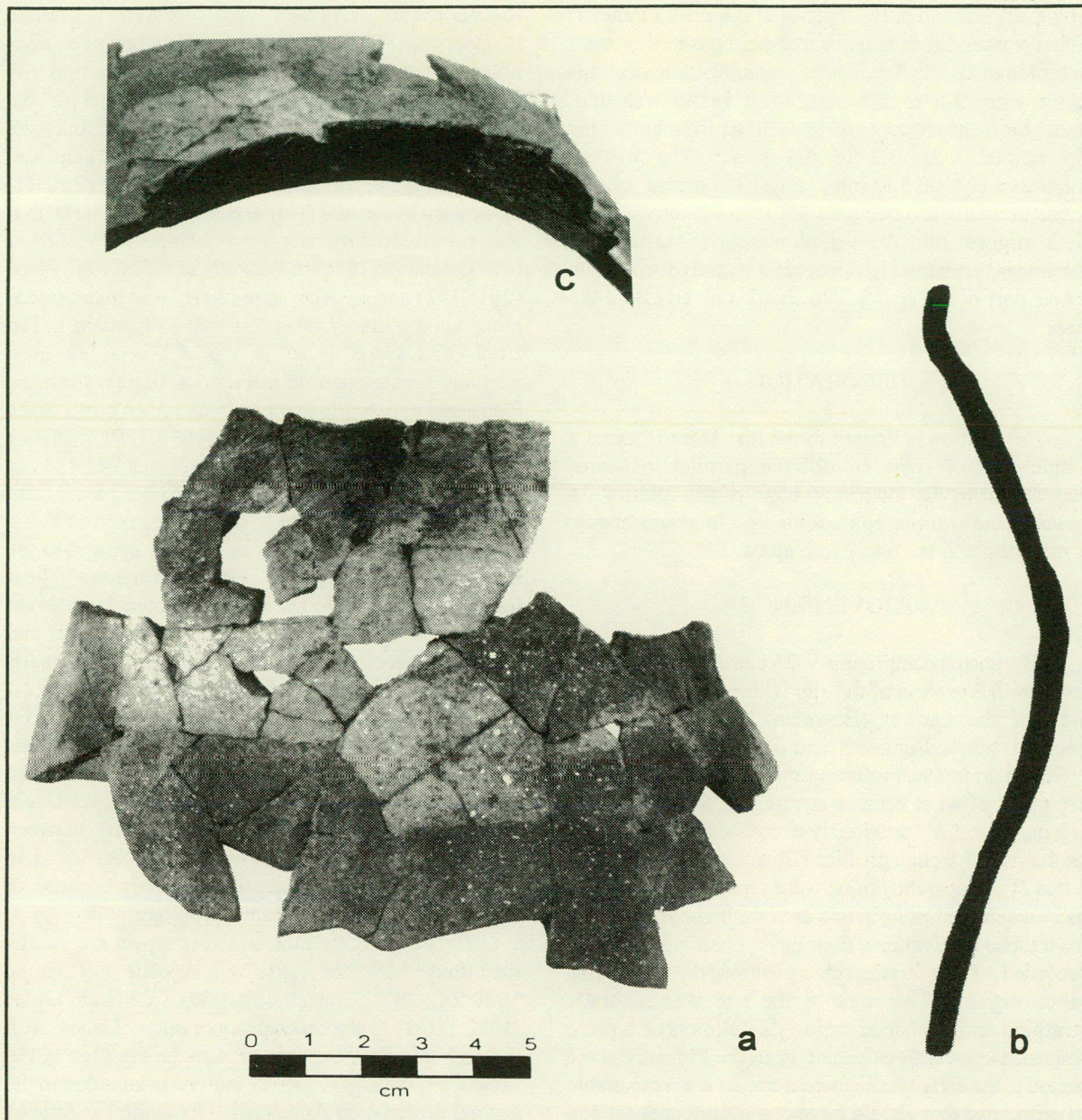


Figure 2. V 25 as reconstructed by Peter Bowman: a) reconstructed section, b) rim profile, c) lip decoration.

