MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

THE LAND IN BETWEEN: ARCHAIC AND FORMATIVE OCCUPATIONS ALONG THE UPPER RÍO HONDO OF SOUTHEASTERN NEW MEXICO

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ADMINISTRATIVE SUMMARY

In the winter and spring of 1989, the Office of Archaeological Studies, Museum of New Mexico, excavated two prehistoric sites in the upper Río Hondo Valley of southeastern Lincoln County, New Mexico. The excavations were requested by the New Mexico State Highway and Transportation Department as part of a safety-improvements project for U.S. Highway 70/380.

Excavations at the Sunset Archaic site (LA 58971) exposed storage pits, rock hearths, and trash radiocarbon-dated to the first five centuries A.D. Animal and plant remains indicate a subsistence economy based on a variety of mammals, fish, wild plants, and small amounts of corn. The few projectile points include San Pedro Large and Hueco types, suggesting affiliation with Cochise- and Chihuahua-tradition Archaic groups to the west and southwest.

Excavations at the Sunset Shelters (LA 71167) involved a cluster of four very small caves and rock shelters. Tintop Cave was the largest of the group and contained the most substantial deposits. All caves and shelters were used for short-term activities during the Archaic (possibly), Formative, and Historic periods, but most of the remains represent the Formative (pottery) period. Formative-period subsistence remains indicate an economy based on a variety of mammals, fish, wild plants, and small amounts of corn. The corn remains were less plentiful and less ubiquitous than at the Sunset Archaic site. Synthesis of the data suggests that the Formative-period occupants *may* have been hunter-gatherers who grew small amounts of corn and acquired pottery from the nearby Jornada-Mogollones.

MNM Project No. 41.441 (Picacho)
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Submitted in fulfillment of Joint Powers Agreement D03553 between the New Mexico State Highway and Transportation Department and the Office of Archaeological Studies, Museum of New Mexico, Office of Cultural Affairs.

For Clark C. Pfingsten (1910-1994),
a remarkable man and a valued friend

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INTRODUCTION

Improvements to U.S. Highway 70 about 50 km (30 mi) west of Roswell, New Mexico, provided the opportunity to investigate two sites along the upper Río Hondo between the mountains and the Pecos River Valley (Fig. 1 and Appendix 1). Archaeological records and local folklore suggest that prehistoric use of the upper Hondo was minimal and left few traces, in sharp contrast to both the Pecos Valley and the Sierra Blanca/Sacramento highlands, where sites have long been known.

The work described in this report was undertaken by the Office of Archaeological Studies (OAS), Museum of New Mexico, for the New Mexico State Highway and Transportation Department. During the project, OAS investigated two sites: an open-air Late Archaic site and a group of tiny shelters and caves bearing Archaic and Formative deposits.

The fieldwork took 11 weeks and was done in two phases between mid February and early June 1989. The project supervisor was R. N. Wiseman, assisted by Guadalupe A. Martinez. Crew size varied from one to five laborers and included Clark C. Pfingsten, Pete Salas, Jr., Frank McTeague, Sybil Melik, Richard Ortega, and Amelia Shafer. Eric Blinman provided invaluable assistance with the computer. This report was produced by Ann Noble and Tom Ireland.

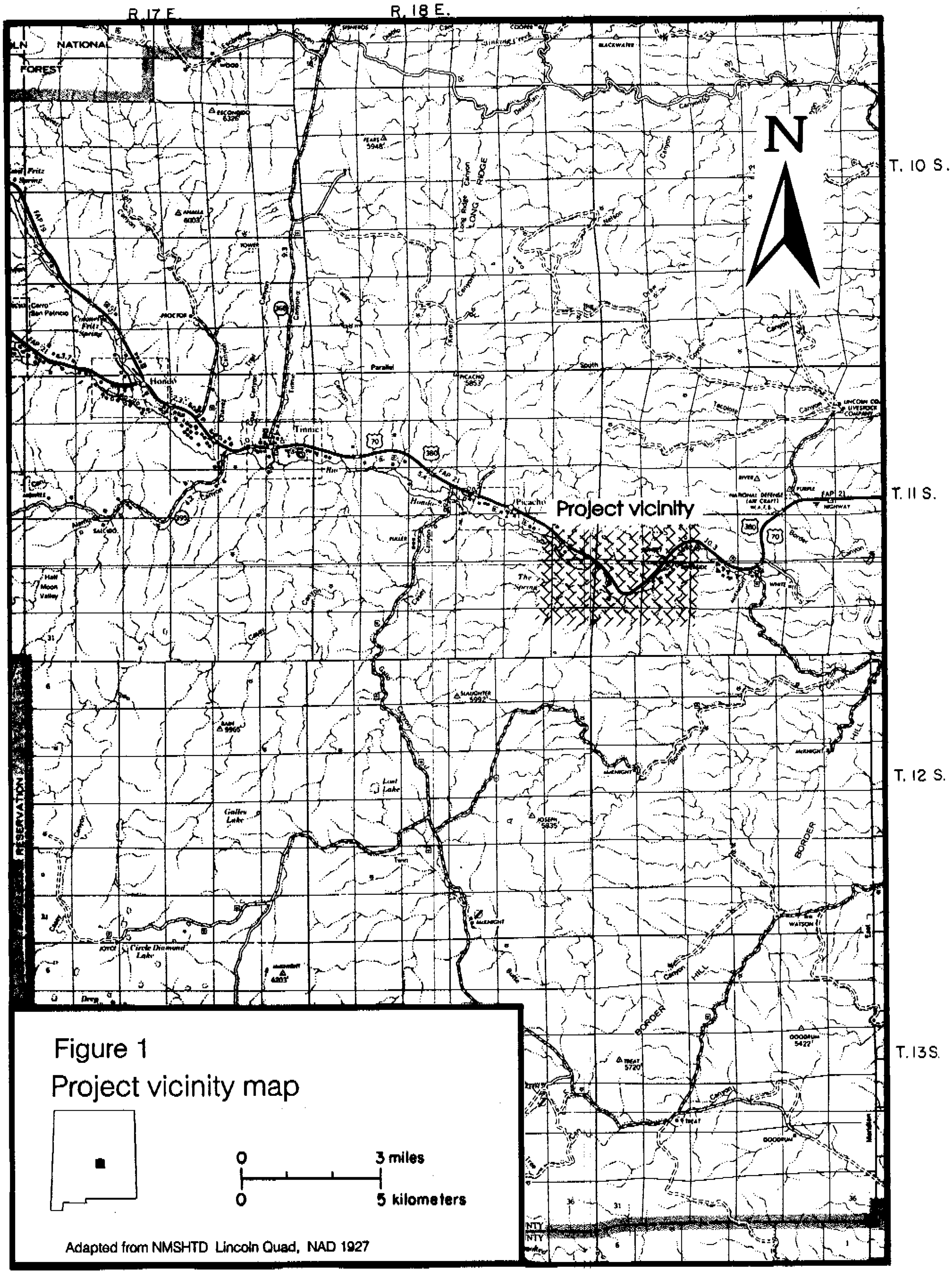

Figure 1
Project vicinity map

PHYSICAL ENVIRONMENT

Paleoclimate

Our understanding of the paleoclimate of the Southwest in general and southeastern New Mexico in particular are rudimentary at best. Wills (1988:51-58) provides an outline of the main events as we currently know them. The characterization that follows relies heavily on his discussion.

The retreat of the glaciers about 10,000 years ago brought about an end to the cool, moist Pleistocene climate and signaled the beginning of a drying and warming trend. This trend deepened until about 3,000 B.C., when it culminated in what scientists call the Altithermal, a period of relatively extreme heat and dryness.

The situation reversed itself starting about 2,500 or 2,000 B.C., when the Southwest experienced a cooling trend characterized by greater effective moisture. Although improved conditions increasingly favored plant growth and perhaps greater diversification of species, the composition and distribution of plant communities as we currently know them were established by this time. The modern regime of moisture and temperatures, constituting a slight warming-drying trend, started about the time of Christ.

Modern Climate

The climate of southeastern New Mexico is temperate, with mild winters and warm to hot summers. A short weather record for the village of Picacho shows an average annual temperature of 14.3 degrees C, a July average of 23.8 C, and a January average of 5.4 C (Gabin and Lesperance 1977). The average frost-free season lasts 160 to 180 days (Tuan et al 1973).

The modern average annual precipitation isohyet of 38 mm (15 in) passes through the Sunset Shelters (USDC 1967). This is below the 41 mm (16 in) line, the minimum believed necessary for successful dry farming. However, above-average years and especially groups of such years in the Picacho area would permit horticulture on the level believed practiced by prehistoric peoples.

Given the project area's position between the Sierra Blanca (Ruidoso) to the west and the Pecos Valley (Roswell) to the east, it is instructive to compare the Picacho climatic data with those for these areas with a temperature/precipitation plot (Fig. 2). Although Picacho is in a river valley about half way between Ruidoso and Roswell, its climate curve is more like Roswell's. However, its protected position in the valley results in somewhat warmer winters, cooler summers, and greater average annual precipitation than in Roswell. Picacho is significantly warmer in both winter and summer than Ruidoso.

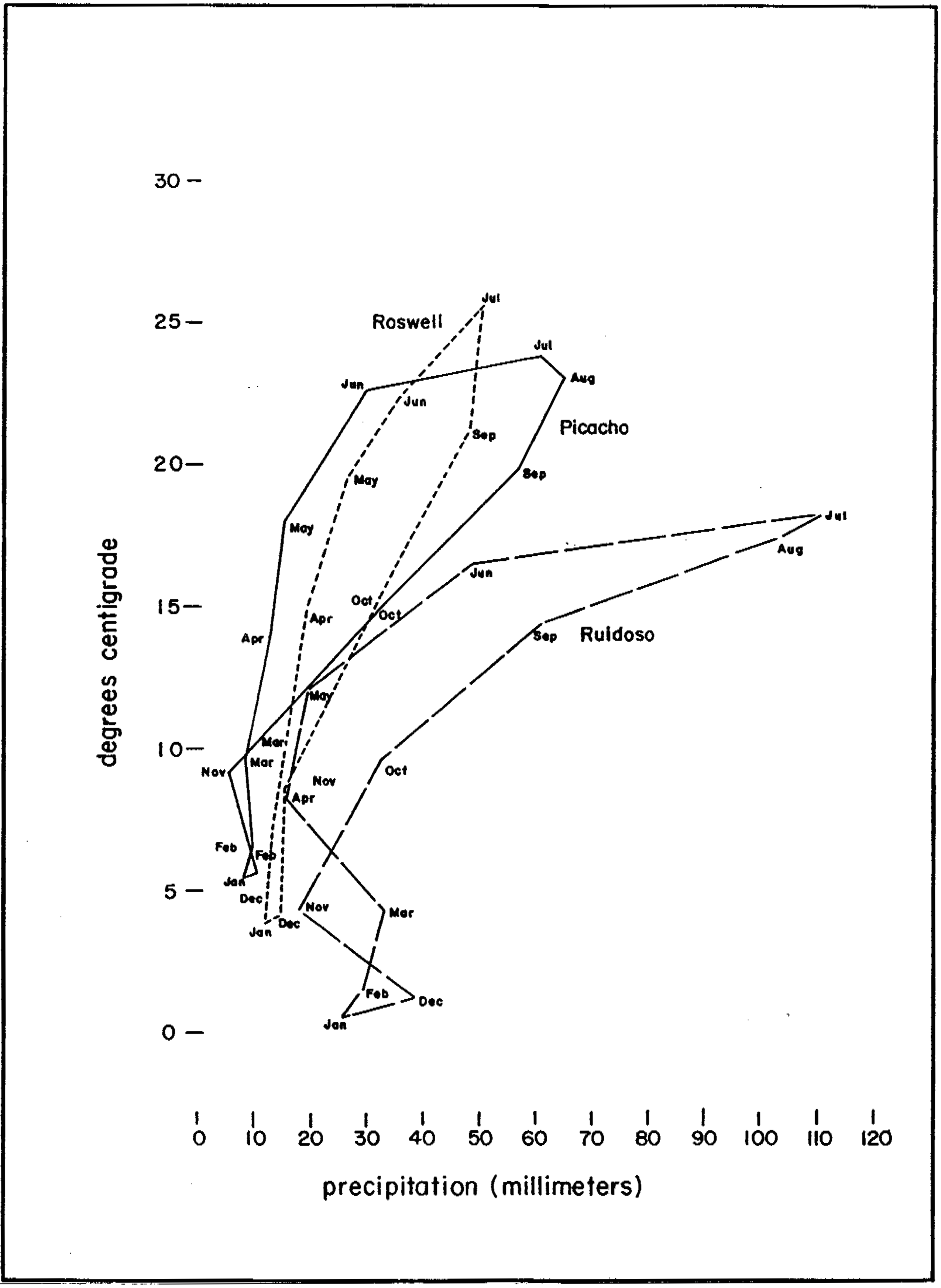

Figure 2. Comparison of precipitation and temperature curves for Picacho, Ruidoso, and Roswell.

Topography

The Río Hondo has deeply incised its course through the Sacramento Plain, an erosional feature emanating from the Sacramento/Sierra Blanca/ Capitan highlands to the west. The elevation of the Hondo Valley bottom at Picacho is 1,500 m, and the hilltops and ridges on either side of the valley reach 1,670 m. The Sierra Blanca, which forms the headwaters of the Hondo, reaches elevations in excess of 3,650 m.

The terrain in the project area includes the narrow, southeast-trending Hondo Valley, with rather large tracts of arable bottomland. The hills and ridges on either side of the valley rise abruptly and are periodically cut by short side canyons 1 to 5 km long. Eight km downstream, the Hondo enters a narrows 16 km long.

Geology

The surface geology of the project area is fairly simple (Kelley 1971). The valley bottom and lower slopes are composed of outcrops of the Yeso formation (Permian). The middle and upper slopes of the hills and ridges on either side of the valley are composed of the Río Bonito member of the San Andres formation (Permian), and the tops of the hills and ridges are the Bonney Canyon member of the San Andres. The Yeso formation is compsed of sandstone, siltstone, dolomite, and gypsum. Colors of the various strata include tan, red-yellow, gray, and white. In the San Andres formation, the thick-bedded Río Bonito member includes gray and brownish-gray dolomite, limestone, and sandstone (Glorieta). The thin-bedded Bonney Canyon member includes gray, light gray, and local black dolomite and local limestone.

Kelley (1971:10) states that chert is not generally characteristic of the San Andres except in the southern Guadalupe Mountains. However, two archaeological projects in the vicinity of Roswell, one along U.S. 70 between Riverside and Roswell (Hannaford 1981) and the other at Two Rivers Reservoir (Phillips et al. 1981), have documented chert eroding over large areas from the Bonney Canyon member. The pieces of whitish and light to dark gray chert include numerous variations in the form of mottled, striped, blended, and uniform colors. Raw material units appear to be mostly roundish concretions that seldom, if ever, exceed 10 cm in the longest dimension. Although the concretions can be rather sparse in an outcrop, they can also be plentiful and provide excellent collecting quarries.

Soils

Three soil associations occur in the immediate vicinity of the project (Sprankle et al. 1983). The valley bottom soils belong to the Gabaldon-Riverwash association. Gabaldon soils are fine-silty, mixed, mesic Cumulic-Haplustolls that are very deep, well-drained, and formed in alluvium derived from mixed sources. The surface layer is a brown silt loam.

A series of low slopes and ridges along the south side of the valley opposite the Sunset Archaic site are covered by Darvey-Pastura association soils. Darvey soils are fine-loamy, mixed, mesic Ustollic Calciorthids. They are very deep, well-drained, and formed in alluvium that is mainly derived from limestone. The soil horizons from the surface down are dark brown heavy loam, brown loam, pink heavy loam, and light brown heavy loam. Pastura soils are very shallow to shallow, well-drained, and formed mainly from limestone. The brown loam, clay loam, and gravelly clay loam overlie indurated caliche that may be found as little as 32.5 cm (13 in) below the ground surface.

The high hills along the north side of the valley are covered by Deama-Rock Outcrop association soils. Deama soils are loamy-skeletal, carbonatic, mesic Lithic-Calciustolls that are very shallow to shallow, well-drained, and formed from limestone. Brown to dark brown, very cobbly loam surface and subsurface layers are underlain by limestone at depths of 17.7 to 50.7 cm (7 to 20 in).

Water

The Río Hondo was perennial in all but the driest years before the installation of modern dams and irrigating systems. When it failed to flow, large holes supplied abundant water in many areas (Shinkle 1970:165). The drainage area, which heads on the east slopes of the Sierra Blanca, is several hundred square kilometers in size. Annual stream flow varies throughout the year, and high flows occur at least twice, once during spring melt and again during the late summer monsoon season.

Vegetation

The vegetation of the project area is characterized by semidesert grassland by Browne and Lowe (1983). The valley bottom, especially along the river, supports a riparian community that has been augmented by introduced agricultural and ornamental species.

Kuechler (1964) suggests that before recent disturbances, the area was covered by elements of the grama-tobosa shrubsteppe. The primary members of this community include black grama, tobosa, and creosotebush.

Observations made during the project revealed additional important information not covered by the above authors. The plant communities on the valley sides vary with exposure. The vegetation on north-facing slopes (along the south side of the valley) is similar to that described by the authors cited above. The south-facing slopes (along the north side of the valley and near the project sites) support Chihuahuan Desert species, most notably sotol, wait-a-minute bush, mesquite, and others. The piñon-juniper woodland resources associated with the nearest mountains, the Capitans, lie to the northwest.

Animals

Locally available animals that may have been eaten by prehistoric people include cottontails, jackrabbits, gophers, cottonrats, woodrats, and a variety of rock squirrels and ground squirrels. Deer, especially mule deer, water at the Hondo, and road kills were seen during the project. Their primary habitat, however, lies to the north and northwest of the project area. Antelope are found on the Sacramento Plain south of the Hondo Valley, but their primary habitat is east of the project area (Findley et al. 1975).

CULTURE HISTORY

Previous Archaeological Investigations in the Area

Archaeological investigations in and around the upper Río Hondo Valley have been practically nonexistent. At this writing, only 28 sites have been recorded for the area beginning at the juncture of the Río Bonito and Río Ruidoso (the starting point for the Río Hondo), 15 km west of the Sunset Archaic site, and ending 30 km to the east at the Two Rivers Reservoir, southwest of Roswell.

Twenty-four of these sites are lithic material gathering locales and twentieth-century historic sites in the hills of the Sacramento Plain, north of the Hondo Valley. All were recently investigated by the Museum of New Mexico (Hannaford 1981). LA 55370 is the village of Sunset just northeast of the Sunset Shelters. Of the remaining three sites, two are recorded as prehistoric sherd and lithic scatters, and the last is an "open camp site" with a chopper, a mano fragment, and an unspecified number of lithic artifacts (New Mexico Cultural Records Management System, Historic Preservation Division, Santa Fe).

One other site is known to the writer. This unrecorded midden-ring site is situated on the Hondo Valley bottom where the Hondo enters the narrows, 8 km downstream from the Sunset Shelters. Aside from one or two midden circles and a scatter of burned rock, the only cultural materials were a few lithic flakes.

Regional Culture History

The following culture history outline of southeastern New Mexico is distilled from a number of sources. Sources for the prehistoric period include Stuart and Gauthier (1981, a general study of New Mexico archaeology), Sebastian and Larralde (1989, for east-central and southeastern New Mexico), Kelley (1984, a more specific study pertaining to the Sierra Blanca region west of the project area), Jelinek (1967, the Pecos River between Roswell and Fort Sumner), and Katz and Katz (1985, the Pecos River between Artesia and Carlsbad). The primary references for the historic period are Schroeder and Matson (1965) and Oakes (1983).

Emphasis here is placed on the Late Archaic and early to middle Ceramic periods because the project sites represent these manifestations. The Archaic sequence is for the Carlsbad Basin (Katz and Katz 1985) because the Sunset Archaic site (SAS) is in the Pecos River drainage, even though it is not specifically in the Carlsbad Basin. Whether the Carlsbad sequence, the Archaic Chihuahua tradition sequence (MacNeish and Beckett 1987; MacNeish 1989), or some other sequence is more appropriate to the SAS will be discussed in this report.

Human occupation of southeastern New Mexico began with the Llano Complex (Clovis Culture) of the Paleoindian period, which dates at least 13,000 years ago. These people, and their successors of the Folsom and Cody periods, hunted large mammals (mammoths and extinct forms of bison) and maintained a nomadic or seminomadic lifestyle.

The retreat of the Pleistocene glaciers brought a warming of the more southerly latitudes and a shift in human adaptation called the Archaic period. This adaptation depended upon a wide variety of small animal species, especially because the larger forms had disappeared. The appearance of large numbers of grinding tools and specialized burned rock features suggests a greater reliance on plant foods.

Along the Pecos River in the vicinity of Carlsbad an Archaic sequence has developed that may be applicable to the Sunset Archaic site (Katz and Katz 1985). It starts with the Middle Archaic, rather than the Early Archaic, suggesting that, at least along the river, there may have been an occupational hiatus between the Paleoindian and the Avalon phases (3000-1000 B.C.). Little is known about the peoples of the Avalon phase except that they occupied the Pecos River floodplain near the river channel during at least part of the year, constructed hearths in the open, and consumed one or more species of freshwater shellfish. The subsistence orientation was clearly riverine. Projectile point styles, if any were used, are currently unknown.

Late Archaic peoples of the succeeding McMillan phase (1000 B.C. to A.D. 1) are better known because more sites with more remains have been documented. They constructed relatively small hearths (1 m diameter clusters of small rocks) and burned rock rings (or midden circles). Previously named projectile point styles associated with the McMillan phase include the Darl and Palmillas types. Subsistence involved both riverine and upland species of animals and plants.

The Terminal Archaic in the Carlsbad area, the Brantley phase (A.D. 1 to 750), saw a continuation of the previous patterns and a greater use of burned rock rings. Although this suggests that certain upland resources such as agave and sotol were becoming more important in the diet, the ratio of riverine to upland sites remains the same, with a continuing emphasis on floodplain living. Projectile point types commonly associated with the Brantley phase include the previously known San Pedro style, the newly described (and provisional) Pecos point, and several less standardized, but familiar, styles of points commonly found in the region.

From A.D. 750 to 1150 (Globe phase) in the Carlsbad locale, occupation of the floodplain environment reached its zenith. Four major changes occurred at this time. Brownware pottery, the bow and arrow, and a piled rock habitation structure (called "stone enclosures" in northeastern New Mexico and eastern Colorado) appear for the first time. The subsistence system changed from the earlier emphasis on riverine resources supplemented by upland products to an emphasis on upland resources supplemented by riverine products. Projectile point styles are dominated by the corner-notched arrow tips called Scallorn points. However, there seems to be a general continuation of earlier culture traits, although in many respects the emphasis shifted towards the lifestyle manifested in succeeding phases.

After A.D. 1150, occupation along the river in the Carlsbad area diminished significantly. The culture retained its essentially Archaic nature, but with the addition of pottery. About this time in the Roswell area, people were inhabiting small, oval pithouses such as those at the King Ranch site (Wiseman 1981). Although absolute dates were not obtained and the cultural inventory recovered was minimal, several aspects of the site were reminiscent of a hunter-gatherer lifestyle.

Whether the King Ranch site represents a continuation of the Archaic lifestyle or a transition into an agricultural lifestyle is currently unknown. Some researchers believe that the Archaic lifestyle continued well into the Ceramic period in some areas, such as Santa Rosa and the Guadalupe Mountains. In the Roswell area, however, an agricultural adaptation did appear, no later than the A.D. 1200s, at the Rocky Arroyo site (Wiseman 1985) and perhaps the Henderson site (Rocek and Speth 1986). Just how these manifestations relate to those described for the Sierra Blanca region by Kelley (1984) (see below) is uncertain, but they were clearly related, as indicated by architecture and pottery, among other things.

Kelley (1984) defines three pottery phases for the Sierra Blanca region west of Roswell. The undivided Glencoe phase involves the southern part of the region, from the Río Bonito south to the Río Peñasco. The Corona and Lincoln phases pertain to the northern part of the region, including the Río Bonito northward to the Corona area.

The Glencoe phase is characterized throughout by pithouse architecture. The pottery is dominated by Jornada Brown, Chupadero Black-on-white, and Three Rivers Red-on-tan. Small quantities of several intrusive types from over much of New Mexico and northern Mexico are also found. During the early part of the phase, wild plant gathering may have been more important than either hunting or agriculture. Late in the phase, hunting became more important, but the importance of agriculture throughout the phase is unknown. Precise dates for the Glencoe phase are unknown, but Kelley indicates a Pueblo III affiliation (about A.D. 1100-1300?).

Corona-phase sites include multiroom buildings of contiguous shallow pithouses with jacal walls and rock-lined bases. Sites are composed of one or more of these units loosely grouped in ranchería fashion. Primary pottery types include Jornada Brown and Chupadero Black-on-white. Kelley does not discuss the subsistence mode. The phase dates to the early Pueblo III period, or about A.D. 1100-1200 (?).

Lincoln-phase remains are the most obvious prehistoric sites in the Sierra Blanca region. Architecture consists of pueblo-style rooms of adobe or stone in simple linear roomblocks or a group of linear roomblocks placed in quadrangular fashion around a central open space or plaza. The pottery complex includes Chupadero Black-on-white, Three Rivers Red-on-tan, Lincoln Black-on-red, Corona Corrugated, and a variety of traded types from throughout New Mexico and northern Mexico. Lincoln-phase people subsisted on included cultigens, wild plants, and wild animals. Hunting seems to have gained in importance during the phase. Kelley dates the phase from middle Pueblo III into Pueblo IV times, or about A.D. 1200 to 1450 (?).

