MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

ARCHAEOLOGICAL EXCAVATION AT THE CRISTO REY SITE, SUNLAND PARK, DONA ANA COUNTY, NEW MEXICO

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ADMINISTRATIVE SUMMARY

In the spring of 1987, the Office of Archaeological Studies (formerly the Research Section), Museum of New Mexico, tested an archaeological site within the limits of a project to reconstruct New Mexico State Road 273 in Sunland Park. The excavation in 1988 was approved by the New Mexico State Highway and Transportation Department. The site is located on a terrace east of the Rio Grande in Doña Ana County, New Mexico, in a dunal environment.

LA 1644 (the Cristo Rey site) consists of a pit structure, burned areas, and artifacts located in blowouts of a dunal area. The pit structure produced a corrected C-14 date of A.D. 465 $\pm$ 60, placing it in the early Mesilla phase of the Jornada Mogollon Culture. A variety of activities was represented by the artifact assemblage, in which locally available materials were used. The ceramic assemblage consisted mostly of El Paso Brown Ware.

It is difficult to assess the site as a seasonally used site partly because portions of it had been removed by utility trenches and partly because of the nature of the artifacts found on the site. However, additional evidence suggests that Cristo Rey was perhaps seasonally occupied.

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TABLE OF CONTENTS

Figures

Tables

ACKNOWLEDGMENTS

This report discusses the results of excavation at LA 1644, the Cristo Rey site. David A. Phillips, Jr., former director of the Office of Archaeological Studies, served as principal investigator. I would like to thank the field crew for working hard through both cold and hot weather, and also through some very strong dusty winds. Thanks also to the New Mexico State Highway and Transportation Department patrol yard at Anthony for providing a backhoe and operators.

Many people assisted in the preparation of this report, Anthony Martinez and Kalay Melloy did the lithic artifact analysis and Rhonda Main performed the ground stone analysis and also helped in writing the ceramic section. Regge Wiseman, Bruce Buchanan, Mollie Toll, Linda Mick-O'Hara, and Glenna Dean are thanked for their specialist contributions. The report production crew is appreciated and also Nancy Warren for providing the photographs.

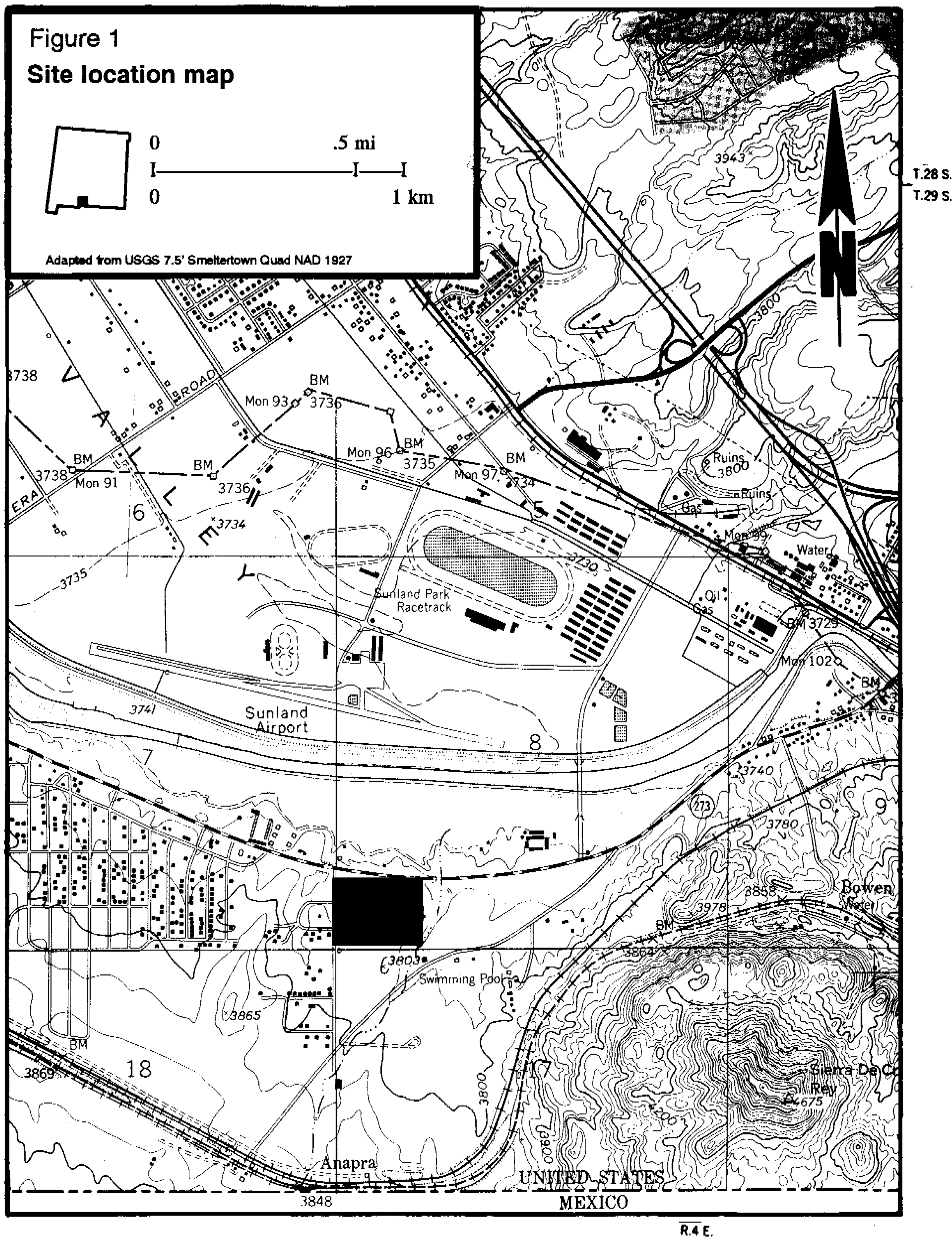
INTRODUCTION

At the request of William L. Taylor of the New Mexico State Highway and Transportation Department, the Office of Archaeological Studies, Museum of New Mexico, conducted archaeological studies of LA 1644 along New Mexico State Road 273 in Sunland Park, Doña Ana County, New Mexico (Fig. 1). Initial testing was conducted from September 9 to 30, 1987, followed by data recovery from March 1 to 22, 1988.

LA 1644 was first discovered by Mera in 1937 and was recorded as a sherd area with El Paso Brown and unclassified brown wares; no report was published. During the current studies, LA 1644, consisting of a pit structure and several burned areas within a dunal area, produced a corrected C-14 date of A.D. 465 $\pm$ 60 suggesting that it is an early Mesilla phase site.

The field crew consisted of Office of Archaeological Studies personnel including Dorothy A. Zamora, project supervisor, assisted by Rhonda Main, Rodney North, Kalay Melloy, and Anthony Martinez.

Figure 1
Site location map



PHYSICAL ENVIRONMENT

The Cristo Rey site is on the first large terrace south of the Rio Grande floodplain. The area is within the Mexican Highland section of the Basin-and-Range physiographic province, in which tilted fault block ranges were uplifted in the late Tertiary period. During the Pleistocene epoch of this period, intermontane basins filled with debris from the erosion of uplands (Kottlowski 1958).

During the middle of the Pleistocene, the Rio Grande began to carve its present valley into the basin settlements, and has since aggraded or degraded its beds in response to the glacial-pluvial cycles (Kottlowski 1958; Metcalf 1967).

Soils

by Bruce Buchanan

Soils are often used as a marker of landscape stability. Therefore, in general, a surface or landscape that has been stable allows soil development to progress. Poorly developed soils are more representative of landscapes that are unstable (they are either eroded or material has recently been deposited). Soil development is a function of parent material, climate, topography, biotic factors, and time. The process is slow in arid climates but there exists well-documented characteristics that are associated with arid soil development. The most common is formation and redistribution of calcium or magnesium carbonate. Soils having secondary carbonate accumulation indicate an older soil than those lacking carbonate. Clay formation or redistribution and structure formation are also associated with well developed or older soils.

The soils of the transect area are mapped as Bluepoint loamy sand on 1 to 5 percent slopes (Bulloch and Neher 1980). These soils have formed in sandy alluvium that has been modified by wind and occur on fans, terraces, and ridges along the Rio Grande Valley. Typically, the soil is light brown loamy sand reaching a depth of 150 cm or more. Mapped adjacent to the Bluepoint soils approximately 100 to 150 m to the north are the Aqua Variant and Belen Variant soils. These are nearly level and are on the flood plain of the Rio Grande, and are primarily are used for grazing. Irrigated grasses and legumes are rarely grown because of sand build up.

Vegetation

Southern New Mexico lies within the boundary of the Chihuahuan Desert (Shreve 1942). Local vegetation consists of four-wing saltbush *(Atriplex canescens)*, torrey yucca *(Yucca torreyi)*, rabbitbrush *(Chrysothamnus nauseosus)*, broom dalea *(Dalea scoparia)*, joint-fir *(Ephedra trifurca)*, trailing allionia *(Allionia incarnata)*, sand verbena *(Abronia villosa)*, stick leaf *(Mentzelia pumila)*, Russian thistle *(Salsola kali)*, and western pepper grass *(Lepidium* *montanum).* Grass cover is very sparse and consists of dropseed (*Sporobolus* spp.), which is associated with disturbed or deep sandy soils (O'Laughlin 1977). There is some evidence that local alluvial plains and terraces were once covered by grasses and that desert shrub vegetation was much more restricted than it is now (Gardner 1951; York and Dick-Peddie 1969).

Fauna

Some of the most common mammals in the area include the desert cottontail *(Sylvilagus audubonii),* black-tailed jackrabbit *(Lepus californicus),* pocket mouse *(Perognathus* spp.), white-footed mouse (*Peromyscus* spp.), kangaroo rat (*Dipodomys* spp.), white-throated woodrat *(Neotoma albigula),* coyote *(Canis latrans),* striped skunk *(Mephitis mephitis),* and mule deer *(Odocoileus hemionus).*

Climate

The climate for the area is semiarid mesothermal. The average annual precipitation for El Paso is 200 mm (8 inches), with about half of that falling during July, August, and September (USDC 1969). The annual precipitation for the Las Cruces area ranges from 180 to 230 mm (7 to 9 inches); up to 410 mm (16 inches) falls on nearby mountains. Precipitation during the summer usually takes the form of thunderstorms of short duration, while winter precipitation tends to be light. An average of 42 thunderstorms a year occur from April through October, a few of which are accompanied by hail (Maker et al. 1971). Dust storms occur in the spring, when winds are the strongest and soils are dry.

Snowfall is light in the lower elevations from November to March. The annual snowfall ranges from 60 to 130 mm (2.5 to 5 inches) at lower elevations (Maker et al. 1971). There are considerable changes in day and night temperatures. The average maximum temperature for El Paso ranges from 35.2 degrees C (93.4 degrees F) in June to 13.5 degrees C (56.3 degrees F) in January. The average number of frost-free days is 248 (O'Laughlin 1980). The highest temperatures have been 45.6 degrees C (114 degrees F) at Hatch. The lowest temperatures, recorded at the Jornada Experimental Range, have been -6.7 degrees C (-20 degrees F).

CULTURAL OVERVIEW

Paleoindian Period

The Paleoindian period (12,000 B.C. to 6000 B.C.) is the earliest known period of human occupation in the study area. The population of that time is thought to have been small with mobile groups subsisting on big-game animals (O'Laughlin 1980). Little is known of their settlement behavior because evidence of their presence has consisted primarily of isolated projectile points, similar to those found at bison kill sites. The Paleoindian period has never been well defined, but this particular pattern appears to have ended around 6000 B.C. (O'Laughlin 1979).

In the El Paso area, Paleoindian remains consist of surface finds and occasionally items in context on stratified sites. Sites from this occupation have not been intensively investigated. Chipped stone assemblages from surface scatters are interpreted in the light of more extensive investigations in central and eastern New Mexico and in the midcontinental grasslands of North America (Judge 1973). These studies suggest that the Paleoindians were oriented toward hunting large mammals and collecting plant foods. Social groups were small and group membership was flexible and very mobile. Mobility is reflected in the uniformity of projectile points and other chipped stone tools over very large areas (O'Laughlin 1980). Several changes occur at the end of the Paleoindian period. A change in climate, the extinction of many large mammals, and the establishment of varied ecological communities caused hunters and gatherers to search for food and animals in more widespread areas (O'Laughlin 1980).

Archaic Period

The majority of Archaic sites in the study area consist of surface projectile points. Only a few sites are securely dated, and even fewer have been excavated. The Archaic period in south-central New Mexico ranges from 6000 B.C. to A.D. 400, and has been referred to as the Hueco (Lehmer 1948), Desert Cochise (Minnis 1980), the Archaic Chihuahua Tradition (MacNeish and Beckett 1987), and a branch of the Picosa (Irwin-Williams 1967). The people of this period are characterized as having a dispersed, nonsedentary way of life, whose subsistence strategies were based on hunting and gathering (Oakes 1981).

The few known architectural features of the Archaic period consist of pit rooms, hearths, surface structures, and occasionally pit burials. Desert Cochise projectile points are typically large and broad. Spear and dart points are the primary hunting tools.

Small projectile points are not typical of Archaic sites. However, choppers, knives, drills, hammerstones, and scrapers are the tools found on Archaic sites (Bailey 1980:6). LeBlanc and Whalen (1980) state that late Archaic and early Mogollon pithouses are similar in form, but there is a slight difference in size. They further state that the lack of remodeling during the late Archaic may be an indication of a mobile rather than a more sedentary lifestyle.

Small campsites located at the base of mountainous areas were occupied during the spring for processing leaf succulents (O'Laughlin 1979). On the edge of the Rio Grande, Greiser (1973) excavated a site composed of a series of small encampments occupied from time to time throughout the year for processing lithic materials, hunting, and gathering. These sites reflect the mobility of social groups corresponding to seasonal availability and spatial distribution of economically useful plant and animal resources (O'Laughlin 1980).

The introduction of pottery marks the end of the Archaic period. At this time, population seems to have increased as groups became more sedentary and more dependent on agriculture.

Formative Period

The Archaic period ends when agricultural village life begins. This is known as the Formative period (A.D. 900 to A.D. 1400) (Whalen 1978:8). This cultural area, known as the Jornada branch of the Mogollon (Lehmer 1948), is divided into a northern part, the Tularosa Basin and areas to the east, and a southern part, the Hueco Bolson, which includes the study area and adjacent areas. There are three phases represented in the Hueco Bolson: Mesilla, Doña Ana, and El Paso.

Mesilla Phase

The Los Tules site, excavated by Lehmer (1948), was the first Mesilla phase site recorded. This study led to the first formal description of this phase with diagnostic artifacts. The ceramics recovered at Los Tules included El Paso Brown, Mimbres Black-on-white, Mimbres Corrugated, San Francisco Red, and Alma Plain. Based on these ceramics, Lehmer (1948) places the Mesilla phase at A.D. 900 to 1100. In the White Sands area, Oakes (1981) received a radiocarbon date of A.D. 600 on a pit structure, but Whalen's work (1980) has pushed back the date to A.D. 400. Few excavations of Mesilla phase sites have occurred.

Anyon (1985), on the other hand, has divided the Mesilla phase into early and late, distinguishing each by the presence or absence of Mimbres Black-on-white ceramics. Beckett (1979) also has divided the Mesilla phase into early (A.D. 200 to 750) and late (A.D. 750 to 1100) to correspond with the earliest dated ceramics. Anyon et al. (1981) derived the dates for these subphases from the dates for Mimbres Black-on-white ceramics (A.D. 750). Anyon (1985) also states that the early Mesilla cannot be further divided, however, the late Mesilla can be broken down into subphases by stylistic differences in Mimbres Black-on-white ceramics.

The architecture for the Mesilla phase consists basically of pithouses. The pithouses are both shallow (Whalen 1980) and deep structures (Lehmer 1948). Hard (1983) differentiates between the two types of structure, as does O'Laughlin (1980). Hard refers to structures that are less than 30 cm deep as huts, and those more than 30 cm deep are called pithouses. Huts are short-term occupation structures, while pithouses are winter habitation units (Hard 1983).

Settlement patterns for this phase are similar to those of the Archaic period, which suggest high mobility of small, loosely integrated social groups that depended on hunting and gathering with some domestication of plants (Beckes 1977; Whalen and Thompson 1980). Ceramics and the bow and arrow suggest new methods for processing and fulfilling subsistence needs (O'Laughlin 1980).

Sedentary settlement patterns are noted at about A.D. 900 to 1100 (O'Laughlin 1980). Communities became larger and a greater degree of integration of social groups is implied by the house settlement patterns (Lehmer 1948; Whalen and Thompson 1979, 1980). Some communities were located along the Rio Grande or near areas where water collects from mountain runoff, suggesting that domesticated plants were being grown (O'Laughlin 1979; Whalen 1980).

O'Laughlin (1980) states that population pressure near the end of the phase may have reduced the areas from which local populations could procure native plant and animal resources. He further states that reduction in environmental resources may have stimulated changes in diet, in site location, and permanency of occupation. More variability in site types may indicate a change in organization of activity with little decrease in mobility (O'Laughlin 1979; Whalen 1978).

Doña Ana Phase

This phase (A.D. 1100 to 1200) is very controversial because archaeologists do not agree that it exists. Lehmer (1948) describes the Doña Ana phase as a time of transition. It involved the development of above-ground adobe structures. Both multiroomed units and pithouses occurred. The local ceramics ranged from El Paso Brown to El Paso Polychrome. Lehmer (1948) also notes that trade wares increased in number and variety. Trade wares from the Mimbres area, Zuni area, and from the Tularosa Basin were being imported into southern New Mexico at this time (Sebastian 1989:74-77).