#### FORM

The vessel has a direct, flaring rim, the upper part of which, in cross section, thins very slightly to the lip. The exterior surface of the lip is flattened and perpendicular to the exterior surface; the interior lip surface is flat with a slight inward bevel. The neck is indistinct and is merely the apex of a long gradual curve joining the upper body and the rim (see rim profile in Figure 2b). The reconstruction leaves off in the shoulder region, making it difficult to describe vessel form below the neck. It appears, however, that

the vessel wall sloped gradually from the neck to the shoulder and that the shoulder was as gradual and indistinct as the neck. The form of the body below the shoulder and of the base cannot be determined for this specific vessel.

#### SIZE

The rim height is ca. 4.5 cm, measured from the lip to the neck. Interior neck diameter is ca. 15 cm. The preserved rim section is a bit too fragmentary to reliably measure the vessel's orifice diameter; it is,

however, only slightly larger than the neck diameter. Other vessel dimensions cannot be measured or even approximated. Thicknesses of undamaged lip sections range from 2.8 to 2.9 mm. The vessel was thin; thickness measurements of 100 sherds from below the lip ranged from 3.3 to 4.8 mm. The median measurement is 3.9 mm, and 61 percent of the measurements are between 3.8 and 4.2 mm. These data suggest that the vessel was of fairly uniform thickness, presumably thickening slightly toward the lower part of the vessel. No sherd is clearly from the base.

#### DECORATION

Decoration is limited to the lip. Here is found a single row of right-left oblique parallel incisions, running from the innermost edge of the interior lip bevel to the exterior edge of the lip. Incisions are ca. 5 mm long and are 6 to 7 mm apart.

#### PROVENIENCE

The sherds comprising V 25 came from Area 7, a terrace-like section of the site within and on the west side of the canyon (Bowman 1960:38; see also McLean herein:Figures 3 and 6). Most sherds were collected during the preliminary investigations from an area east of what became squares S4 to S7 (in other words, from the "previously excavated" areas shown on the Area 7 trench profiles [Bowman herein:Figures 1 and 2]). Apparently none were recovered during the more extensive testing in this area, or if some did come from those excavations, their exact positions were not recorded. Their stratigraphic position, therefore, also is uncertain. This area of the site was naturally stratified and contained within its sediments a culture sequence apparently extending from the Plains Archaic period to the early twentieth century, so it is reasonable to expect that they should have come from near the top of the profile. Bowman (herein:47) does, in fact, suggest that they probably came from one of the zones designated 2 through 4. He goes on to conclude, however, that "until some are found in place, exact provenience is unknown."

#### IDENTIFICATION

Coal-Oil Canyon vessel V 25 is not the only mica-tempered, or as it is often designated, micaceous, pottery from a High Plains site. Micaceous sherds, as Bowman (1960:47-49) recognized, are found in sites of the Dismal River aspect, a Late Ceramic period archeological culture of the High Plains in western

Kansas and Nebraska and eastern Colorado (Gunnerson 1960). Micaceous pottery, however, does not occur at all Dismal River sites and is a minority ware when present. It comprised "just under 5 percent of the total" number of sherds at the Scott County site (14SC1) in western Kansas (Wedel 1959:242) and less than 1 percent of the sherds at the Lovitt site (25CH1) in western Nebraska (Hill and Metcalf 1941:180). It was represented by only one (Champe 1949:288) or two (Gunnerson 1960:160) sherds at White Cat village (25HN37) and appears in similarly low quantities at other sites (Gunnerson 1960:181-238 *passim*). The Coal-Oil Canyon vessel is one of a very few even partially reconstructible micaceous vessels from the Plains and apparently is the only one from north of the Arkansas River. (See Brunswig [1995:189] for notice of several vessels from extreme southeast Colorado or Dale [1973] for a description of a whole vessel from the Oklahoma panhandle.)