Starting some time in the A.D. 1300s and continuing into the 1400s, the Sierra Blanca and the Roswell regions were abandoned. The events that transpired between the final abandonment and the coming of the peoples described by the early Spanish explorers in the late 1500s are unknown. It is possible that nomadic peoples used the region between these times. From the late 1500s until just prior to the American Civil War, various Apachean and other Plains tribes kept Spanish, Mexican, and Anglo-American settlement of southeastern New

Mexico in abeyance.

The exact founding date for the Hispanic village of Las Placitas, later Lincoln, is unknown, but it clearly took place some time in the early to mid 1850s. Following the Civil War, the region began to be settled through mass westward movement of Euroamericans and the eastward drift of small groups of New Mexico Hispanics. Many of the early settlers took up farming, stock raising, and mining. More towns were settled, and when the railroad reached Roswell in 1894 and the Alamogordo area in 1899, the region became fully linked to the national economy.

RESEARCH CONSIDERATIONS

In-depth discussions of the data recovery plans for the Sunset Archaic site and Sunset Shelters can be found in Wiseman and Phillips (1988) and Wiseman (1989), and only a summary of the primary points will be made here. Although Sebastian and Larralde (1989) was not widely available when the data recovery plans were written, it should be noted that the goals stated in the present report were given high-priority status as research questions.

1. Determine site functions (Sebastian and Larralde 1989:56-57). Before the Sunset Archaic site can be compared and contrasted with other Archaic- and Ceramic-period manifestations in the region, we must know what activities were performed at the sites. We must also learn, to the degree possible, whether the sites were occupied during a specific season or seasons to determine how site use satisfied specific needs of the occupants. This, in turn, will help us determine what other kinds of sites, activities, and needs were part of the seasonal round of thess groups.

2. Date the occupations (Sebastian and Larralde 1989:56-57). Archaic sites in southeastern New Mexico are primarily dated by means of projectile point styles, based on work in surrounding regions. This approach is tenuous at best and misleading at worst. The same is true of the Ceramic-period sites. Tree-ring dating is not reliable in the Sierra Blanca, leaving pottery as the primary means of dating sites. Before substantive evaluation of the Sunset Archaic site and the Sunset Shelters can be done, it is necessary to obtain accurate dates. Reliable dates for both sites will also greatly enhance our ability to deal with other Archaic- and Ceramic-period manifestations in the area. If we can build a local projectile point chronology and accurately date the various pottery types, we can accurately relate both sites to other sites in the region.

3. Determine what natural resources were available locally and which were used (ancillary to #1). The lithic raw materials, plant remains, and animal remains used at the sites can provide important information on site activities (food collection, preparation, and storage), resource zones exploited, and season of use. These data are critical to understanding the use of the sites and the area and how both fit into human adaptation in the region as a whole.

We must also discover to what degree, if any, cultigens were grown and used at the sites. The Archaic site apparently dates to about the time (A.D. 1) when cultigens are thought to have been adopted in the region. W. H. Wills (1988) suggests that cultigens were simply added to the existing subsistence milieu and that the impact of corn, for instance, was fairly minimal for several centuries thereafter. He says that the conditions conducive to the adoption of cultigens were already in place, that the site features and related aspects of the culture were already present, and that the cultigens induced no changes in the culture (archaeologically or otherwise) other than the addition of the plants to the diet. We need to know whether the Sunset Archaic site, with its large storage pits, had corn. If not, then we have an instance in which subsistence intensification (as indicated by storage) was going on prior to the adoption of cultigens.

The question is somewhat different in the case of Sunset Shelters. We have a Ceramic-period occupation with the grinding equipment normally thought to be indicative of a hunting and gathering adaptation. If cultigens are absent, then the Sunset Shelters occupants were probably hunter-gatherers with pottery (Sebastian and Larralde 1989) rather than agriculturists. It should be recognized, though, that the range of interpretations for the Sunset Shelters is wide and fraught with pitfalls. Regardless of whether we reach definite conclusions about the subject, we need to determine whether cultigens were present at one or both sites.

4. Determine how the sites fit into a larger subsistence round. This aspect has two facets. Once we learn what activities took place and what foods were present at the sites, we will have some idea of whether the occupation was temporary or seasonal. We can then look at other sites in the region and ask how, and to what degree, our sites might have been part of the same subsistence system. By this means, we might be able to correlate archaeological manifestations over a large area and increase our understanding of human adaptation.

5. Assess how the adaptation reconstructed for the project sites compares to those for surrounding regions. If we are successful in reconstructing the subsistence system and other aspects of the culture for the project sites, we will then compare and contrast them with those of cultures from surrounding regions. Reconstructions for the Carlsbad Basin (Katz and Katz 1985), the Chihuahuan Desert (MacNeish and Beckett 1987; MacNeish 1989), and others are available with which to compare, contrast, and therefore better characterize the adaptation represented by the project sites. The perspective gained by this procedure will be invaluable for understanding the human experience in this portion of the Southwest and perhaps learning why it took a specific form. Conversely, a similar understanding may be reached regarding adaptations elsewhere and their variations.

SUNSET ARCHAIC SITE (LA 58971)

LA 58971, the Sunset Archaic site, has been a part of the local folklore for a number of years. It first came to attention during the initial highway construction in 1938, when several human skeletons were discovered and reburied just north of the present right-of-way fence. Today, the new grave is marked by a cross and a rectangular concrete curbing about the size of a one-person grave. The presence of the prehistoric site apparently went unnoticed until 1987. Sixteen human skeletons were found: 15 adults and 1 child (Tom Mann, personal communication to C. Hacker, 1987). Most of the skeletons *may* be those of a small party of men who were returning to their farms in the valley after having fled the Confederate advance on Fort Stanton. According to newspaper accounts in January 1862, the party was massacred by Apaches (Wilson 1987).

The Sunset Archaic site is situated on a gravel bench overlooking the confluence of a tributary with the Río Hondo to the south. The elevation of the site is 1,515 m (4,970 ft) above sea level and 12-15 m above the valley floor. A portion of the site was removed by a roadcut made in 1938, but a large section remains north of the highway right-of-way.

OAS excavations were limited to the existing highway right-of-way since the proposed highway improvements will also be restricted to this area. Thus, our excavations involved two strips on top of the bench and along the north and south sides of the highway. Each strip is 6-7 m wide and up to 35 m long.

The Sunset Archaic site is so subtle that it might have been missed during survey were it not for modern disturbances. Prior to excavation, four light to moderate charcoal stains were noted in the north and south cutbanks for the highway (Fig. 3). Also, heavy equipment scraping on the lower slope within the right-of-way north of the highway revealed a shallow layer of carbonized soil. Overall, artifacts were scarce on the surface. Burned rock is more common but not particularly noticeable among the natural cobbles of the bench surface.

Excavation Techniques

The virtual absence of artifacts and the presence of dark soil stains at depths of 1 to 1.25 m below the surface led to the decision to make quick, deep excavations to get down to a level where the stains could then be excavated with greater care. Excavations proceeded in 30 cm levels. The bottom of each level was scraped off and examined for soil stains, soil breaks, or other changes that might signal the presence of cultural features. The fill above the stains was not screened, but the dirt was carefully turned by shovel to expose any artifacts.

After the initial cut over Features 1E and 1W exposed a 20-30 cm thick deposit of the charcoal-stained fill starting in the grass roots, a grid of 1 m squares was imposed over the site. The grid baseline was run along the north right-of-way fence. The grid was expanded as needed, and excavations proceeded on a square-by-square basis.

Figure 3. Charcoal staining in north cutbank exposed by scraping with hand tools, LA 58971.

Vertical control varied from 10 to 30 cm increments according to the situation. Increments of 10 cm were used within features. The largest vertical increments (20-30 cm) were used in the squares outside the central part of the site because the excavations showed that rodents had thoroughly disturbed most deposits from top to bottom. In all cases, the larger increments constituted the distance from surface to sterile caliche.

All fill within features was sampled for flotation and screened through quarter-inch wire mesh. A 50 percent sample (every other shovelful) of fill from squares was screened. Records were maintained on standard Museum of New Mexico forms, all pertinent details were photographed using a 35 mm camera, and the site was mapped by alidade and plane table.

Excavation Results

Excavation revealed that, north of the highway, the site is about 35 m east-west. It appears to extend at least 25 m north of the fence. South of the highway the site is about 20 m east-west, but its extent south of the fence is unclear. However, the relatively few flakes recovered from the excavations on the south side suggest that the southern boundary is not far.

The excavations revealed a large, shallow refuse area, trash broadcast over a larger area,

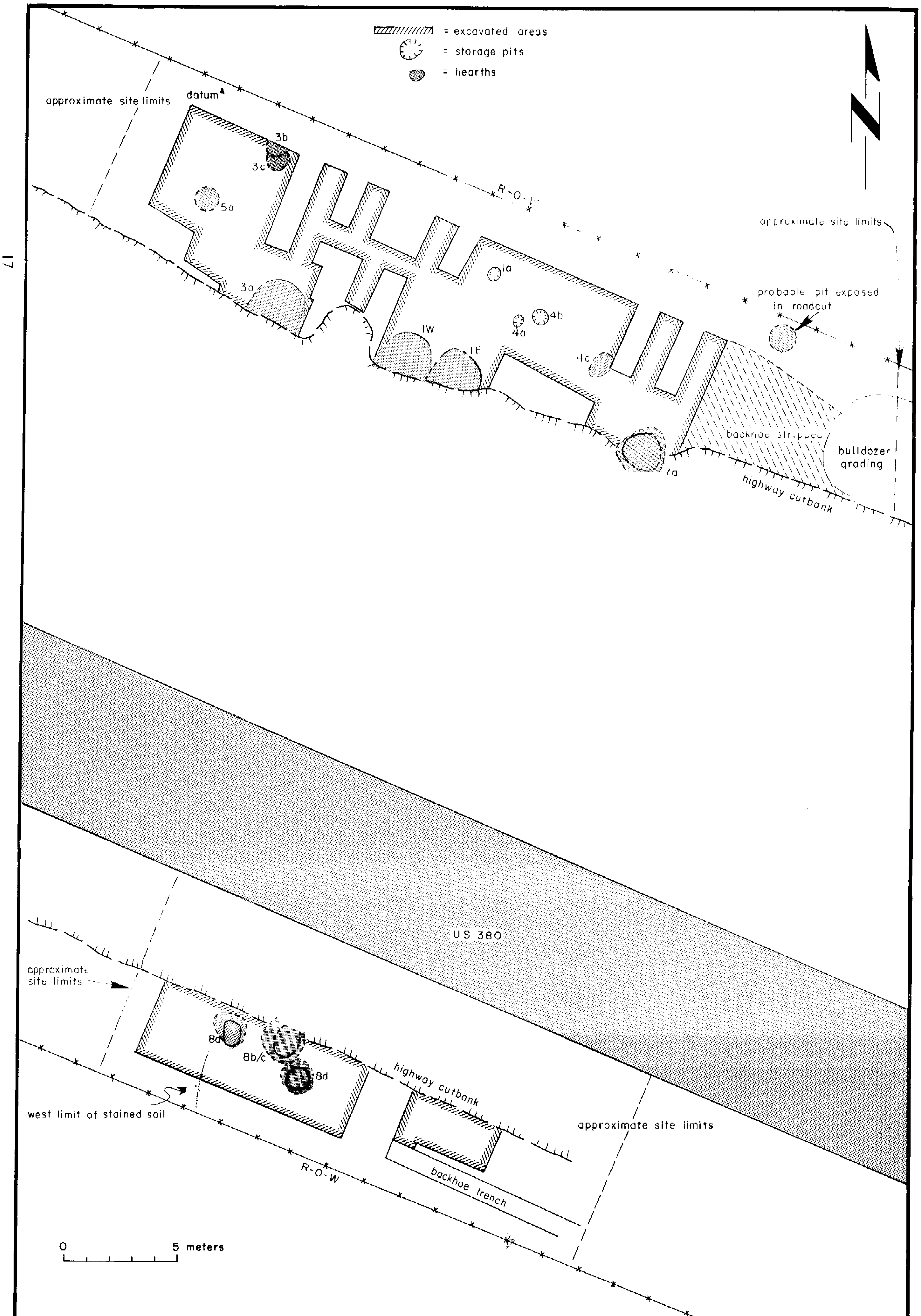

Figure 4. Sunset Archaic site (LA 58971), showing excavations and cultural features.

eight medium to large bell-shaped storage pits, two small miscellaneous pits, and four (including one probable) rock hearths (Fig. 4).

Refuse Area and Broadcast Trash

The refuse area was in the eastern half of the excavated area north of the highway (Fig. 5). The intensity of black color, depth of deposits, and quantities of lithic debris (i.e., the refuse deposit) were greatest in that part of the site to the north and east of the three excavted hearths. The maximum thickness of this deposit was 60 cm. It started in the grass root zone and continued to sterile clayey-caliche. The deposit itself and the top part of the sterile were riddled by rodent burrows, some of which were still open at the time of excavation. Aside from chipped stone debitage, abundant but scattered burned rock, and a few artifacts, the deposit was essentially homogeneous in color, texture, and composition.

Figure 5. Profile of refuse area, LA 58971.

There was no strict demarcation between the refuse and the broadcast trash. The broadcast trash was denoted by less intense dark coloring, shallower deposits, and fewer artifacts. Overall, the organic stain was lighter south of the highway than north of it. Color intensity, depth of deposit, and numbers of cultural items (including burned rock) diminished markedly toward the periphery of the site. In fact, boundaries of the organic content (dark soil) were noted at the west end of the site on both sides of the highway. Although a few flakes were recovered from squares beyond the limits of organic staining, the distributions of the flakes and staining were very similar. The range in thickness of the broadcast trash was 20 to 30 cm. Aside from rodent burrowing, the only obvious modification of the deposit was a large, shallow depression bulldozed into it in the west-central part of the site on the north side.

Medium and Large Bell-Shaped Storage Pits

Upon excavation, the deep stains noted in the north face of the 1938 highway cut turned out to be the bottom portions of three large, trash-filled storage pits (1e, 1w, and 3a; Figs. 6-9). The angle of the highway cut, rodent disturbance, and wall collapse made the sides difficult to define in all three pits. The well-defined bottoms, dug into the top of a compact silty clay stratum, discouraged rodent penetration and left no doubt as to the extent and sizes of the pits.

Pits 8a and 8b/8c (Figs. 14-16) were in slightly better condition, but rodent burrowing left some question as to the shape of the sides. Pits 7a (Figs. 12-13) and 8d (Figs. 16-17) were sufficiently intact to fill in the final details and to confirm our reconstructions of all pit configurations. Pit 5a (Figs. 10-11) was the smallest storage pit and the least belled of the group.

Regardless of size and shape, all of the pits were similarly made (Table 1). All were excavated into a sandy clayey silt stratum down to the top of a silty clay stratum. The sides were more or less smoothed to an even surface, though rodents frequently scarred them after abandonment and filling. Small patches of thin, light-gray sandy clay adhered on the surfaces of some pits, suggesting plaster. The bottoms were slightly dish-shaped and dug into the upper surface of the compact silty clay stratum and smoothed but not plastered. Upon drying, the bottoms were so hard that they resisted penetration by rodents and provided excellent indications of the maximum diameter of the pits.

Table 1. Descriptive data on storage pits, Sunset Archaic site

Pit	Bottom Diameter (cm)	Minimum Diameter (cm)	Depth (cm)	Capacity (cu m)	Fill Type[a]
le	ca. 190	est. 125	ca. 145	est. 2.0	H-b
lw	ca. 195	est. 125	ca. 158	est. 2.3	H-b
3a	ca. 195	est. 125	ca. 115	est. 1.7	L-t
5a	98	96	65	est. 0.5	L-t
7a	186	ca. 150	129	est. 2.4	L-t
8a	130	ca. 85	60	est. 0.4	L-t
8b/c	ca. 168	ca. 95	60	est. 0.6	L-t
8d	138	90	65	est. 0.5	L-t

[a] Fill type: Trash density (flakes/cu m): L = light (<300), H = heavy (>1000). Distribution in fill: t = throughout, b = bottom.

Figure 6. Pits 1w (left) and 1e (right), LA 58971.

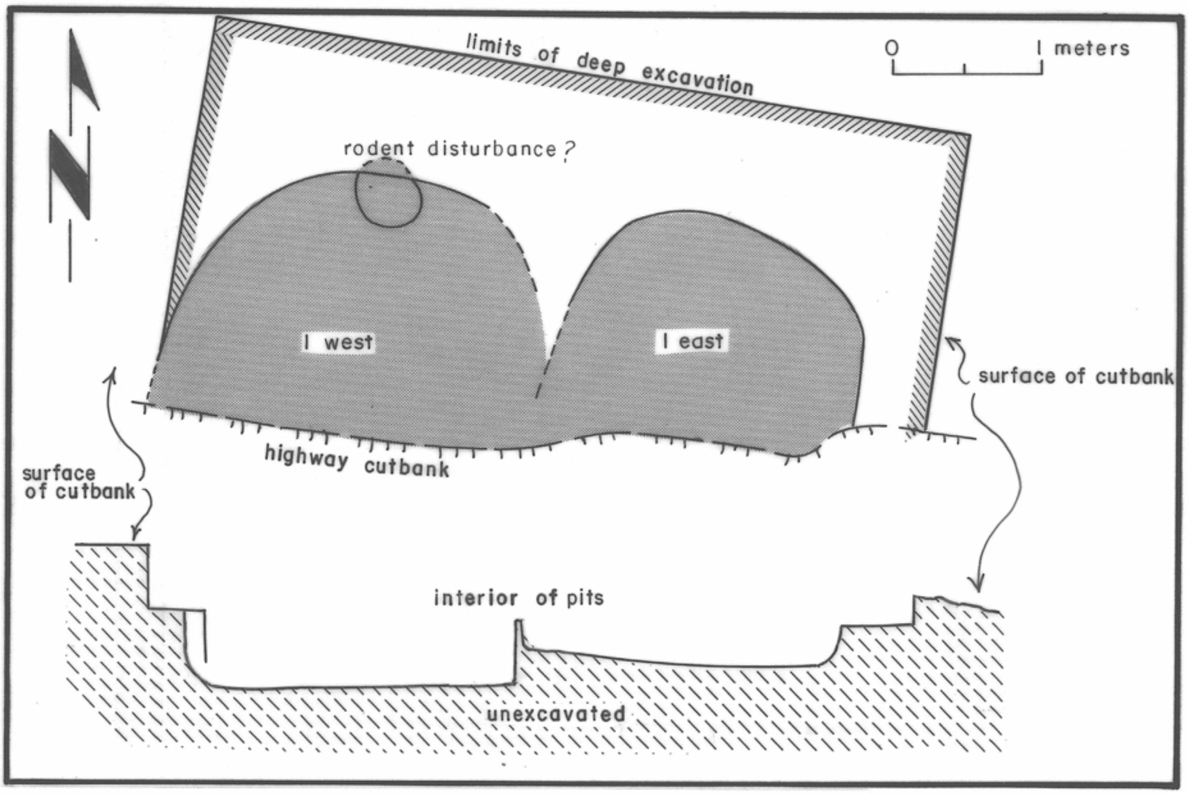

Figure 7. Plan and profiles of Pits 1w and 1e, LA 58971.

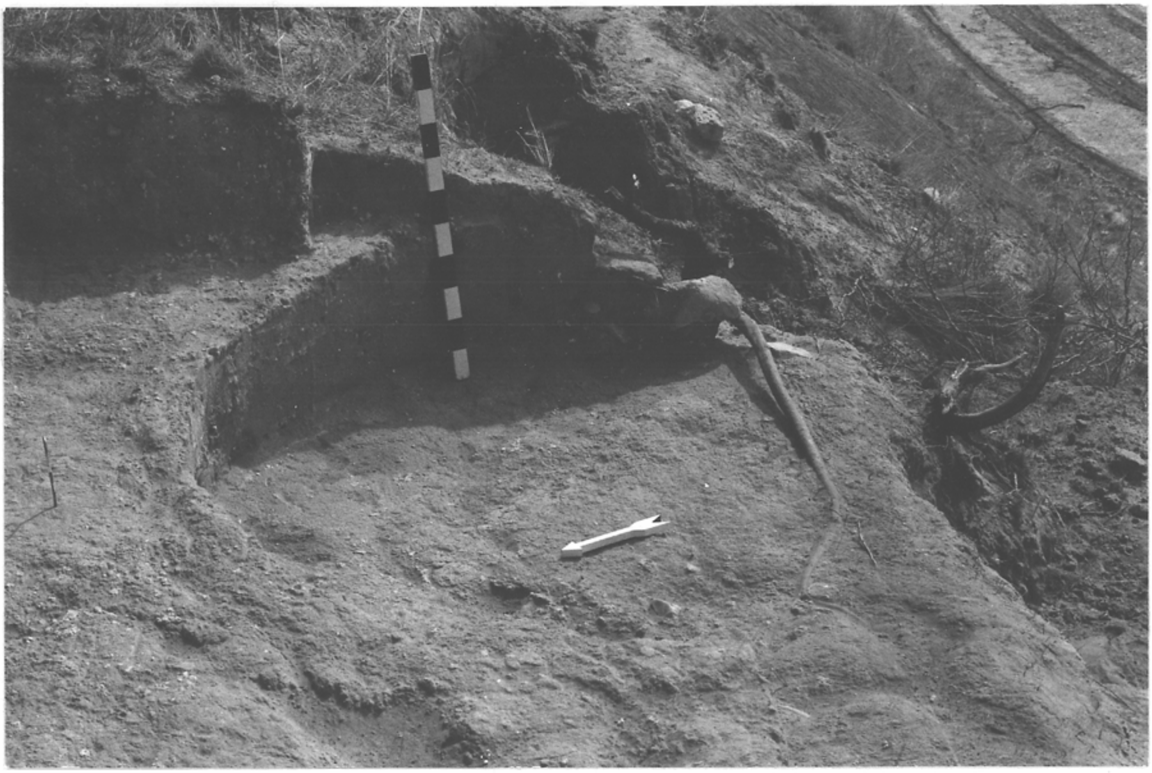

Figure 8. Pit 3a, LA 58971.

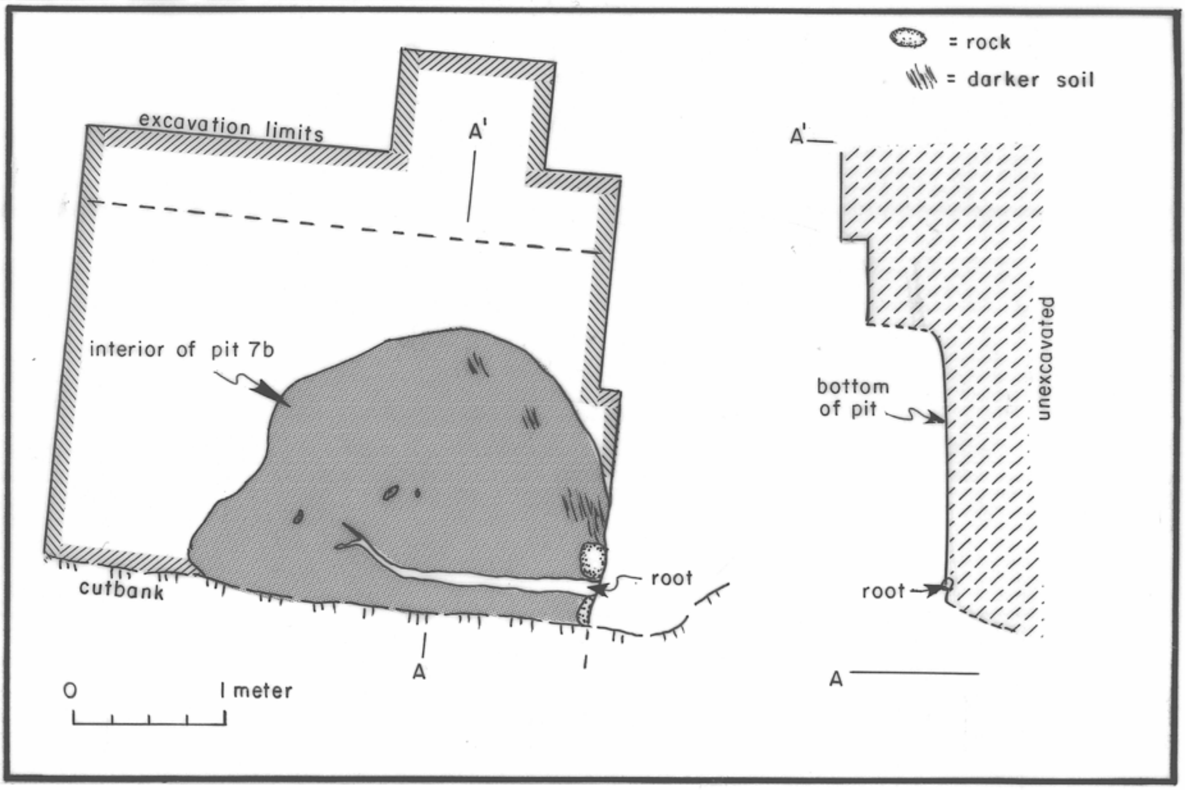

Figure 9. Plan and profile of Pit 3a, LA 58971.

Figure 10. Pit 5a, LA 58971.