Anyon (1985) argues that Doña Ana sites are actually multicomponent sites containing both Mesilla and El Paso phase structures and materials. Carmichael (1986) argues that the Doña Ana phase is not only real, but a period crucial to understanding the intensification of agriculture in the Jornada Mogollon area. Anschutez and Seaman (1987) question Carmichael's ability to distinguish "true" Doña Ana phase sites from mixed Mesilla and El Paso occupations. They also suggest that Doña Ana sites be revisited and reassessed, as most work has been survey oriented and significant problems such as chronology and context have not been resolved (Anschuetz and Seaman 1987).

Archaeologists such as Whalen (1978), Eck (1979), and Anyon (1985) have dropped the Doña Ana phase because of the difficulty of identifying the sites. Whalen (1981) calls this phase a pueblo-to-pithouse transition rather than Doña Ana. Beckes (1977:179) mentions that Doña Ana phase sites outnumbered the Mesilla phase sites on McGregor Range. Way (1979) reports sites with Doña Ana phase characteristics but calls them early El Paso phase sites instead.

El Paso Phase

More is known about the El Paso phase (A.D. 1200 to 1400) than any of the Jornada Mogollon phases. Considerable surveys and excavations have dealt with this phase. Research has led to the discovery of small, single-room units to large multiroomed pueblos. El Paso phase sites are described by Lehmer (1948) as consisting of adobe room blocks arranged either around a plaza or in long east-west oriented tiers. El Paso Polychrome is the dominant ceramic type, but other wares such as Chupadero Black-on-white, Lincoln Black-on-red, and Three Rivers Black-on-terracotta are common.

The presence of El Paso Polychrome and various trade wares along with a more sedentary adaptation to the environment are characteristic of the El Paso phase (Oakes 1981). During the El Paso phase, populations depended primarily on agriculture for subsistence needs (Anyon 1985).

Whalen (1977, 1978) divides the El Paso phase sites into habitation sites and special activity sites. Habitation sites occur along the Rio Grande and areas where runoff from the mountains accumulates. Evidence of corn, beans, and squash have been found growing on these sites (Brooks 1966; Ford 1977). Sites are occupied on a fairly permanent basis for varying lengths of time (O'Laughlin 1980). Special activity sites are larger camps and are restricted to activities such as hunting, gathering, and processing (O'Laughlin 1980).

At about A.D. 1400-1500 the area was abandoned. Environmental changes may have occurred or the adaptive system, which had relied heavily on agriculture, collapsed (O'Laughlin 1980). Several El Paso sites have been recorded by Cosgroves and Cosgroves (1947) and White (1965) near Three Rivers, New Mexico, and El Paso, Texas. Two cave occupations were recorded near El Paso: La Cueva (O'Laughlin 1974) and the White Rock Cave site (Brice and Phillips 1967).

RESEARCH DESIGN

(The following research design is taken from Zamora [1987] and is quoted fully here.)

Testing data indicated that LA 1644 may be a residential site of the Jornada Mogollon branch. The occupation has been dated by ceramics to the Mesilla phase (A.D. 900 to 1100). Several possible features discovered during the initial survey were tested and produced small fragments of bone, fire-cracked rock, ceramics, lithic artifacts, burned adobe, and shell objects. The research proposal focuses on determining the subsistence strategies and settlement system employed by the residents of the site. The potential of finding buried deposits and pithouses is considered high.

Mesilla sites have been described as habitation or special activity sites on the basis of size, the density of surface artifacts, and relative dependence on domestic plants. Using data from extensive surveys of the Hueco Bolson, Whalen (1977, 1978) describes the Mesilla subsistence settlement system as generalized and extensive, with small, dispersed residential sites. He infers that along with horticulture, generalized hunting and gathering were of increasing importance in the Mesilla phase. Because this hypothesis is based on survey data alone, investigation of a Mesilla phase site such as LA 1644 should help clarify some of the existing ambiguities about settlement systems and subsistence strategies.

Mesilla phase sites have a wide distribution, whereas El Paso phase sites are virtually confined to runoff zones of mountain bases (Whalen 1977, 1978). Sites along the Rio Grande tend to be from longer occupations, with some seasonal occupation during the winter months. Formative sites, showing increased dependence on domesticated plants, have been found on the west side of the river (O'Laughlin 1980). Mesilla phase sites on the west side consist of a large number of camps with fire-cracked rock hearths. Some of these sites have moderate to light scatters of ceramics and extensive deposits of fire-cracked rock or numerous identifiable hearths. LA 1644 may represent a similar Mesilla phase settlement pattern.

Archaeological remains of foods utilized by prehistoric groups in the Hueco Bolson and Tularosa Basin have been recorded by many researchers. Basehart (1974) determines that the Mescalero Apaches sought mescal, mesquite, sotol, prickly pear, piñon, and other resources from the region around the Tularosa Basin. Charred mesquite pods, sunflower seeds, cheno-am seeds, and cactus seeds from a Mesilla phase site in the Hueco Bolson were recovered by Whalen (1981:83). O'Laughlin (1980) found economic pollen of wolfberry, prickly pear, and other cacti on upper alluvial Bolson slopes and macrofloral remains of soaptree yucca, goosefoot, amaranth, mesquite, and grasses. Food production is evident only as a supplemental activity during Mesilla phase occupation of the southern Tularosa Basin and Hueco Bolson (Whalen 1981). Subsistence strategy is therefore a plausible subject of research in the area.

The length of the Mesilla phase suggests that subtle changes in subsistence strategy, mobility, and settlement patterns may eventually be detected (O'Laughlin 1980). Populations probably depended primarily upon hunting and gathering. Around A.D. 1000, communities became larger and more permanent, implying a greater dependence on domesticated plants.

However, a great deal of work still needs to be done on Mesilla phase occupations, and there is high potential for further clarifying site types and identifying subsistence activities.

Research Questions and Data Needs

Further research at LA 1644 will concentrate on the questions and strategies outlined below.

1. When was LA 1644 occupied? Can the local time frame be refined as a result of work at the site?

LA 1644 has been tentatively defined as a Mesilla phase site, based on a small ceramic sample. Typological studies of a large sample, derived through excavation, will serve to verify the phase assignment.

Absolute dates for local phases depend heavily on ceramic cross-dating. Recovery of datable materials would assist in verifying traditional phase dates. At LA 1644, possible sources of absolute dates include carbonized remains, obsidian, and hearths. Each of these types of remains should be sampled for dating if found during excavation.

As noted above, O'Laughlin (1980) believes that within the 200-year span of the Mesilla phase, communities became larger and more permanent, and grew to depend more heavily on cultivated foods. Careful dating of LA 1644 may help place it within a specific portion of the Mesilla phase and therefore allow us to better evaluate O'Laughlin's arguments.

2. What was the internal time frame for occupation at the site?

If possible, stratigraphic and other field data should be combined with available dates to determine if the occupation at LA 1644 was brief or if it spanned many decades. To begin with, information on the duration of site use would help indicate if local use patterns involved frequent site shifts or if they were fairly stable through time. Beyond this, such information could lead to identification of earlier and later portions of the site and more thorough understanding of internal changes in subsistence through time.

3. What was the basic function of the site?

Excavation data should verify the tentative identification of LA 1644 as a habitation site. Specifically, it should be possible to use feature and artifact data to identify specific sets of activities corresponding to the somewhat vague functional term "habitation site." For example, pit features may reflect use of space for occupation shelter, storage, or food preparation. Comparisons with previously excavated Mesilla phase sites will assist in the functional identification of excavated features. Ideally, the project would identify the site as temporary or permanent and determine if it was oriented towards a narrow (possibly seasonal) or broad range of resources.

Studies of ceramic form and wear may shed light on the importance of food storage, preparation, and serving at LA 1644. Studies of lithic reduction will determine if chipped stone tools were produced or only maintained at the site, while studies of edge wear will indicate if expedient or long-term tool use was the rule. Also, edge studies may shed light on specific activities carried out at LA 1644. Analysis of ground stone will indicate if site activities emphasized the preparation of plant foods (wild or domesticated). A study of faunal and floral remains, to be treated as a separate research question, will round out the picture of site function derived from studies of features and artifacts. If it is possible to establish internal time controls within LA 1644 (Question 2), changes in function through time should be documented.

4. What specific plant and animal foods were being consumed at the site?

O'Laughlin (1980) argues that wild foods were more important than domesticated foods in the Mesilla phase. Ethnobotanical and pollen samples will be useful in determining the relative importance of plant foods at LA 1644. Also, these samples may indicate if the site was occupied during a single season or several seasons.

Independent studies of past and present environmental conditions will provide a context for interpreting archaeological data from LA 1644.

5. What does the site reveal about the size and nature of Mesilla phase social groups?

Although the site is disturbed, it should be possible to at least estimate what size and type of group was using the site, for example, an individual family or a large number of families living in a village. Comparisons with other Mesilla phase sites would then indicate if the pattern at LA 1644 was common or unusual for the phase.

6. What evidence is there for local or regional exchange networks?

Preliminary data on sherd temper indicate a reliance on local temper sources for pottery making. At the time, the presence of shell artifacts (including a piece of *Glycymeris* bracelet) indicate contacts reaching ultimately to the Pacific coast. Obsidian flakes may indicate trade contact of an intermediate scale.

In the El Paso phase, the immediate area was probably heavily involved in regional exchange efforts. El Paso phase sites commonly have a large number of exotic pottery types, including specimens from Chihuahua. Schaafsma (1974) has argued that the El Paso area was linked in some way with the Casas Grandes culture. It would be useful to investigate data on regional interaction, however limited, to attempt to define the extent to which El Paso phase trade had roots in earlier phases.

FIELD METHODS

Personnel from the Office of Archaeological Studies first tested LA 1644 in September 1987 (Zamora 1987). The testing revealed several stained areas with associated cultural materials and a burned shallow pit structure.

Before archaeological excavation began, the primary datum, established during the testing program, was relocated. A baseline was then placed in an east-west direction. A 1-by-1-m grid system was laid over the entire site. Surface collections were made in 1-sq-m units over the entire site. Artifacts were collected and bagged by grid proveniences and excavated levels were also sorted by material type (sherds, lithics, and bone). Each feature was photographed prior to and after excavation.

Surfaces were completely stripped and collected where cultural features (such as hearths and pits) or artifact scatters were present. The areas around the features or scatters were stripped until no further cultural materials were present.

Hand tools were used for excavation. All of the excavated fill was passed through a ¼-inch mesh screen. Each excavation unit was dug in 10 cm arbitrary levels until a cultural level or sterile soil was reached. If a feature was encountered, 1 by 1 m units were placed within and around the feature and given a designated grid number for control. Auger tests were placed in the center of each grid unit in order to locate subsurface features. After the hand excavation was finished, a backhoe was used to excavate 10 trenches (10 m long in an east-west direction) to ensure that no subsurface features were missed.

Most artifacts were recovered at a depth of 0 to 30 cm below the present ground surface (bpgs). Profiles were drawn for each feature and in units where stratigraphy of site deposits was obvious.

Ethnobotanical and radiocarbon samples were collected from all features. Upon completion of the excavation, all units and backhoe trenches were backfilled and the site map was completed using a transit and stadia rod.

LABORATORY METHODS

The artifacts collected from the excavation were processed at the Office of Archaeological Studies' analysis laboratory. Nonperishable artifacts were washed, labeled, and rebagged for identification and analysis. Perishable materials such as flotations, pollen, and C-14 samples were processed according to the procedures outlined by processing and analytical laboratories.

The stone artifacts were separated into categories including flakes, cores, formal tools, ground stone, hammerstones, and projectile points. The attributes monitored are listed in Appendix 4. Ceramics were typed using existing typologies. Attributes monitored included paste, temper, and surface finish. The faunal and botanical analyses were performed by specialists (Appendixes 2 and 3). The analysis data are on file at the Site Survey Files of the State Historic Preservation Division in Santa Fe.

Following the analysis, all artifacts were reboxed and submitted to the New Mexico State Archaeological Repository at the Laboratory of Anthropology in Santa Fe.

EXCAVATION RESULTS AT THE CRISTO REY SITE (LA 1644)

Physical Description

The Cristo Rey site is a fairly large site consisting of several blow-outs within a dunal area. Hundreds of artifacts and a few features, mostly outside the proposed right-of-way, were located. The area within the right-of-way had been affected by several utility lines. The utilities consist of a gas main, Southwest cable, AT&T cable, and a water line. These lines were put in before any archaeological work was performed. Outside of the right-of-way, several eroded hearths were delineated. Within the right-of-way, a pit structure was recorded and subsequently excavated. Often it was difficult to determine if a surface was a cultural feature or natural. The sand was compacted in some areas and very compacted in others (almost a sandstone consistency). A radiocarbon sample of A.D. 465 $\pm$ 60 was obtained from the excavated pit structure (Figs. 2-5). The site is at an elevation of 1,158 m (3,800 ft), on a terrace south of the Rio Grande floodplain.

Several burn areas were discovered during the testing phase, but after further investigation, were found to have been disturbed by mechanical means when the utility lines were installed for the town of Sunland Park.

Architecture

One architectural feature was found. This was a probable pit structure found on the edge of Blowout A (Fig. 3). The feature was dug into the sand and measured 2.38 by 1.58 m by 20 cm deep covering 4 sq m. The sandy unstratified fill contained charcoal, fire-cracked rock, flakes, bone, and some saltwater shell. A C-14 sample was taken from this fill. Also found in the surface stripping was a stone bead. The feature was highly disturbed with rodent burrowing. No post holes were found. The floor was slightly compacted sand with embedded charcoal and caliche. The size of the feature plus its depth would place it into Hard's (1983) and O'Laughlin's (1980) category of a hut. Both Hard and O'Laughlin state that any structure under 30 cm deep is considered to be a hut and deeper than 30 cm a pithouse. The walls of the pit structure were 30 cm high and were semicompacted sand with small embedded fragments of charcoal. The pit structure did not show any evidence of burning. No floor features were present.

Stratigraphy

The stratigraphy for the site is relatively uniform. The uppermost soil (6 to 10 cm thick) is loose, fine dry sand with the sand becoming slightly compacted from 12 cm to 40 cm. Below 40 cm the compact sand changes to a yellowish compact sand containing caliche and gravels (Figs. 6-9).

Very few grids were excavated below 30 cm, so a number of backhoe trenches were placed near the right-of-way edge in undisturbed areas to ensure that no other cultural resources were missed during excavation. Four of the ten backhoe trenches were analyzed by a geomorphologist because only these four trenches revealed distinctive differences in the soils. The soils are described below.

Soil Descriptions

by Bruce Buchanan

Five soil profiles are described in four trenches that had been dug by a backhoe along the study transect. The transect extended west to east along the south side of NM 273. The transect was divided into 10 m sections beginning from the west end and continuing east, a distance of approximately 350 m. The four trenches were dug between the 20 to 30 m, 170 to 180 m, 290 to 300 m, and 320 to 330 m baseline sections.

The soils of the 20 to 30 m section (Profiles 1 and 2) were representative of Aqua Variant soils (Figs. 6-7). The profiles appeared to have a recent deposit of eolian sand 10 to 12 cm thick over what seemed to be a plow layer approximately 15 cm thick. The soils were likely plowed or manipulated by man within the last 50 to 100 years and have recently (< 50 years) had sand deposited on the surface. The Aqua Variant soils did not extend east beyond the 40 m section of the transect. In fact the remaining portion of the transect (40 to 350 m) is considered to be entirely a Bluepoint loamy sand in different stages of erosion and deposition.

The soil in Trench 2 (Profile 3) at the 170 to 180 m section is a Bluepoint loamy sand (Fig. 8). There is a recent deposit of sand ranging in depth from 15 to 30 cm and averages 20 cm deep along this section of the transect. Below the 20 cm deposit is a relatively stable Bluepoint soil (18 to 135 cm) and below the Bluepoint soil is a soil similar to the Aqua Variant (135 to 150 cm). The Bluepoint soil appears to have been stable for 1,000+ years based on carbonate accumulation. The surface at 20 cm was probably deposited within the last 50 years.

The soil in Trench 3 (Profile 4) at 290 to 300 m section is Bluepoint loamy sand (Fig. 9). The first 100 cm of soil is nearly free of carbonates and may have been deposited in the last 50 years. From 100 to 200 cm the soil material is older (more carbonates) and is considered to have been deposited within the last 1,000 years. Some cultural artifacts were found in this layer of soil. Below 200 cm, the material is Bluepointlike but represents an older, more developed soil than the layers above. The profile was exposed to 330 cm and the deeper soils had well-developed carbonate fragments 2 to 4 mm in size.

The soil in Trench 4 (Profile 5) at the 320 to 330 m section is Bluepoint loamy sand and similar to Profile 4 in Trench 3 (Fig. 8). The surface at 100 cm represents a recent eolian deposit over an older alluvium found at the 100 to 300 cm depth. The first 100 cm of the profile is considered to be deposited recently, within the last 50 to 100 years. Below 100 cm, the soil has increasing amounts of carbonate and thus represents older soils that may have been deposited during the last 1,000 years. Below the 184 cm layer, the material has well-developed carbonates and is thought to represent soils older than 1,000 years.