Two type designations have been applied to the mica-tempered pottery from Dismal River sites. These include Lovitt Mica Tempered, defined by Metcalf (1949:77-78) for the material at the Lovitt site, and Scott Micaceous, designated (although not really formally defined) by Wedel (1959:443) for the Scott County site material. Since Coal-Oil Canyon is far closer to the Scott County site than to the Lovitt site, V 25 until recently would probably have been identified as a Scott Micaceous rather than a Lovitt Mica Tempered vessel. The difference, if any, between these two pottery types is nowhere made clear but is, in any event, now of historic interest only because of recent revisions to the ceramic typology.

The people of the Dismal River aspect are usually identified as the Plains Apache (Champe 1949:289-292; Gunnerson 1960), although Opler (1982:141-143) gives a contrary opinion. Hence, with the archeological cultures of Apache peoples of the Southwest, the Dismal River culture is included in the general designation Apachean. But while the Apache presence on the High Plains is well-documented, it has been suspected for some time that micaceous pottery was not indigenous to the region (Gunnerson 1968:178-179). By 1985 participants in a conference on Apachean pottery concluded that the micaceous pottery found at Dismal River sites was a trade item from the Southwest (Baugh and Eddy 1987:795). All micaceous pottery from Apachean sites, including that from Dismal River sites, therefore was placed within a single ware, designated Sangre de Cristo Micaceous (Baugh and Eddy 1987:797). The type names Lovitt Mica Tempered and Scott Micaceous were dropped (the type names of their non-micaceous counterparts were retained within a ware designated Dismal River

Grey, still regarded as indigenous to the Plains), and all types within the Sangre de Cristo ware were given their Southwest names. Included among them is Ocate Micaceous, the type to which Coal-Oil Canyon vessel V 25 almost certainly is identifiable.

Gunnerson (1969:26-27) defined the Ocate Micaceous pottery type for the predominant (96 percent of the sherds) pottery at the Glasscock site (29MO20) on Ocate Creek in northeastern New Mexico (see also Gunnerson [1979:164] for illustrations or Brunswig [1995:188-190]). It was made by Jicarilla Apache potters, using techniques and rituals described by Opler (1971) and possibly in imitation of vessels produced at the nearby pueblos of Taos and Picuris (Baugh and Eddy 1987:797). Its distribution is predominantly in northeast New Mexico and adjacent southeast Colorado south of the Arkansas River valley (Brunswig 1995:179). It is, however, one of several types of trade items that appear with some regularity, albeit in small quantity, in Dismal River sites to the north and west of the Jicarilla Apache core area (Brunswig 1995:179). Estimated manufacturing dates are A.D. 1550 to 1750 (Gunnerson 1969:26, 1979:164); the Dismal River aspect is most recently dated ca. A.D. 1675 to 1725 (Gunnerson 1987:103) and, therefore, is contemporaneous with the latter part of this period of manufacture.

Properly speaking, Ocate Micaceous is one of four micaceous types assigned to Sangre de Cristo ware (Baugh and Eddy 1987:796). Numerous micaceous types also were made in the upper Rio Grande pueblos and are especially associated with Taos and Picuris. Hummer (1989:351) reported that she was cautioned not to try to identify micaceous pottery without petrographic analysis. Her study area, however, was in extreme southeast Colorado, close to the source area for micaceous pottery and, therefore, an area where several types can be expected. Indeed, her analysis did identify several other micaceous types in that study area (Hummer 1989:353-363), and it also is likely that the vessel described by Dale (1973) is of another type. These study areas, however, are south of the Arkansas River, and Brunswig (1995:188) pointed to historic reasons to not expect micaceous types other than Ocate Micaceous in much of eastern Colorado north of the Arkansas River. This expectation should, of course, be equally valid for western Kansas north of the Arkansas River. Additionally in the Coal-Oil Canyon case, the pottery appears as a partial vessel and not simply as a collection of sherds. The observable characteristics of these sherds match the Ocate Micaceous type definition in form, size, and treatment, suggesting that the identification is reliable. The Glasscock site, in the heart of the micaceous ware distribution area and the

type site for Ocate Micaceous pottery, is about 270 straight-line miles southwest of Coal-Oil Canyon. Therefore, Coal-Oil Canyon V 25 is indeed a vessel brought in from some distance, probably in the late seventeenth or early eighteenth century.