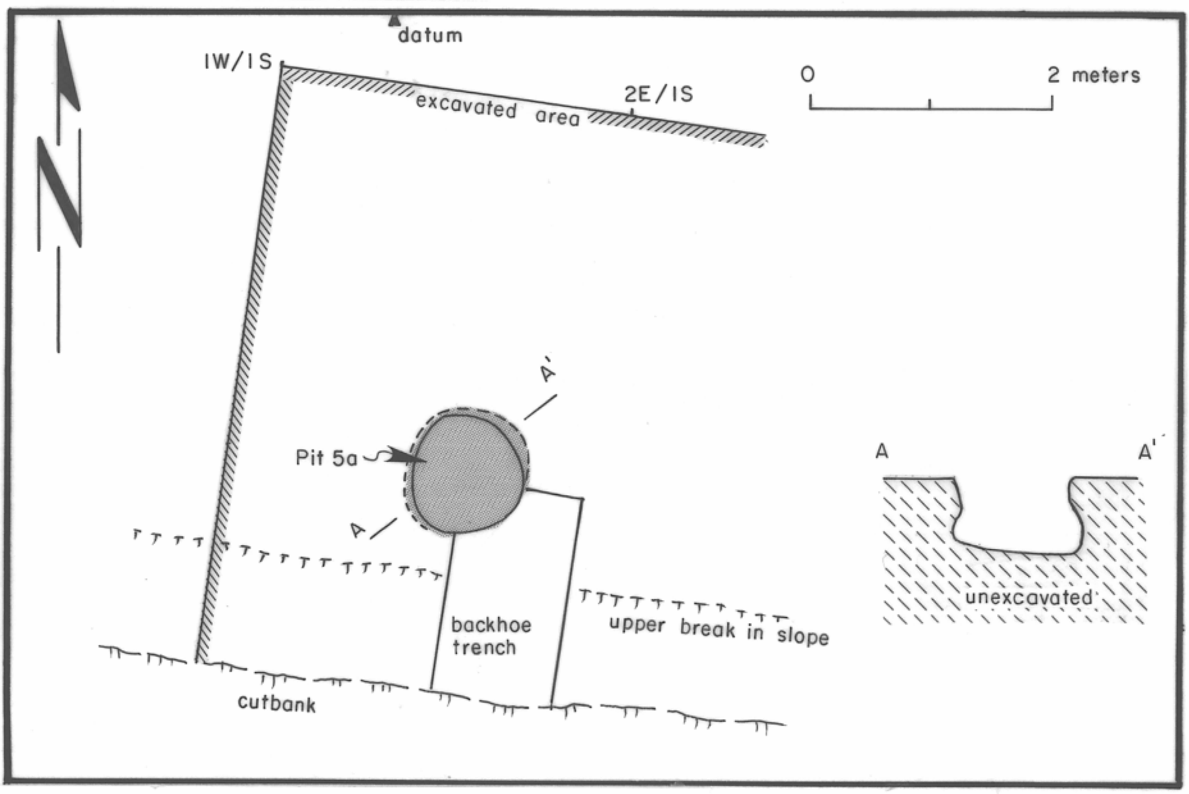

Figure 11. Plan and profile of Pit 5a, LA 58971.

Figure 12. Pit 7a, LA 58971.

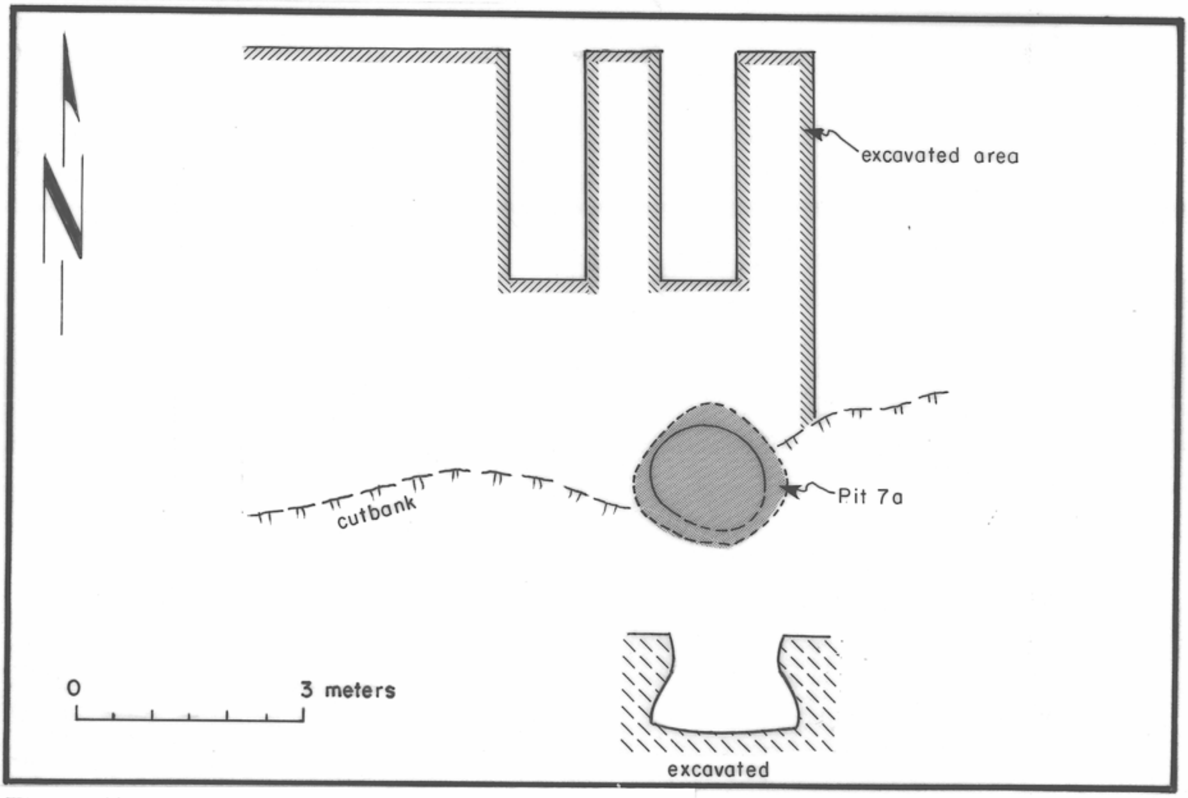

Figure 13. Plan and profile of Pit 7a, LA 58971.

Figure 14. Pit 8a, LA 58971.

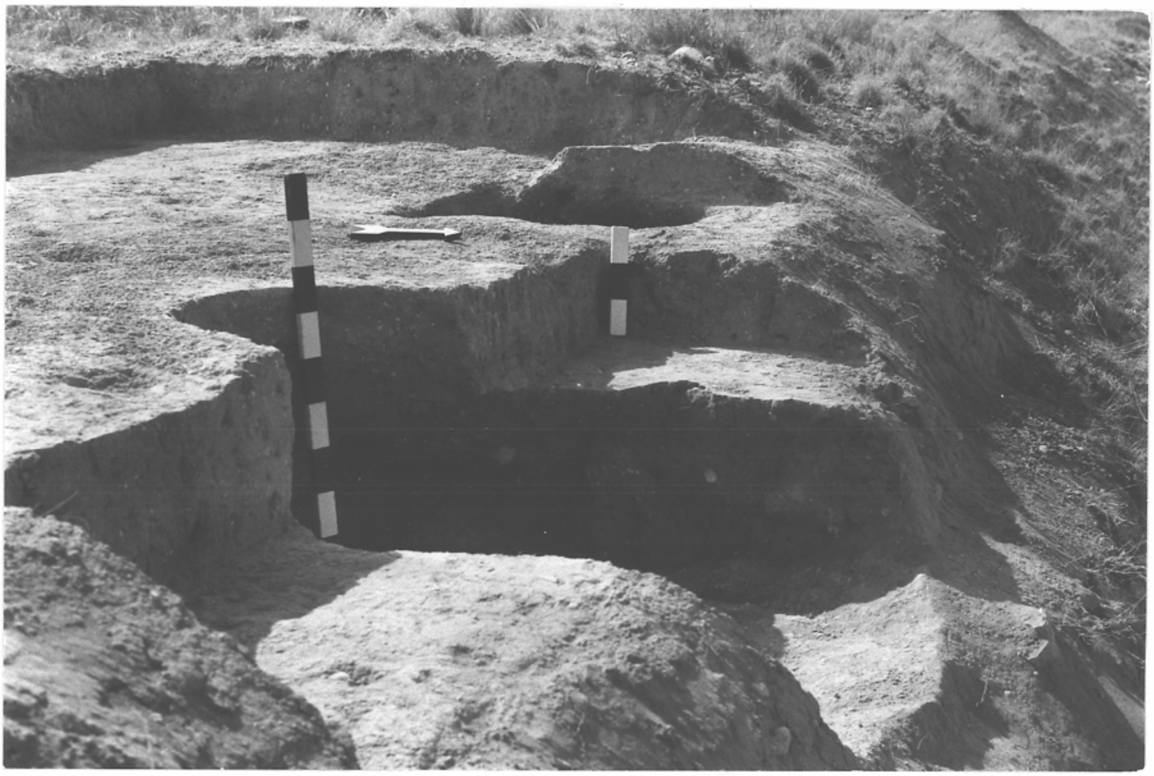

Figure 15. Pit 8b/c, LA 58971.

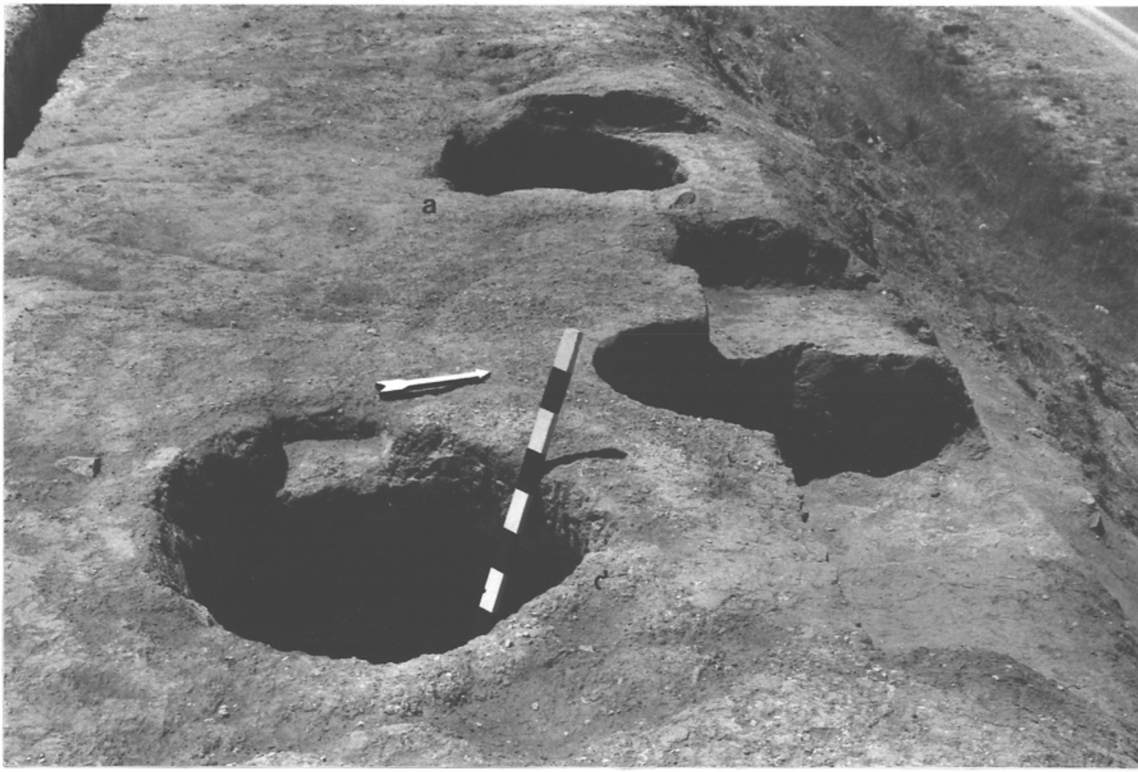

Figure 16. Pits 8a-8d, LA 58971.

The cultural contents of the pits at the time of excavation varied widely. All had at least some trash composed of charcoal-stained fill, burned rock, lithic debris, and/or a few artifacts. The amount of trash, calculated as flakes per cubic meter, and its distribution in the fills are summarized in Table 1.

Only two proveniences (Pits 1e and 1w) produced substantial trash; both deposits lay on pit bottoms, and the remaining fill of both pits contained few items or other cultural remains. It might also be noted that, in all other pits, the flakes and other cultural manifestations were not evenly distributed throughout. Dark lenses containing many items were frequently separated by light-colored lenses with fewer items.

The degree of belling (sharpness of the undercut) varied greatly from pit to pit, but also within many pits. The degree to which the sides of Pits 8a, 8b/8c, and 8d are undercut is remarkable. The stratum into which they were dug, upon drying, gets quite hard. However, it is difficult to imagine that a 57 kg (125 lb) adult would not cave in the sides when standing above them.

While this access problem was being pondered, it was noticed that each strongly belled pit also had one side which was nearly vertical. Such a side, being much stronger, would permit access to the pit without fear of caving it in. The fact that the nearly vertical sides of Pits 8a, 8b/8c, and 8d are all on the same (south) side suggests that they were all reached from that

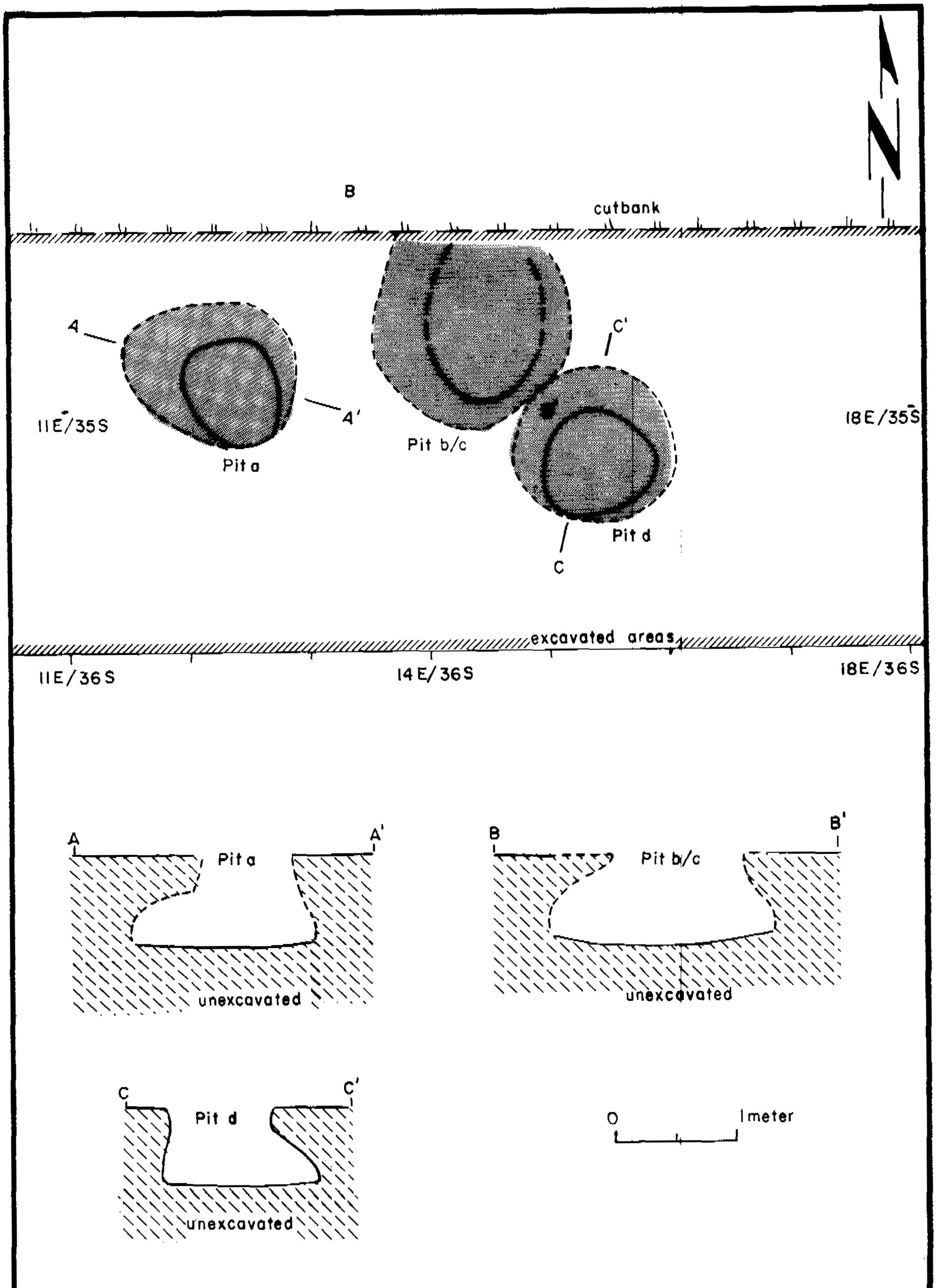

Figure 17. Plan and profile of Pits 8a-8d, LA 58971.

direction. Furthermore, this suggests that these three were contemporary and probably belonged to the same family or group. A similar phenomenon was noted at the Ceramic-period Bent site (LA 10835), near Mescalero, New Mexico. There, unique entry features on a group of pits centered on a common space (Wiseman 1991a), suggesting contemporaneity and single ownership.

Pits 1e, 1w, and 3a are aligned. The size and configuration of an erosion pipe in the highway cut between Pits 3a and 1w suggest that the erosion followed the outlines of a fourth pit in the group. It seems clear that, in spite of the alignment of these pits, they were not all contemporaneous. Although the sides of Pits 1e and 1w were not completely defined, it is clear from the trajectories of their sides that one cut the other. The bottom of Pit 1w was also 13 cm deeper than that of Pit 1e, and the radiocarbon dates confirm different ages for the pits.

Small Miscellaneous Pits

Two deep basins, Pits 3c and 4c (Figs. 18-21), were similar in size, shape, and other details. Both were oval in plan with insloping sides and rounded bottoms. The outlines were not quite regular, nor were the sides and bottoms smoothly finished or plastered. The fills reflected the general fill from above and around each pit; rodent disturbance of the fills and modification of the pits themselves was everywhere apparent. The function of these pits is questionable. Four small fragments of long bones recovered from the fill of Pit 3c may be human, indicating that the location was a human interment. Pit 3c measured 98 by 73 cm (diameter) by 34 cm (depth); Pit 4c, 145 by 100 cm (diameter) by 31 cm (depth).

Rock Hearths

Three excavated rock hearths, Hearths 1a, 4a, and 4b (Figs. 22-26), were small, shallow, oval basins partially or completely filled with burned rock and charcoal-stained fill. The edge of a probable hearth, 3b, was encountered but not excavated because it is protected by its location at the edge of the construction zone. The three excavated hearths were grouped between the refuse area on the northeast and two large storage pits on the southwest, indicating that this part of the site was a living area. Hearth 1a measured 60 by 50 by 15 cm; Hearth 4a, 50 by 36cm (diameter) by 10 (depth) cm; Hearth 4b, 67 by 53 cm (diameter) by 18 (depth) cm. The probable hearth was not completely excavated.

Artifacts

Lithic debitage and several classes of formal artifacts were recovered. The formal artifacts represent a variety of activities and include, in order of abundance, manos, bifaces, metates, hammerstones, miscellaneous ground stone, projectile points, ornaments, awls, minerals, a paint grinding stone, a uniface, and a possible pick.

Figure 18. Pit 3c, LA 58971.

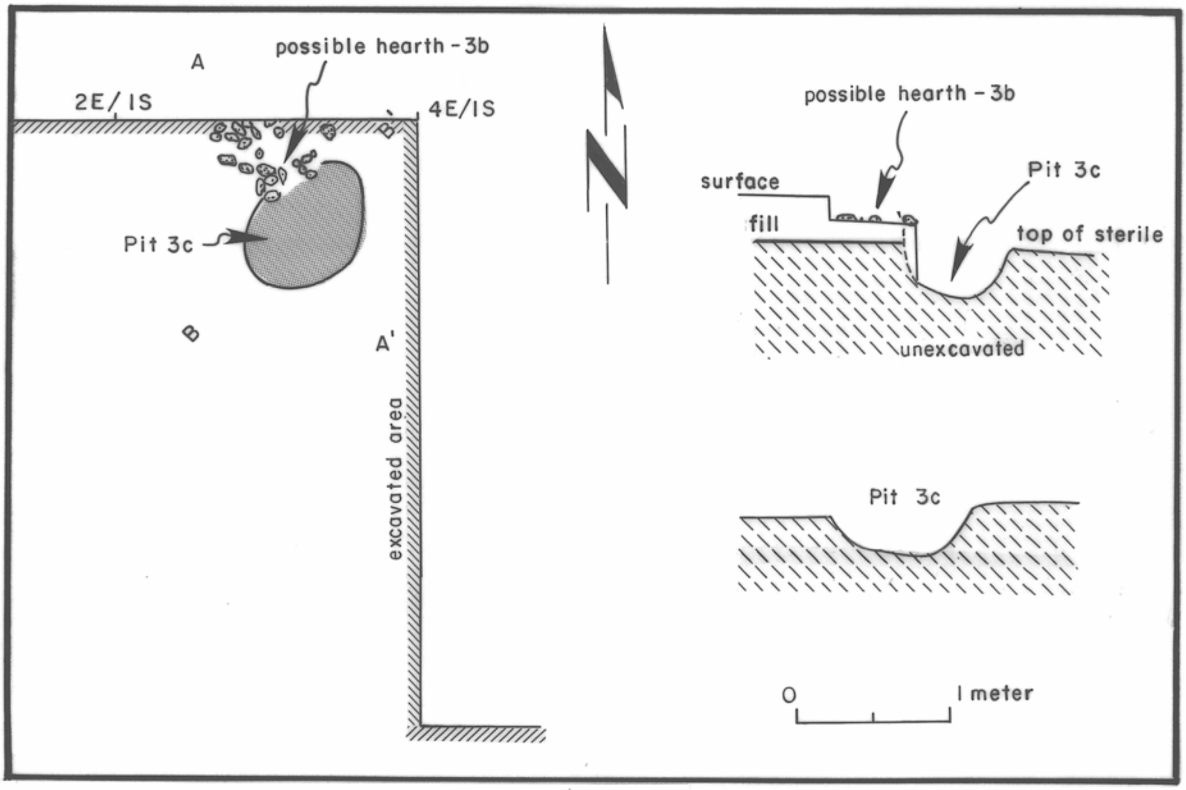

Figure 19. Plan and profile of Pit 3c, LA 58971.

Figure 20. Pit 4c, LA 58971.

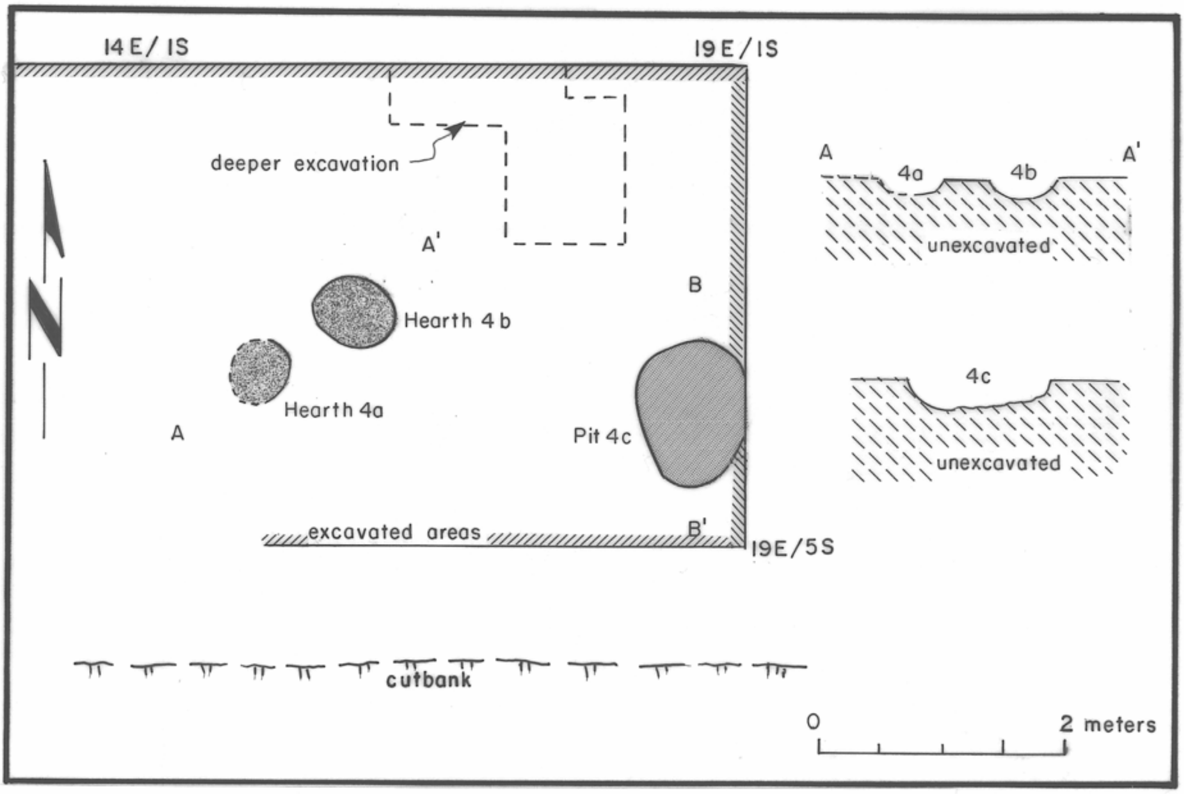

Figure 21. Plan and profile of Pit 4c and Hearths 4a and 4b, LA 58971.