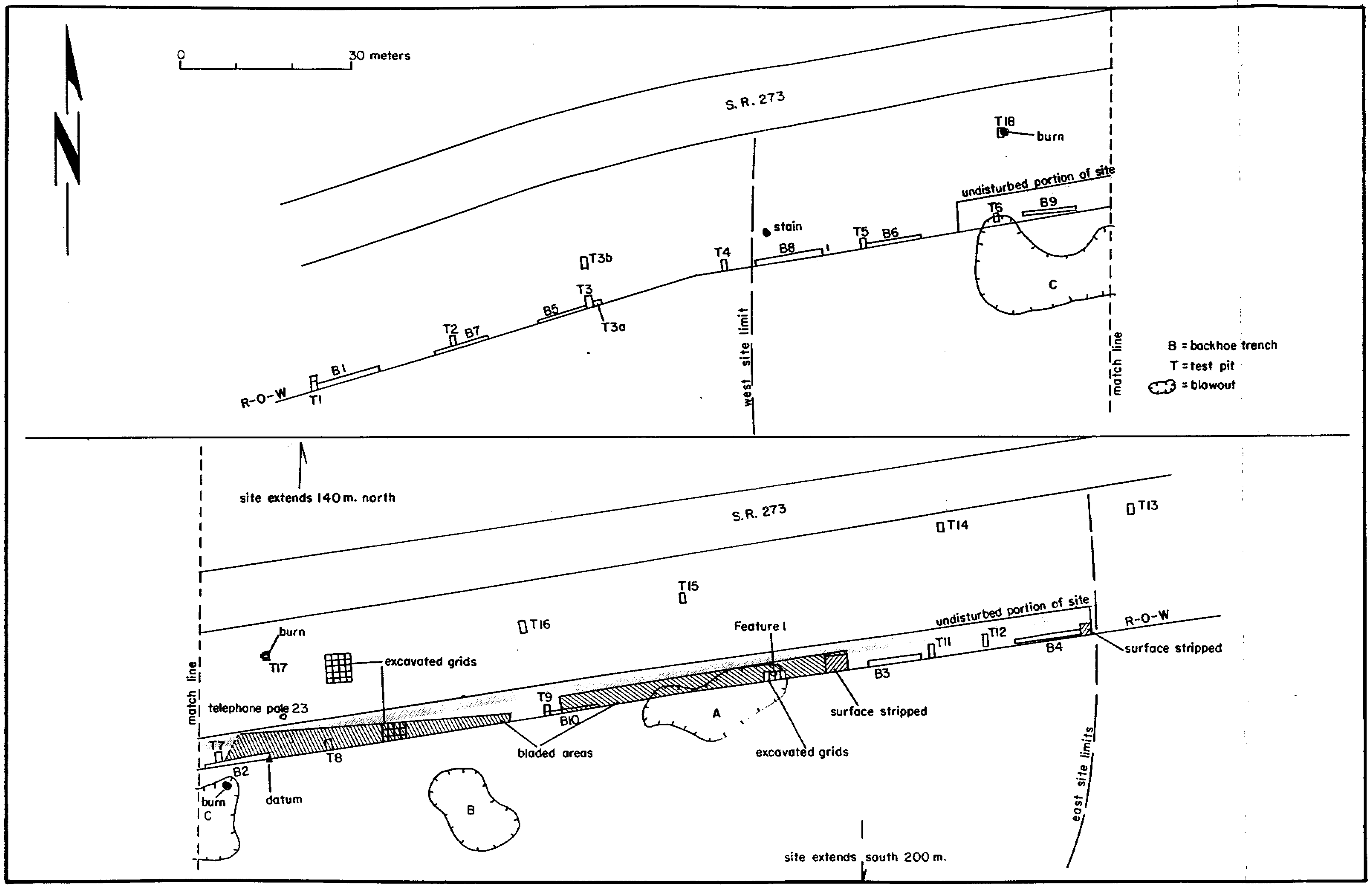


Figure 2. Site map, LA 1644.

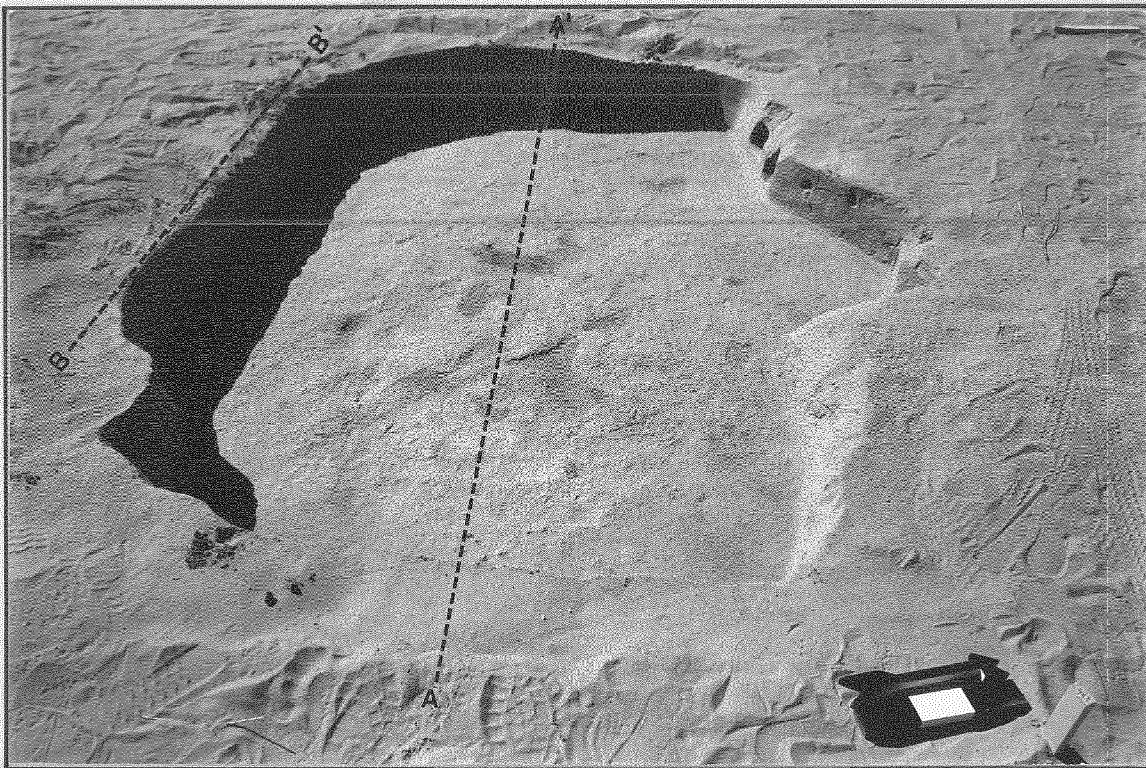


Figure 3. Pit structure, LA 1644.

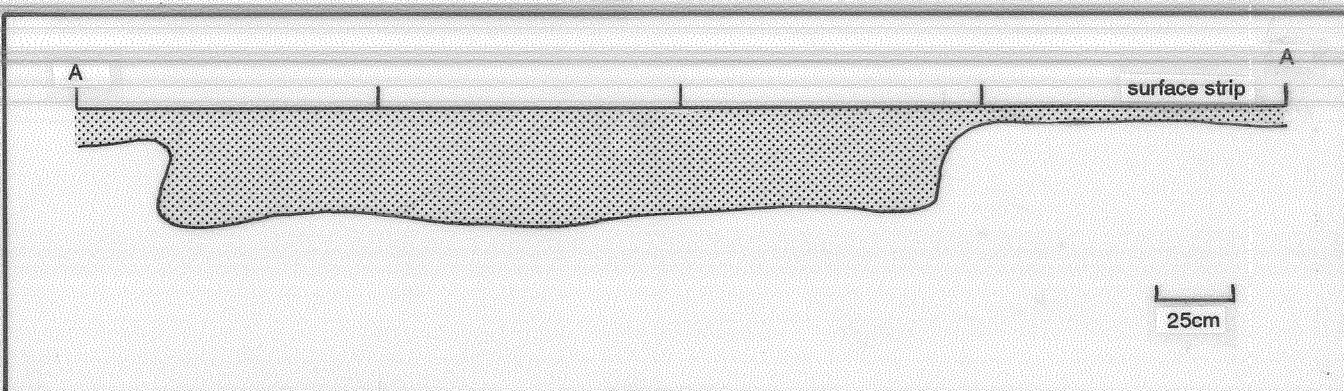


Figure 4. Pit structure profile.

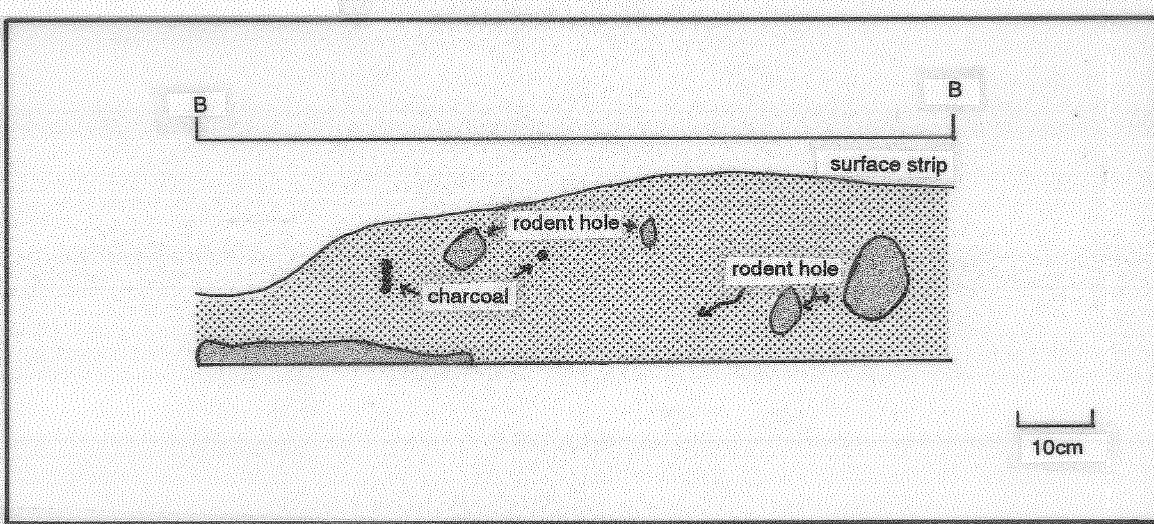


Figure 5. South wall of the pit structure.

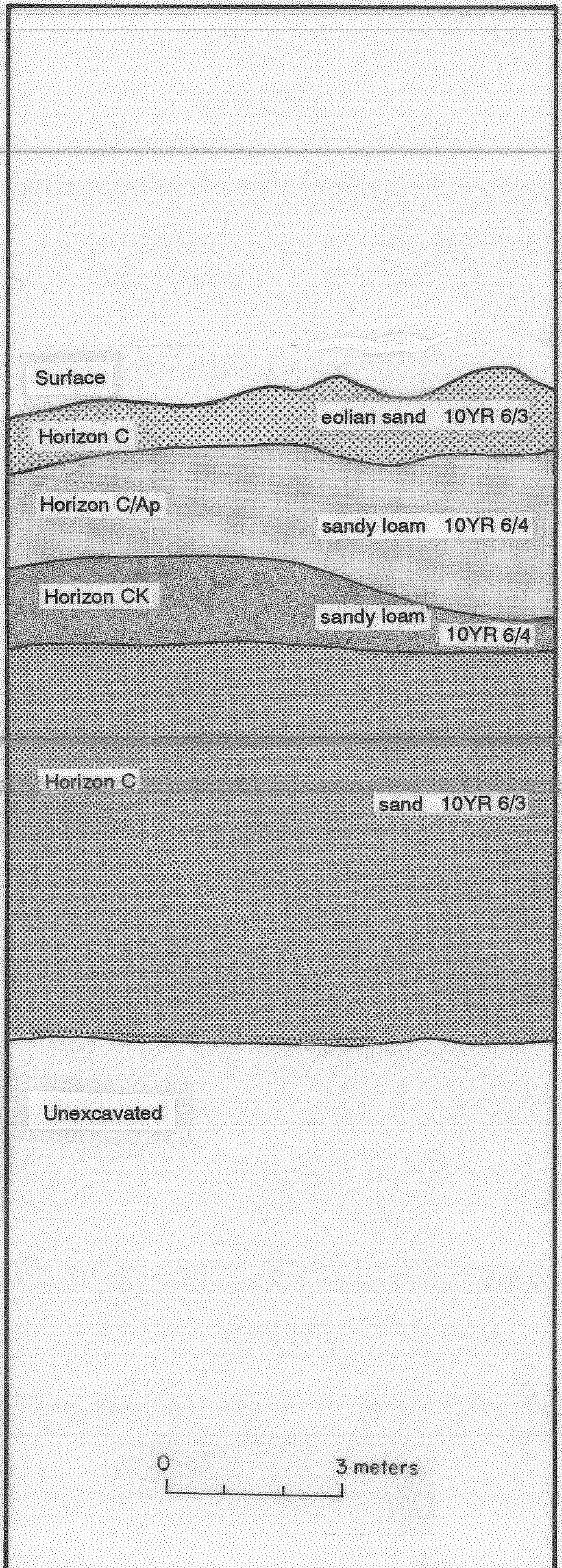


Figure 6. Backhoe trench #1, profile.

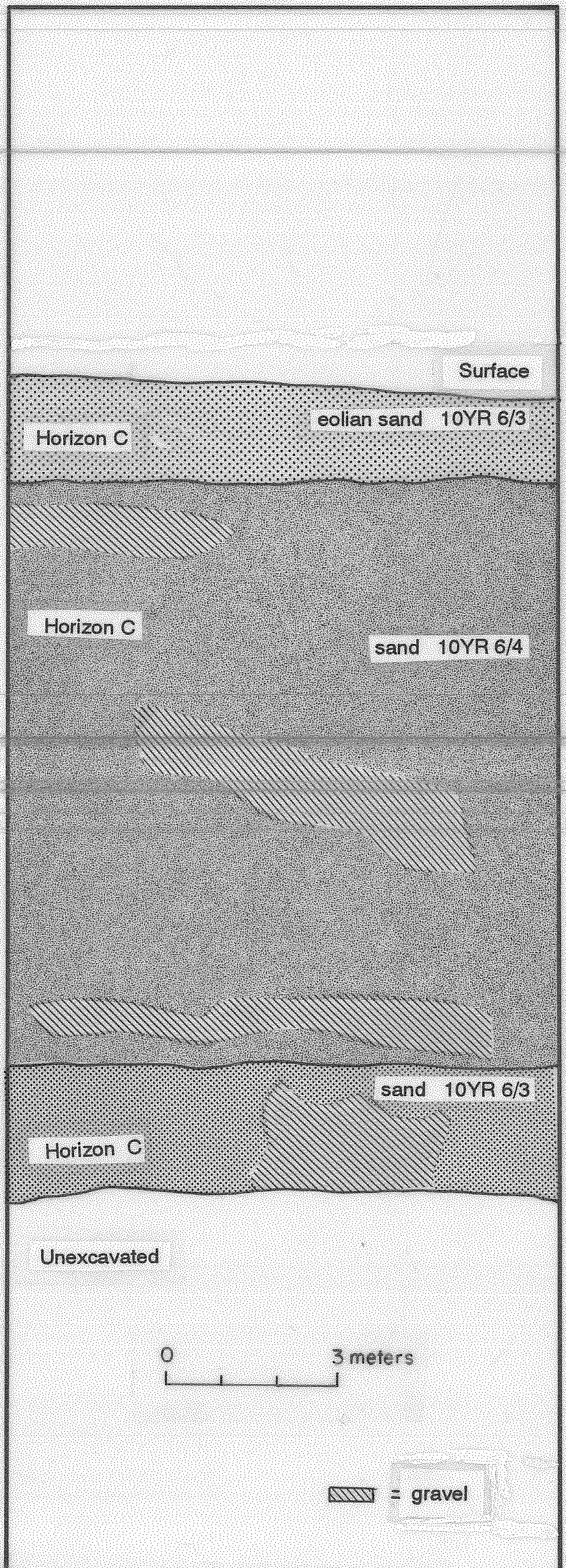


Figure 7. Backhoe trench #2, profile.

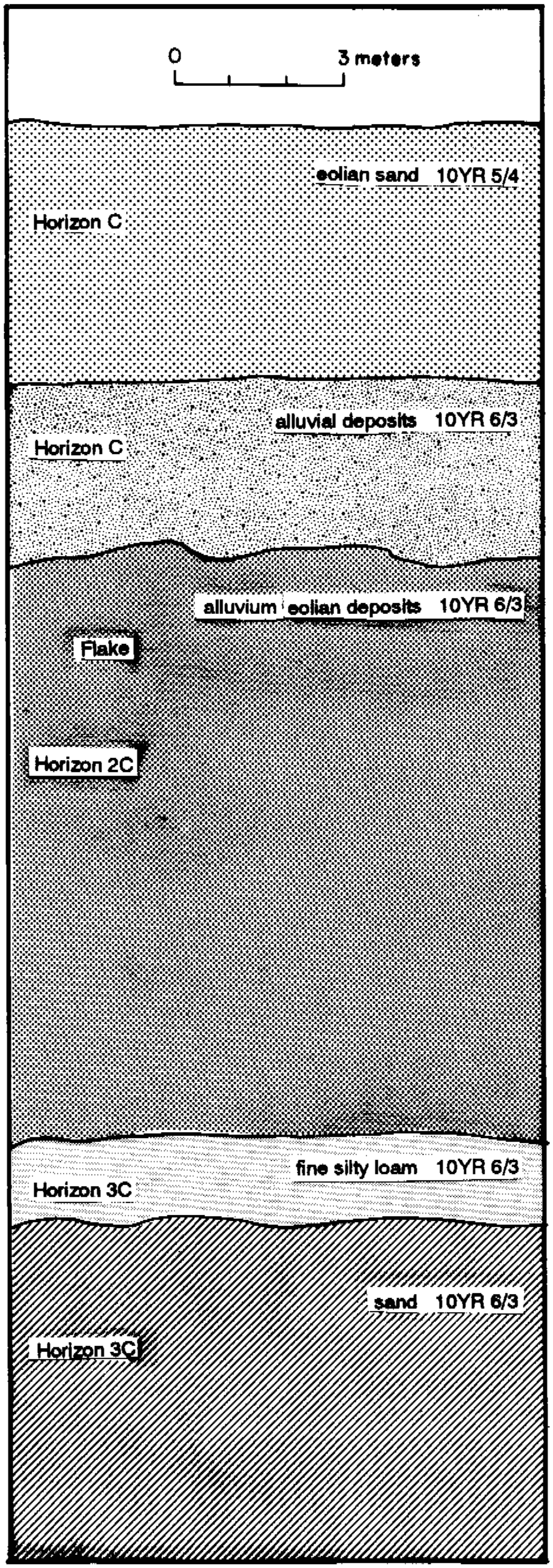


Figure 8. Backhoe trench #3, profile.