## CONCLUSIONS

The Ocate Micaceous vessel stands out, not just because it is a trade piece but because it is the only Apachean pottery vessel in the Coal-Oil Canyon collection—that is, the collection contains no Dismal River Gray pottery, and thus it would not be correct to say that the site has a Dismal River component. Further, V 25 is one of very few Late Ceramic period vessels from the site. This may reflect on how locations for sites, even short-term campsites, were selected during this period. Coal-Oil Canyon was most intensively used during the Middle Ceramic period, and its setting is consistent with the types of locations selected for contemporaneous sites on the High Plains. It is, however, atypical of the kinds of places in which Late Ceramic period sites were located. (This point about settlement is more fully discussed elsewhere [Roper 1995:10-12].) It may seem remarkable that one of the few artifacts from this period is a trade item—but then again, it may not. Trade on the Plains was active in protohistoric times, and pottery is known to have been a trade item (e.g., Bolton 1916:226). It is not too difficult to imagine, say, an itinerant trader abandoning a pot somehow broken in this area during a trek on the High Plains. Of course, a specific and ephemeral scenario such as this is impossible to demonstrate, but it illustrates how a lone pot can get to a remote site by processes known to have been operating in the general area at the time.

This leads to a final point, and that is the route by which V 25 reached Coal-Oil Canyon. The site is 32 straight-line miles west-northwest of the Scott County site, usually now regarded as the site of El Cuartejejo, to which populations from Taos and Picuris fled periodically in the latter half of the seventeenth century. It was in pursuit of some people from Picuris that Ulibarri was dispatched to El Cuartejejo in 1706. His route, which went from Santa Fe via Picuris, Taos, and the Jicarilla Apache core area, is described in his diary (Thomas 1935:59-77) and has been traced by Gunnerson (1992; this reference is the source for the route plotted on Figure 1). Passages in the diary would seem to leave little doubt that the Spanish were following established trails, presumably parts of a network of trails linking the upper Rio Grande area, the Southern Plains, the upper Smoky Hill River drainage, and undoubtedly also other parts of the Plains. This is

highly relevant in the present case since Ulibarri must have used those trails within at most a few decades of the time the Ocate Micaceous pot reached Coal-Oil Canyon. It is, however, interesting to note that some Middle Ceramic period pottery from Coal-Oil Canyon also seems to reflect similarities to pottery from the Texas and Oklahoma panhandles/southeast Colorado area (Roper 1995; this will be more fully documented in future articles on the Coal-Oil Canyon material), as well as to the Upper Republican core area to the north and east in Kansas and southern Nebraska. Also there are occasional other indications of exchange between the Central and Southern Plains during the Middle Ceramic period. This would suggest some antiquity for the movement of goods and ideas between the western Central Plains and the Southern High Plains via western Kansas. The single Apachean vessel, therefore, is one of the latest physical manifestations of a link that was sundered when the trade network of the High Plains was radically altered in the late seventeenth and early eighteenth centuries.

*Acknowledgments.* I first must thank Jack Hofman for inviting me to work with the Coal-Oil Canyon pottery. I don't know if he was aware that only a couple of months earlier I had inquired about the collection at the historical society and therefore how delighted I was when he told me that it was in Lawrence and available for study. Janice McLean's organization of the collection and her exhaustive work with the extant documentation of the fieldwork and the collection has made it much easier to understand something about the site. Janice also provided helpful comments on a draft of this manuscript, as did several anonymous readers for the journal. The photographs and profile drawing comprising Figure 2 are the work of Cynthia Blaker of Manhattan. Finally, I extend special recognition to Peter Bowman, Jerome Bussen, and their associates for their exceptional work with a complex site and for their superb work with the collection. Although we can now update the identifications and comparisons of the pottery, there is very little need for revision of their original analysis.