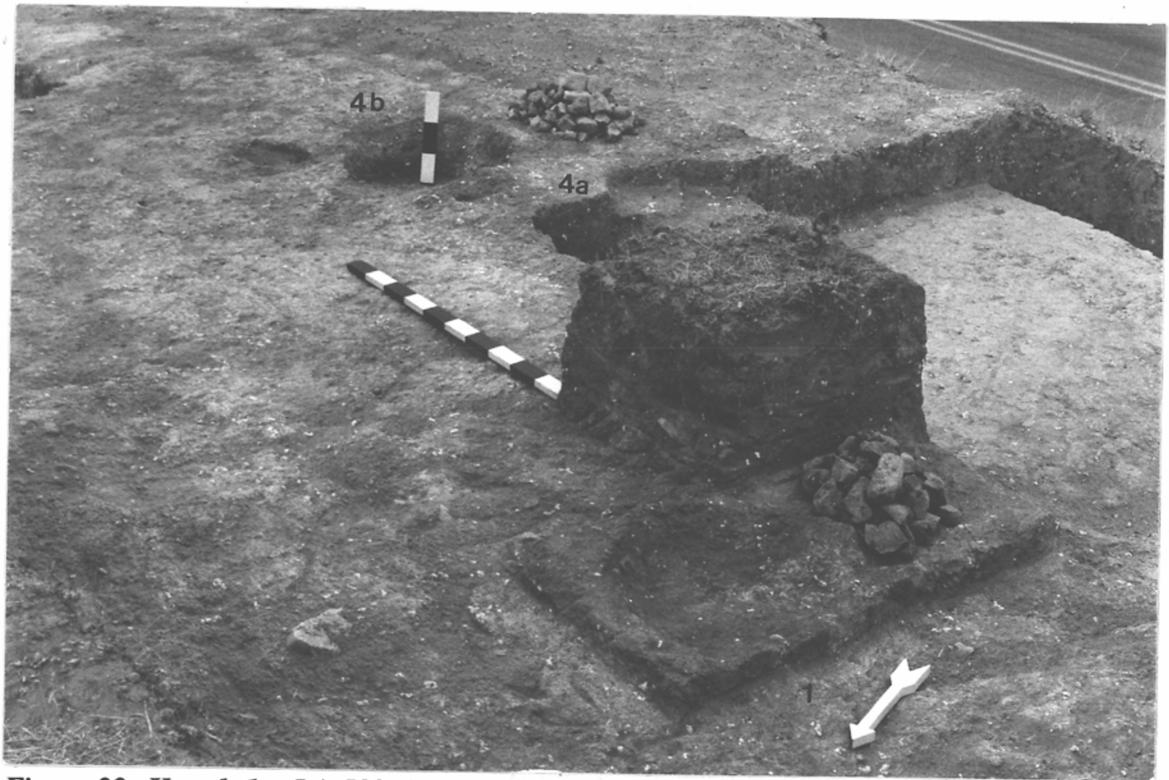

Figure 22. Hearth 1a, LA 58971.

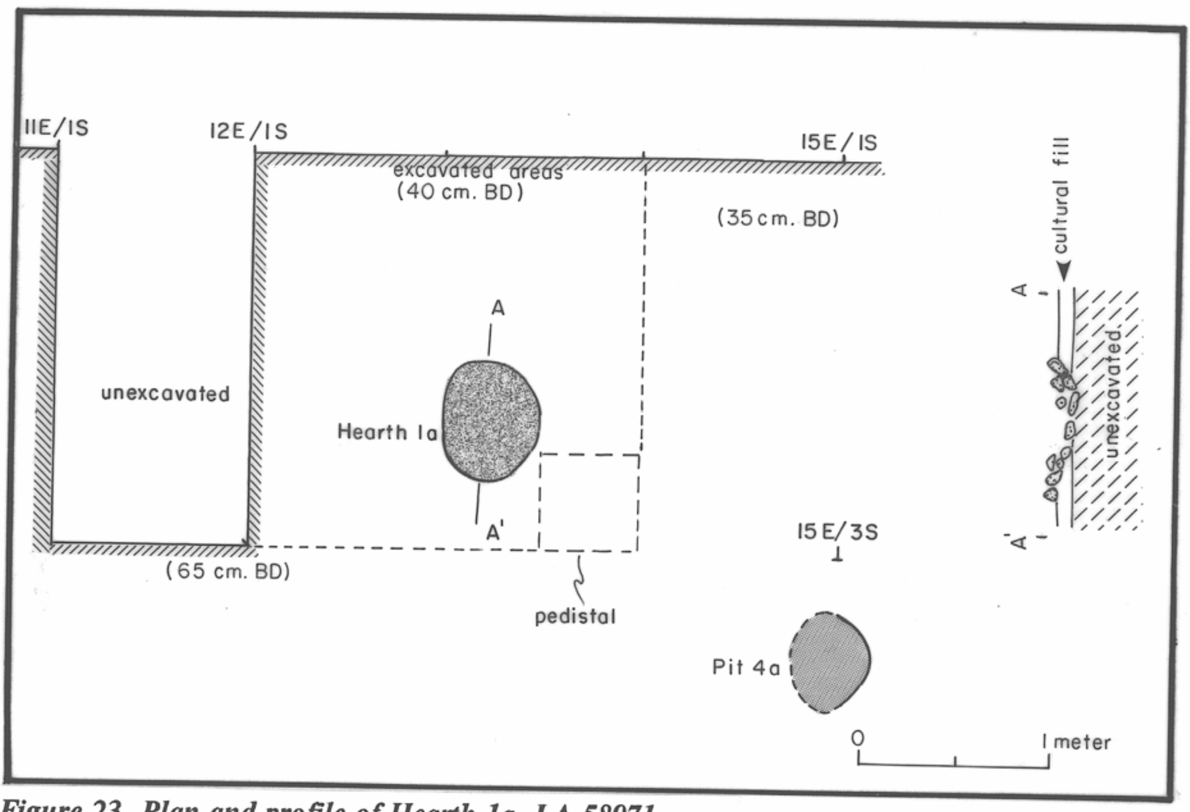

Figure 23. Plan and profile of Hearth 1a, LA 58971.

Figure 24. Hearths 4b and 4a, LA 58971.

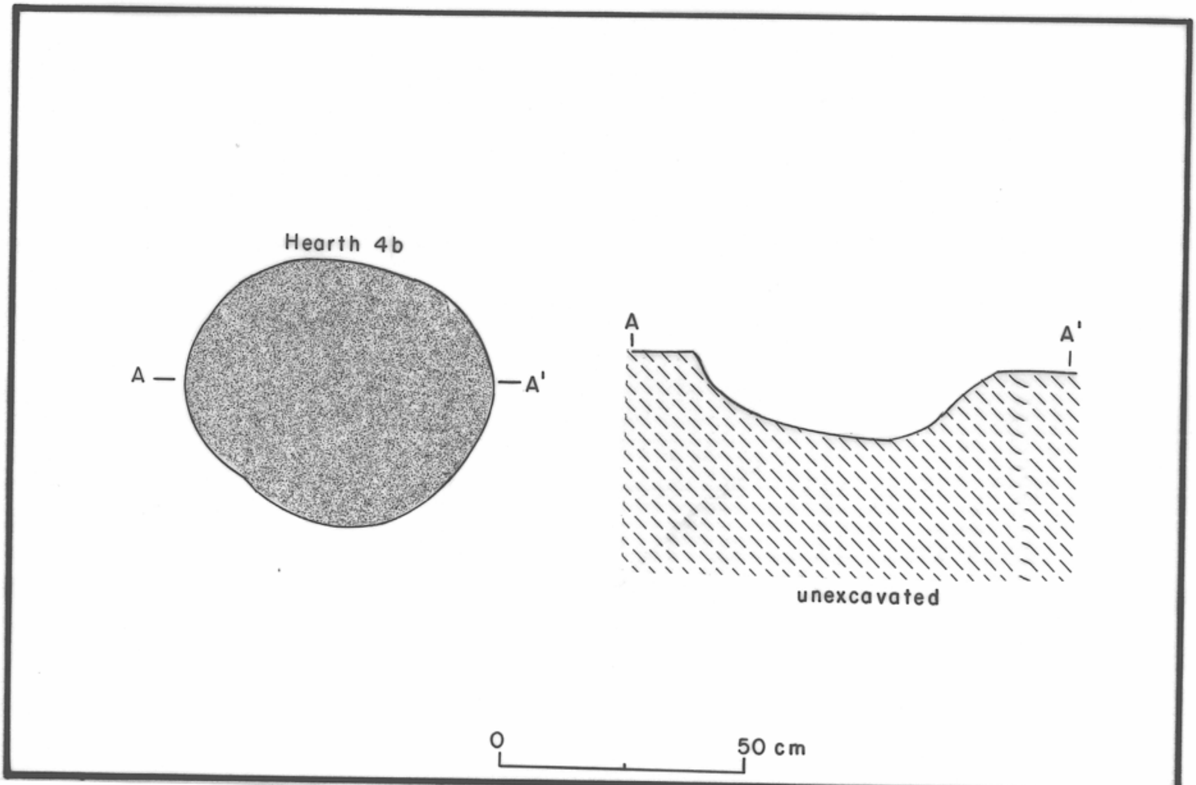

Figure 25. Plan and profile of Hearth 4b, LA 58971.

Figure 26. Hearths 4a and 4b, LA 58971.

The following descriptions and discussions has two fundamental, interrelated tenets. First, during the planning and production of a tool or artifact, the individual had in mind either a specific tool for a specific function or a more generalized tool for multiple functions. This is not to say that many or indeed most special-use tools did not, during their use-lives, serve more than one function. Most probably did. The anticipation of specific tool needs, skill requirements, relative labor investment, and fragility of the finished product are all important aspects of the distinctions being made here.

A good example of a common special tool is the projectile point. For reasons of aerodynamics, design, and function, their characteristics (size, shape, weight, and details of hafting elements) had to meet certain specifications. They were hafted onto arrow or atlatl shapes and used to kill game or human enemies. This undoubtedly did not preclude the occasional use of a hafted point for limited cutting or scraping chores as long as those tasks did not impose serious risk of breakage. Secondary uses after the projectile point was broken was another matter. Broken points might, for example, have been used for impromptu cutting and scraping in the same way that many flakes were picked up, used, and then discarded. Importantly, such uses may or may not be distinguishable from secondary-use characteristics engendered while the artifact was hafted and still a viable projectile tip.

General purpose tools were made with the intention of serving two or more functional purposes. The functions were not necessarily related. Two examples of such a tool are the awl and the hammerstone. The awl might be used for hide working and basket weaving. Hammerstones could be used to manufacture chipped stone and ground stone artifacts and also refurbish ("resharpen") the grinding surfaces of manos and metates as needed.

The second tenet is that, having identified tools and artifacts according to the principles just discussed, their descriptions are arranged in a fashion that facilitates discussions of activity types, site function, and settlement and subsistence practices. By this method, the reader can discern at a glance what types of activities took place at the site.

Plant Food Processing Artifacts

Manos. Sixteen one-hand manos embody a wide range of sizes and shapes (Figs. 27-28, Table 2, and Appendix 2). Nine are complete, the rest fragmentary. Of four rock types--sandstone (12), limestone (2), granodiorite (?) (1), and aplite (?) (1)--sandstone was the preferred material. Shapes include almost circular, oval, elongate oval, and subrectangular. While most manos are tabular in cross section, two are quite thick and loaf-shaped. The assemblage is almost evenly split between manos with one and two grinding surfaces. On several of the single-surface manos, the surface opposite the grinding surface has very slight pecking and grinding, which could be smoothing for gripping or an incipient second grinding surface. Cross sections of the grinding surfaces vary from almost flat to slightly convex to very convex; flatness and degree of convexity are *not* related to intensity of use. Most manos are completely pecked and ground to shape. One long edge of a partly shaped specimen was roughly flaked to shape, while the other three edges were roughly pecked and ground.

Table 2. Summary of one-hand mano dimensions, Sunset Archaic site

Dimension	Number	Range	Mean	S.D.
Length	10	9.6 to 19.2	14.57	2.62
Width	10	9.0 to 11.4	10.34	0.70
Thickness	10	3.2 to 7.5	4.81	1.29

Secondary attributes of the manos include traces of red paint on three specimens (0-97, 3-3, and 3-24). Two manos display edge and face damage, one (8d-63) in the form of a battered and broken end, and the other (3-3) in the form of three flakes from both faces.

Metates. Ten basin metates occur in three basic forms: rock slabs, river cobbles, and small boulders (Figs. 29-30; Appendix 3). Only two of the specimens are complete, or nearly so, and all of the remainder are small fragments. Aside from creation of the grinding surfaces, minor shaping, and perhaps the reduction of bulk, the stones were not dressed or substantially altered in any way. All were made from sandstone.

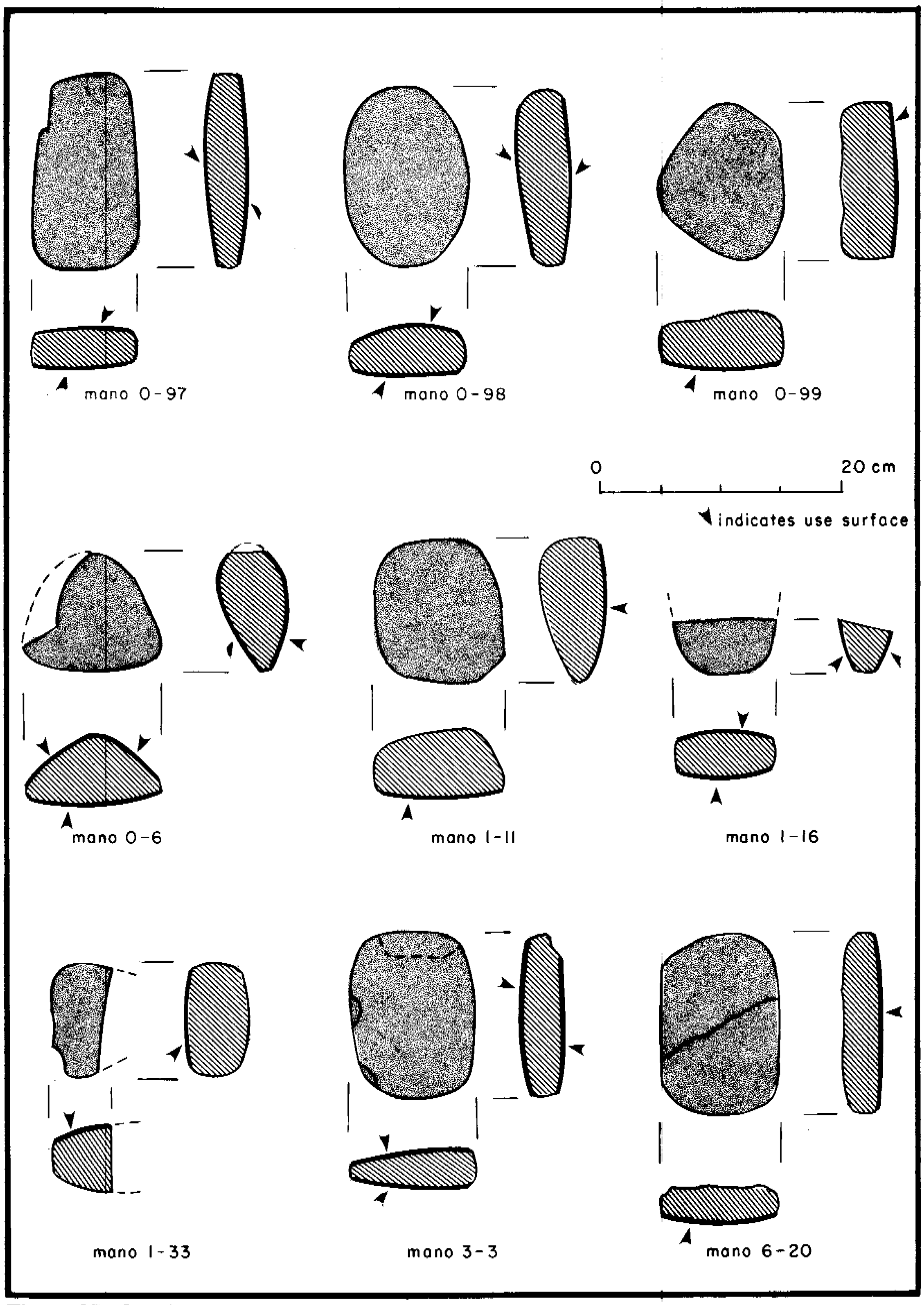

Figure 27. One-hand manos, LA 58971.

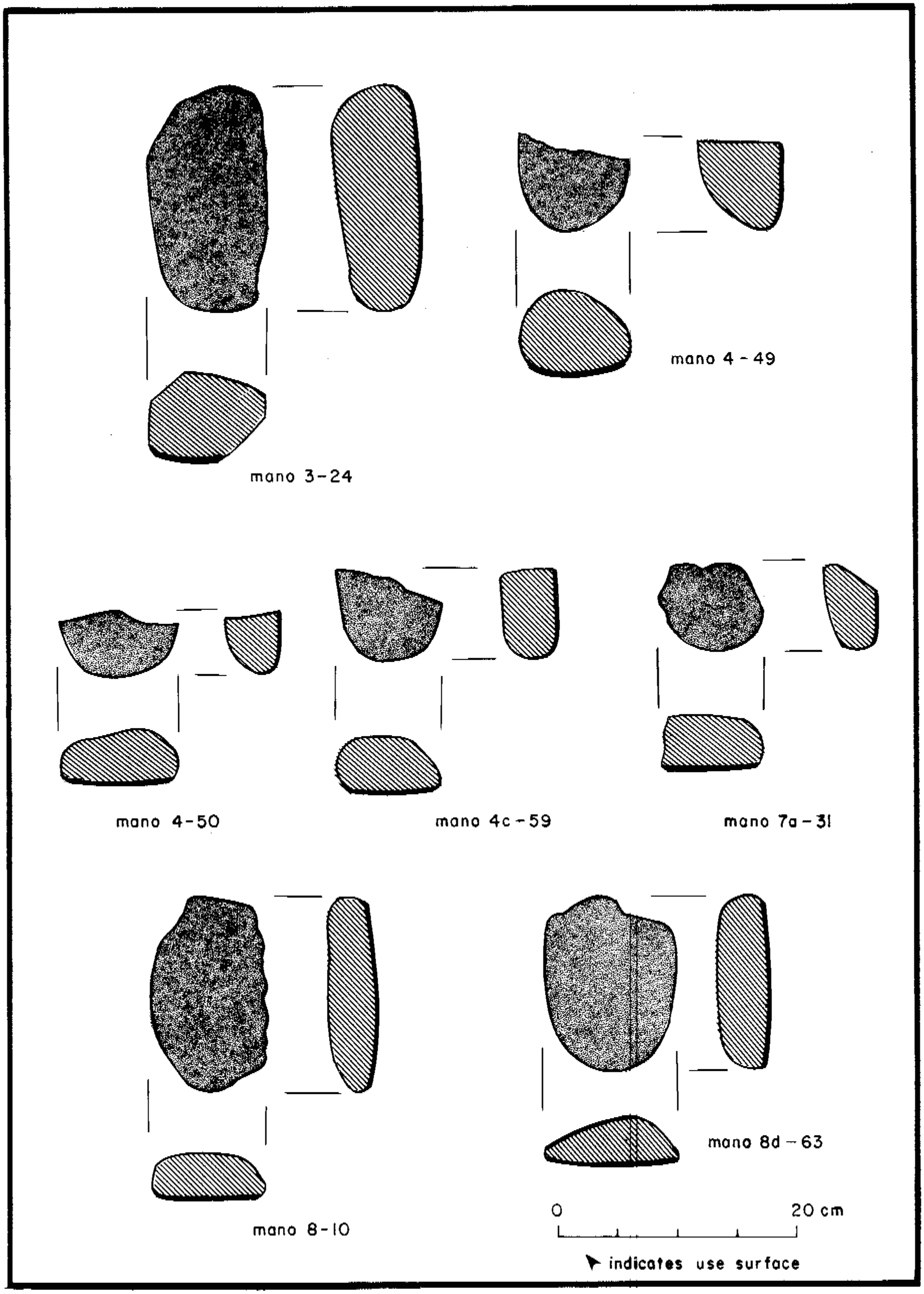

Figure 28. One-hand manos, LA 58971.

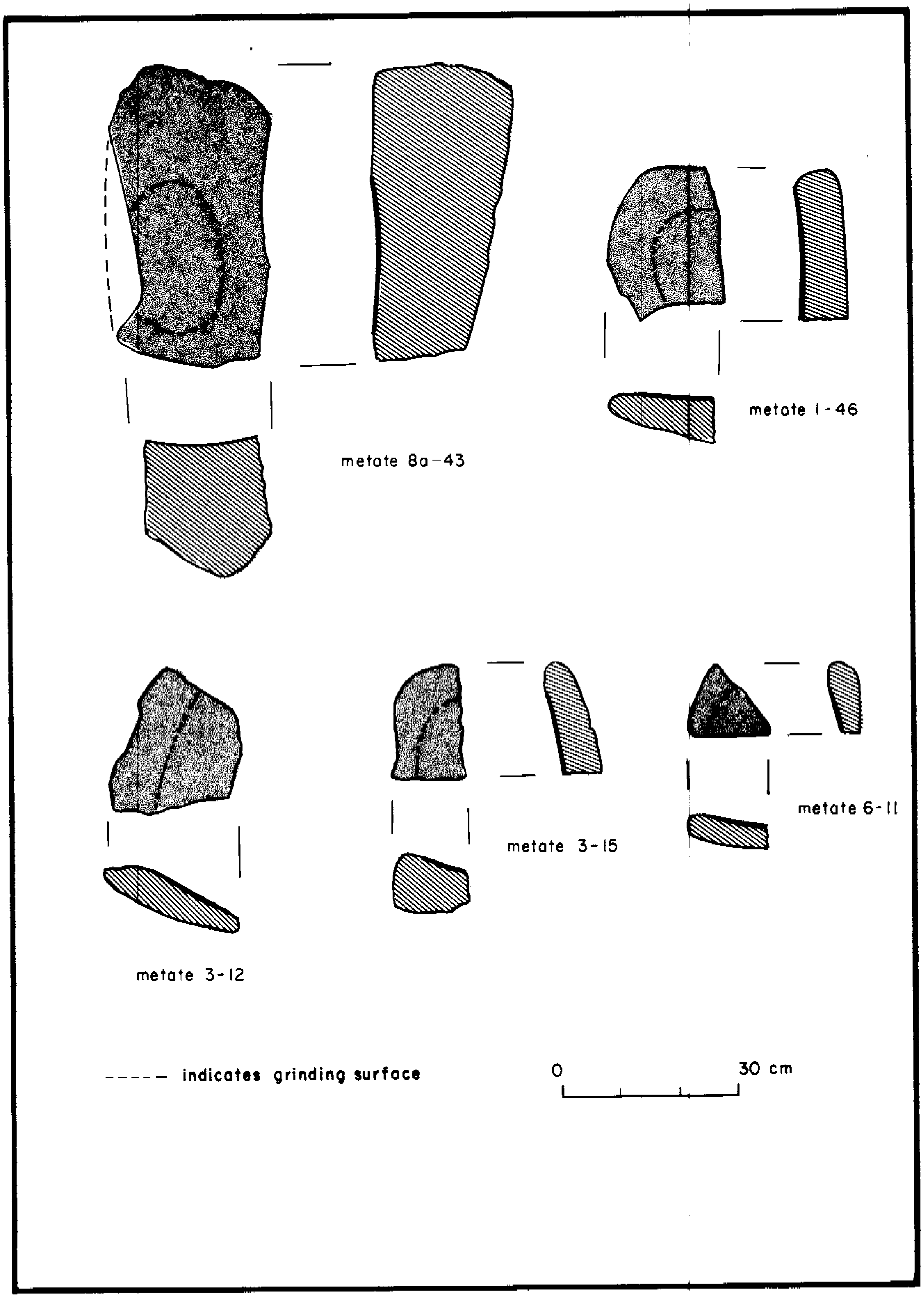

Figure 29. Metate fragments, LA 58971.

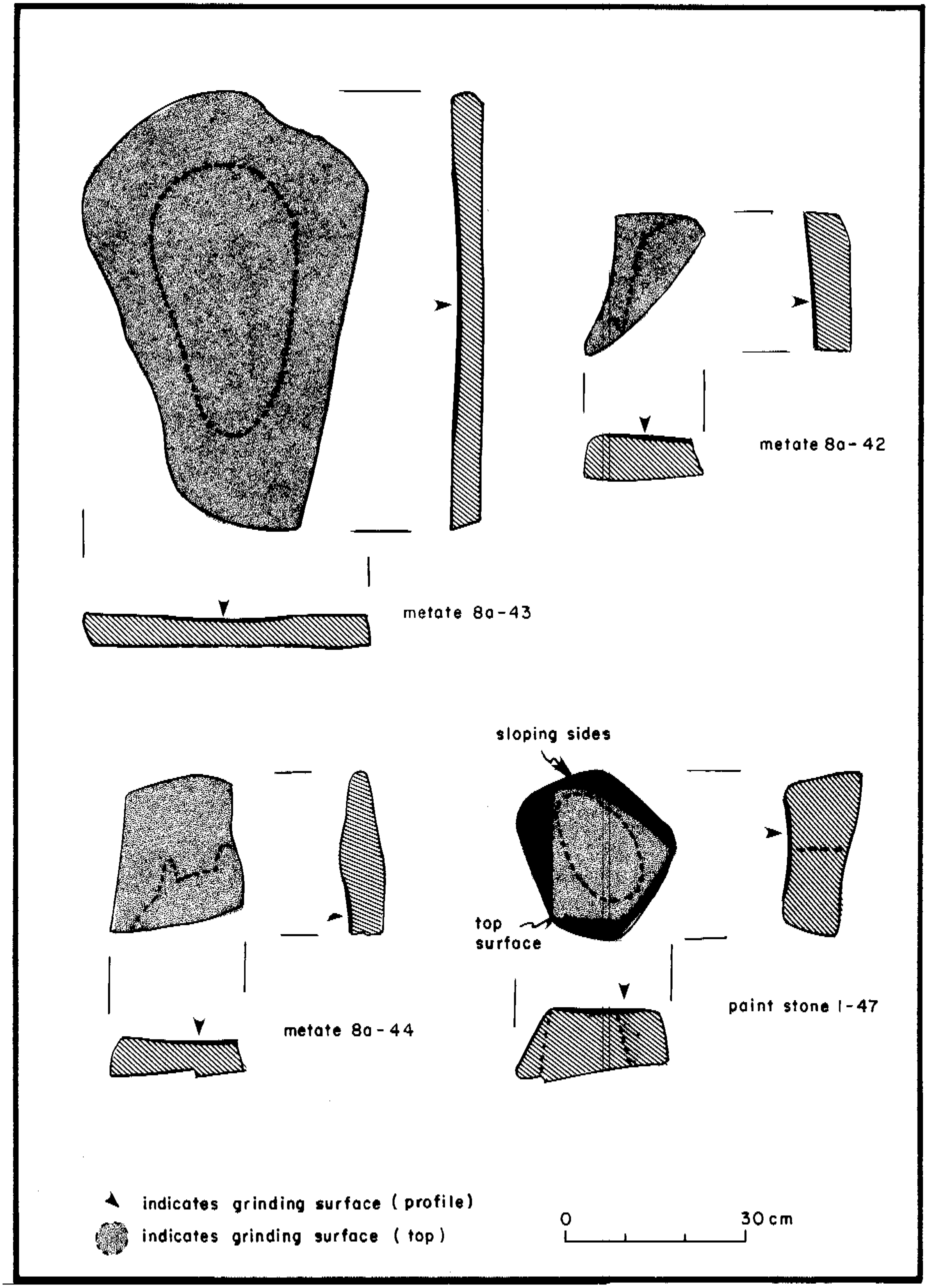

Figure 30. Metate fragments and paint stone, LA 58971.