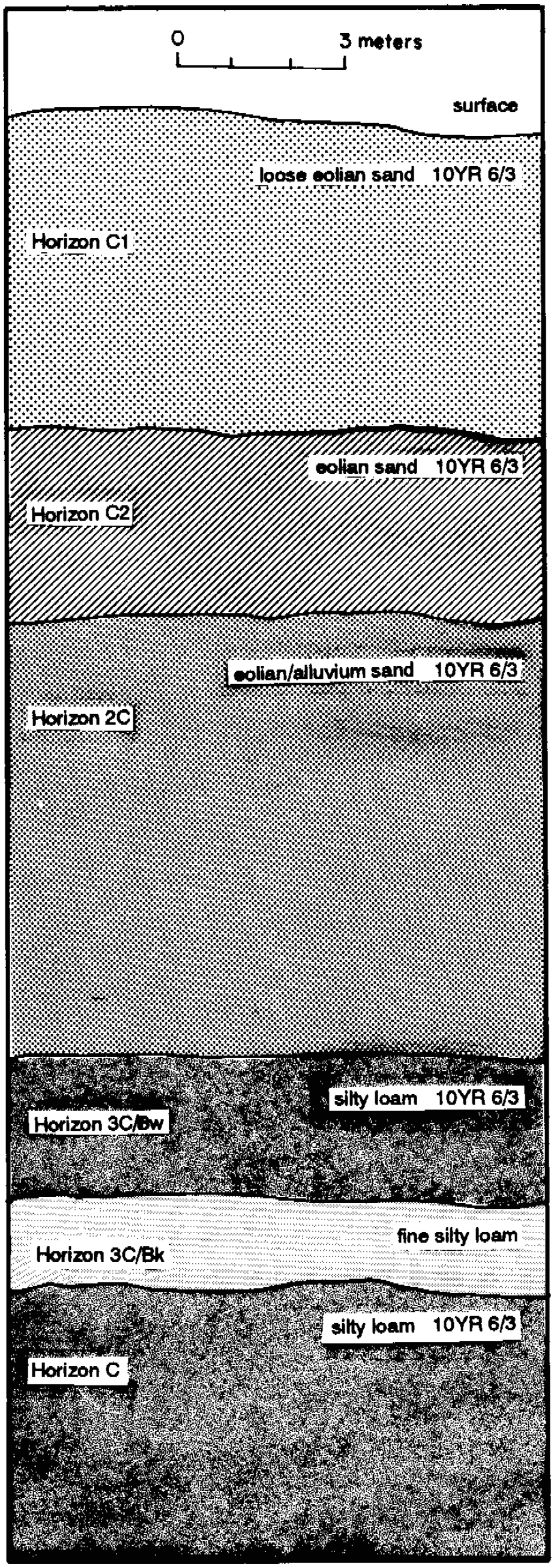


Figure 9. Backhoe trench #4, profile.

Generally the landscape is sandy alluvium (Bluepoint soils) with a strong eolian influence. The subsurface materials for the transect are considered to have been deposited within the last 10,000 years. The Rio Grande seems to have deposited soils at the west end of the transect but the majority of the soils are derived from alluvium from the drainages originating to the south.

After the sandy alluvial materials were deposited, the surfaces were reworked by the wind to form the hummocky landscape presently found. At some locations along the transect the surface represented old alluvium that had been exposed by erosion. These areas are represented by a "lag" of rock fragments at the surface that were not removed by the wind. In some instances cultural artifacts could be found at the surface of these sites. The soil material removed from these locations appears to have formed small dunes or hummock areas that range in depth from less than 20 cm (Profile 3) to depths of 200 cm (Profile 4).

CULTURAL MATERIALS

A total of 246 sherds and 1,408 stone artifacts were recovered within the proposed right-of-way at the Cristo Rey site.

Ceramics

by Rhonda Main

The purpose of this study is to compare the 246 collected sherds from the site to the defined ceramic types of the region, and to use them to assist in dating the site.

The sherds were sorted first by visual traits and were then examined under a binocular microscope at a magnification of 20X. The small size of the sherds, general lack of decoration, limited quantity of rims, and eroded surfaces narrowed the range of attributes that could be studied.

Each sherd was examined for color, vessel form, wall thickness, surface texture, surface finish, temper type, and amount and size and type of fracture. Based on these attributes an attempt was made to type each sherd.

Categories for temper types were taken from Runyon and Hedrick (1973). Other major references were Lehmer (1948), Whalen (1981), O'Laughlin (1979), Shepard (1980), Lynn, Baskin, and Hudson (1975), and Wiseman (personal communication, 1988). After research and analysis, most of the sherds in this assemblage were defined as El Paso Brown. The rest were classed as Jornadalike, Mimbres Classic Black-on-white, unspecified corrugated, and unspecified plain wares (see Table 1). Vessel form was, for the most part, indeterminate for the entire assemblage. The identifiable sherds were jars and bowls (Table 2).

Table 1. Site Ceramic Types

Ceramic Type	Number	Percent
El Paso Brown	215	86.0
Jornadalike	5	2.0
Mimbres Classic	11	5.1
Corrugated	4	1.8
Unspecified	11	5.1
TOTAL	246	100.0

Table 2. Vessel Form

Bowls		Jars		Indeterminate	
Number	Percent	Number	Percent	Number	Percent
14	5.0	21	8.0	211	85.0

El Paso Brown

As a result of varied firing atmospheres (including oxidation and reducing), the 215 sherds defined as El Paso Brown ranged in color from buff through brown, rusty red, gray, and black. Wall thickness ranges from 2.2 to 9 mm. Most of the sherds (63 percent) have feldspar and quartz temper with or without mica and magnetite. The next most common tempering agents are feldspar and sand, usually with mica (27 percent). A few sherds (9 percent) have feldspar with or without mica and magnetite. Amount of temper is moderate to heavy with fine to coarse temper grains often protruding from the surface. Generally, these El Paso Brown sherds are soft, granular, and friable, and have irregular ragged breaks when freshly broken. Surface texture varies considerably from rough and grainy to smooth and compact (Table 3). Temper texture, based on particle size, was noted as fine (< 0.25 mm), medium (0.25 mm-1.0 mm), and coarse (> 1.0 mm).

Table 3. El Paso Brown Temper

Temper Type	Number	Percent
Feldspar/quartz with/without mica and magnetite	133	62.0
Feldspar/sand usually with mica	55	26.0
Feldspar with/without mica and magnetite	19	19.0
Temper Size	Number	Percent
Fine	72	33.0
Medium	106	49.0
Coarse	37	17.0
Amount of Temper	Number	Percent
Sparse	0	0.0
Moderate	172	80.0
Profuse	43	20.0

Although surface finish was difficult to assess on many sherds due to erosion, several finishing methods were noted (Table 4). For example, on some sherds the interiors are lumpy, while the exteriors are smoothed and floated leaving a lustrous finish. Others have smooth matte surfaces with pits and striations. Degrees of luster are displayed on both sides of some sherds. When luster was not apparent to the unaided eye, it was visible in some cases under the microscope. These variations in finish are due in part to the various types of tools used to shape and smooth the pottery, as well as to the type of clay and amount of moisture in the clay at the time of processing. In general, as Shepard (1980) states, "wiping tools cause plastic flow, scrapers make striations and grooves according to the form of their edges, and rubbing tools leave smooth streaks." Each of these methods were noted among the El Paso sherds.

Table 4. El Paso Brown Attributes

Attributes	Number	Percent
Smooth matte at least one side	72	37.0
Appeared matte but has sheen under microscope	32	16.2
Floated with/without polish	40	20.3
Polish on one side	41	20.8
Polished two sides	5	2.5
Signs of weathered polish	7	3.5
TOTAL	197	100.0
Of the above sherds the following also have these attributes:		
Eroded	37	46.7
Fireclouded	5	6.7
Smudged	23	29.8
Striated	13	16.8
TOTAL	77	99.7

A definition of terms is necessary when it comes to the use of "polish" in much of the literature concerning surface finish. It is an important attribute in many type definitions, including distinctions between El Paso Brown and Jornada Brown. Many factors affect the presence of luster on a sherd, including composition and texture of the paste, moisture content during processing, type of tool used, evenness of surface before polishing, the uniformity with which the surface is covered with scraping strokes, and shrinkage after polishing. As a potter, this writer agrees with Shepard (1980:66-67, 122-124, 190-191) who states that "Clays differ greatly with respect to the kind of surface they will attain when rubbed...the production of lustrous ware cannot be regarded as a simple matter of choice or custom." Weathering and use also have an effect on the appearance and feel of a sherd, and there is a possibility that some rough and matte finishes are weathered or worn polished wares.

Two other surface finishes that should be noted are fireclouding, present on 5 sherds, and smudging, present on 23 sherds (Table 4).

One El Paso Brown sherd has a round edge, as if used as a smoothing tool. Another section of a pot (consisting of ten refitted sherds) has been rounded off at the rim in the same manner, possibly for use as a scoop. A single sherd has a row of punctate designs and could be an example of the occasional punching or incising found on El Paso Brown (Lehmer 1948).

El Paso Red-on-Brown, Red-on-brown Variant

Four sherds that exhibited characteristics of El Paso Brown, but have a stripe of red paint added, are referred to as El Paso Red-on-brown in this report (Table 5).

Table 5. El Paso Brown Variants

Ceramic Variant	Number	Percent
Plain brown	209	97.2
Red-on-brown (Bichrome)	4	1.8
Other	2	.9
TOTAL	215	99.9

Jornadalike Wares

Five sherds exhibiting most of the El Paso Brown characteristics were defined as Jornadalike. These sherds have a finer paste, a blockier fracture, and a slightly higher degree of polish than the bulk of El Paso Brown sherds. A further discussion of the ambiguities of El Paso/Jornada distinctions by R. N. Wiseman is included in this report.

Mimbres Classic Wares

Eleven Mimbres Classic Black-on-white sherds were found. Wall thickness ranges from 3.8 to 6 mm. Paste is light to dark gray with a temper of fine to medium quartz sand. Interiors and exteriors of bowl sherds are evenly smoothed; the interiors are covered with a chalky white slip and slightly weathered polish. Some of the sherds have hatching in narrow black lines of carbon paint. The only rim has parallel sides with rounded edges.

Corrugated Wares

The four corrugated/rubbed sherds in the assemblage are an unspecified type but are similar to Lynn, Baskin, and Hudson's type (1980), Rubbed/Corrugated. Exterior paste color is light gray brown, the core has a pinkish tint. The paste includes a moderate to heavy temper of quartz and feldspar. Wall thickness ranges from 4.8 to 6.2 mm. They differ from Rubbed/Corrugated in that the horizontal corrugation lines are even more obliterated by rubbing. Interiors have a smooth matte finish. Vessel form is unknown.

Unspecified Wares

The remaining 12 sherds are unspecified plain brown wares. One sherd in particular is similar to El Paso Brown but has a smooth and even highly burnished finish on one side. According to Wiseman (personal communication, 1988), it is similar to sherds he found near Carlsbad, New Mexico. Another sherd, plain gray with sand temper, is reminiscent of Anasazi gray wares. The other unspecified sherds are of unknown origin, but could possibly correspond to Chihuahuan types (Wiseman, personal communication, 1988). A small piece of ceramic, light gray in color with sparse temper, was also found, and appears to be a pipe fragment.

The provenience tabulation is presented in Table 6, but it should be noted that because of the disturbed nature of the site and the result of eolian deposition, the collected sherds lack contextual integrity.

Table 6. Ceramic Proveniences

Ceramic	Surface	Level 1	Level 2	Level 3	Level 4	Unknown	Total
El Paso Brown	58	69	56	12	2	18	215
Jornadalike	4	1	0	0	0	0	5
Mimbres Classic	4	4	2	0	0	1	11
Corrugated-Rubbed	0	1	1	0	0	0	2
Unspecified	1	1	2	3	1	4	12
Total	67	79	61	15	2	24	246

<u>Summary</u>

The Sunland Park ceramic collection is basically congruent with other assemblages in the region. The analysis confirmed that the majority of sherds are the El Paso Brown. The question remained how many should be distinguished as Jornada. In this study there was very little evidence to support a clear distinction. The spatial distribution is the same for both types; north of Carrizozo, New Mexico to north of Kenna, New Mexico, south to Villa Ahumada, Chihuahua;

west to the New Mexico-Arizona state line, east across southern New Mexico into Texas. The focus for El Paso Brown is the Rio Grande Valley near El Paso, for Jornada Brown Wares it is the northern area of the Jornada region (Runyon and Hedrick 1987).

The C-14 sample from the pithouse, dating A.D. 465 $\pm$ 60, suggests that the site was occupied during the Mesilla phase. The presence of a few El Paso Brown, Red-on-brown (or Bichrome) variant sherds possibly indicates site reoccupation during a transitional period from about A.D. 1100 to 1400. The presence of the intrusive Mimbres Classic Black-on-white trade wares suggests that some occupation took place during the period of A.D. 900 to 1100 (Lehmer 1948; Whalen 1981).

In summary, the bulk of the pottery from the Cristo Rey site was produced by pithouse-dwelling peoples of the Jornada Branch of the Mogollon using nearby resources. There is a likelihood of exchange or trade with outside areas including the Mimbres Valley, Chihuahua, and areas to the northeast, as indicated by intrusive ceramics.

Observations on Ceramics

by R. N. Wiseman

One of the most persistent problems in prehistoric pottery classification in southern New Mexico and western Texas concerns the plain brown wares. In 1940, Jesse Jennings described but did not name the predominant brown ware he obtained at LA 2000 in the southern Sacramento Mountains of New Mexico. Three years later, H. P. Mera (1943:12) provided an encapsulated description of the same material and named it "Jornada Brown." He gives the range as south to the El Paso region and west to the east slopes of the Black Range. In 1948, D. J. Lehmer (1948:94) described the type "El Paso Brown," and although he did not discuss its range, subsequent workers have found it over a vast area centering on the city of El Paso. Since the 1940s, a number of other workers have had the occasion to describe and discuss various aspects of these and related types (Jelinek 1967; Runyon and Hedrick 1973; Warren 1973; Burns 1977; O'Laughlin 1979; and Whalen 1981).

In spite of what might appear to be a thorough treatment of the brown wares, major problems persist. These vessels were, for the most part, made by hand at the household level, resulting in substantial variation in materials, processing, and construction and finishing techniques. While this statement is true of Southwestern pottery in general, it is especially true of the brown wares of southern New Mexico and western Texas. The naming of the two types El Paso Brown and Jornada Brown leads the unwary into thinking that the ceramic picture in this region is both simple and well known. Nothing could be further from the truth, and there is little wonder that so many archaeologists, in trying to analyze their assemblages, often become exasperated.

The Sunland Park project pottery embodies both the regularities and the ambiguities of the southern New Mexico-western Texas brown wares. As discussed by Main (this volume), most of the sherds conform to classic El Paso Brown with its relatively thin vessel walls, surface colors, zonation of paste colors, fine to coarse quartz and/or feldspar temper, scraped interior surfaces, and matte exterior surface finish. The coarse temper grains, in combination with wall thickness and clay friability, result in a characteristic, ragged fracture of the sherd edges. A small number of sherds have been categorized as Jornadalike Brown and unspecified brown.

The one aspect of the collection that will lead to disagreement by some analysts such as O'Laughlin (1979:33) is the presence of polish on one or both surfaces of some of the El Paso sherds. In part, this conflicts with most descriptions of El Paso Brown and in part it constitutes a point of confusion with respect to Jornada Brown. Most often the polish on both groups of sherds is in the form of lustrous streaks, which frequently cover less than half of the surface; in rare cases the coverage can be so complete as to render a well-polished, burnished finish.

One example of the latter in the Sunland Park collection is typed as El Paso Brown on the basis of other characteristics. In many instances, what appears to be nonshiny polishing streaks are present; it may be that a polished or lustrous finish was intended but that either the clay is bentonitic and not amenable to polish or else it shrank during firing, thereby destroying the luster (Shepard 1980:123-124). The writer has noted the presence of variable polishing on substantial numbers of both El Paso Brown and El Paso Polychrome sherds in collections from several regions in south-central and southeastern New Mexico. Polishing appears to be part of the El Paso ceramic industry even though it may be a minor trait in some assemblages.

It is precisely this factor--presence or absence of polishing--that seems to be causing the most serious typological problem. The confusion arises because Jornada Brown (Jennings 1940:5-6; Mera 1943:12) is renowned for its polished surfaces. Compared to El Paso Brown, and particularly what Whalen (1980:31-32) calls "early" El Paso, it has relatively thick vessel walls and finely ground temper.

The problem is twofold. Simply defined, it has to do with (1) physical-mechanical properties, and (2) the cultural reasons why an individual chooses to polish pottery. Shepard (1980:66-67, 122-124, 190-191) gives us some insight into how a polish is achieved (or attempted unsuccessfully, in some cases) through a discussion of properties of clays, tools, and techniques, and discusses some of the beneficial aspects of polishing. Regarding the latter, she centers her discussion on polishing (and rubbing) to gain luster as "an important means of obtaining fine finish" (1980:66).

More is involved in a polish than technically fine finishing. Aesthetics must have played some role in the spread of the technique. Quite possibly, this aesthetic aspect is in part manifested in streaky polishes that fail to completely cover the surfaces of vessels.