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## BOOK REVIEWS

*Prehistory of the Central Mississippi Valley*. CHARLES H. MCNUTT, editor. University of Alabama Press, Tuscaloosa and London, 1996. xiii + 313 pp., index. ISBN 0-8173-0807-5. Reviewed by Chris Benison, Kansas State Historical Society

McNutt's substantial volume of edited papers synthesizes new data for the central Mississippi River valley, a region for which the last comprehensive summaries were prepared more than 25 years ago. McNutt's contribution contains much more than basic artifact trait lists, which are now considered to be hallmarks of the so-called "cultural historian" camp within archeology. These researchers, who were most active from the 1930s through the early 1960s, tried to relate cultures in different regions by comparing definable functional and stylistic attributes or clusters of attributes in artifacts. In this regard, nearly all cultural historians (a term disparagingly used by the "New Archaeology" heirs-apparent of the mid-1960s) were intimately concerned with issues of general cultural evolution, population movement, and economic and social exchange. Since the cultural historians did not have the benefit of radiocarbon dating (this became available after 1950), they tended to interpret both archeological sites and cultures according to what is today regarded as truncated chronological scale. As a result, cultural historians explained evidence for abrupt functional or stylistic change in the archeological record in terms of large-scale population migration (including warfare and conquest) or, alternatively, by relying on diffusionist arguments stressing cultural interactions between regions. This migrationist/diffusionist bias should be contrasted with more recent perspectives that tend to emphasize the importance of in place or in situ cultural development (compare Smith 1984). Proponents of both points of view have been engaged in a rather hot debate for a long time now; the persistence of the discussion is suggestive of the basic importance of the issues in question.

Bearing in mind this historical context for early modern investigations, McNutt's book can be seen as a tribute to the work of several "founding fathers" of the cultural-historian persuasion. Indeed, the photographs of three such luminaries within Mississippi Valley archeology—namely Phillip Phillips, James A. Ford, and James B. Griffin—grace the volume's cover. The best known contributions of these famous researchers include such seminal papers as *Archaeological Survey in the Lower Yazoo Basin, Mississippi, 1949-1955* (Phillips), *The Tchefuncte Culture: An Early Occupation of the Lower Mississippi River Valley*

(Ford), and *Prehistoric Cultures of the Central Mississippi Valley* (Griffin). The most important collective contribution of these three archeologists is represented in their massive monograph *Archaeological Survey in the Lower Mississippi Alluvial Valley, 1940-1947*. Taken as a whole, this work summarized the results of the **only** systematic surface survey of its time in the area and additionally codified basic ceramic typologies still in use today. At a more basic level, it strengthened the fundamental principles and methods according to which prehistoric ceramics were and are classified.

Today, while radiocarbon dating provides an anchor to which cultural sequences and chronological frameworks are secured, the ceramic typologies that Phillips, Ford, and Griffin helped to build are in part integral to addressing questions that require very fine-grained chronologies. In contrast to radiocarbon dating, which typically can resolve prehistoric time into century-long intervals, temporal frameworks based on carefully seriated ceramics can help archeologists to refine time still further. In the case of Mississippian societies in the American Southeast, for example, fine scale ceramic seriations are enabling regional specialists to develop models to evaluate the frequency and regularity of mound site abandonments (see papers in Scarry 1996). Addressing such low scale problems as this in turn can translate into an enhanced understanding of different relationships, both between sites and among cultural systems, during various periods in prehistory. Further, it is not difficult to recognize that these kinds of issues and questions were virtually identical to those which concerned the early "cultural historians," including Phillips, Ford, and Griffin. Seen from this perspective, McNutt's volume can easily be considered a natural extension of these three early workers' research, but with the considerable additional benefit of countless expanded and improved field and interpretive methods and approaches.

As with Phillips, Ford, and Griffin, the scale at which McNutt approaches the Central Mississippi River valley archeological record can be characterized as broadly regional. This tendency to regionalize is clearly paramount even within the individual contributions, which appear in no particular order. Each paper includes extended discussions (with much new and interesting data) on major subareas within the larger Central Mississippi valley region, and each reviews in detail broad scale adaptive patterns typical of the major cultural periods (Paleoindian through Protohistoric times). Integration of recently available radiocarbon date suites into relevant chapters and sections results in a generally improved understanding of relationships between

(for example) Late Archaic and representative Woodland cultures. Further in this regard, most of the contributors to McNutt's volume take the time to review and re-evaluate evidence for intraregional and interregional linkages (e.g., Late Archaic Poverty Point exchange with northern Tchefuncte groups). Virtually all the authors in McNutt's fine book thus consider stylistic and functional similarities in (for example) ceramic assemblages from very different areas of the greater Central (and Lower) Mississippi valley and moreover try to suggest **reasons** for the similarities.