Although it is difficult to determine with certainty, all of the basins appear to be shallow to moderately deep (< 1 to 6 cm). Two are so shallow that they might be more accurately described as oval grinding areas on the surfaces of rocks.

Secondary attributes are limited to traces of red pigment on one metate (1-46), but the pigment was not on the grinding surface.

Hunting Artifacts

Projectile Points. Only five projectile points were recovered at the Sunset Archaic site (Fig. 31; Appendix 4). One and possibly two are San Pedro points (Figs. 31a and 31d, respectively) (Dick 1965), and a third is a Hueco point (not shown) (MacNeish and Beckett 1987). The remaining point (Fig. 31c), while complete or nearly so, does not conform to named types in the Southwest, Texas, or Oklahoma (Suhm and Jelks 1962; Bell 1958, 1960; Perino 1968, 1971). All but 9-9 (Fig. 31b) are chert or chalcedony; 9-9 is an unidentified dark gray stone which has partly patinated to light gray.

The San Pedro point (Fig. 31a) is of special note. Phillip Shelly identified the orange tinging of the gray chert as the result of heat treatment. The flaking is exceptionally well done and appears to be fine pressure flaking. The point is sufficiently long (44 mm) to qualify as a San Pedro Large (see discussion of San Pedro points from Tintop Cave below; Dick 1965).

Manufacturing Tools

Awls. Three fragmentary bone awls (Fig. 32) were recovered from deep proveniences (Pit 1e, Level 4; Pit 7a, Levels 9 and 10). The elements used are a deer metatarsal (proximal lateral; Fig. 32a), a large mammal long bone splinter (Fig. 32b), and a dog or coyote tibia (proximal diaphysis; Fig. 32c). The surfaces of all three are eroded, obscuring manufacture details. Presumably these implements were used in hide working, basketry production, or both.

Fletching Tool. A single flake has one rather large notch with a short projection in the center. The projection was made by chipping two contiguous notches and leaving the high point between as a point. This projection, guided by the notches, could be used to make shallow seating grooves for placing feathers in the proximal ends of arrow (or dart) shafts. The flake measures 23 by 23 by 9 mm overall, weighs 4.9 g, and is made of local gray chert. The notches have a combined diameter of 12 mm, and the projection is 1 mm long. It was found in the lower fill of Pit 1e, north side.

Hammerstones. The eight hammerstones are spherical to tabular pieces of gray cherty limestone (four), coarse-grained gray chert (three), and brown limestone (one). The largest is 85 by 77 by 57 cm and the smallest 49 by 44 by 42 cm. Weights in grams are: 106, 154, 157, 248, 303, 309, 329, and 434 (mean 255.08; S.D. 110.07). The heavily battered edges, angles, and ridges of these tools suggest that they were used primarily for producing and maintaining

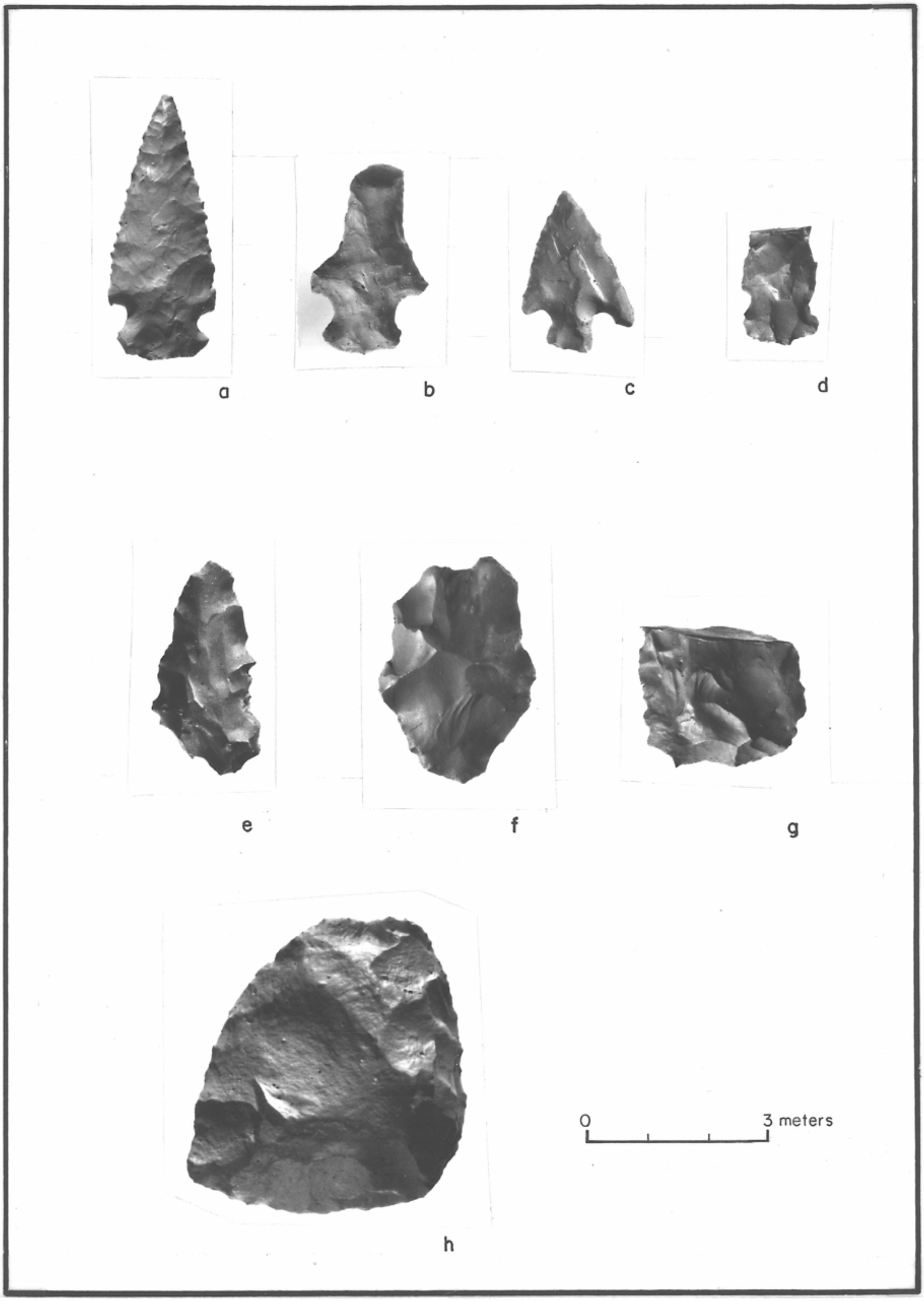

Figure 31. Chipped stone tools, LA 58971: (a) San Pedro Large; (b-c) unidentified; (d) probable San Pedro Small; (e-f) complete bifaces; (g) fragmentary biface; (h) uniface.

ground stone artifacts (manos and metates in particular) and perhaps the initial reduction of cores. Six came from the lower fills of Pits 1e (2), 1w (1), 3a (3), and 8d (1), and one came from extramural trash.

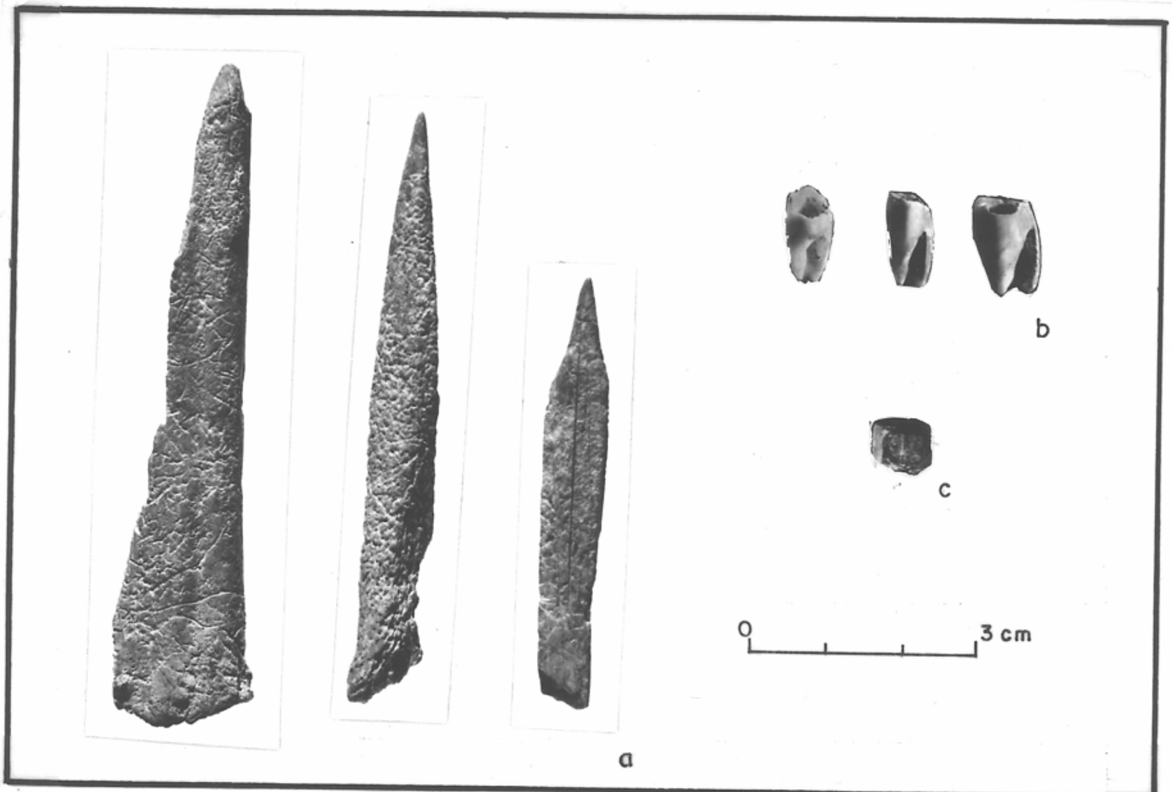

Figure 32. (a) Bone awls; (b) olivella shell beads; and (c) galena crystal, LA 58971.

Ceremonial, Recreational, or Ornamental Artifacts and Materials

Galena Crystal. One small galena crystal coated with lead oxide came from Pit 5a fill (Fig. 32e). It was not altered in any way and measures 8 by 6.5 by 5 mm.

Ornaments. Three fragments of freshwater mussle shell have one or more ground edges. One has the shape of a parallelogram; the other two are small fragments of much larger items. The complete specimen (fragmented during excavation) was 21 by 13 by 1 mm, and it was found in Pit 1w fill. The other two, with dimensions of 16 by 16 by 1 mm and 18 by 12 by 1 mm, came from Pit 1w fill and Pit 4c fill, respectively.

Three small olivella shell beads were recovered, two from the fill of Pit 5a and the third from the lower fill of Pit 1e (Fig. 32e). The shells, with their spires ground off for stringing, measured 13 by 8 mm, 8 by 6 mm, and 12 by 6 mm.

Paint Grinding Stone. A small oval boulder of reddish (burned?) sandstone from Pit 1a fill has a grinding surface smeared with red pigment (see Fig. 30). The overall dimensions of the stone are 29 by 24 by 14 cm. The grinding surface, the only modification to the stone, is 19 by 14 by 0.5 cm.

Pigment. The small lump of yellow ochre has two ground facets. The lump itself measures 37 by 36 by 21 mm, while the facets are 30 by 8 mm and 27 by 11 mm. It was found in Pit 8d fill.

Miscellaneous Artifacts

Ground Stone Fragments. Seven small fragments of rock display a variety of indications for shaping or use. Evidence of shaping includes pecking or flaking and grinding of edges. Use-wear includes grinding, polishing, or both. Materials are reddish (burned?) sandstone (3), gray sandstone (1), miscellaneous sedimentary rock (1), cherty limestone (1), and andesite (1). The largest piece is 120 by 92 by 45 mm. These fragments were found in Pit 1 overburden (2), Pit 3a fill (1), and extramural refuse (4).

Pick. The pointed tip of a picklike artifact was recovered from the disturbed surface. It measures 66 by 43 by 22 cm and is made of dark gray quartzite. A thick coating (about 1 mm) of calcium carbonate over the entire piece, including the broken surface, suggests great age. The carbonate coating prevented examination of the edges for wear. The tool may have been used as a pick, though there is no evidence of hafting.

Uniface. A large triangular flake of medium gray andesite has been unifacially edge-trimmed around its entire periphery. The flakes were removed from the dorsal surface. The dimensions are 49 by 46 by 13 mm, and it was found in Pit 3a overburden. The absence of use-wear suggests that it was not a finished tool.

Flakes with Use-Wear or Intentional Retouch

A total of 145 flakes from the Sunset Archaic site possess evidence of use-wear or very fine intentional retouch in the form of unifacial or bifacial edge damage, notches, or projections (Table 3). While most of the flakes have only one edge with use-wear, some have two, three, or even four edges displaying use-wear.

The most variable aspect of the used flakes is the length of the use-wear along the edges. Of 132 unifacial edges of all configurations (except notches and projections), the mean length of use-wear is 9.76 mm (S.D. 5.57; range 1-40 mm). The mean length of use-wear on the 15 bifacial examples is 10.67 (S.D. 7.53; range 4-33). The dimensions of the 14 notches are also variable: diameters are 1 to 13 mm and average 4.86 mm (S.D. = 3.51), and depths range 1 to 3 mm with an average of 1.50 mm (S.D. = 0.76).

The functions of use-worn debitage are mainly conjectural, but we believe that various cutting and scraping tasks were involved. Given the nature of the "tools" (i.e., the flakes) and

Table 3. Distribution of use-worn flakes, Sunset Archaic site

Type	North Side		South Side		Totals	
	N	%	N	%	N	%
Number of Flakes by Type						
One-edge flakes	91	78	14	88	105	80
Two-edge flakes	19	16	2	13	21	16
Three-edge flakes	4	3	-	-	4	3
Four-edge flakes	2	2	-	-	2	2
Total flakes	116	99	16	101	132	101
Number of Edges by Type						
Unifacial Wear:	119	82	13	72	132	81
straight edge	44	-	4	-	48	29
convex edge	21	-	5	-	26	16
concave edge	16	-	-	-	16	10
sinuous edge	3	-	-	-	3	2
serrated edge	4	-	-	-	4	2
irregular edge	31	-	4	-	35	21
Bifacial Wear:	12	8	2	12	14	9
straight edge	5	-	-	-	5	3
convex edge	2	-	-	-	2	1
concave edge	-	-	1	-	1	1
sinuous edge	2	-	-	-	2	1
serrated edge	1	-	-	-	1	1
irregular edge	2	-	1	-	3	2
Notch	11	8	2	11	13	8
Projection	3	2	-	-	3	2
Edge Grinding/ Use-Polish	-	-	1	6	1	1
Total edges	145	100	18	101	163	101

Table 4. Summary of chipped stone debitage classes, Sunset Archaic site

Type	North Side	South Side	Site Totals		Total Class
	N	N	N	%	%
Cores:					
Single-platform	28	5	33	33	
Two-platforms-adjacent	24	8	32	32	
Two-platforms-parallel	5	1	6	6	
Three-platform	3	1	4	4	
Four-platform	1	-	1	1	
Indeterminate	18	6	24	24	
Core total	79	21	100	100	3
Flakes:					
Decortication	112	18	130	4	
Platform preparation	3	3	6	<1	
Core reduction	2255	465	2720	84	
Platform Rejuvenation:					
From top	3	-	3	<1	
From side	19	2	21	<1	
Biface thinning	112	50	162	5	
Biface notching	2	-	2	<1	
Hammerstone	1	-	1	<1	
Potlid	3	-	3	<1	
Indeterminate	131	42	173	5	
Flake total	2641	580	3221	98+	94
Shatter	61	4	65	100	2
Pieces of material	23	12	35	100	1
Total debitage	2804	617	3421	-	100

the limited evidence for use, the flakes were probably picked up at random, used briefly, then discarded. It is not clear whether those flakes bearing two or more use-wear features were used for a series of tasks before being discarded or whether they were fortuitously picked up for use on more than one occasion. The low frequency of multiple feature flakes suggests that the latter was the case.

Manufacturing Debris

Bifaces. The 13 bifaces (2 complete; 11 fragmentary) embody a variety of shapes, including oval, triangular, rectangular, and pentagonal. All are percussion flaked and generally "rough" in appearance, as if they are not finished artifacts. Sizes also vary. The two complete specimens (see Figs. 31e and 31f) measure 37 by 26 by 10 mm and 35 by 19 by 8 mm; however, some of the more fragmentary examples appear to have been both larger and smaller (Fig. 31g). All the bifaces are chert, and all but one are various shades of gray and brownish-gray. The one exception is red and black with white speckles. Three have orange tints, probably from heat treatment. It is assumed that the bifaces are manufacturing rejects or failures created during the process of making projectile points, drills, or other formal tools. They were found in Pit 1w fill (1), Pit 1e fill (1), Pit 3a fill (1), Pit 4c fill (1), Pit 7a fill (3), Pit 7b fill (1), and extramural refuse (5).

Chipped Stone Debitage. Chipped stone debitage, the waste generated during the manufacture of projectile points and other tools, is represented by four classes of materials: cores, flakes, shatter, and pieces of material (Table 4). The raw materials and definitions used to classify and analyze chipped stone debitage are described in Appendix 5. The cores, core reduction flakes, biface thinning flakes, and exotic materials are described in detail below. Pieces of debitage bearing use-wear or intentional retouch are described in the section on tools.

Cores: The 79 cores from the north side include five types: single platform (28, or 35 percent); two platforms, adjacent (24, or 30 percent); two platforms, parallel (5, or 6 percent); three platforms (3, or 4 percent); and four platforms (1, or 1 percent) (Tables 5 and 6). Eighteen cores could not be classified by type. The cores are generally small, mainly because the natural raw material units are small. The longest core is 10.5 cm, and the average is less than 5 cm (Table 5). Materials are dominated by local gray cherts (51 percent), followed by "other" materials (mostly limestones and silicious fine-grained sandstones, or 25 percent) and siltites and quartzites (13 percent) (Table 6). Up to 20 percent of the cores are heat treated.

The 21 cores from the south side include four types: two platforms, adjacent (8, or 38 percent); single platform (5, or 24 percent);two platforms, parallel (1, or 5 percent); and three platforms (1, or 5 percent) (Tables 5 and 6). Six cores could not be classified as to type. The cores are generally small, mainly because the natural raw material units are small (Table 5). Materials are dominated by local gray cherts (95 percent), and up to 48 percent of the cores are heat treated (Table 6).

Table 5. Summary of complete cores, Sunset Archaic site

North Side of Site				
	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
A. Single-platform Cores				
N	21	21	21	21
Mean	47.29	38.14	24.38	77.14
S.D.	18.87	18.22	11.56	134.06
Range	23-105	14-94	10-47	2.7-635.5
B. Two-platforms-adjacent Cores				
N	22	22	22	22
Mean	46.55	37.00	26.18	89.04
S.D.	20.48	16.83	13.41	98.16
Range	22-86	15-75	9-54	6.0-339.7
C. All Other Cores				
N	8	8	8	8
Mean	31.75	25.13	17.63	20.68
Range	25-44	18-35	11-24	5.5-70.9
South Side of Site				
	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
D. Single-platform Cores				
N	5	5	5	5
Mean	46.60	35.00	25.00	57.36
Range	29-70	27-55	12-42	10.2-173.0
E. Two-platforms-adjacent Cores				
N	8	8	8	8
Mean	37.38	27.25	17.13	17.85
Range	25-52	18-38	10-29	5.3-39.8
F. All Other Cores				
N	2	2	2	2
Mean	33.50	26.00	21.50	24.25
Range	31-36	22-30	17-26	8.5-40.0

Table 6. Summary of all cores, Sunset Archaic site

	North Side		South Side		Site Totals	
	N	%	N	%	N	%
Materials:						
Local gray cherts	40	51	20	95	60	60
Other cherts	1	1	1	5	2	2
Local chalcedonies	-	-	-	-	-	-
Limestones						
Siltites and quarzites	13	16	-	-	13	13
Other materials	25	32	-	-	25	25
Totals	79	100	21	100	100	100
Heat Treatment:						
None	63	80	11	52	74	74
Yes	7	9	2	10	9	9
Possibly	9	11	8	38	17	17
Totals	79	100	21	100	100	100

Core Reduction Flakes. Complete core reduction flakes numbered 1,240, or 46 percent of this flake class. The fragments include 644 proximals (24 percent), 305 distals (11 percent), 210 medials (8 percent), 175 laterals (6 percent), and 146 small pieces (5 percent). The assemblage has been divided into two macroproveniences (north side and south side) for heuristic purposes.

Summary statistics of the dimensions of the complete core reduction flakes from the north side (Table 7) show that the flakes are generally small, with a mean length of only 19 mm. The flakes are almost as wide as they are long and rather thick. A correlation matrix (Table 8) shows no strong correlations among the attributes of length, width, thickness, and weight. Overall, the occupants of the north side of the Sunset Archaic site were not successful in obtaining long, narrow, thin flakes.

Other characteristics of the core reduction flakes from the north side are as follows (Table 9). Local gray cherts (49 percent) and gray to brown sandstones and limestones (25 percent, subsumed under "Other" in Table) comprise the majority of the materials. Single flake scar platforms are the most common (46 percent), followed by multiple flake scar platforms (24 percent). The incidence of hinged and stepped flakes is high (32 percent). The cortex profile, derived from pooling core reduction and decortication flakes, indicates that products of the full sequence from decortication through production of usable flakes is present. Up to 17 percent of the core reduction flakes were heat treated.

Table 7. Summary of complete core reduction flakes, Sunset Archaic site

North Side of Site				
	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
N	1063	1064	1064	1062
Mean	19.66	19.71	5.43	3.55
S.D.	10.02	9.15	3.46	7.59
Range	4-84	5-69	1-30	0.1-105.9
South Side of Site				
	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
N	173	172	173	172
Mean	18.66	19.56	5.47	3.42
S.D.	10.00	10.03	3.50	6.80
Range	7-59	8-63	1-20	0.2-44.4

Table 8. Correlation matrices of dimensions of complete core reduction flakes, Sunset Archaic site

North Side of Site				
N=1062	Length	Width	Thickness	Weight
Length	1.0000			
Width	.7617	1.0000		
Thickness	.7394	.7640	1.0000	
Weight	.7063	.7300	.7574	1.0000
South Side of Site				
N=172	Length	Width	Thickness	Weight
Length	1.0000			
Width	.7693	1.0000		
Thickness	.7532	.7891	1.0000	
Weight	.8061	.8664	.7526	1.0000

Table 9. Summary of all core reduction flakes, Sunset Archaic site

	North Side		South Side		Site Totals	
	N	%	N	%	N	%
Materials:						
Local gray cherts	1113	49	344	74	1457	54
Other cherts	64	3	11	2	75	3
Local chalcedonies	23	1	4	1	27	1
Limestones						
Siltites and quarzites	424	19	46	10	470	17
Other materials	631	28	60	13	691	25
Totals	2255	100	465	100	2720	100
Platform Types:						
Cortex	201	12	32	11	233	12
Single-flake-scar	738	46	155	52	893	47
Multiple-flake-scar	382	24	58	19	440	23
Pseudodihedrral	208	13	43	14	251	13
Edge or ridge	91	6	13	4	104	5
Totals	1620	101	301	100	1921	100
Distal Termination Types:						
Feathered	775	54	151	55	926	54
Modified-feathered	201	14	33	12	235	14
Hinged and stepped	467	32	91	33	558	32
Totals	1443	100	275	100	1719	100
Cortex:						
0%	739	53	127	55	866	53
1-10%	169	12	21	9	190	12
11-25%	170	12	30	13	200	12
26-50%	111	8	14	6	125	8
51-75%	80	6	17	7	97	6
76-90%	42	3	5	2	47	3
91-99%	34	2	8	3	42	3
100%	52	4	9	4	61	4

Totals	1397	100	231	99	1628	101
Heat Treatment:						
None	1875	83	387	83	2262	83
Yes	137	6	25	5	162	6
Possibly	239	11	53	11	292	11
Totals	2251	100	465	99	2716	100

Complete core reduction flakes from the south side number 173, or 37 percent of this flake class. The fragments include 121 proximals (26 percent), 55 distals (12 percent), 33 medials (7 percent), 39 laterals (8 percent), and 44 small pieces (9 percent). The assemblage has been divided into two macroproveniences (north side and south side) for heuristic purposes.