It is also interesting that many of the more consistently polished types also tend to be those that are either fired at lower temperatures or else are made of clays that apparently do not fire well at the temperatures or firing durations normally obtained under basic firing conditions (Shepard 1980:19ff). These products are more susceptible to wear, damage, and breakage through handling and everyday use. They simply do not hold up as well as examples of other types. The properties of the available clays clearly have a bearing on this aspect. The laboratory assistant who soaks El Paso Brown, El Paso Polychrome, and Jornada Brown sherds too long before washing them, quickly learns that they have a tendency to disintegrate when water-logged.

What might be the functional--as opposed to aesthetic--role of polishing vessel surfaces? One possible answer is that a slick surface reduces friction during cleaning and handling. This may translate into less abrasion and therefore increased use-life. Surface compaction due to polishing would also reduce liquid absorption rates, thereby allowing use of these vessels as liquid containers.

Assuming that these ideas are plausible, we can return to the potential meaning of the question of polish on to El Paso Brown and Jornada Brown vessels, and the Sunland Park brown wares specifically. In an earlier study, Wiseman (1973) found a similar ceramic suite at the Bent site (LA 10835). That is, the major brown ware was El Paso Brown, but a number of Jornadalike sherds were also present. The Abajo de la Cruz site (LA 10832), also excavated on the same project, dated somewhat later than the Bent site, and its major utility pottery was Jornada Brown. It was suggested that perhaps there was, at least in part, a direct relationship between the two types with Jornada Brown being an outgrowth of El Paso Brown. Thus, the partial overlap in attributes between the two may have an historical aspect as well as a functional one. In this scenario, the Jornadalike sherds from these and similar assemblages would be so-called transitional examples.

Chipped Stone

Anthony Martinez and Kalay Meloy

A total of 1,408 pieces of chipped stone was collected from LA 1644 (Table 7). A computer-produced distribution plot is shown in Figure 10. Figure 10 shows that most lithic artifacts occur in Blowout B. Prior to excavation, utility lines were installed. Nevertheless, there was still evidence of some charcoal staining. The area was trenched with a backhoe and no cultural features were found. However, it is probable that a hearth or activity area was once present in this location.

The lithic artifacts were monitored for a variety of attributes (Appendix 4). Individual flakes were categorized under primary, secondary, and tertiary stages of reduction. A primary flake is defined as having 50 to 75 percent of the cortex present on its dorsal side. Secondary flakes have 25 to 50 percent cortex present, and tertiary flakes will have 0 to 25 percent cortex. Table 7 shows the breakdown of the assemblage.

A variety of raw materials were used in the lithic assemblage (Table 8). The material mostly used is chert (n = 560, 39.8 percent). Limestone, fine quartzite, rhyolite, chalcedony, and obsidian make up the rest of the assemblage (60.3 percent).

Because these materials are locally available in the San Andres Mountains, in the Franklin Mountains, and in the Rio Grande gravels, it is not surprising to find all of the materials at the site. The limestone comes from the San Andres Mountains 18 km (11 miles) northeast of the Cristo Rey site, and 7 km (4 miles) east are the Franklin Mountains where rhyolite outcrops. The rest of the materials are found in the Rio Grande gravels.

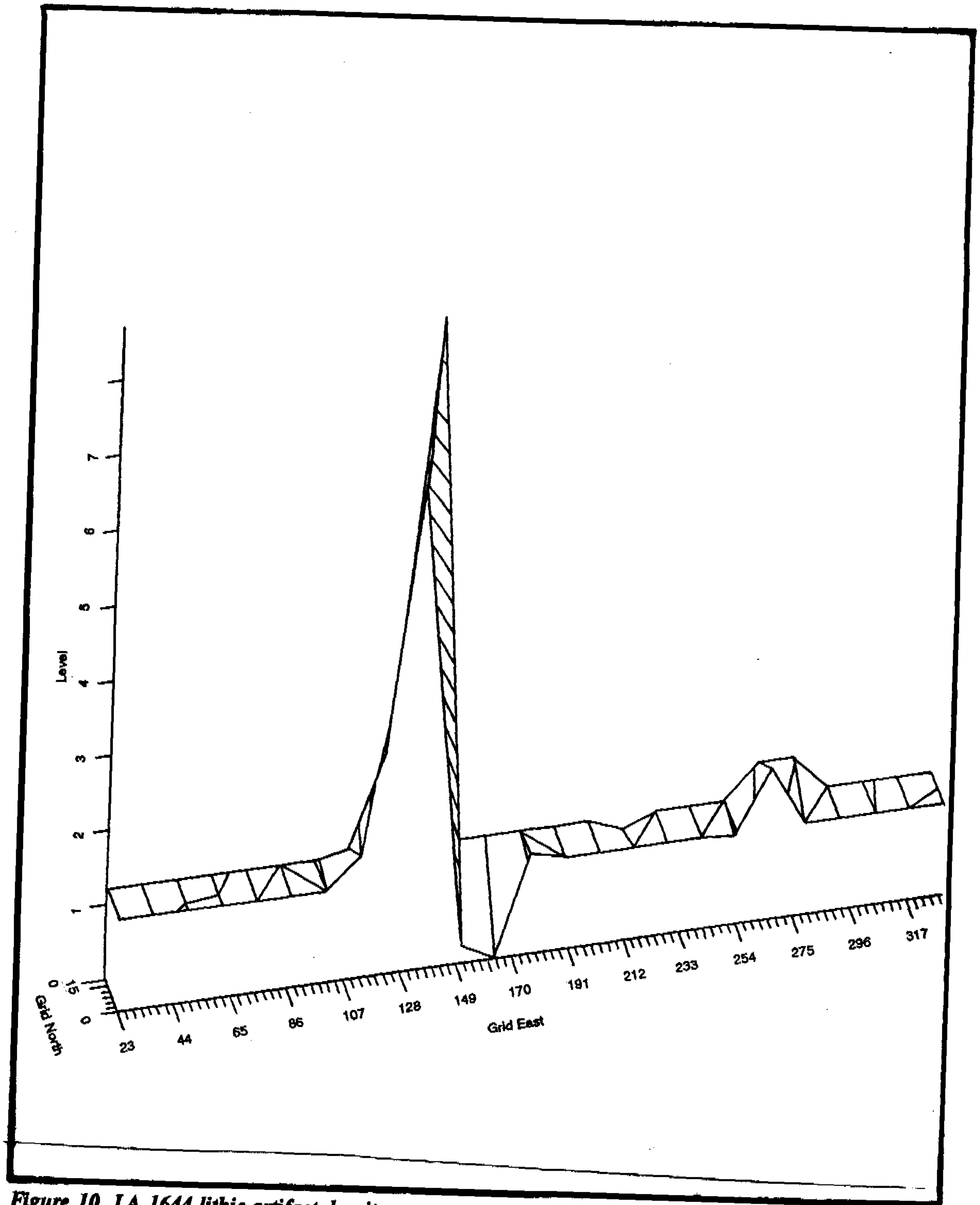


Figure 10. LA 1644 lithic artifact density.

The large amount of tertiary flakes (75.5 percent) present on the site suggest that tools were being manufactured there; however, few tools were found on the site. Because of the disturbance and the existence of residences nearby, many tools may be missing. Also, site residents may have curated tools for use at another site.

In the undisturbed areas outside of the right-of-way (on the surface and in blowouts), large numbers of formal tools are present (including scrapers, bifaces, hammerstones, and chopping tools). Only seven tools (9.2 percent) were recovered from within the right-of-way. These tools were tertiary flakes that had bidirectional scarring, unidirectional scarring, and

Table 7. LA 1644 Chipped Stone Assemblage

	Number	Percentage
Debitage		
Flake Type		
Primary	121	8.7
Secondary	198	14.3
Tertiary	981	70.6
Angular Debris	90	6.4
Total	1390	100.0
Formal Tools		
Flaked tools	3	16.0
Bifaces	1	5.2
Projectile points	6	31.6
Drill point	1	5.2
Cores	4	21.1
Tested cobbles	1	5.2
Hammerstones	1	5.2
Polished fired cobble	1	10.5
Total	19	100.0
Assemblage Total	1409	100.0

Table 8. LA 1644 Lithic Material Types

Material Type	Number	Percent
Unknown	3	.2
Chert	560	39.8
Clastic chert	18	1.3
Chalcedonic chert	3	.2
Silicified wood	18	1.3
Chalcedonic silicified wood	2	.1
Palm wood	2	.1
Chalcedony	116	8.2
Quartzite	3	.2
Fine quartzite	141	10.0
Medium quartzite	15	1.1
Coarse quartzite	1	.1
Quartz	3	.2
Unknown igneous	2	.1
Basalt	14	1.0
Andesite	1	.1
Rhyolite	124	8.8
Granite	2	.1
Obsidian	40	2.8
Sandstone	18	1.3
Siltstone	9	.6
Limestone	304	21.6
Limey chert	6	.4
Shale	2	.1
Assemblage Total	1408	100.0

Table 9. LA 1644 Flaked Tools

	Flake Type	
	Tool	
	Number	Percentage
Material Type		
Chert	1	33.3
Silicified Wood	1	33.3
Rhyolite	1	33.3
Outline		
Straight	2	66.7
Concave	1	33.3
Serration	3	100.0
Number of Modified Edges		
2	1	33.3
3	2	66.7
Edge Angle		
35 degrees	1	33.3
45 degrees	1	33.3
76 degrees	1	33.3
Damage		
Unidirectional scarring	1	33.3
Bidirectional scarring	1	33.3
Unidirectional rounding	1	33.3

unidirectional rounding indicative cutting or scraping (Table 9). One drill tip, extensively used, was also recovered.

The biface found had no wear and could possibly be a projectile point preform. It is 5 cm long with a convex base (Fig. 11g). Six projectile points were recovered (Fig. 11a,f). Five are made of chert and one of rhyolite. Five of the points are side notched with moderate barbs, expanding stems, and convex bases (Table 10).

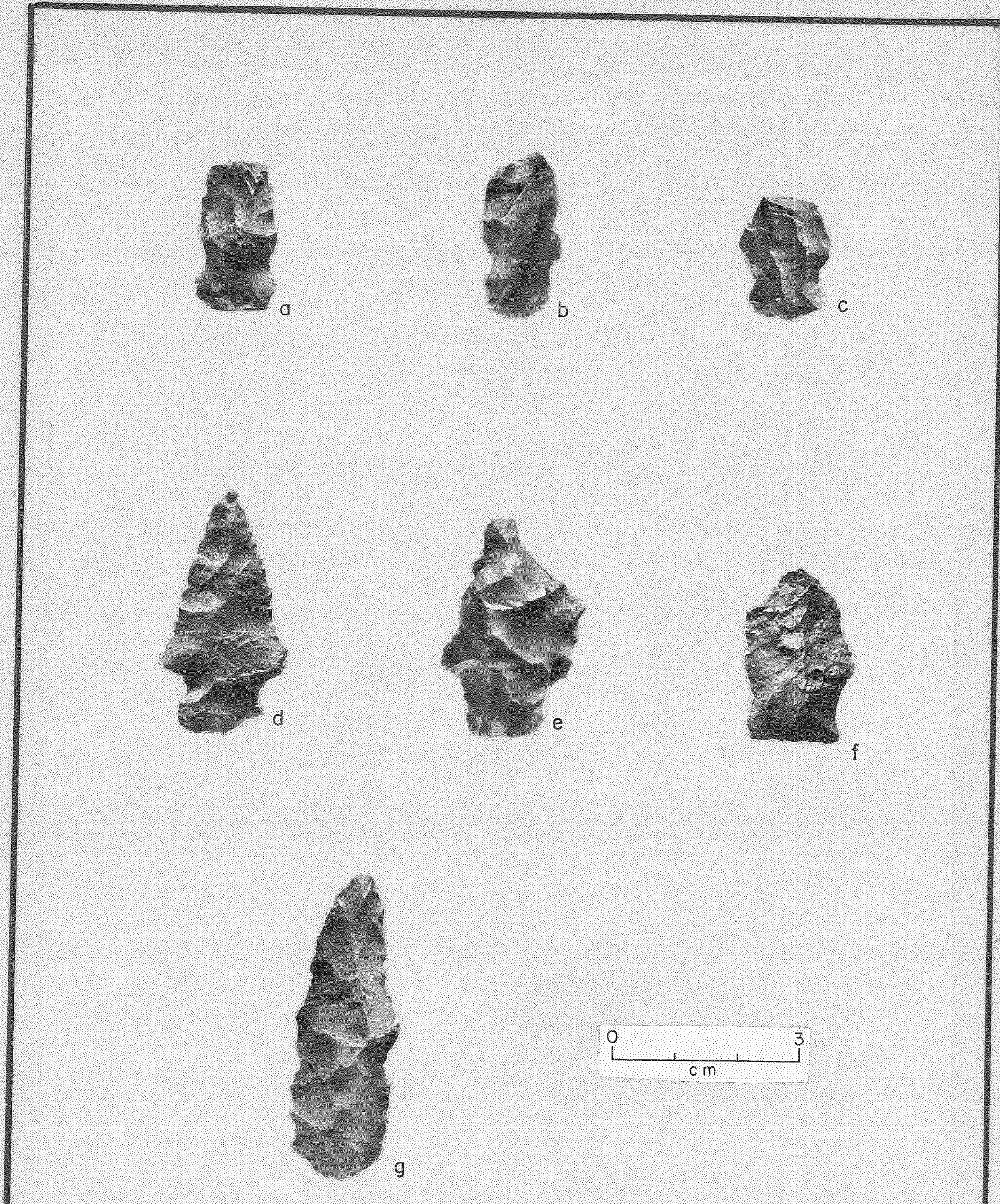


Figure 11. Projectile points, biface, and drill tip.

Table 10. Projectile Point Measurements

Figure Ref.	Material Type	Length (cm)	Width (cm)	Notching
a	chert	23	12	side
b	chert	27	13	side
c	chert	20	15	side
d	chert	38	20	side
e	chert	35	20	side
f	rhyolite	27	18	side

O'Laughlin (1980) states that corner and side-notched points of moderate size are diagnostic for the Mesilla phase of the Formative period. These points are widely distributed throughout the Great Basin, Southwest, and trans-Pecos Texas and into the highlands of southern Mexico. Carmichael (1986) places similar projectile points in the early Archaic period. None of these points showed wear patterns along the edges and are crudely made. Only one complete projectile point was recovered and is possibly a San Pedro point (Fig. 11d). It measures 2.8 cm long by 2.0 cm wide, and is side notched with the tangs reworked, and has a reflaked base.

The cores exhibited single platform reduction with only a few flakes removed; no exhausted cores were recovered. Only one tested cobble of chert, one hammerstone of limestone, and two burned polished cobbles were found.

Ground Stone

by Rhonda Main

A total of 30 specimens are included in this assemblage, most of which are fragmented. Sandstone is the most common material (n = 23), followed by granite (n = 7). The source of the raw material is local, primarily from the Franklin/Organ Mountain chain (Whalen 1978).

Eight cobbles were determined to be whole manos (based on convex shape and ground surface). Three of these are ground on both sides. The others are tabular mano fragments found on the site (Tables 11-12).

The metates, all tabular with concave profiles, include one small corner fragment and one large corner piece, and appear to be basin metate fragments. The six other fragments appear to be medial and end pieces of unshaped milling slabs. Three ground specimens, because of their small size, cannot be classified. Three of the total exhibit evidence of burning (Table 13).

Sizes of the specimens range from 2 by 3 by 2 cm for the smallest metate piece to 11 by 11 by 7 cm for the largest basin metate corner fragment. The complete mano is 7 by 12 by 3 cm. Some of the smaller fragments are possibly residue from the shaping of larger artifacts. Specific sizes are given in Tables 12 and 13.

The attributes for the metates are listed in Table 13. All the pieces for the metate category were fragmented. No whole metates were recovered from the site. Some of the fragments revealed burning, which could explain the fragmentation of the ground stone.