Specific subregional treatments of Central Mississippi valley archeology include papers on Southeast Missouri (Lafferty and James A. Price), western Kentucky (Lewis), the "Reelfoot Lake Basin" of the Kentucky/Tennessee interborder area (Mainfort), the west Tennessee bluff zone (Smith), northeast Arkansas (the Morses), east-central Arkansas (House), and the Upper Yazoo Basin (McNutt). The final chapter, written by the editor, contains a comprehensive but very readable summary of the developments and discoveries that have continued to shape Central Mississippi valley archeology since the halcyon days of Phillips, Ford, and Griffin. This synopsis, together with the seven masterfully edited papers, constitutes a thorough overview of nearly the full scope and swell of recent archeology in this part of the southeastern United States. Any person wanting to gain an appreciation of the richness of Central Mississippi valley archaeology, as well as the prehistoric cultures that it professes to study, will surely benefit from reading, and perhaps owning, McNutt's excellent volume.

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*Snapshots of the Past*. BRIAN FAGAN. Altamira Press, Walnut Creek, California, 1995. 167 pp., black and white illustrations. Hardcover \$32.00; Paper \$14.95. ISBN 0-7619-9108-5 (hc); ISBN 0-7619-9109-3 (pb). Reviewed by Marlin Hawley, Kansas State Historical Society

*Snapshots of the Past* by Brian Fagan is a lively collection of short vignettes, or snapshots, on various aspects of modern archeology. Fagan is a professor of anthropology at the University of California at Santa Barbara, and while his early interests centered on Africa, he has long specialized in public archeology. Seeking to convey in plain language the excitement of modern archeology, typically in historic perspective, he is our best and most ardent popularizer (in the best sense of the word). Among his books are *Journey Out of Eden*, *The Great Journey*, and *Time Detectives*, as well as numerous archeological histories and several of the most widely used college textbooks. Ranging widely in time, space, and subject matter, the essays in *Snapshots of the Past* were, with two exceptions, originally published in Fagan's column in *Archaeology* magazine. The essays are organized loosely into four sections, revolving around the themes of early lifeways, complex societies, issues in contemporary archeology, and the relationship of archeology and society. The essays are personal in tone but never lose sight of Fagan's concern for accuracy and clarity.

The first set of essays range the most widely in time and space, although all are focused on early (i.e., pre-civilization) lifeways. Opening essays discuss early hominid sites of Olduvai Gorge in Tanzania and Hadar in Ethiopia and the elusive hominid *Homo erectus*. Progressing through time, other essays report on the Christmas day 1994 discovery of a previously unknown cave in France, its walls adorned with spectacular art, to early fisherfolk of the Jomon culture of Japan, the African site of Kafue Flats and the hunting behavior of our distant ancestors, the domestication of cattle, and the neolithic tombs and villages of Ireland. A common theme running through the diverse topics of these essays is the continual overturning or, in some cases, fine tuning of long held beliefs. Fagan's awe at our abilities, through patience and imagination, to elucidate the human past shines through.

The essays in Part II range from a book review of George Bass' 1988 book *Ships and Shipwrecks of the Americas* to the domestication of camels and Maya hieroglyphic decipherment. Essays report not only on early civilizations but also the recent efforts of historical archeologists to document the history of a

short-lived state in the interior of Brazil, founded and ruled by runaway slaves. As much as the sites, the essays concern themselves with the kinds of questions archeologists ask and some of the ways in which they seek answers. Particularly important to Fagan are interdisciplinary efforts, such as the union of archeologists, ethnologists, and epigraphers in deciphering Maya hieroglyphs, thus bringing the Maya fully into the realm of documented history.