Summary statistics of the dimensions of the complete core reduction flakes from the south side (Table 7) show that they are short (mean of 18 to 19 mm), somewhat wider than they are long, and rather thick. A correlation matrix (Table 8) indicates a fairly strong correlation between flake weight and length (.8061) and between weight and width (.8664), but the small sample size casts doubt on the value of these statistics. Overall, the occupants of the south side were not successful in obtaining long, narrow, thin flakes.

Other characteristics of the core reduction flakes from the south side are as follows (Table 9). Local gray cherts (74 percent) and gray to brown sandstones and limestones (9 percent, subsumed under "Other" in Table 9) comprise the majority of the materials. Single flake scar platforms are the most common (52 percent), followed by multiple flake scar platforms (19 percent). The incidence of hinged and stepped flakes is high (33 percent). The cortex profile indicates that the full core reduction sequence (decortication through production of usable flakes) is present. Up to 16 percent of the core reduction flakes were heat treated.

Biface Thinning Flakes: A total of 112 biface thinning flakes were recovered from the north side (Table 10). The 39 complete biface thinning flakes display a great range in size variation; they are somewhat longer than they are wide, on the average, and are rather thick for thinning flakes. However, five of the flakes are longer and heavier than the majority. Therefore, the statistics have been recalculated for the remaining 34 flakes to provide a more accurate comparison (Table 10). The larger biface thinning flakes are similar in all respects other than size to the majority of the class.

Other characteristics of north-side biface thinning flakes are given in Table 11. Local gray chert is the dominant material (89 percent).

Table 10. Summary of complete biface thinning flakes, Sunset Archaic site

North Side of Site				
	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
A. All Biface Thinning Flakes				
N	39	39	39	39
Mean	14.08	11.90	1.79	0.46
S.D.	5.47	4.38	.066	0.34
Range	8-36	7-29	1-3	0.1-1.5
B. Sample of Biface Thinning Flakes				
N	34	34	34	34
Mean	12.56	10.53	1.71	0.35
S.D.	3.17	2.14	0.63	0.16
Range	8-21	7-15	1-3	0.1-0.8
C. All Biface Thinning Flakes				
N	22	22	22	22
Mean	12.41	10.64	1.77	0.27
S.D.	4.72	3.11	0.81	0.25
Range	7-27	7-19	1-4	0.1-1.2
D. Sample of Biface Thinning Flakes				
N	21	21	21	21
Mean	12.19	10.24	1.67	0.22
S.D.	4.72	2.55	0.66	0.14
Range	7-27	7-16	1-3	0.1-0.6

Table 11. Material and treatment of complete biface thinning flakes, Sunset Archaic site

	North Side		South Side		Site Totals	
	N	%	N	%	N	%
Materials:						
Local gray cherts	100	89	46	92	146	90
Other cherts	5	4	2	4	7	4
Local chalcedonies	1	1	1	2	2	1

Limestones						
Siltites and quartzites	4	4	-	-	4	3
Other materials	2	2	1	2	3	2
Totals	112	100	50	100	162	100
Heat Treatment:						
None	80	72	44	88	124	77
Yes	16	14	3	6	19	12
Possibly	16	14	3	6	19	12
Totals	112	100	50	100	162	101

Biface thinning flakes came from throughout the north side of the site, but two concentrations should be noted. These are the main refuse area (17E/1S, 2S, 3S and 18E/1S, 2S, 3S; 24 flakes, or 21 percent) and Pit 7a fill (23 or 21 percent).

The 50 biface thinning flakes that came from throughout the south side were especially concentrated in and around the three storage pits. The 22 complete examples display great variation in size. They are somewhat longer than they are wide, on the average (Table 10b). However, one of the flakes is longer and heavier than the majority. Therefore, the statistics have been recalculated for the remaining 21 flakes to provide a more accurate comparison (Table 10d).

Other characteristics of south side biface thinning flakes are given in Table 11. Local gray chert is the dominant material (92 percent). Up to 18 percent of the biface thinning flakes are heat treated.

Exotic Materials. Three pieces of imported stone material were recovered from the Sunset Archaic site. A biface thinning flake of Alibates material (orange-red variety) and an indeterminate flake of calcrete came from the main refuse area on the north side. A biface thinning flake of what may be Tecovas or Quitaque chert was recovered from an extramural location immediately southwest of Pit 8a on the south side.

Dating

Seven radiocarbon dates were obtained on charcoal recovered from four pits (Appendix 6; Toll, this report). Multiple dates were obtained for Pits 1E and 7 to check the reliability of the overall results.

Each sample to be used for radiocarbon dating was first sorted into species and categories by Mollie Toll (this report). Each sample was comprised of numerous species, unknowns, and unidentifiables. Species such as juniper and mesquite are notorious for their long-term natural preservation in nature and consequently skew radiocarbon dates (i.e., the "old wood" effect). In an attempt to circumvent this problem, the following species and categories were deleted from all but one of the samples that were dated: juniper, greasewood, mesquite, all unknowns, and all undetermineds. It would have been desirable to delete the creosote charcoal as well, but the samples would have been too small to date by the conventional method. The sample from Pit 8 was so small that only the saltbush (because it is a 4-carbon-pathway plant), Unknown L, and the undetermined nonconifer could be deleted.

The second standard deviations of all dates overlap to varying degrees (Fig. 33), indicating that, statistically speaking, they could represent a single date (Tamers, pers. comm., 1991). However, six of the dates form three pairs and are consistent among themselves and with the stratigraphy. These paired dates may reflect three separate occupations at the site, as discussed below. The seventh date, while falling within the span of the other dates, is somewhat problematical.

The calibrated dates of A.D. 398 and A.D. 411 (both $\pm$ 80) from the lower fill and the bottom fill of Pit 1E are virtually identical. Both contrast sharply with the A.D. 214 $\pm$ 90 bottom fill date of Pit 1W. Although we could not be certain from the excavation evidence which of these intersecting pits was earlier, it is clear from the radiocarbon dates that Pit 1W, the deeper of the two, is earlier.

The Pit 1W calibrated date is virtually the same as the A.D. 239 $\pm$ 70 calibrated date for the bottom fill of Pit 7. We accept this as indicative that Pits 1W and 7 were more or less contemporary.

The last pair of dates--A.D. 15 $\pm$ 60 and A.D. 28/45/51 $\pm$ 80--is from lower-fill levels 9 and 8 of Pit 7, respectively. Although these dates are very similar, and therefore essentially one in the same, they are also stratigraphically correct relative to one another. They differ strikingly from -- and are earlier than -- the date of A.D. 239 $\pm$ 70 from the bottom fill (level 10) of Pit 7. We accept the validity of the two early dates as being indicative of reverse stratigraphy and as representing a third (and earliest) occupation.

The seventh date represents the middle fill of Pit 8a located south of the highway. Its three intercept dates of A.D. 261, 288, and 327 are closer to the intercept dates for the bottom fills of Pits 1W and 7, but the first sigma range of A.D. 227 to 399 is closer to the first sigma ranges for dates from the lower and bottom fills of Pit 1E. We cannot determine at this time whether the Pit 8a date (1) belongs with one or the other dated pair; (2) represents a fourth occupation; or (3) simply demonstrates that the site was occupied more or less continuously over the span of the dates.

The average of the seven dates is A.D. 221 $\pm$ 28. The one sigma range is A.D. 140 to 239, and the two sigma range is A.D. 123 to 316.

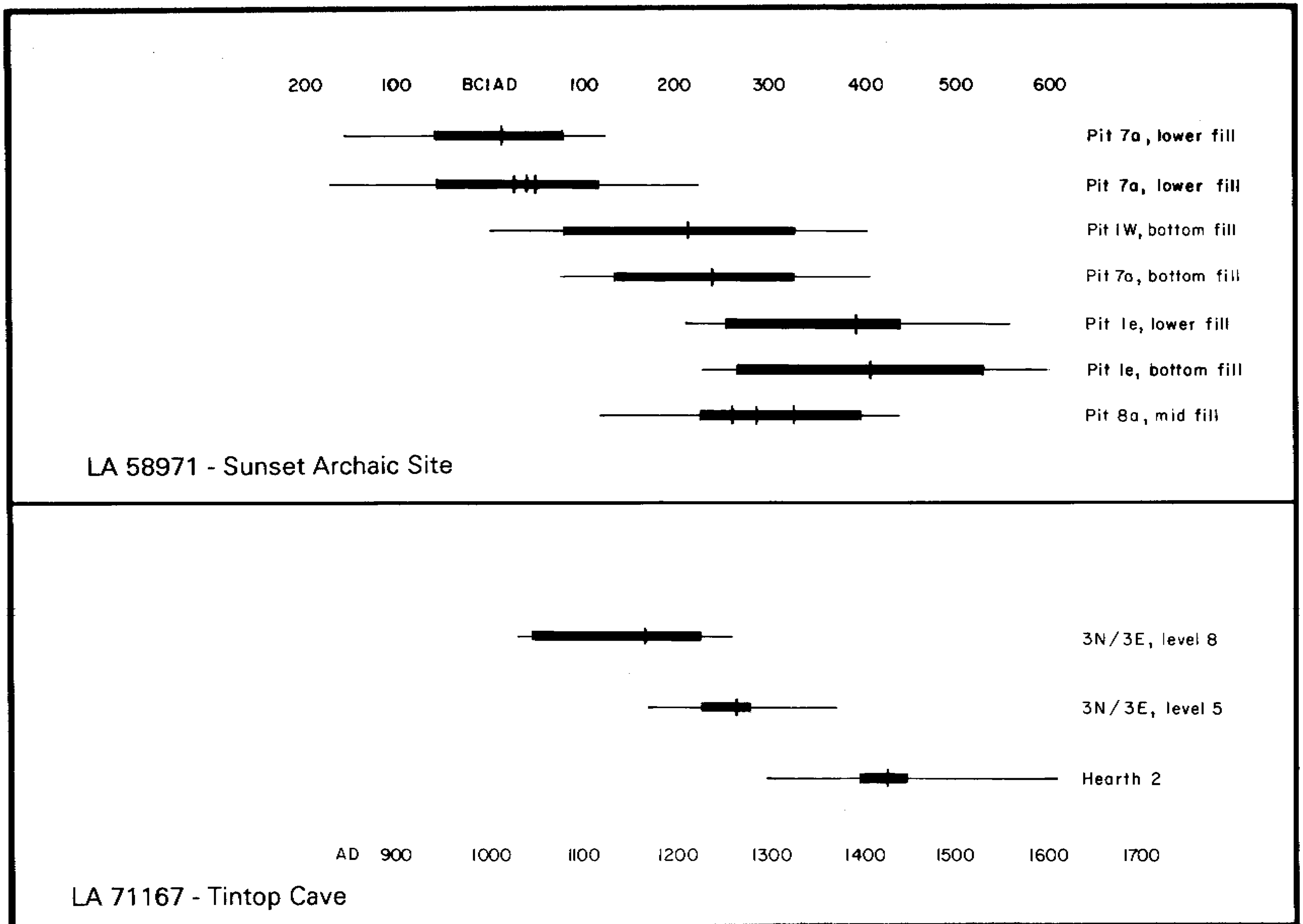

Figure 33. Radiocarbon results, LA 58971 and LA 71167.

The idea of three occupations, rather than one, is attractive for three reasons. As discussed, six of the dates "pair" into groups that are rather widely separated in time. Each pair is consistent with stratigraphic evidence where it exists. And, the amount of trash (dark soil, artifacts, manufacture debris), while fairly sizable for a hunterer-gather life-style, is still relatively meager compared to what might be expected for a site steadily inhabited over a period of 450 years (the span of dates for LA 58971). We must also keep in mind that, if the site was intermittently occupied, we may have identified only three or four of numerous episodes.

In summary, the seven radiocarbon dates from the Sunset Archaic site indicate occupation in the first five centuries A.D. The average of the seven dates is A.D. 221 $\pm$ 28. But for the reasons discussed, we believe that three separate occupations are indicated by paired dates, even though, statistically speaking, all dates could be one occupation at the level of the second standard deviation. The proposed occupations, arbitrarily bracketted in 50 year increments for convenience, are dated as follows: ca. A.D. 1-50; ca. A.D. 200-250; and ca. A.D. 375-425. The seventh date does not readily fit with one of the pairs, weakening the interpretation of three separate occupations.

SUNSET SHELTERS (LA 71167)

LA 71167 is comprised of two very small shelters, two very small caves, and a set of bedrock mortars. Initially, the locations were named North Shelter, North Cave, South Shelter, and South Cave. The name "South Cave" was changed to "Tintop Cave" since this cave produced the bulk of the cultural remains. Tintop Cave will be the primary focus of this chapter.

All caves, shelters, and the bedrock mortars are at the same elevation and within 100 m of each other. They are situated along the north edge of the Hondo Valley at the base of a series of low rock outcrops (Fig. 34). At this point, the Hondo Valley makes a turn toward the northeast, giving the rock outcrops and site a southeastward exposure. The elevation of the site is 1,487 m (4,880 ft) above sea level and 5 m above the valley bottom.

The site was first reported by a local collector. The initial examination failed to find any cultural materials on the surface, but two species of plants known to colonize former human habitations indicated that, at a minimum, testing should be conducted. The results of testing, which was conducted in late March of 1989, warranted further investigation. The bedrock mortars lying within heavy vegetation just outside the project right-of-way went unnoticed for another three years.

Excavation Techniques

All excavations were done in 1 m squares. At Tintop Cave, vertical control was maintained from a single datum set near the center of the back wall. At the other three locations, vertical control was established as the northeast corner of each square, and all elevations were tied in through the scaled profile drawings.

The standard vertical increment was 20 cm except where microstratigraphy was encountered. In those areas, finer vertical units based on individual features (such as fire areas) were used for proveniencing. To coordinate the microstratigraphic information with the overall level system, both the microstratigraphic designation and the 20 cm level designation were placed on the specimen sacks and in the notes. All fill was screened through one-quarter-inch (6.4 mm) hardware cloth.

Records were kept on standard Museum of New Mexico forms, and all pertinent details were photographed by 35 mm camera. The excavations and configuration of the cave were mapped from the grid.

Figs. 34 and 35

Tintop Cave (South Cave)

Most of the ceiling and part of the overhang of this small cave collapsed during blasting for the 1938 highway cut (Fig. 35). Debris was left where it fell, obscuring the mouth of the cave and covering the talus deposits. This debris also channeled runoff into the shelter, resulting in the deposition of 40-50 cm of sediment on the cave floor. A large mesquite and other vegetation grew luxuriantly and completely hid the cave. These accumulations were removed to permit access to the cave deposits. A backhoe was used to pull large rocks and rock debris from the cave. After the vegetation and debris were removed, a baseline and grid of 1 m squares were established.

Twenty-four sq m were excavated to sterile soil, the majority of the cultural deposits in Tintop Cave (Fig. 36). However, an area of about 2 sq m in the deepest recess of the cave and thin balks along the walls of the cliff were not excavated for reasons of safety. Also, we did not fully explore all of the deposits in the toe of the remaining talus slope since so few cultural remains were retrieved from the deepest deposits. The very dark soil, however, did continue downward with the angle of the slope. The original southeastward extent of the deposits could not be determined, for the toe of the slope was removed during the construction of the highway in 1938.

Stratigraphy

Deposits and features uncovered at Tintop Cave represent the recent historic period, the prehistoric Ceramic period, and perhaps the Archaic period. For the most part, the deposits in Tintop Cave were well stratified. Five primary strata, numbered 1-5, latest to earliest, were delineated (Figs. 37-39).

At various places in the descriptions and discussions that follow, reference is made to the east and west halves of the site. By coincidence, the halfway line, grid line 0W, fell along a major feature of the deposits. West of the line lay the sheltered cave deposits where the primary occupations took place. The outside deposits, lying east of the line, were open to the elements. There, a cone of detritus built up through colluvial action along the cliff face. Understandably, humans used this area much less frequently, and cultural deposits were minimal.

Stratum 1. Stratum 1 was an aggregate of strata including natural roof fall, the debris resulting from the 1938 highway construction, and the sediments channeled into the cave by runoff falling on blasting debris. In the west half of the stratum, the color was predominantly tan. In the east half, organic debris from vegetation growing on the site between 1938 and 1989 gave the stratum a slight grayish cast.

In some areas of the site, Stratum 1 was easily distinguished from the underlying Stratum 2, but in others, no distinction could be made. This situation occurred near the periphery of the site because there the primary matrix (rock spalls) was the same and the coloration of Stratum 2 was weakest.

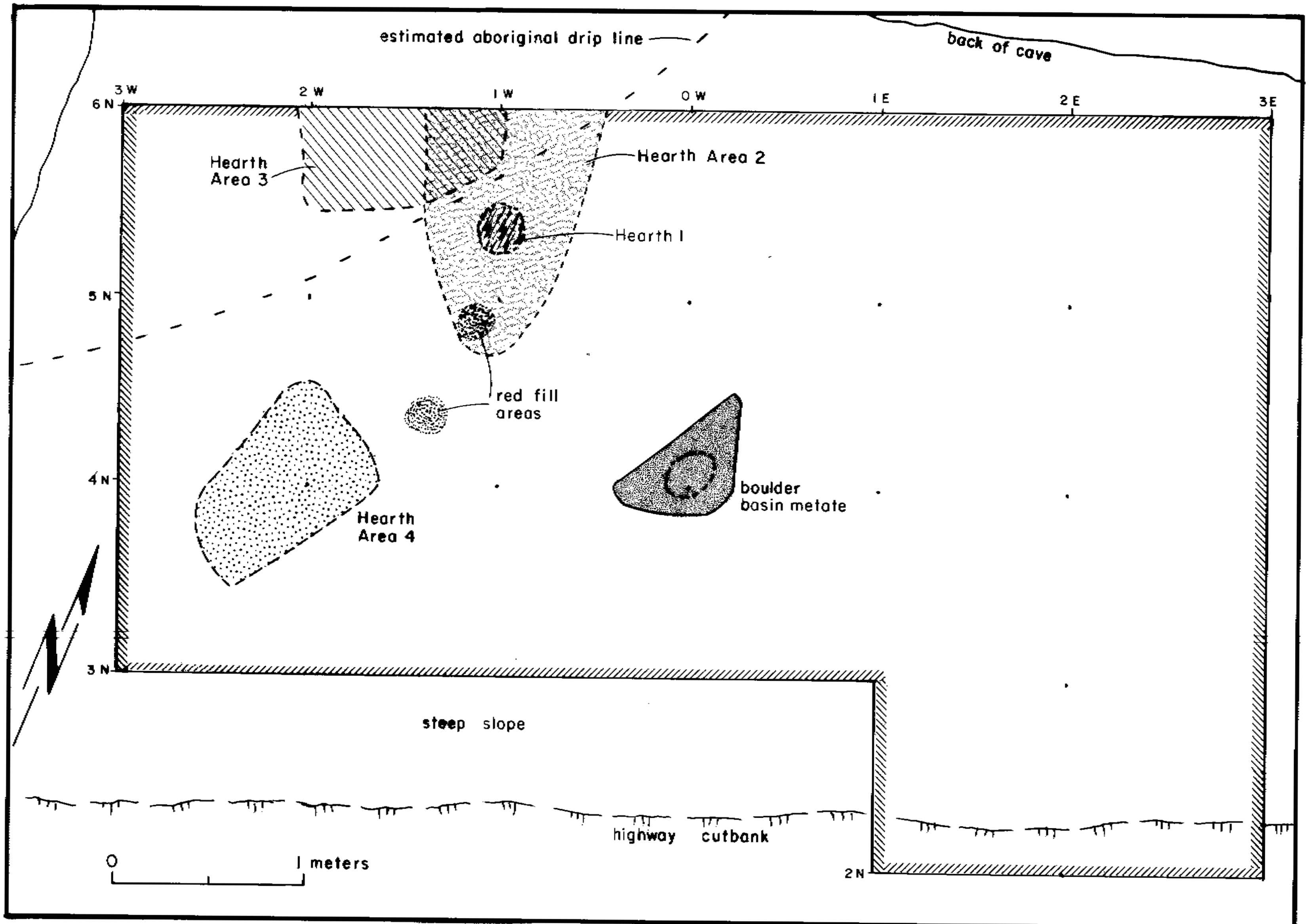

Figure 36. Plan of excavations, Tintop Cave.

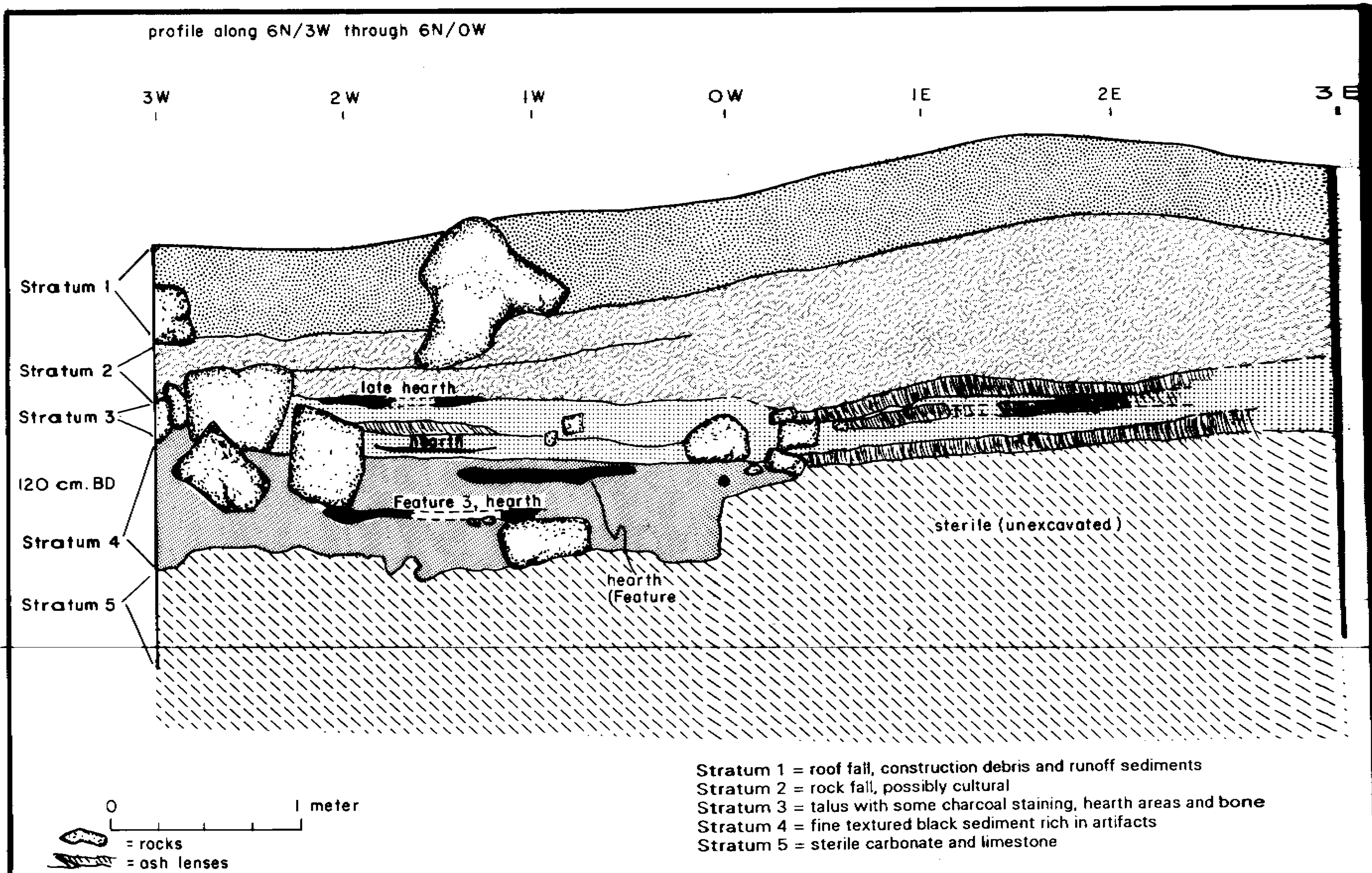

Figure 37. Profile of fill stratigraphy, Tintop Cave.