Table 11. Whole Manos

Material	Surface	Shaping	Striations	Texture	Burned	Size (cm)
Sandstone	convex wedge	ground	unidirectional	smooth	no	7x12x3
Sandstone	convex/round	ground	multidirectional	smooth	no	7x7x3
Sandstone	rectangular	peck/ground	unidirectional	smooth	yes	5x8x3
Granite	convex	ground/chipped	multidirectional	smooth	no	5x6x2
Sandstone	convex	ground	unidirectional	smooth	no	4x4x2
Sandstone	convex (both sides)	chipped edges	bidirectional	polished	no	4x5x2
Sandstone	convex	pecked/ground	unidirectional	coarse	no	4x10x5
Granite	convex	ground	multidirectional	smooth	no	4x4x1

Table 12. Fragmented Manos

Material	Surface	Shaping	Striations	Texture	Burned	Size (cm)
Sandstone	convex	ground	indeterminate	smooth	no	4x2x2
Sandstone	convex	ground	indeterminate	smooth	no	4x6x4
Sandstone	convex	ground	indeterminate	smooth	no	4x7x2
Sandstone	convex	ground	indeterminate	smooth	no	5x6x3
Sandstone	convex	ground	unidirectional	smooth	no	3x4x3
Sandstone	convex	ground	unidirectional	smooth	no	2x3x3
Sandstone	convex	ground	indeterminate	smooth	no	5x7x3
Sandstone	convex	ground	indeterminate	smooth	no	4x6x3
Sandstone	convex	ground	indeterminate	smooth	no	3x3x2
Sandstone	convex	ground	indeterminate	smooth	no	3x2x2
Sandstone	convex	ground	indeterminate	smooth	no	3x7x2
Sandstone	convex	ground	indeterminate	coarse	no	2x6x3
Sandstone	convex	ground	indeterminate	smooth	no	2x3x2
Sandstone	convex	ground	indeterminate	smooth	no	4x3x2
Sandstone	convex	ground	indeterminate	coarse	no	3x3x2
Sandstone	convex	ground	indeterminate	coarse	no	3x2x1
Sandstone	convex	ground	indeterminate	coarse	no	3x5x4
Sandstone	convex	ground	indeterminate	coarse	no	2x5x3
Granite	convex	ground	indeterminate	smooth	no	3x3x2
Granite	convex	ground	indeterminate	smooth	no	4x3x1
Granite	convex	ground/ chipped	indeterminate	smooth	no	3x4x2
Granite	convex	ground	indeterminate	smooth	no	3x2x3

Table 13. Metate Artifacts from LA 1644

Material	Surface	Shaping	Striations	Texture	Burned?	Measurements
Sandstone	Concave	Peck/Ground	Unidirectional	Coarse	No	11x11x7
Sandstone	Concave	Ground	Unidirectional	Polished	No	2x3x3
Sandstone	Concave	Ground	Unidirectional	Smooth	Yes	5x10x3
Granite	Concave	Both sides ground	Unidirectional	Smooth	No	2x7x2
Sandstone	Concave	Ground	Multidirectional	Smooth	Yes	2x3x5
Granite	Concave	Ground	Multidirectional	Polished	No	5x6x2
Sandstone	Concave	Ground	Indeterminate	Smooth	Yes	3x6x5
Granite	Concave	Ground/Chipped	Indeterminate	Smooth	No	4x6x3

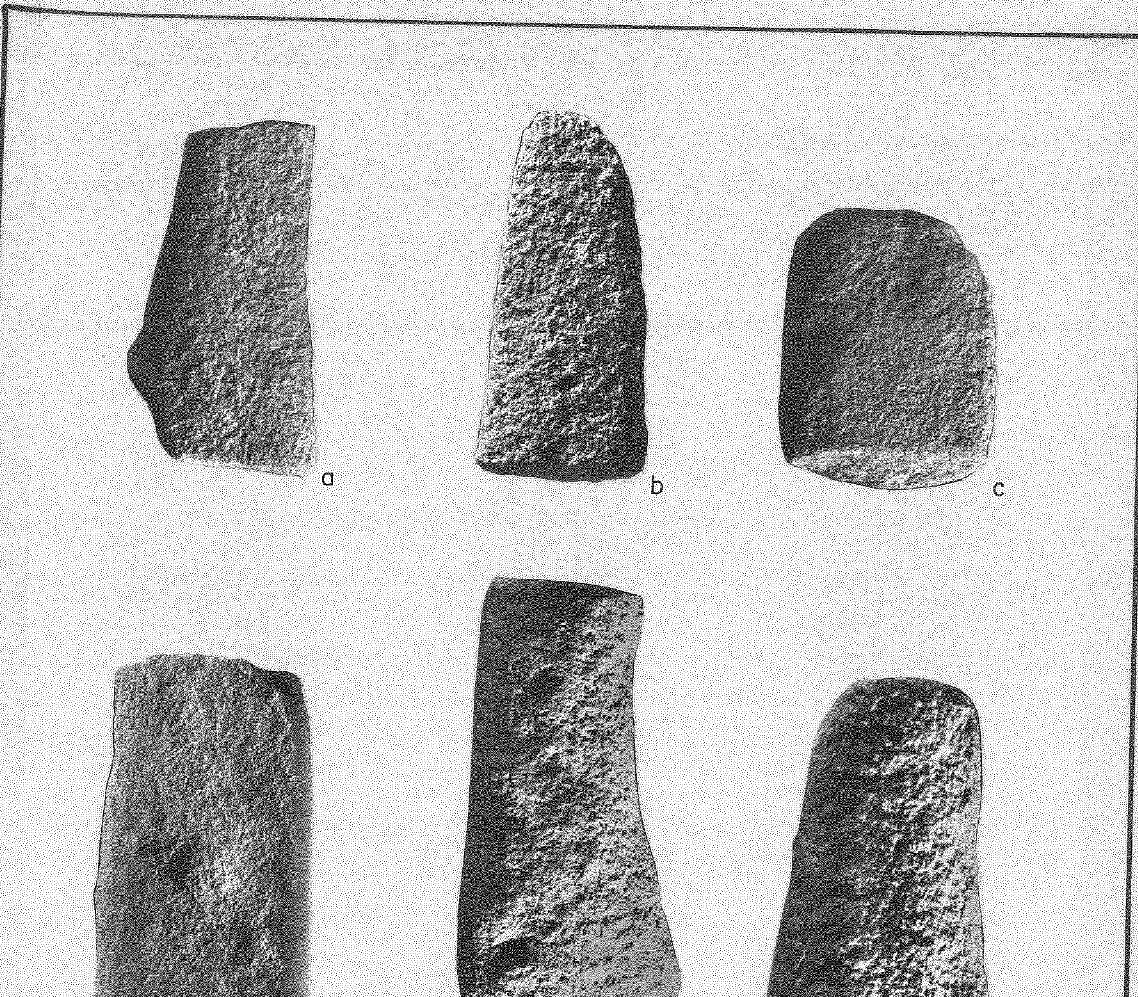


Figure 12. Cone-shaped sandstone artifacts from LA 1644.

Table 14. Shaped Cones from Sunland Park

Fig. ref.	Material	No. Ground Edges	Condition
f	Gray medium grain friable sandstone	2	fragmented
e	Gray medium grain sandstone	1	fragmented
g	Gray medium grain sandstone	2	fragmented
b	Coarse grain sandstone	1	fragmented
c	Medium grain friable sandstone	3	fragmented
h	Gray medium grain friable sandstone	1	fragmented
d	Gray fine grain friable sandstone	2	fragmented
a	Gray medium grain friable sandstone	2	fragmented

Eight specimens in the assemblage are small round cones and rectangular items of tabular sandstone. Most look like irregular cones. In six cases, there is evidence of further shaping by grinding on the edges and flat surfaces (Fig. 12). The function of these cones is unknown. All were found on the surface in and around the blowouts. The attributes of the cones are listed in Table 14.

Lancaster (1983), in his analysis of Mimbres Valley ground stone, suggests that one-handed manos functioned as utility grinding implements and were used expediently for a variety of tasks. However, based on the size and relative smoothness of the manos and metates in this assemblage, the Sunland Park ground stone seems to have been used primarily for the processing of wild foods, specifically edible seeds and nuts of plants such as mesquite, sunflower, amaranth, chenopods, grasses, oak, and piñon (Whalen 1980). Four of the larger mano fragment edges show evidence of having been used for pounding, perhaps to break up the food before grinding.

According to Gould, Koster, and Sontz (1971), different seeds and nuts require different grinding motions, which in turn result in different ground surfaces. The preparation of seed paste involves vertically pushing and rotating the mano with both hands in an arc from back to front giving the mano a smooth convex surface. The grinding of other seeds is done with a simple back and forth motion causing a flatter surface to form on the mano. Both of these methods are evident in this assemblage.

The Archaic appearance of the ground stone (Wening, personal communication, 1988) is likely due to an Archaiclike adaptation of hunting and gathering subsistence that apparently persisted into the late Mesilla and later phases in which ceramics were utilized (Oakes 1981).

Faunal Analysis

Linda Mick-O'Hara

All faunal remains identified from Sunland Park were recovered from a probable pit structure isolated within a blowout on that site. There were 94 pieces of bone recovered during the excavation of this structure. All remains were extremely fragmentary; 41 fragments (or 43.6 percent of the sample) exhibited light to moderate weathering.

Table 15 presents the frequency and percentage of each identified category. All specimens were compared to the collections housed at the Office of Archaeological Studies and specific identifications were made whenever possible. Only two species and one genus could be identified from the sample and only a few of the fragments could be assigned to each. The remainder of the sample could only be identified as small and large mammal or bird (85.1 percent) due to the condition of the remains. Fragments of long bone were the predominantly identified bone in the overall sample while the pieces that could be further identified were both cranial and postcranial, including tooth fragments.

Table 15. Sunland Park Identified Faunal Remains

Species	Frequency	Percent of Total
Small mammal	75	79.8
Large mammal	4	4.2
Spermophilus sp. (ground squirrel)	1	1.1
Sylvilagus audubonii (Desert cottontail)	9	9.6
Lepus californicus (Black-tailed jackrabbit)	4	4.2
Bird	1	1.1
Total	94	100.0

Of the nine fragments assigned to desert cottontail, six were cranial, two were pelvis fragments, and one was an ulna fragment. The remains assigned to black-tailed jack rabbit included fragments from a right radius, a right ulna, a right tibia, and a left maxillary molar. One maxillary incisor could be assigned to the genus *Spermophilus* but was not identifiable to species. Many of the other bone fragments may have been remains from these species but fragmentation and burning prevented their further identification.

Table 16. Frequency of Burning by Species at LA 1644

Species	Light	Light mottled	Light to black	Black	Black to calcined	Calcined
Small mammal	18	20		3		6
Large mammal			1		1	2
Sylvilagus audubonii	2		9	1		1
Lepus californicus				1		
Total	20	20	10	5	1	8

Some degree of burning was present on 64 fragments recovered from the pit structure in Blowout A. This amounts to 68.1 percent of the sample. The degree of burning suggests that the remains were discarded into an active hearth for some time and may have been present in the structure as remnants of the maintenance process. Table 16 illustrates the extent of burning in the sample and the identifications of those specimens. In addition to this obvious burning, seven fragments exhibited chalky surfaces that could be the result of processing in a cooking pot (Binford and Bertram 1977).

The weathering apparent in this sample and its fragmentary condition would suggest that the animals represented here were fully utilized. The carcasses could have been pounded on grinding stones or flat rocks before being introduced to the cooking pot and dumped as refuse into or by the hearth. Dumping by the hearth may account for the high burned component on the site. The small size of the sample and its condition also suggest that periodic maintenance was taking place within this structure and the bone fragments isolated were the remains after this process.

Ornamental Artifacts

A *Glycymeris* shell bracelet (Fig. 13a) and a stone bead were recovered from LA 1644. The stone bead (Fig. 13b) came from the pit structure fill at 10 cm bpgs. The shell bracelet was found on the site surface by the NMSHTD archaeologists during the initial survey. Whalen (1981) and O'Laughlin (1981) state that ornamental artifacts found on a site are usually associated with a residential occupation. It is possible that other pit structures were present on the site; small adobe casts were found in a utility trench implying the presence of another structure.

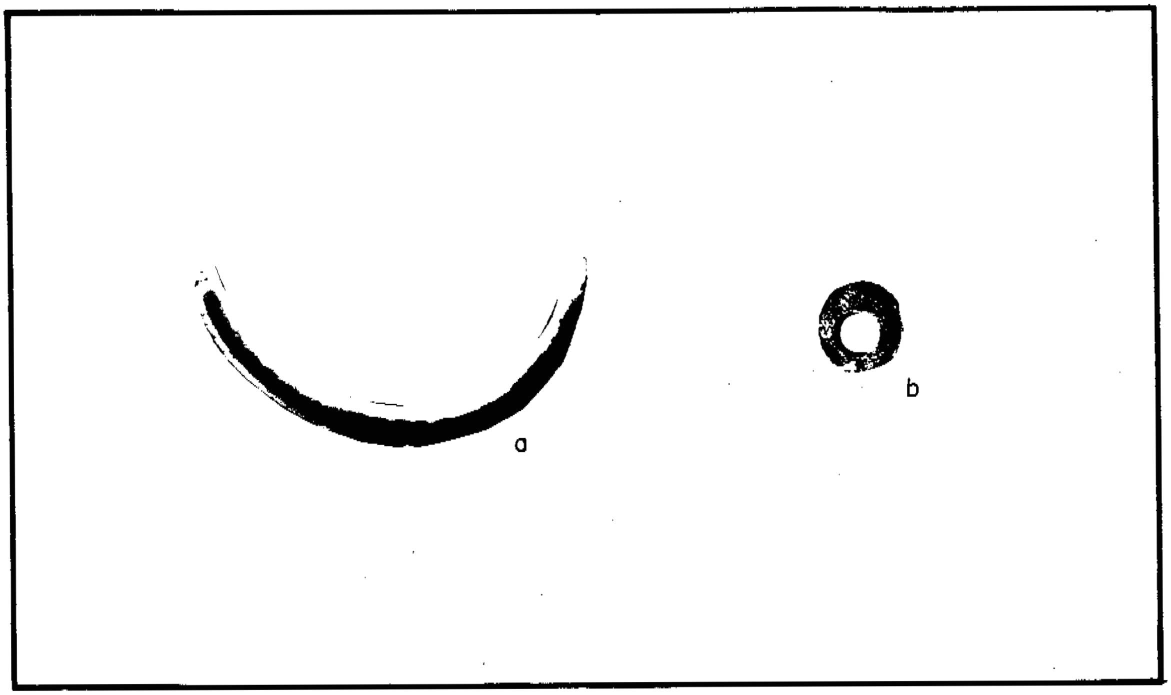


Figure 13. Shell bracelet and stone bead.

Radiocarbon Analysis

One C-14 sample was submitted for analysis to Beta Analytic, Inc. The charcoal sample was extracted from the pit structure fill. It produced a corrected date of A.D. 465 $\pm$ 60. This date,
along with the ceramics found on the site, places the Cristo Rey site in the early Mesilla phase. This is important because it is one of the earliest dates recorded for Mesilla phase ceramic sites.

Ethnobotanical Summary

A total of three ethnobotanical samples were submitted for analysis. The results suggest that the pit structure was seasonally used because the species found in the flotation samples are perennial and harvested in early fall (Appendix 2). Mesquite, hedgehog cactus, and prickly pear cactus have also been found repeatedly in assemblages from the Rio Abajo (Toll, this volume). Toll (1987a, 1988a) states that charred cacti seeds have been recovered from shallow sites in the El Paso and Alamogordo areas. The charcoal species associated with the pit structure were saltbush and either cottonwood or willow. Toll (this volume) also mentions that sites directly within the Rio Grande corridor show a heavy use of cottonwood or willow, while sites in the foothills of the Sacramento Mountains at Florida Avenue in Alamogordo are dominated by conifers.

Pollen Summary

Several pollen samples were collected and analyzed. The analysis found a very low presence of tree pollen (1 percent or less of pine family and juniper), and an overwhelming abundance of wind-pollinated, weedy Cheno-am and low-spine Compositae. Pollen from grasses is next in abundance among the wind-pollinated taxa. This type of pollen is capable of being carried long distances by the wind, especially in sparsely vegetated areas such as may be characteristic of the project area (Appendix 3). Based on the pollen findings alone, we might consider that the suitability of the project area for growing prehistoric crops is poor.

DISCUSSION AND SUMMARY

The Cristo Rey site (LA 1644) is probably a small resource gathering site located on the first terrace above the Rio Grande. The site consists of one shallow pit structure, several areas of fire-cracked rock, ground stone, chipped stone, and ceramics. This discussion focuses on the research questions put forth earlier in this report. The site dates to the early Mesilla phase of the Jornada Mogollon culture based on a corrected radiocarbon date of A.D. 465 $\pm$ 60, El Paso Brown ceramics, and architectural units consisting of shallow pit structures.

Date of Site

One radiocarbon date was obtained from the fill in the small pit structure. The corrected date, based on an extended counting time, is A.D. 465 $\pm$ 60. The Jornada Mogollon culture begins with the Mesilla phase, which Whalen (1980) and Oakes (1981) have verified as starting as early as A.D. 400 based on several early C-14 dates obtained from sites of this period in the Hueco Bolson. The A.D. 465 $\pm$ 60 date suggests that the Cristo Rey site occupation period lies at the beginning of the time frame for the Mesilla phase and just after the end of the Archaic period (ca. A.D. 400) in the Hueco Bolson. Because of the presence of ceramics, limited size of the site, and small pithouse, we believe the site fits best within the early Mesilla phase classification. The earliest dates for the Mesilla phase start at about A.D. 400, accompanied by early forms of El Paso Brown ceramics (Whalen 1980). The use of a single C-14 date for the site is not totally reliable, but it may be very important for extending the beginning of the Mesilla phase earlier than A.D. 600.

Ceramics from the site include El Paso Brown, Red-on-brown variant (Bichrome), Jornada-like, Mimbres Classic, corrugated, and unidentified types. Most are thought to date from A.D. 400 to A.D. 1400 as shown in Table 17 (Oakes 1981; LeBlanc 1980). If the site does fit into the early Mesilla phase, then the ceramic dates for the Jornada-like brown wares and bichromes also date as early as A.D. 400. The presence of later ceramics, such as Mimbres Classic, Red-on-brown, Jornada-like, and corrugated, also indicate reuse of the site area at later periods during the El Paso phase.

Table 17. Ceramic Dates

Ceramic	Date	Phase
El Paso Brown	A.D. 400 to 1150	Mesilla
Red-on-Brown (Bichrome)	A.D. 1100 to 1400	Doña Ana to El Paso
Jornada-like	A.D. 900 to 1400	Mesilla, Doña Ana, and El Paso
Mimbres Classic	A.D. 900 to 1450	Mesilla, Doña Ana, and El Paso
Corrugated	A.D. 1265 to 1460	El Paso

Whalen (1978) subdivides El Paso Brown into early (A.D. 400 to 700) and late (ca. A.D. 1000) types. Early El Paso Brown vessels are smaller and have thicker walls and the rims are pinched. In later El Paso Brown wares, wall thickness is thinner and the rims are less pinched, being noticeably square or flattened. The El Paso Brown ware ceramics found at LA 1644 had relatively thick walls and, using Whalen's criteria, place the site in the early Mesilla phase.

The ceramics at the Cristo Rey site were compared (Table 18) to another nearby site of the Mesilla Phase: the Sandy Bone site (A.D. 900 to 1000; O'Laughlin 1977). The dominant ceramic type for the two Mesilla phase sites is El Paso Brown. There are some Mimbres Black-on-white ceramics (.9 percent) present on the Sandy Bone site. There were no Mimbres Black-on-white sherds found on the Cristo Rey site. This difference is probably due to the later date of the Sandy Bone site. In most respects, however, the assemblages of the two sites are very similar. Mimbres Classic and Mimbres Black-on-white are helpful in determining site chronologies. Mimbres Classic is the most common nonlocal pottery at LA 1644, consisting of 11 (4.5 percent) sherds dating between A.D. 900 to 1100 in the Mesilla phase (Whalen 1978). These are from a later time period than indicated by the radiocarbon date, suggesting reuse of the site.