Part III turns to some recent issues and controversies in modern archeology. Archeology and archeologists often seem to thrive on controversy, and there are two thorny ones discussed here: mitochondrial "Eve" and the settling of the Americas. The first has pitted geneticists against many paleoanthropologists and, some would argue, against the highly fragmentary human fossil record, while the second, according to Fagan, exposes the right and wrong ways to approach a complex problem. He contrasts the calm weighing of data and efforts to address potential data-related problems of some researchers, such as James Adavasio, who as the excavator of Meadowcroft Rockshelter in Pennsylvania, has been embroiled in the Early Man in the Americas debate for years, with the French team investigating Pedro Furada in Brazil. Unlike the French archeologists exploring the Brazilian site of Pedro Furada, who have relied so far in the media on assertions of great antiquity without the hard evidence to back them up, Adavasio has patiently sought to address key questions, such as possible contamination of his pre-11,500 year old radiocarbon samples. Throughout the essay, Fagan reminds us that science is not about taking sides.

Part III also includes essays on current feminist or, to be politically correct, gender-based archeology, experimental archeology, and cannibalism. Fagan does not chauvinistically protest gender-based studies, but as with claims for early sites in the Americas, challenges its adherents to work close to the data. Indeed, throughout the book Fagan constantly stresses the importance of the data and its meticulous, cautious analysis. Experimental archeology is lauded in its efforts to give substance to what might otherwise remain conjectural.

The final essays in the Part III, "The Arrogant Archeologist" and "Archeology's Dirty Little Secret," should be required reading for anyone with a serious interest in the past or in archeology. While sites are destroyed by looting or development at an almost exponential rate, archeologists, Fagan observes, prefer to talk about it but do little. Lacking, in his view, is a commitment to produce in our graduate programs professionals who care about such unglamorous things

as conserving the past, the affects of tourism at archeological sites, and the like. Rather, much time is spent continuing to excavate sites often to rather limited scientific ends. The issues that drive archeology are, in Fagan's view, at variance with the world as it is. As archeology is reduced to a series of ugly equations, involving such things as "tenure," "prestige" and "rank," dollars and cents, "clientrightism," and "compliance," the resource (as our heritage, the *human* heritage, is glibly called) continues to disappear. But, paradoxically, when archeologists do excavate, too often they do not publish or publish only the occasional "preliminary" report (sometimes over and over again). Cultural resources management or CRM has meant that much more is written up these days, but the reports are rarely circulated very widely. The past is destroyed not only by development or looters but just as surely by neglect in all its various and sundry forms.

The essays in the Part IV discuss the relationship of not only the archeological community but the past itself to the public. The public is engaged by the past in a variety of ways. For some, the past is commodity. Fagan reports the looting of Slack Farm, an important Mississippian site in Kentucky. Although reprehensible, the looting of this site and the General Electric Mound in Indiana resulted in tremendous public outrage, ultimately transmuted into new laws or modifications of existing laws to protect sites. But though a concern, however belated, for the remains of

the past move some, the myth of progress drives development that further threatens sites. Probably it is only the public that can change the balance of the equations. In England the discovery of the Rose, an early theater where Shakespeare trod and where some of his plays were first performed, in the course of a development attracted the attention not only of the acting community but many others. In the end the site was saved, preserved beneath the building. Guatamalan concerns about the loss of scores of poorly documented sites to inundation by a Mexican-sponsored reservoir project have so far stalled the project but for how long? The efforts in this country by the Archaeological Conservancy to protect sites are applauded.

There is much to recommend this book. It is especially geared to the general lay public and would certainly be suitable for the beginning student, the jaded graduate student, and readers of *The Kansas Anthropologist*. The essays are gracefully written and manage to convey not only the excitement of archeology but also its variety and its failings. Archeology is presented as a science but a necessarily very human one. Fagan embraces both the escoteric science and the emotions felt in the course of research with equal ardor. The essays themselves are very cleanly edited; there are occasional glaring typographical errors in the newly written introductory sections, but these do not in any way distract from the overall high quality of the book.

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