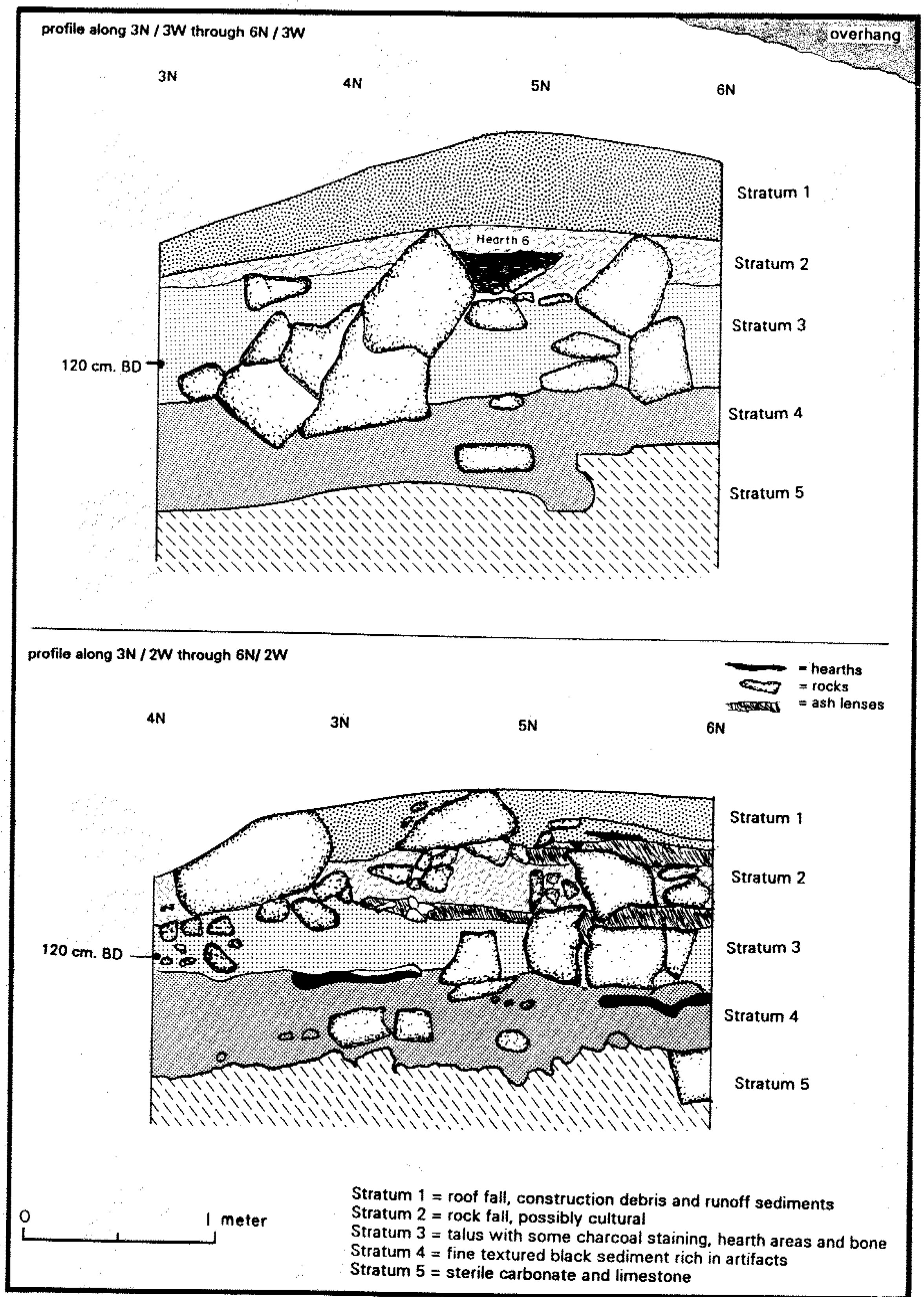

Figure 38. Profiles of hearths, rocks, and ash lenses, Tintop Cave.

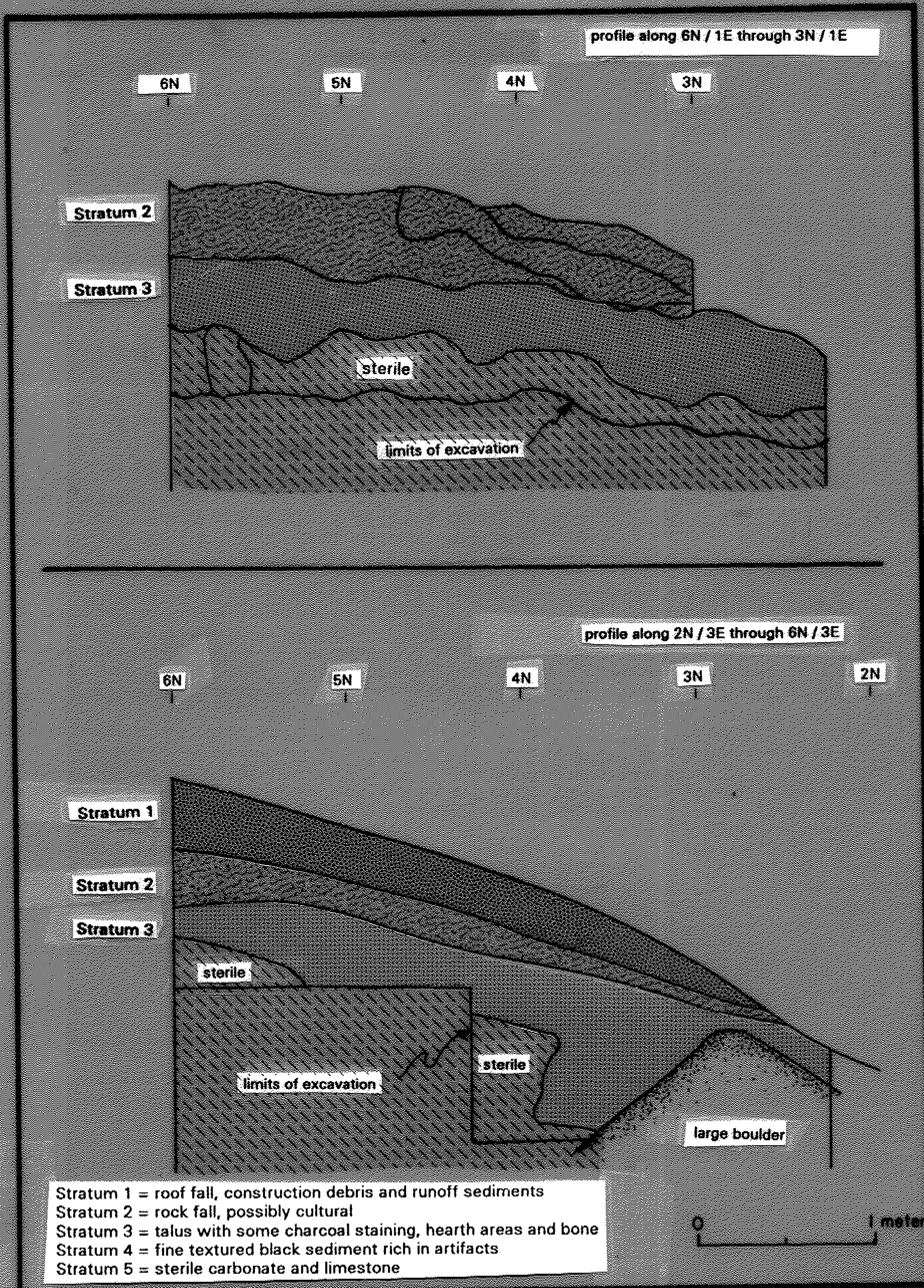

Figure 39. Profiles of fill stratigraphy, Tintop Cave.

Aside from a rare flake or potsherd (probably moved upward by rodent activity), Stratum 1 contained no cultural materials or features. The thickness of the stratum varied from about 20 cm on the slope to 50 cm where it piled against the walls of the cave and cliff face.

Stratum 2. Stratum 2 consisted mostly of large rocks and rock spalls fallen from the cliff face and the ceiling of the cave. The upper part of the stratum in the west half of the site was stained light gray. Whether the gray stain was caused by charcoal (i.e., cultural), organic material from vegetation growth, or both, is uncertain. The stain gradually phased out and disappeared in the east half. The lower part of Stratum 2 in the west half of the site and throughout all of the stratum in the east half consisted of tannish dirt and rock spalls.

The thickness of Stratum 2 varied greatly across the site. In the south end of the site, it ranged from 5 cm on the slope to 35 cm under the overhang. At the east end, it ranged from 65 to 90 cm.

Stratum 3. The eastern and western halves of Stratum 3 differed somewhat and are described separately. Rock spalls comprised the primary matrix of both halves, and a few artifacts were scattered throughout.

The west half of Stratum 3 had two primary components demarcated by a short lens of coarse rock spalls. The upper component was moderately charcoal stained, and the lower one was tan. Two minor lenses in Stratum 3 may have been fire areas.

The first minor lens was located between 1W and 2W at the west end of Stratum 3. It was fairly well defined, soft, and slightly darker than Stratum 3. The dimensions were 90 cm across and 5 cm thick.

A second possible fire area, located below the first one, lay within the lower component of Stratum 3. It was thin, hard, dark reddish-black, and homogeneously fine textured; it appeared to be burned. No charcoal or gray or white ash was on or around the lens, but the intensity of the burning, plus the lenticular shape, almost certainly indicates that it was a fire area. Where cross-sectioned, the lens was 65 cm across and 2 to 3 cm thick.

The east half of Stratum 3 was composed of three lightly charcoal-stained microstrata near the back wall. As these microstrata extended east and south towards the front slope, the darkness deepened, and the three combined into a single, thick stratum. At the front slope, this single stratum blended imperceptibly into Stratum 4.

Perhaps the most important aspect of Stratum 3 is that a number of bison bones were scattered along the juncture of this stratum and Stratum 4. The primary concentration of bones was within squares 6N/0W, 6N/1E, and 6N/2E.

Stratum 4. The fill of the upper half of Stratum 4 was a homogeneous, fine-textured, black sediment rich in artifacts, animal bone, and organic residue (but no unburned perishables). Rock in the form of roof spalls, river pebbles and cobbles, and fire-broken fragments were rare compared to the other strata. Beyond the core area of this stratum (the 1W and 2W squares situated under the overhang), the color gradually shifted to a dark gray, then a light gray as distance increased from the overhang. Rock spall content also increased, especially along the sides of the cave and the rock face to the north.

The lower half of Stratum 4 was somewhat lighter in color, contained more rock spalls, and possessed fewer artifacts and animal bones. The lighter coloration derived from slight admixture with yellowish sterile soil and rock which worked its way upward, perhaps through rodent action. The color and texture transition between the upper half and the lower half was quite smooth; no line of demarcation could be discerned except for a limited area around Large Hearth Area 4 (see below). Frequencies of artifacts and animal bone diminished markedly in the outer, deeper portions of the stratum even though the color intensity did not.

The thickness of Stratum 4 varied from 25 to 90 cm where excavated. It was originally thicker to the east of the excavation squares, but that portion of the deposits was truncated by road construction in the 1930s. Stratum 4 was also the only stratum to project well beyond the eastern edge of the cave drip line.

Stratum 5. Stratum 5 is the sterile carbonate and limestone underlying the occupation layers of the cave. Clark C. Pfingsten, a lifelong resident of the region, said that the indurated carbonate material in the west half of the cave has the texture and configuration of spring deposits, indicating that, previous to aboriginal habitation, the cave may have been a source of water. The age of this spring is currently unknown.

The Occupations

Historic Period. The historic period is represented by a single hearth (Hearth 6) and probably by Stratum 2. No historic materials other than some nails were recovered from the hearth. The hearth was found at the south end of the cave at the common corner of squares 4N/2W, 5N/2W, 4N/3W, and 5N/3W. At the time of use, it was probably just under the edge of the overhang. At the time of the excavation, its position was 50 cm out in the open and 1.25 to 1.50 m below the ceiling of the cave. No other artifacts representing this period were found elsewhere in Stratum 2.

Hearth 6 was an accumulation of gray ash nestled into a pocket in the cave breakdown 50 to 70 cm below datum. A large rock (too big to be readily moved) and a few slab fragments lining the bottom (Fig. 39) probably were incidental to its makeup. The ash concentration measured 57 by 50 by 21 cm.

Hearth 6 probably dates to the twentieth century on the basis of three 3 to 4 in (7.6 to 10.2 mm) wire nails found among the ashes. The wood used to make the fire may have been scrap lumber with the nails still in it, but no board remnants were present.

Prehistoric Ceramic Period. Remains from the middle part of the Ceramic period were the most common features and materials recovered from Tintop. Several occupations are represented by Strata 3 and 4. The deposits, measuring up to a total of 1 m thick, included macrostratigraphy and microstratigraphy, at least five hearth areas, a boulder basin metate, and cultural refuse. Of the latter, pottery and animal bone constitute the bulk of the remains, though chipped stone debitage and formal artifacts of several classes were also recovered.

The upper portion of Stratum 4 contained one small hearth area and three large hearth areas. Small Hearth Area 1 and Large Hearth area 4 were excavated in their entirety. Large Hearth Areas 2 and 3 were only partially excavated because they extended into unexcavated squares.

Small Hearth Area 1 was circular, 25 cm across, and 3 to 4 cm thick. It was a lens of charcoal situated in fill and had no discernable use-surface in association. Presumably, it was an unprepared campfire used only one time.

Each of the large hearth areas consisted of a 2 to 5 cm thick, orange-red "patch" of burned fill, overlain in all but one case (Large Hearth Area 4) by variable thicknesses of white ash and/or charcoal-stained "fill." Each hearth area evidently was an aglomeration of centrally located campfires on the floor of the cave and was used over fairly long periods of time. None of the hearth areas were on the same level, indicating multiple uses of the cave during the accumulation of the upper portion of Stratum 4. The vertical distances between the hearth areas varied from 3 to 9 cm. The dimensions of the large hearth areas are: Large Hearth Area 2, 130 by 73 by 8 cm; Large Hearth Area 3, 110 by 55 by 5 cm; and Large Hearth Area 4, 110 by 75 by 5 cm.

Only Large Hearth Area No. 4 had a discernable use-surface associated with it. The presence of the use-surface was denoted by a slight color change from the overlying black fill; the surface itself was the medium-dark, yellowish-black of the lower part of Stratum 4 (see above). The use-surface could be traced only a meter or so north from the hearth area. Two 20 to 25 cm diameter patches of reddened fill were noted on the use-surface and are believed to be places where hot cooking vessels were set to cool. The reddened fills of these patches were only a few millimeters thick.

The boulder metate was a basin in the upper surface of a large boulder of indurated limestone. The boulder measured 85 by 43 by 50 cm and weighed in excess of 90 kg. The oval grinding basin on the upper surface measured 31 by 23 by 3 cm. The bottom of the boulder rested on *top* of Stratum 4, indicating that it belonged to the latest prehistoric occupation (Stratum 3) at Tintop Cave.

<u>Archaic Period</u>. A few flakes and no pottery in the lowermost 20-30 cm of the deposits across the cave *may* indicate an Archaic occupation. However, associated features, datable materials, and separate stratigraphic associations by which to conclusively identify the flakes as Archaic were lacking.

<u>Summary of Occupations</u>. If Tintop Cave was used during the Archaic period, the paucity of remains indicates that such use was minimal, short-term, and sporadic.

The Ceramic-period occupations were the most intensive. Although the deposits from this period were more substantial than those of the Archaic and the Historic periods, they still were not of the intensity normally thought to indicate year-round occupations. Instead, seasonal occupation by a small group seems more likely.

The Historic-period occupation at Tintop Cave, to judge by the few artifacts and the single campfire, was probably a single episode and probably not longer than a few days at most. It seems likely that the occupants were either sheepherders tending their flocks, cowboys tending their cattle, or road construction crews seeking shelter at some point during the last 100 years.

North Shelter

North Shelter was formed under a section of bedrock that protrudes from the steep hillside (Fig. 40). The back wall is straight, and the sheltered area is open on three sides. Staining, whether natural or cultural, occurred spottily on the ceiling. Steep talus on either side diverts runoff into the shelter, precluding preservation of perishable materials. Because the shelter lay just outside the right-of-way, most of the excavations were restricted to the area in front (southeast) of the overhang. A total of seven sq m was excavated, all of them to sterile soil (Fig. 41).

Total cultural depth was not reached in all squares. However, the sparsity of artifacts, increasing compaction, and light color of the fill at the bottom of 3N/0W indicated that truly sterile deposits were at hand.

Stratigraphy

Deposits and features uncovered at North Shelter represent the recent Historic period, the prehistoric Ceramic period, and perhaps the Archaic period. Eight strata were recognized on the slope and the flat area in front of the shelter (Fig. 42).

Stratum 1. Stratum 1 was the uppermost stratum on the talus slope. It consists of colluvially deposited tan rock spalls with some modern organic debris (decaying sticks and twigs). Cultural materials were rare. Stratum thickness varied from 10 to 40 cm, and the deepest part was generally on the lower slope in the western squares.

Stratum 2. Stratum 2 consisted primarily of colluvial rock spalls in a medium to dark gray soil. Few cultural materials were noted in this stratum, though its gray color suggests that it had a cultural origin. Stratum thickness averaged 10 to 20 cm.

Stratum 3. Stratum 3 also consisted of colluvial rock spalls, but in this case, the soil matrix was a uniform light to medium gray color. Cultural materials (sherds, lithics, some bone) were concentrated in this stratum, particularly in the lower half. Stratum thickness was fairly uniform and averaged 50 to 60 cm.

Figure 40. North Shelter during excavation.

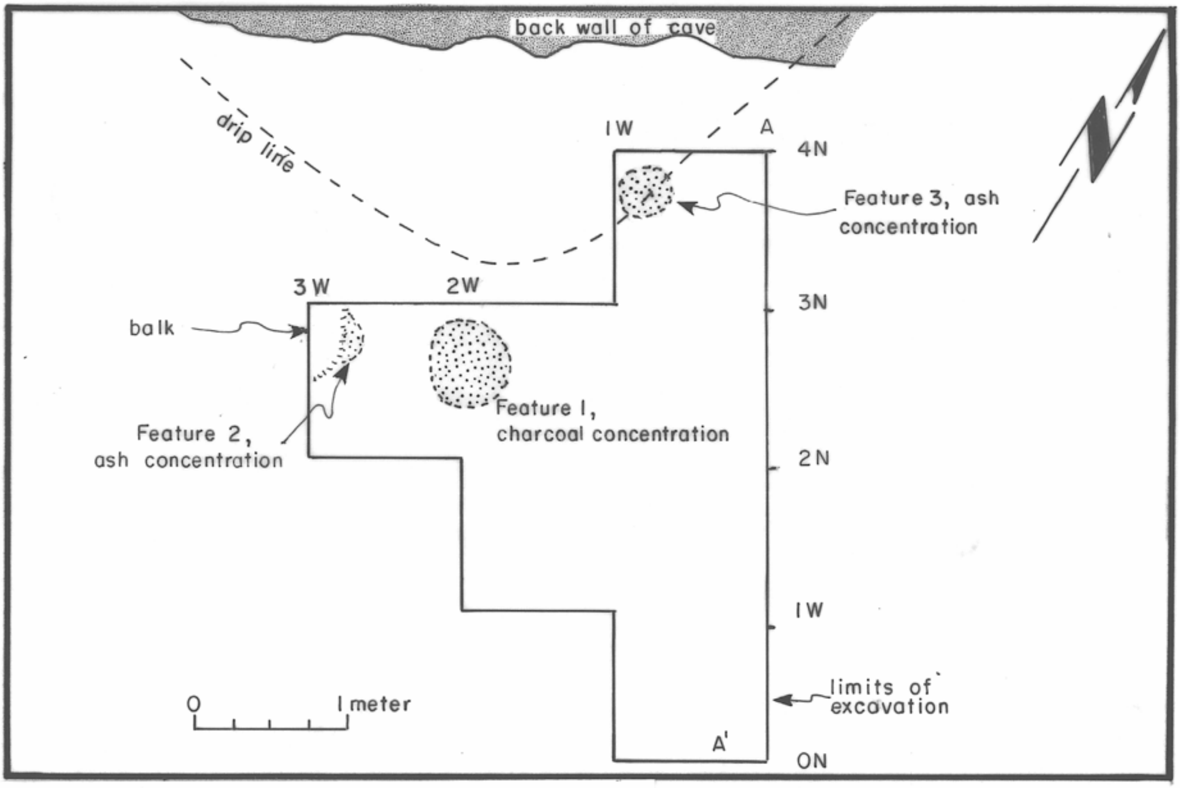

Figure 41. Plan of excavations, North Shelter.

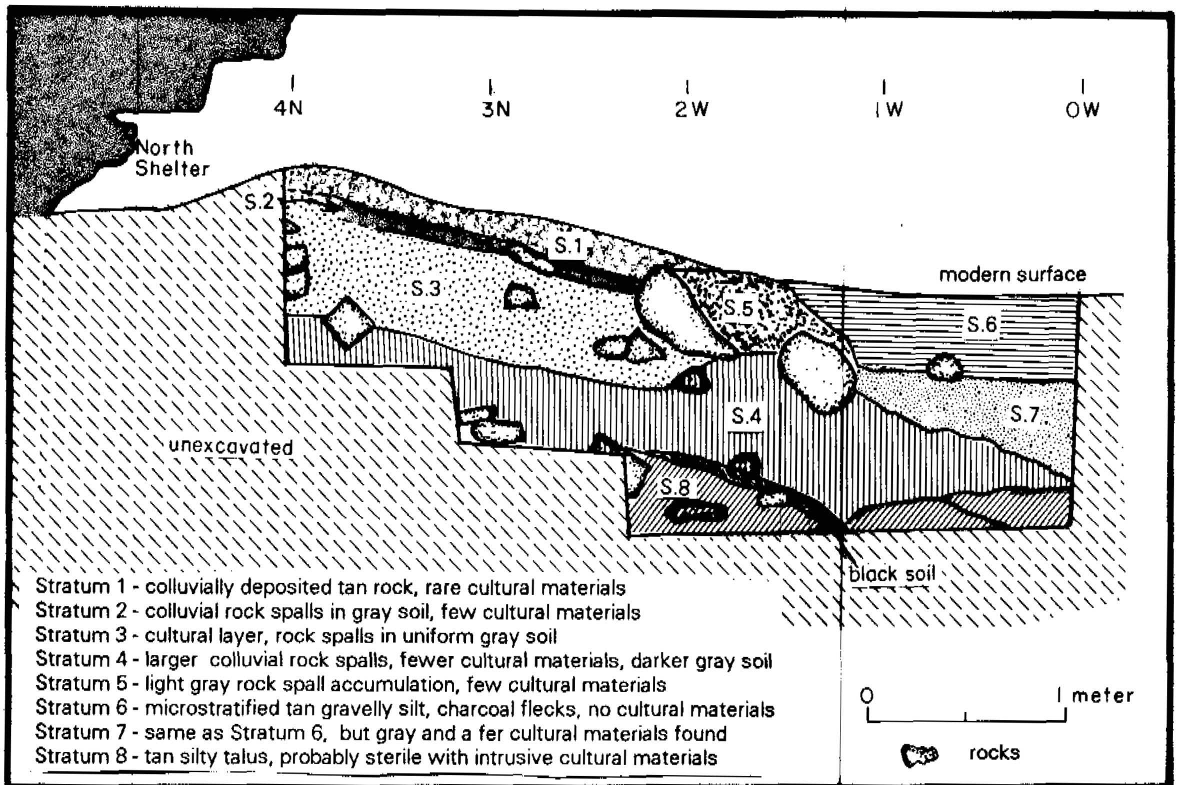

Figure 42. Profile of stratigraphy, North Shelter.

Stratum 4. Stratum 4 consisted of colluvial rock spalls with a higher incidence of larger rocks than in the overlying strata. The soil was generally darker gray than Stratum 3, but cultural materials were decidedly fewer. This stratum also extended further out from the shelter than any other stratum. A small, dark gray to black lens lay at the bottom of Stratum 4 in 2N/0W. Stratum 4 thickness varied from 30 to 65 cm.

Stratum 5. Stratum 5 was a light gray rock spall accumulation at the juncture of the talus slope and the flat area in front of the shelter. Although the light gray color suggests a cultural origin, few cultural items were recovered from this stratum. The stratum varied up to 40 cm thick and lensed out both upslope and downslope.

Stratum 6. Stratum 6 was a microstratified tan gravelly silt of mainly colluvial origin. Although a few small, scattered pieces and flecks of charcoal (probably wind or water deposited) were noted during excavation, no artifacts were recovered from this stratum. Stratum thickness, where exposed, was a uniform 45 cm.

Stratum 7. Stratum 7 was virtually identical to Stratum 6 except that the rock content was higher and the soil color was light to medium gray. A few artifacts were recovered. The top of this stratum was virtually level, but the bottom dipped steeply downward to the southeast. The thickness of Stratum 7 ranged from 10 cm on the northwest to 50 cm on the southeast.

Stratum 8. Stratum 8 included three related units at the bottom of 1N/0W and 2N/0W. The subunits, from northwest to southeast, were composed of tan silty talus (mostly rock spalls), tan silt with fewer rock spalls, and tan gravelly silt. Small pieces and flecks of charcoal were occasionally noted in all three subunits. A flake, a mussle valve, and a couple of pieces of large mammal bone were recovered from either the tan silt or the tan gravel or both. These finds were probably intrusive (perhaps the result of rodent burrowing) from overlying strata.

The Occupations

Recent Historic Period. This period is represented by two hearths and limited numbers of artifacts primarily in Stratum 1. Both hearths were 10 to 15 cm below the present surface. Only a tobacco can was recovered in situ at a depth of 10 cm below the surface. All other artifacts were recovered in the screen.

Feature 1, a charcoal concentration measuring about 55 cm in diameter and 2 to 3 cm in thickness, was encountered at a depth of 10 to 11 cm below the surface in 3N/1W and 3N/2W. No rocks or other signs of preparation were noted. No white ash or reddening of the underlying rock spalls was noted, indicating that the use of this campfire was short-term and nonintensive. No use-surface could be discerned in the fill, nor were any artifacts found in direct association with this campfire.

Feature 2, a white and light gray ash concentration measuring at least 30 cm in diameter and 3 to 4 cm thick, was encountered in the northwest corner of 3N/2W at a depth of 15 cm below the modern surface. No rocks or other signs of preparation were noted. The feature was not fully exposed and may have been larger than indicated here. The fact that both white and light gray ash were present indicates that its use was longer and/or more intense than in Feature 1. Its slightly greater depth suggests that it also predated Feature 1, although the difference in time cannot be judged. No use-surface could be discerned in the fill, nor were any artifacts found in direct association with this campfire.

Rusted fragments of a tobacco can, a bent 45 mm wire nail, a metal strip opener (to a sardine can?), and a well-worn 1910 nickle, all from the uppermost 20 cm of Stratum 1 in 3N/1W, belonged to the Feature 1 or Feature 2 occupations, or both. One of the workmen, who was born in 1910, said that the metal strip opener came into use in the Lincoln region during his youth (ca. 1920).

Thus, one or probably both campfires date to about the turn of the century or slightly later. Shepards, cowboys, or travelers probably used the site as a temporary camp.

Prehistoric Ceramic Period. Remains from the early to middle part of the Ceramic period were the most common cultural materials recovered from the North Shelter. However, the number of artifacts and their overall density were low. The primary association, especially for the pottery, was the lower half of Stratum 3 and the upper half of Stratum 4. No features unequivocally belonging to the Ceramic period were found in this shelter (but see below under "Archaic"). The prehistoric peoples probably used the shelter as a temporary camp.