The ceramic dates for the Jornada-like brown wares and bichrome may date as early as A.D. 400, indicative of an early Mesilla phase site (Table 17). Ceramics also indicate reuse of the site area at later periods during the late Mesilla and El Paso phases.

Table 18. Ceramic Comparisons

	Sandy Bone	Percent	Cristo Rey	Percent
El Paso Brown	205	94.9	215	87.4
Jornada			5	2.0
Mimbres Classic			11	4.5
Corrugated			4	1.6
Plain wares	6	2.8		
Mimbres Corrugated	3	1.4		
Mimbres B/w	2	.9		
Unspecified			11	4.5
TOTAL	216	100.0	246	100.0

Seasonality

The taxa found in the flotation samples by Toll (this volume) were available only during the spring season, implying a probable spring occupation. The site's proximity to the Rio Grande may have provided a greater abundance of flowering wild plants than elsewhere.

Settlement patterns for this phase are similar to the Archaic period: high residential mobility of loosely integrated small social groups that depended on hunting and gathering with some domesticated plants being grown (Beckes 1977; Whalen et. al. 1980). Because of the spring availability of the taxa recovered and the nonpermanent nature of the pit structure, it is our opinion that the Cristo Rey site appears to be a seasonally used resource procurement and processing site.

Occupation Span

We have attempted, with difficulty, to determine the length of occupation at the Cristo Rey site. Were site occupants involved in frequent shifts in site locations or was this a site used over time? As stated earlier, a small portion of LA 1644 was within the right-of-way and only a part of that remained unaffected by land alterations. Much of the site lies outside of the project limits, and therefore we can only suggest the duration of occupation based on data from the pithouse.

The lack of prepared walls and surfaces in the small unit, no evidence of structural reuse, and absence of surrounding storage pits or hearths within the right-of-way suggest minimal labor investment, indicative of a short-term occupation. However, other structures or pits may exist outside of the right-of-way.

The presence of lithic debitage, chipped stone tools, and ground stone on LA 1644 suggests a variety of maintenance and food processing activities, and for these reasons it is believed that the Cristo Rey structure was a residential habitation. The lithic raw materials are available within the immediate area, and sandstone for the ground stone is available from the Franklin Mountains, 4.8 km (3 mi) to the northeast.

The large percentage of flakes (93.6 percent), the small amount of angular debris (6.4 percent), and the low number of cores (n = 4) would suggest that tools were brought to the site and resharpened instead of manufactured. The presence of six projectile points indicates that some hunting was pursued on or near the site.

The ground stone on the site totaled 30 specimens, including 8 metates and 22 manos. The ground stone indicates processing of subsistence items on the site. The ground stone implements may have been used to process the types of wild food found in the pollen and flotation samples. A few metate fragments exhibited heavy wear.

An analysis of ground stone performed by Calamia (1988) from several sites in the Hueco Bolson concluded that, on residential sites, the ground stone is larger and has more wear than on special activity sites. He also concludes that the ground stone on special activity sites (i.e., seasonal sites) is small in size and there is less wear evident. The ground stone found at the Cristo Rey site is fragmented; however, the thickness and the wear on the ground surface is similar to the ground stone description by Calamia (1988) for residential sites.

Subsistence Patterns

Based on the faunal analysis, food resources used by the occupants of the Cristo Rey site include ground squirrel, desert cottontail, black-tailed jack rabbit, unknown bird specimen, a large amount of unidentified small mammals, large mammals, mesquite, hedgehog cactus, and prickly pear cactus. These are all locally available.

O'Laughlin (1980:25) believes that from about A.D. 900 to 1100 communities consisted of more integrated social groups with a higher degree of permanence; they were still mostly dependent on hunting and gathering. He also mentions a minor dependency on domesticated plants. If true, there should be less cultivated food and more wild resources at the Cristo Rey site because it is an early site.

Studies by O'Laughlin (1980) on the Keystone Dam Project have suggested that there has been little climatic change during the last 4,000 to 5,000 years. A slight drying trend has led to an increase in cheno-am and pine pollen, and a decrease in Gramineae, Compositae, ephedra, oak, walnut, and hackberry pollen. This is true in the specimens found at the Cristo Rey site.

In early sites on the Keystone Dam Project, O'Laughlin found lechuguilla and sotol. These have hearts and leaf bases that are known to be more appetizing in the spring (O'Laughlin 1980). He also recovered datil and prickly pear fruit (which is available in late spring), mesquite, tornillo, and cattail (which can be stored), and hearts, leaf bases, and flowering stalks of soap-tree yucca, whitehorn, acorn, wolfberry fruit, and grass seeds. At the Sandy Bone site (O'Laughlin 1977), which dates around A.D. 1100, the food resources consisted of mesquite, soap-tree yucca, and tornillo. At neither of these sites (Keystone Dam and Sandy Bone) was evidence for domesticates present in the flotation samples dating to the Mesilla phase. However, corn could have been grown in the area. O'Leary's (1987) study of sites dating from Late Archaic to late Mesilla phase also had no domestic food sources reflected in the pollen samples.

The Cristo Rey site (LA 1644) produced juniper, Pinaceae, cheno-am, Graminae, Mormon tea, low-spine Compositae, sage, high-spine Compositae, Cactaceae, cholla, and *platyopuntia* in the pollen, which are modern species and are found in the site environment today. Also, mesquite, hedgehog cactus, and possibly prickly pear cactus seeds were found in the flotation samples. Several perennial species are harvestable in the early fall. Both hedgehog cactus and prickly pear are listed in the ethnographic record as important food resources for a variety of Southwestern peoples (Toll, Appendix 2). Other specimens found in the flotation samples contained scorpion weed, a hairy, noxious weed that has no known economic use. Charcoal composition indicates that there was reliance on three local species: mesquite, saltbush, and cottonwood or willow. Elsewhere in the Rio Abajo these species are common. Along the Rio Grande corridor the principal species are cottonwood and willow.

O'Laughlin (1977) identified three hunting strategies: highland, lowland, and riverine. The highland hunting strategy is reflected in sites at higher elevations such as Fresnal Shelter (Wimberly and Eidenbach 1972) located on the west side of the Sacramento Mountains at 2,109 m (6,299 ft), and Lehmer's (1948) La Cueva located on the west slopes of the Organ Mountains at 1,740 m (5,709 ft). At Fresnal Shelter, the faunal remains consisted of deer, small mammals, birds and reptiles. At La Cueva, the remains consisted of cottontail, jackrabbit, deer, pronghorn, and mountain sheep. Deer was the predominant animal hunted in the mountain areas and is typical of the highland hunting pattern (O'Laughlin 1977). The lowland hunting strategy is characterized by hunting cottontail, jackrabbit, and some pronghorn sheep. This is also seen at La Cueva, but most sites reflecting this pattern are below 1,500 m (4,922 ft) in elevation. These sites are located in areas of shrub desert or desert grassland in the Hueco Bolson. Brooks (1966) reported jackrabbit, cottontail, pronghorn sheep, deer, and long-tailed weasel from an El Paso phase village on the bolson floor. Whalen (1977) has found jackrabbit, cottontail, and pronghorn in both Mesilla and El Paso phase sites.

A riverine hunting strategy is found along the Rio Grande in Doña Ana County. The pattern is similar to the lowland hunting strategy but also includes animals less common or not found in the lowland areas away from the river (O'Laughlin 1977). These animals include duck, fish, western box turtle, and spiny soft shell turtle.

On the basis of O'Laughlin's findings, LA 1644 would fall into the lowland hunting pattern. The fauna found at the Cristo Rey site had only three identifiable species, which included desert cottontail, ground squirrel, and black-tailed jackrabbit. The black-tailed jackrabbit has its greatest frequency in low elevation grassland and deserts (O'Laughlin 1977). At Los Tules, 90 percent of the faunal remains were cottontail rabbit. At the Sandy Bone site, which is on State Road 273 near Anapra, the faunal remains represent a riverine hunting strategy. At the sites in the Mesilla Bolson, O'Leary (1984) found bird, mammal, medium-sized mammal, and jackrabbit. The faunal assemblage collected by O'Leary resembles the faunal remains at LA 1644.

Jackrabbit seem to be the major meat diet at the Cristo Rey Site and at Los Tules, Sandy Bone site, and the Mesilla Bolson sites, suggesting that there is an abundance of this species in the area. It might also indicate short-term use of these sites with prehistoric peoples hunting those species, such as jackrabbit, that are easily available. It has been suggested by O'Laughlin (1980) that poor bone preservation is probably responsible for the small number of faunal remains found on sites in the region.

Trade and Exchange Networks

The recovery of a *Glycymeris* bracelet on the site may indicate that there were trade contacts extending as far as the Pacific coast. *Glycymeris* shell has also been found on other Mesilla phase sites within the project area. Brooks (1984:97) found shell from Baja or Lower California at the Bob John's site. O'Laughlin (1980:163) also recovered a shell bead from Site 33 on the Keystone Dam Project. The *Glycymeris* shell bracelet would suggest that regional exchange systems existed during the Mesilla phase in this area of New Mexico.

Determining obsidian sources, unfortunately, did not help in determining intra-regional trade contacts. Of the lithic material assemblage from the Cristo Rey site, 2.4 percent was obsidian. The obsidian in the area, including that from LA 1644, comes from the gravels of the Rio Grande in small water-worn nodules. O'Leary (1987) had some samples analyzed by the New Mexico State Obsidian Hydration Laboratory and found 14 distinct chemical types within the obsidian from these gravels (Camilli 1985b). The results identified the material as coming from Obsidian Ridge in the Jemez, Polvadera Peak, and Grants Ridge, all far to the north of the region.

In the El Paso phase there is evidence for extensive regional trade. Exotic materials such as shell artifacts and Chihuahuan ceramics are found on these sites and some archaeologists think that the El Paso area was linked with the Casas Grandes culture (Schaafsma 1974). Mimbres Classic ceramics are common on Mesilla phase sites in the southwestern portion of the Jornada Mogollon culture area and it is not necessarily considered a trade ware.

The site area within the highway right-of-way dates to the Mesilla phase; however, later Mimbres sherds indicate that the site was occupied for a short time during the El Paso phase. Within the blowouts outside the right-of-way there are several eroded hearths and possibly one or more pit structures present, also there are more painted ceramics present. It is possible that LA 1644 is a multicomponent site, but the site has been altered by past construction activities and excavation was restricted to the highway right-of-way. It is possible that the site as a whole is a residential location in which several activities took place either seasonally as specific resources became available, or periodically over the years.

Mesilla Phase Group Sizes

If this site is a seasonally occupied habitation, then there must be other sites occupied by the same people during other times of the year. However, we do not know if this site represents a small social unit on a seasonal round or a segment of a larger group possibly divided into a special task unit. Certainly the variety of artifacts present do not suggest just a specialized task force. But whether segmentation is a part of Mesilla phase organizational structure is unknown because of the few sites of the period excavated. The only other comparable site is the Sandy Bone site (O'Laughlin 1977), which is a small Mesilla phase camp; however, excavation was limited to a 2-by-16-m area. O'Laughlin (1977:38) states that there is a possibility that structures are present at the Sandy Bone site. There have been other Mesilla phase sites with shallow pithouses excavated along the Rio Grande, but most are large villages. The lack of cultural features and material at the Cristo Rey site makes it impossible to perform a comparative study in group size.

APPENDIX 2

BOTANICAL REMAINS FROM A JORNADA MOGOLLON CAMPSITE (LA 1644) NEAR EL PASO, TEXAS

Mollie S. Toll

Introduction and Methods

Three flotation samples reported here were taken from March 1988 excavations comprising a portion of a Mesilla phase campsite, approximately 3 miles north of the Mexican-United States border and less than 2 miles northwest of El Paso. The site was located in a sand dune dominated by mesquite and creosote bush, on the second terrace above the Rio Grande. Ground stone, lithics, and ceramics attest to a variety of plant and animal food processing activities at the camp. The samples were collected from two features found in a blowout. Disturbance from recent use of heavy equipment and earlier construction of utility lines was extensive in the site area.

The three soil samples collected during excavation were processed at the Laboratory of Anthropology by the simplified "bucket" version of flotation (see Bohrer and Adams 1977). Samples were measured as to initial soil volume (ranging from 2,250 to 3,900 ml). Each sample was immersed in a bucket of water, and a 30-40 second interval allowed for settling out heavy particles. The solution was then poured through a fine screen (about 0.35 mm mesh) lined with a square of "chiffon" fabric, catching organic materials floating or in suspension. The fabric was lifted out and laid flat on coarse mesh screen trays until recovered material had dried. Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, 0.5 mm mesh), and then reviewed under a binocular microscope at 7-45x. Samples 2 and 3 from Feature A were large and required subsampling in the 1.0 mm and smaller screen sizes. An estimated number of seeds was calculated for the total sample, and all sample totals were standardized to represent the density of seeds per liter of soil.

One flotation sample from Feature A (#2) contained sufficient charcoal for identification of a 20-piece sample. (Ten pieces were selected from the 4 mm screen, and ten from the 2 mm screen.) Each piece was snapped to expose a fresh transverse section, and identified at 45x. Low-power, incident light identification of wood specimens does not often allow species- or even genus-level precision, but can provide reliable information useful in distinguishing broad patterns of utilization of a major resource class.

Results

Feature A, about 1.5 by 2 m in Grid 2N/272E, was thought to be either a sizeable roasting pit or a small living structure. Charcoal, but very little ash, was present in fill. Carbonized seeds in the two flotation samples were few, fragmentary, and in very poor condition. Two fragments of mesquite seed (*Prosopis* sp.) were identifiable in Sample 2, from the top 12 cm below surface (Table A2.1). Sample 2 also contained a single intact specimen of hedgehog cactus (*Echinocereus* sp.) seed. Hedgehog cactus fruits, sought out for their particularly sweet flavor, were reportedly consumed widely in the Southwest (Castetter 1935:26; Stanley 1911:450). Both Sample 2 and 3 (from lower fill, 12-40 cm below surface) contained fragments of what may be prickly pear (*Opuntia* sp.) seeds; condition of these partial specimens was very poor, however, and no distinctive morphological traits remained. Ethnographic records list prickly pear fruits as an important wild food resource for a variety of Southwestern peoples (Castetter 1935:37; Elmore 1944:64-65; Havard 1895:116; Jones 1930:35-36; Robbins et al. 1916:62; Stevenson 1915:69). In contrast to hedgehog cactus, prickly pear frequently grows in sufficient stands to warrant special collecting trips. Both samples contained modern specimens of scorpionweed *(Phacelia* cf. *crenulata),* a hairy, noxious weed causing dermatitis in susceptible people (Kearney and Peebles 1960:698). No economic use is known for this unsavory plant.

Charcoal from the upper portion of Feature A was composed of three taxa collectible within a very short radius of the site. Mesquite was predominant, and smaller proportions of saltbrush and cottonwood/willow were present (Table A2.2).

Feature B was an organic stain located just north of Feature A, and within the top 10 cm below ground surface. Artifacts and charcoal were generally absent. All seeds recovered from this feature were unburned local weed seeds, and probably intrusive.

Two macrobotanical samples, FS 211 from Grid 6N/272E and FS 261 from Grid 5N/262E, contained unburned seeds of a local species, the narrow-leaf yucca (*Yucca* sp.).

Summary

Botanical remains retrieved by flotation associate economic use of several perennial species harvestable in early fall with Feature A, a roasting pit or living structure. Mesquite, hedgehog cactus, and possibly prickly pear cactus seeds suggest utilization of species found repeatedly in Rio Abajo archeobotanical assemblages. Charred cacti seeds have been recovered at shallow sites with little preservation protection in the El Paso (Toll 1987a) and Alamogordo (Toll 1988a) areas; cacti are joined by mesquite, yucca, sedge, and other perennials at better protected sites (pueblos, a pithouse village, a rock shelter) to the northwest along the Rio Grande (Toll 1980, 1986, 1987b, 1987c, 1988b). Charcoal composition indicates reliance on three local species, mesquite, saltbush, and cottonwood or willow. Charcoal composition elsewhere in the Rio Abajo is most often based on these same three species, with relative proportions affected by location. Those sites directly in the Rio Grande corridor, for instance, show principal use of cottonwood or willow (Toll 1986, 1987b, 1987c, 1988b), while Florida Avenue, in the foothills of the Sacramento Mountains, is dominated by low elevation conifers.

Table A2.1. Flotation Results, Sunland Park (LA 1644)

Taxa	Flot. 2 Feature A	Flot. 3 Feature A	Flot. 4 Feature B
Probable Economics:			
Echinocereus (hedgehog cactus)	1/0.5*		
Prosopis (mesquite)	1/0.3*		
Unknown [cf. *Opuntia*, prickly pear]	1/0.3*	1/04*	
Probable Contaminants:			
Amaranthus (pigweed)			3/0.8
Mentezelia cf. *pumila* (stickleaf)			3/0.8
Phacelia cf. *crenulata* (scorpionweed)	3/1.5	2/0.9	30/8.3
Unknown [cf. *Potentilla*, cinquefoil]			6/1.7
Total Seeds			
Number recovered	6	3	42
Seeds per liter of soil	2.6	1.3	11.6
Total Taxa	4	2	4
Total Burned Taxa	3	1	0

* some or all specimens charred
a/b number before slash represents actual number of seeds recovered; number after slash represents estimated seeds per liter of soil, taking into account any subsampling

Table A2.2. Species Composition of Flotation Sample 2, Feature A, LA 1644

Taxa	Pieces		Weight	
	Number	Percent	Grams	Percent
Atriplex (saltbush)	5	25	0.1	33
Populus/Salix (cottonwood/willow)	3	15	< 0.05	--
Prosopis (mesquite)	12	60	0.2	67
TOTAL	20	100	0.3	100

APPENDIX 3

POLLEN ANALYSIS OF SAMPLES FROM LA 1644, CRISTO REY SITE SUNLAND PARK PROJECT, DONA ANA COUNTY, NEW MEXICO

Glenna Dean, Ph.D.

Introduction

Archaeological excavations were conducted in March of 1988 by the Research Section of the Laboratory of Anthropology, Museum of New Mexico, in Doña Ana County, New Mexico near El Paso, Texas. Situated among sand dunes and blowouts on an upper terrace overlooking the Rio Grande floodplain, the site was found by the archaeologists to have been seriously disturbed by heavy equipment and utility line construction. Investigation of the site took place under the general direction of Dorothy Zamora, project supervisor. Artifacts present at the site indicate use of the site area during the early Mesilla phase, A.D. 465-1100 (Dorothy Zamora, personal communication, September 7, 1988).

Archaeobotanical samples were taken from Blowout A and submitted to the Castetter Laboratory for Ethnobotanical Studies (CLES), University of New Mexico, for analysis. Among these were two pollen samples, taken from Feature A, a small pit feature measuring 2.0 by 1.5 m and some 20 cm in depth (Table A3.1). Lack of post holes and discernable activity surfaces prevented firm field identification of the feature as either a residential structure or a roasting pit (Dorothy Zamora, personal communication, September 7, 1988). I have not visited the site area.

The results of the pollen analysis will be presented following a discussion of laboratory processing techniques and other pertinent considerations.

Laboratory Techniques

Chemical extractions of the pollen samples from LA 1644 were performed by CLES personnel and myself using a procedure designed for arid Southwest sediments. This process involves chemical dissolution of carbonates and silicates, and acetolysis of organics and cellulose. The process is described in detail as follows:

1. Both sediment samples from Feature A were screened through a tea strainer (mesh openings of about 2 mm) into beakers, to a total screened weight of 25 grams. The sediments were dry. They were "spiked" with three tablets of pressed *Lycopodium* (clubmoss) spores (batch 414831, Dept. Quat. Geol., Lund, Sweden), for a total addition of 36,300 marker grains each.

2. Concentrated hydrochloric acid (38 percent) was added to remove carbonates, and the samples were allowed to sit overnight.

Table A3.1. Provenience of Samples Analyzed for Pollen Content from LA 1644, Cristo Rey Site, Sunland Park Project, Doña Ana County, New Mexico

CLES No.	LA No.	Provenience
88225	214	Feature A, shallow pit in Blowout A
88224	215	Feature A, shallow pit in Blowout A

3. Distilled water was added to the samples, and the acid and dissolved carbonates washed out by repeated centrifugation at 2,000 RPM in tapered 50 ml tubes. The concentrated residues were transferred back into numbered beakers and more distilled water was added. The water-sediment mixture was swirled, allowed to sit 10 seconds, and the fines decanted off of the settled heavy residue through a 195u mesh into another beaker. This process, essentially similar to bulk soil flotation, differentially floated off light materials, including pollen grains, from heavier nonpalynological matter. The fine "floated" fractions were concentrated by centrifugation at 2,000 RPM; the heavy fraction remaining in the beakers was discarded.

4. The fine fractions were mixed with 49 percent hydrofluoric acid and allowed to sit in beakers overnight to remove smaller silicates. The next day, distilled water was added to dilute the acid-residue mixture. Centrifugation and washing of the compacted residue with distilled water was repeated as above to remove acid and dissolved siliceous compounds.

5. Trisodium phosphate (5 percent solution), a wetting agent, was mixed with the residue and centrifuged. Repeated centrifuge-assisted rinses with distilled water subsequently removed much fine charcoal and small organic matter. The residues were washed with glacial acetic acid to remove remaining water in preparation for acetolysis.

6. Acetolysis mixture (nine parts acetic acid anhydride to one part concentrated sulfuric acid) was added to the residues in the plastic centrifuge tubes to destroy small organic particles. The tubes were heated in a boiling water bath for 5 minutes, followed by cooling in an unheated water bath for about 5 minutes. The residues were compacted by centrifugation and the acetolysis mixture poured off. Following a rinse with glacial acetic acid, multiple centrifuge-assisted washes with distilled water followed to remove remaining traces of acid and dissolved organic compounds. Total exposure of the residues to acetolysis mixture was about 15 minutes.

7. Remaining residues were rinsed with methanol, then stained with safranin O, mixed with liquid glycerol, and stored in 3-dram stoppered vials.

Microscope slides were made using liquid glycerol as the mounting medium under 22 by 22 mm cover slips sealed with fingernail polish. The liquid mounting medium allowed the grains to be turned over during microscopy, facilitating identifications.

The slides were counted using a Nikon Alphaphot microscope at a magnification of 400x, and subsequently scanned at a magnification of 200x in search of the larger pollen grains of cultivated plants. No such grains were found during the scans. Identifications were made to the family or genus level, as possible. Grains that could not be identified despite well-preserved morphological details were tallied as "Unknowns." Pollen grains too degraded (corroded or crumpled) to identify further were tallied as "Unidentifiable."

Limitations of Pollen Data

Two related but separate statistical considerations should be explored in order to evaluate pollen data. The first consideration is the routine "200-grain count" derived from the work of Barkley (1934), and expanded by Dimbleby (1957:13-15) and Martin (1963:30-31). Counting pollen grains to a total of 200 per sample allows the microscopist to assay the most common taxa present in the sample. My calculations using the data presented by Dimbleby (derived from counts of slides containing about 20 pollen taxa) reveal the degrees of accuracy for 200-grain counts as ranging from 75 percent to 85 percent. Barkley (1934:286) reported similar degrees of accuracy in comparing the first 100 grains counted from a sample to the second 100 grains counted (total grains counted: 200) as ranging from 78 percent to 90 percent, averaging 85 percent. Barkley's (1934:287) statistical consideration of these data, from three slides of a single sample, indicated that comparison of two 161-grain counts (a total of 322 counted grains) would be required to yield 90 percent agreement between the two counts. He concluded that the 5 percent average increased accuracy ("0.5 coefficient of reliability") did not warrant the work of counting 122 additional grains, and that a 200-grain count was sufficient.

Fewer grains than 200 can certainly be counted, but with a sharp decline in accuracy in terms of the more common pollen taxa present in the sample. Numerically rare taxa too uncommon to be seen at the routine 200-grain level of accuracy are considered too minor to affect the analytical utility of most counts. Counting more than 200 grains would increase the accuracy of the analysis in terms of recognizing rarer taxa, but at the expense of greatly increased time at the microscope. Instead, rarer taxa are usually assayed by means of specialized counts, sometimes in combination with specialized laboratory processing.

The second consideration is the "1,000-grain-per-gram" rule summarized by Hall (1981:202) and used as an indicator of the degree of pollen destruction in rock shelter samples. An estimate of the number of pollen grains present in a gram of sample is determined by the addition of known numbers of marker grains ("spike") to the sample at the beginning of the processing procedure (Benninghoff 1962; Maher 1981). Separate tallies are then kept of the spike grains and pollen grains counted under the microscope, allowing the proportion of available pollen grains actually seen to be estimated by means of the mathematical equation:

$$\#\text{ Pollen Grains/unit sample} = \frac{\#\text{ fossil pollen counted}}{\#\text{ spike grains counted}} \times \frac{\#\text{ of spike grains added}}{\text{weight (or vol.) of sample}}$$

Pollen grains can be recovered in the tens or hundreds of thousands per gram in well-preserved sediments, amounts fewer than 1,000 per gram are a signal to the analyst that the forces of degradation may have been at work, or that the potential natural pollen rain has been restricted in some way.

A further refinement of this observation is a categorization of the degree of degradation seen in the pollen grains which do remain for analysis in a sample. It is known that the pollen grains from different taxa do not degrade at the same rate, rather that degradation is differential (Holloway 1981, and references cited therein). Some pollen taxa are relatively resistant to destruction, remaining part of the pollen record long after other types have disappeared altogether. Many pollen types readily degrade beyond recognition, while others are so distinct in shape that they remain recognizable even when degraded to optically clear "ghost grains" lacking sufficient structure to take up stain. Thus, differential degradation is compounded by differential recognition. Cushing (1967) devised a six-step scale for preservation/degradation observations; Hall (1981) refined this to a four-step scale. The utility of such scales is that they provide quantifiable evidence of degradation independent of the goals of 200-grain counts or 1,000 grains per gram. The amounts and degrees of degradation have direct implications for the representativeness of the pollen counted by the analyst.

Since pollen grains in perfect condition are rarely seen in archaeological samples, degrees of degradation in the samples from LA 1644 were largely ignored in favor of a single category, the Unidentifiables. These grains were included in the 200-grain count. If a pollen grain was preserved well enough to identify to genus or family, that identification was made and no special notes were necessarily taken of its condition. If, however, a pollen grain was too degraded to assign positively even to family, it was classed as an Unidentifiable with notes as to its condition (degraded or crumpled). Grains that were too degraded to distinguish confidently as a pollen grain or as a spore were not counted at all.

In sum, three considerations must be weighed simultaneously for the following pollen spectra: statistical validity (200-grain count), relative abundance (1,000 grains per gram), and representativeness (amount of degradation). It is possible to have less than 1,000 grains of pollen per gram of sample (as from a sand dune that accumulated rapidly, diluting the available pollen rain), which laboratory procedures could concentrate sufficiently to yield a 200-grain count. Use of such a count from a sample containing large numbers of degraded grains could lead to grossly erroneous conclusions on all fronts, since differential degradation of all taxa originally present in the sediment would result in altered proportions of those still present or in (differentially) recognizable condition.

In this analysis, only 11 pollen types were recognized from the counts of the pollen samples as listed in Table A3.2. Yet, preservation of individual pollen grains was generally acceptable as reflected by the low percentages of Unidentifiable grains (7 percent or less).

Implications of Sampling Loci

Practically speaking, greater or lesser numbers of pollen grains are recoverable from probably any context. Given this, it follows that the archaeological and geomorphological implications of the sampled context become paramount for the interpretation of the recovered pollen spectrum. Just as one example, a pollen sample from pit fill provides pollen information on the fill of the pit. If research questions are directed at events connected with the filling of the pit, the recovered pollen spectrum probably will be appropriate. If, however, research questions are directed at the original function(s) of the pit before it filled, then the recovered pollen spectrum from this sample will probably not be appropriate. These considerations are of importance for LA 1644 in that the exact sampling loci within the shallow depression of Feature A or its fill were not indicated in the documentation included with the samples. Thus, the pollen types recovered in this study could reflect the use of the feature in the archaeological past, or post-abandonment pollen introduced to the feature's basin along with the sediments that eventually filled it, or even completely modern additions to the archaeological record introduced as a result of the reported heavy disturbance of the site.

Another example is a pollen sample from a burned feature such as a hearth. Since pollen grains are destroyed by heat (Ruhl 1986) as well as by exposure to fire, it is likely that few, if any, of the pollen grains recovered from such a burned context relate to the use of the feature per se. Rather, it is highly likely that the recovered pollen grains post-date the active (burning) use of the feature, and indeed were preserved by the very absence of burning. In all instances, pollen data should be integrated with flotation data, since each data set is usually preserved by different conditions.

Table A3.2. Pollen Types Identified in Samples from Feature A, LA 1644, Cristo Rey Site, Sunland Park Project, Doña Ana County, New Mexico

Taxon	Common Name
Pinaceae	Saccate genera of the pine family
Juniperus	Juniper
Cheno-am	Genera of the goosefoot family (Chenopodiaceae) and species of the genus *Amaranthus* (pigweed)
Gramineae	Genera of the grass family
Ephedra	Mormon tea
Low-spine Compositae	wind-pollinated genera of the sunflower family
Artemisia	Sage
High-spine Compositae	insect-pollinated genera of the sunflower family
Cactaceae	genera of the cactus family
Cylindropuntia	species of the cholla cactus subgenus
Platyopuntia	species of the prickly pear cactus subgenus

To summarize, location-specific archaeological considerations usually dictate where pollen samples will be taken. For example, the lack of preserved floor surfaces may require pollen samples to be taken from burned contexts or feature fill. Research questions formulated by the archaeologist must be "field tested" to take into account the anticipated recovery of pollen grains from a sampling locus, and the implications of those grains recovered for site formation processes. In sampling situations where feature preservation is good, the decision as to where to sample is easier in one sense, but still requires forethought on the implications of the pollen grains expected to be recovered.

Results of Analysis

As previously mentioned, only 11 pollen types were identified in the two samples from Feature A. Table A3.3 presents the pollen spectra from both, along with comparative numbers of grains per gram of sample. Examination of the figures presented there reveals that the two samples are similar in the very low presence of tree pollen types (1 percent or less of pine family and juniper), and overwhelming abundance of wind-pollinated, weedy Cheno-am and low-spine Compositae (from 79 percent to 84 percent). Pollen from the grasses is next in abundance among the wind-pollinated taxa, at from 3 percent to 5 percent, bringing the pollen taxa produced by wind-pollinated plants to a total of from 82 percent to 89 percent. This type of pollen is capable of being carried long distances by wind currents, especially in sparsely vegetated areas such as may be characteristic of the project area.

Table A3.3. Pollen Content of Samples from Feature A, LA 1644, Cristo Rey Site, Sunland Park Project, Doña Ana County, New Mexico (expressed as percentages)

Taxon	Sample No.: 214	215
Pinaceae	1	0.5
Juniperus	-	0.5
Cheno-am	81*	72*
Gramineae	5*	3
Ephedra	-	1
Low-spine Compositae	3	7
Artemisia	-	0.5
High-spine Compositae	2	6
Cactaceae	-	0.5
Cylindropuntia	2	0.5
Platyopuntia	0.5	-

Taxon	Sample No.: 214	215
Unknown	1	2*
Unidentified	4	7
Total Pollen Counted	207	203
No. Spike Counted	178	126
No. Grains/g (est.)	1,689	2,339

* one or more clumps of 3 or more grains seen during count

Additionally, all three of these categories bear asterisks in the table, indicating the presence of clumped pollen grains. Clumped grains are often taken as an indication of the former presence of flowers or actual pollen-bearing anthers at the sampling locus. What is not indicated in Table A3.3 is the very large size of the clumps, nor the excellent condition of their grains. Sample 214 contained over 245 grains of Cheno-am pollen in just 16 clumps, as well as a clump consisting of a minimum of 14 grass grains. Sample 215 similarly contained over 136 Cheno/Am pollen grains in just 7 clumps. Because a clump of 3 or more grains was counted as a single grain, these large figures did not influence the 200-grain count. Nonetheless, the occurrence of large clumps, averaging 14 or more grains each, strongly suggests that the clumps are of localized origin, while the excellent condition of individual grains within the clumps suggests that they were introduced to the feature long after its abandonment.

The remainder of the pollen types in Table A3.3 are from insect-pollinated species of high-spine Compositae and various cacti. A spine length of 2.5u was used in this study to differentiate low-spine from high-spine Compositae, and the distinction is generally taken to indicate wind-pollinated and insect-pollinated taxa, respectively. Both types of sunflower-family plants are typical of disturbed environments and various members of the cactus family can be found in the general project area. The lack of specificity on sampling loci prevents considered speculation on the relationship of the sunflower and cactus pollen to Feature A, but both probably reflect the more recent localized site environment.

In sum, the pollen spectra of these two pollen samples from Feature A do not seem to reflect more than the localized vegetation of a site described by the project archaeologist as having been disturbed by heavy machinery and the construction of utility lines. The abundant presence of large clumps of pollen along with the low incidence of Unidentifiable grains together argue for a more recent (post-archaeological) origin for the recovered pollen grains. A better chance for discerning the possible archaeological use(s) of Feature A may lie in the analysis of the flotation samples also taken from the feature.

APPENDIX 4. ANALYSIS FORMS

Ceramic Analysis

Specimen #:______________
Grid North:______________
Grid East:_______________
Loci:____________________
Level:___________________
Artifact #:______________

Surface Treatment

Color

Temper Type

Wall Thickness

Type

Comments

<u>Debitage Analysis Format</u>

Site #:_____
T.P. #:_____
Grid N:_____
Grid E:_____
Level :_____
Artifact #:_____

Material:__

10 chert
14 fossiliferous
15 clastic
16 oolitic

20 silicified wood
22 chalcedonic
23 palm wood

30 chalcedony

40 quartzite
41 fine grained
42 medium grained
43 coarse grained
44 quartz
50 igneous
51 basalt
52 vesicular basalt
53 andesite
54 rhyolite
56 granite
57 obsidian

60 sandstone
61 siltstone
80 limestone
90 shale

Cortex:_

0 absent
1 present 0%-25%
2 present 25%-50%
3 present 50%-75%
4 present 75%-100%

Platform type:_

0 absent
1 cortical
2 single surface
3 multi-surface

Termination:_

0 absent
1 feathered
2 stepped
3 hinged
4 cortical

Alterations:_

0 none
1 unidirectional
2 bidirectional
3 rotary
5 rotary projection

<u>Outline</u>
0 n/a
1 straight
2 concave
3 convex
4 abraded

Serration?
0 no
1 yes

Thermal?
0 no
1 yes

Artifact type:__

5 tools

30 tool
31 biface

00 angular debris	32 scraper
	33 utilized flake
10 flake	40 point
11 primary	45 drill point
12 secondary	50 core
13 interior	55 tested cobble
	60 hammerstone
20 bipolar flake	70 polished/fire cobble

Number of modified edges:_

9 all surfaces

Edge angle on tool:__

Damage:_

0 absent
1 unidirectional scarring
2 bidirectional scarring
3 unidirectional rounding
4 bidirectional rounding
5 battered
6 rotary wear

Length:_____mm Note: On length and width measurements, the following are used after the actual measurements coding:

0 whole artifact
1 portion of artifact

Width:______mm
Thickness:____mm
Weight:_____g

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