Archaic Period. The presence of a few flakes and the absence of pottery in Stratum 8 *may* indicate an Archaic occupation. However, a lack of datable materials precludes definitive dating. A possible campfire *may* belong to the Archaic, though this association is also questionable.

A lens of darkly charcoal-stained silt was found at a depth of 90 cm in the southwest corner of 4N/0W. The depression was scooped out of the top of sterile caliche (Stratum 8?). Although the overlying fill was Stratum 4, no sherds were recovered from this stratum in either this square (4N/0W) or the one next to it (3N/0W). It is therefore possible that the campfire was Archaic. The lens and depression were 33 cm in diameter and 6 cm in thickness.

Summary of Occupations. Both the prehistoric Ceramic and the Historic periods (and the Archaic period if it is represented) appear to have been similar in nature, duration, and intensity. That is, the paucity of cultural materials and low investment nature of the campfires indicates low frequency, short-term, sporadic use of the North Shelter. Occupations were probably overnight or at most a few days duration per episode.

South Shelter

South Shelter was comprised of a very small cavity in a point of bedrock outcrop (Fig. 43). The triangular space of the cavity, which measured 1.3 by 1.2 m, had a bedrock floor situated 20 to 30 cm above the outside talus slope. No sediment or cultural materials were on the floor, and the ceiling was not blackened. Excavations were restricted to the talus slope in front of the shelter, where cultural deposits were found to be a maximum of 1.05 m deep. A total of 2.75 sq m was excavated, all to sterile soil (Fig. 44).

Stratigraphy

With the exception of a spent firearm bullet, the cultural materials recovered from the South Shelter represent the prehistoric Ceramic period. Four strata were exposed in the excavations (Fig. 45).

Stratum 1. Stratum 1 consists of yellowish rock spalls with minimal quantities of brownish-yellow rock flour. Stratum thickness varies from 0 to 25 cm where exposed by the excavations. Prehistoric cultural materials (flakes, sherds, some bone) were recovered primarily from the lower half of this stratum, as was an expended lead bullet.

Stratum 2. Stratum 2 was composed of rock spalls in a light gray soil. It was not clear whether the gray coloring derived from cultural deposition or was natural. Stratum thickness varied from 10 to 50 cm. Prehistoric cultural materials (flakes, sherds, projectile point) were thinly scattered throughout the stratum.

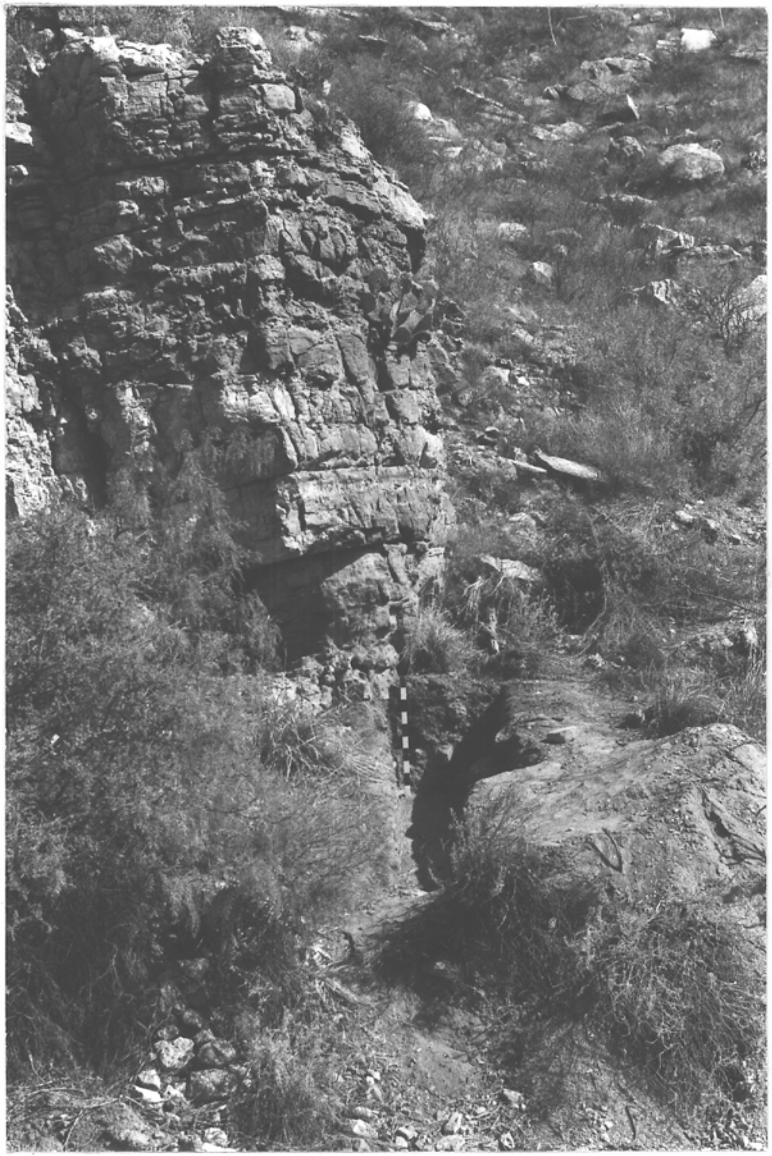

Figure 43. South Shelter during excavation.

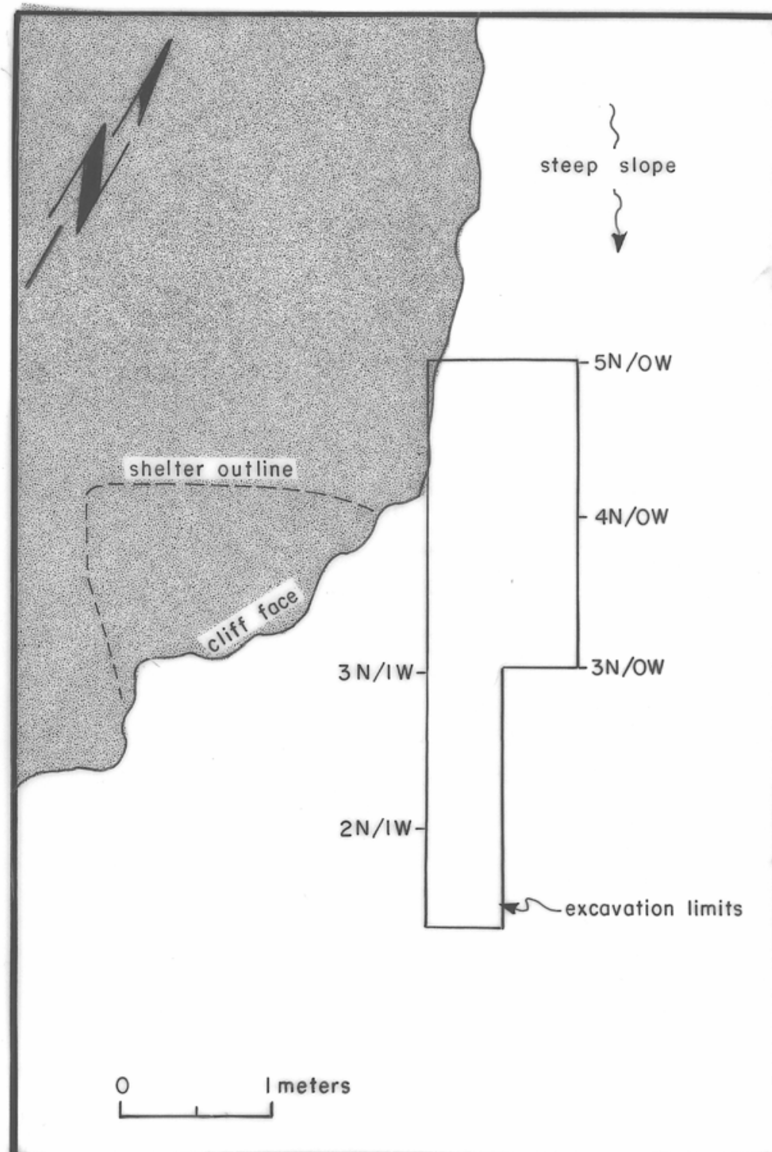

Figure 44. Plan of excavations, South Shelter.

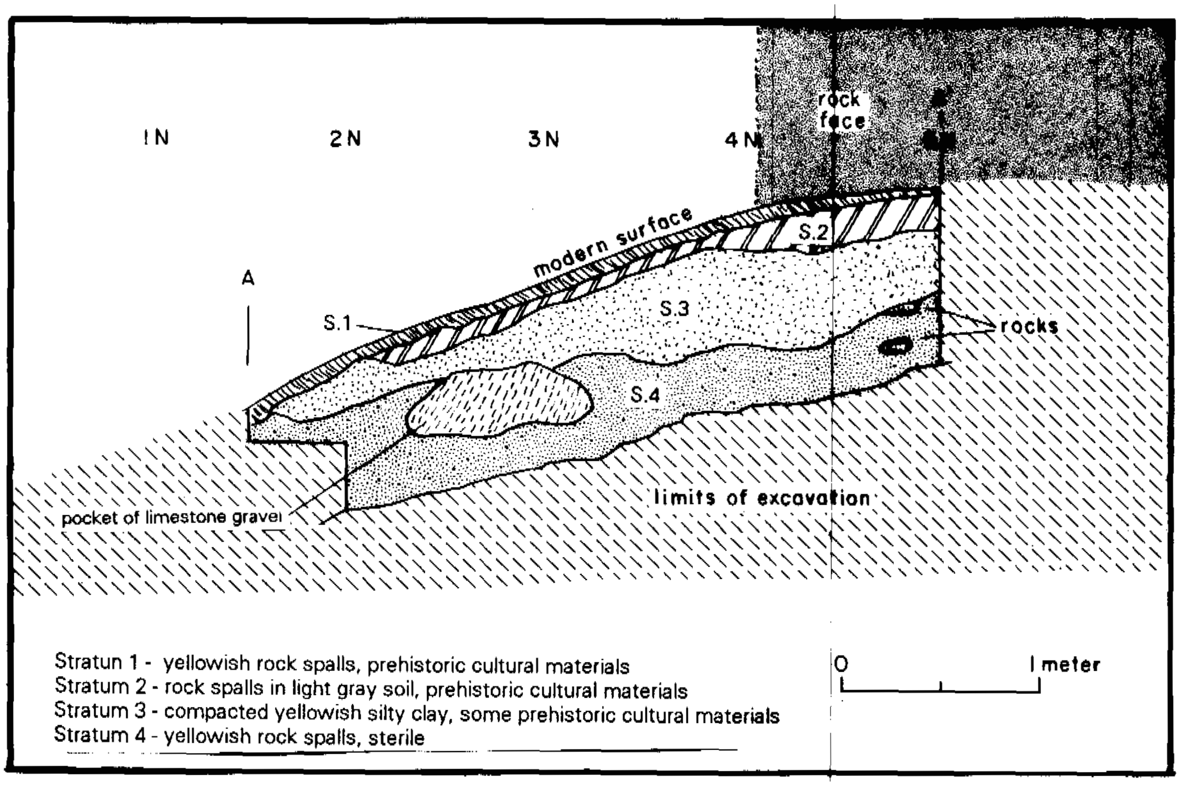

Figure 45. Profile of stratigraphy, South Shelter.

Stratum 3. Stratum 3 was a compacted yellow to grayish-yellow silty clay with a lower rock-spall content than the overlying strata. However, occasional large rocks were encountered. A small subunit of nearly pure rock spalls was noted lying within 3N/0W. Thinly scattered cultural materials (flakes, sherds, projectile point) were collected from this stratum, several of them coming from near the contact with Stratum 4.

Stratum 4. Stratum 4 was the yellowish rock-spall sterile soil of the shelter.

The Occupations

For all practical purposes, the only use of the South Shelter was during the prehistoric, early to middle Ceramic period. The remains of an undetermined number of occupations dating to this period were scattered throughout Strata 1, 2, and 3 of the South Shelter talus deposits. No features were encountered in the excavations.

The artifacts were so thinly scattered through the 1 m deep deposits that numerous, short-term, nonintensive occupations are probably represented. It is apparent from the concentration of cultural materials in 5N/0W the occupant(s) of the South Shelter used the north side of the rock outcrop, probably as a temporary respite from the sun.

North Cave

The North Cave was a small, elongate cavity in a low bedrock outcrop (Fig. 46). The cave was 3 m long and 1.7 m wide, and it had a ceiling height of 1 m. Staining, whether natural or cultural, had a spotty distribution on the ceiling.

The cave and its small talus slope lay outside the right-of-way and were not excavated. Excavations during the current phase of the project were limited to a 1 by 2 m unit dug into the lower slope of the talus and just above a small flat area (Fig. 47).

Stratigraphy

Cultural materials representing the prehistoric early to middle Ceramic and the Historic periods were recovered in the excavations at the North Cave. Three strata were identified in the excavation unit profile (Fig. 48).

Stratum 1. The uppermost stratum consisted of "dirty" yellow silts, rock spalls, and a few small rocks. Cultural material was limited to several rusty fragments of a "tin" can recovered from the surface sediments (uppermost 8 cm). Stratum thickness was a fairly uniform 17 to 20 cm.

Stratum 2. Stratum 2 consisted of rocks spalls and small to medium talus rocks in light to medium gray silts. A few flakes, sherds, and pieces of animal bone were scattered throughout the stratum. Stratum thickness varied from 45 cm on the lower end to 80 cm on the upper end.

Stratum 3. This stratum is the sterile underlying the cultural deposits. The tan to yellow layer contains rock spalls, talus rocks, and small quantities of rock flour. No cultural materials were recovered from Stratum 3.

The Occupations

Judging by our limited excavations in the North Cave talus slope, the only uses of the locality were during the prehistoric, early to middle Ceramic, and Historic periods.

Historic Period. Evidence of this period was limited to five fragments of a "tin" can recovered from just below the surface in 2N/3W. No features identifiable to the Historic period were excavated at the North Cave.

Prehistoric Ceramic Period. Cultural remains belonging to the early or middle part of the prehistoric Ceramic period include several flakes, sherds, animal bone fragments, and an ash lens probably representing a campfire. All of these manifestations were in Stratum 2, and all of the bone was recovered from the ash lens or campfire.

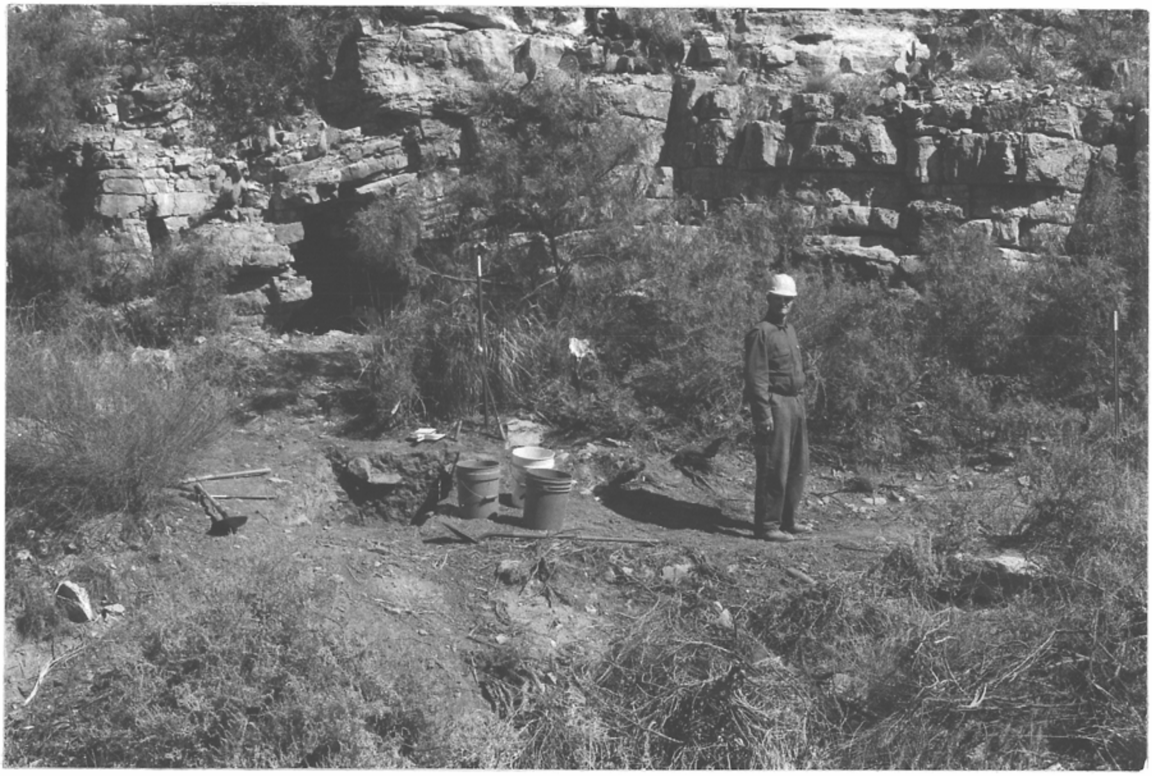

Figure 46. North Cave during excavation.

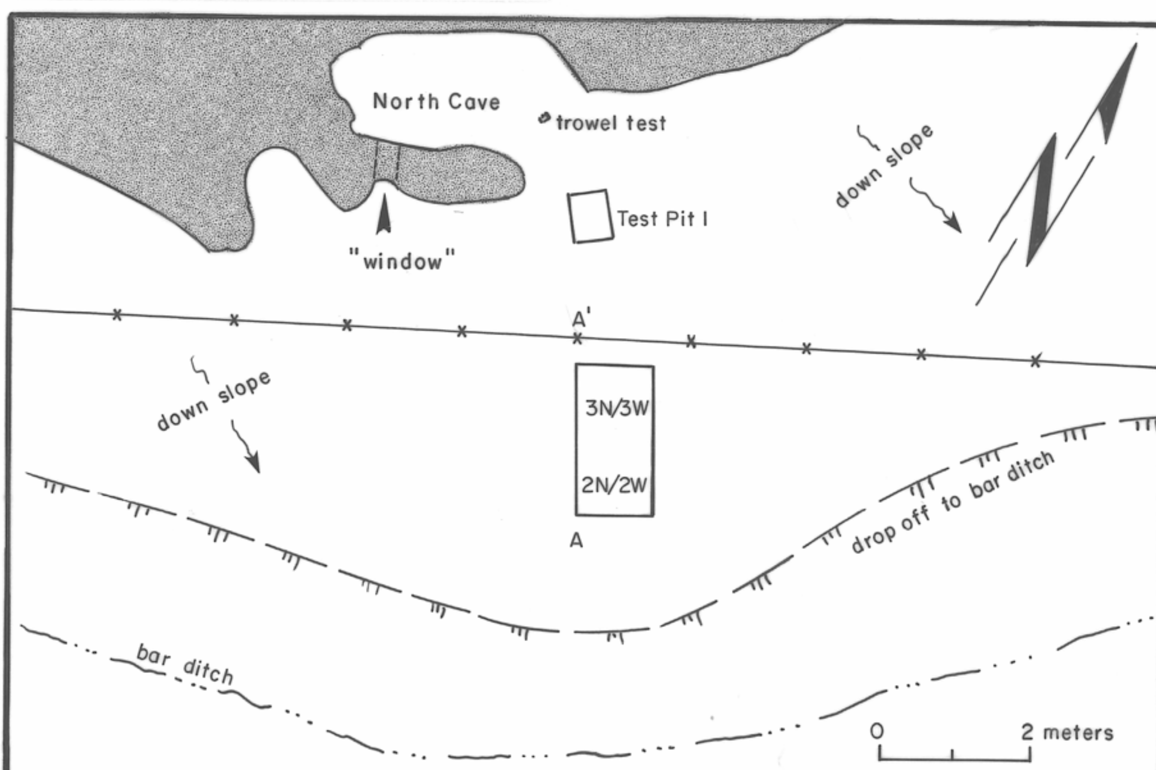

Figure 47. North Cave, plan of excavations.

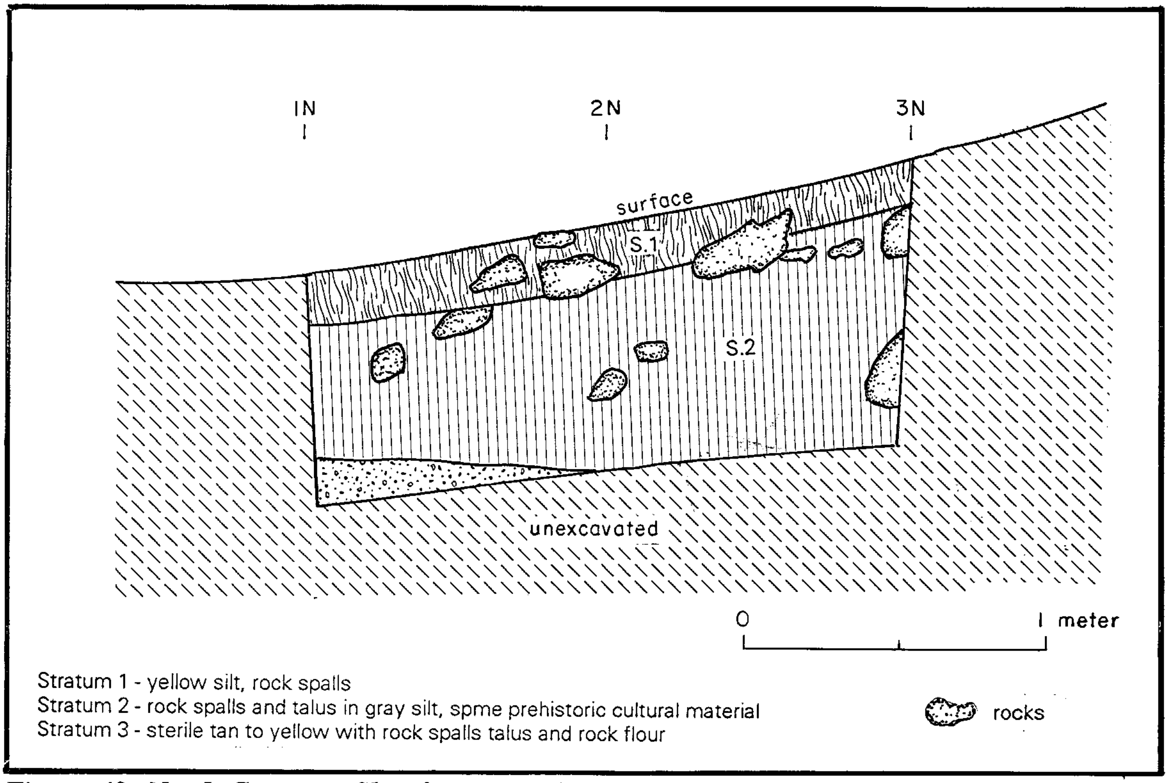

Figure 48. North Cave, profile of stratigraphy.

A gray ash lens containing several fragments of large mammal bone was excavated in the upper part of Stratum 2 within 3N/3W. The depth below modern surface was 18 to 26 cm, a variation due to the steepness of the slope. The lens, a probable campfire, was 35 to 40 cm in diameter and 3 to 8 cm thick. No preparations such as scooping out a pit or placement of rocks were evident.

Summary of Occupations. Judging by the "tin" can, historic use of the North Cave involved food consumption. Although the limited artifactual evidence precludes better definition of the occupation at this time, there are no surface indications on the talus slope or in the cave to suggest that more than a short-term occupation occurred during the Historic period.

The prehistoric Ceramic period artifacts were so thinly scattered throughout Stratum 3 that two or more short-term, nonintensive occupations can be postulated. The campfire suggests at least one overnight visit late in the period of prehistoric use of the cave.

Bedrock Mortars

One of the many exposures of bedrock in the rock slide area between the North Cave and the South Shelter has three shallow, yet distinct boat-shaped mortars ground into its upper surface

(Fig. 34). The mortars are all the same size and depth--16 cm long, 10 cm wide, and 1 to 1.5 cm deep. The mortars are on the north side of a small drainage south of North Cave and just outside the new right-of-way fence. No artifacts were noted on or around the mortars, though there is little reason to doubt that they were used during one or more of the occupations of the caves and shelters.

Artifacts

Chipped stone debitage, pottery, and several classes of formal artifacts were recovered. The formal artifacts represent a variety of activities and include, in order of abundance, projectile points, hammerstones, manos, bifaces, projectile point preforms, metates, ornaments, utilized flakes, awls, scrapers, and choppers.

Plant Food Processing Artifacts

Manos. Eleven oval to subsquare one-hand manos were made from river cobbles (Fig. 49; Table 12; Appendix 2). All but one have single grinding surfaces, and most have moderate to heavy grinding wear. Only five manos are fully shaped, and four have no modification other than the grinding surface.

Table 12. Summary of one-hand mano dimensions, Sunset Shelters

Dimension	N	Range	Mean
Length	5	9.2 to 13.8 cm	11.02
Width	4	8.7 to 11.1 cm	9.63
Thickness	4	3.4 to 5.6 cm	4.90

Unlike manos from the Sunset Archaic site, all but three of the Sunset Shelters manos are fragmentary. The length of complete specimens ranges from 9.2 to 13.8 cm, width from 8.7 to 11.1 cm, and thickness from 3.4 to 5.6 cm.

One of the more peculiar aspects of these manos, and one that differs significantly from the Sunset Archaic site manos, is that all but two are burned. Several are so badly burned that the identification of material type is difficult. Materials are evenly split between sedimentary and igneous rocks (one unknown).

Metates. The five basin metates have two forms: portable rocks and boulders (Fig. 50; Appendix 3). Only the boulder metate is complete (Fig. 51). The four portable specimens are made of sandstone (2), limestone (?) (1), and tufa/limestone (1), and the boulder metate is indurated sandstone. The overall size of the nearly complete portable metate (No. 413) is 61 by 43 by 22 cm, and that of the boulder metate is 85 by 43 by 50 cm.

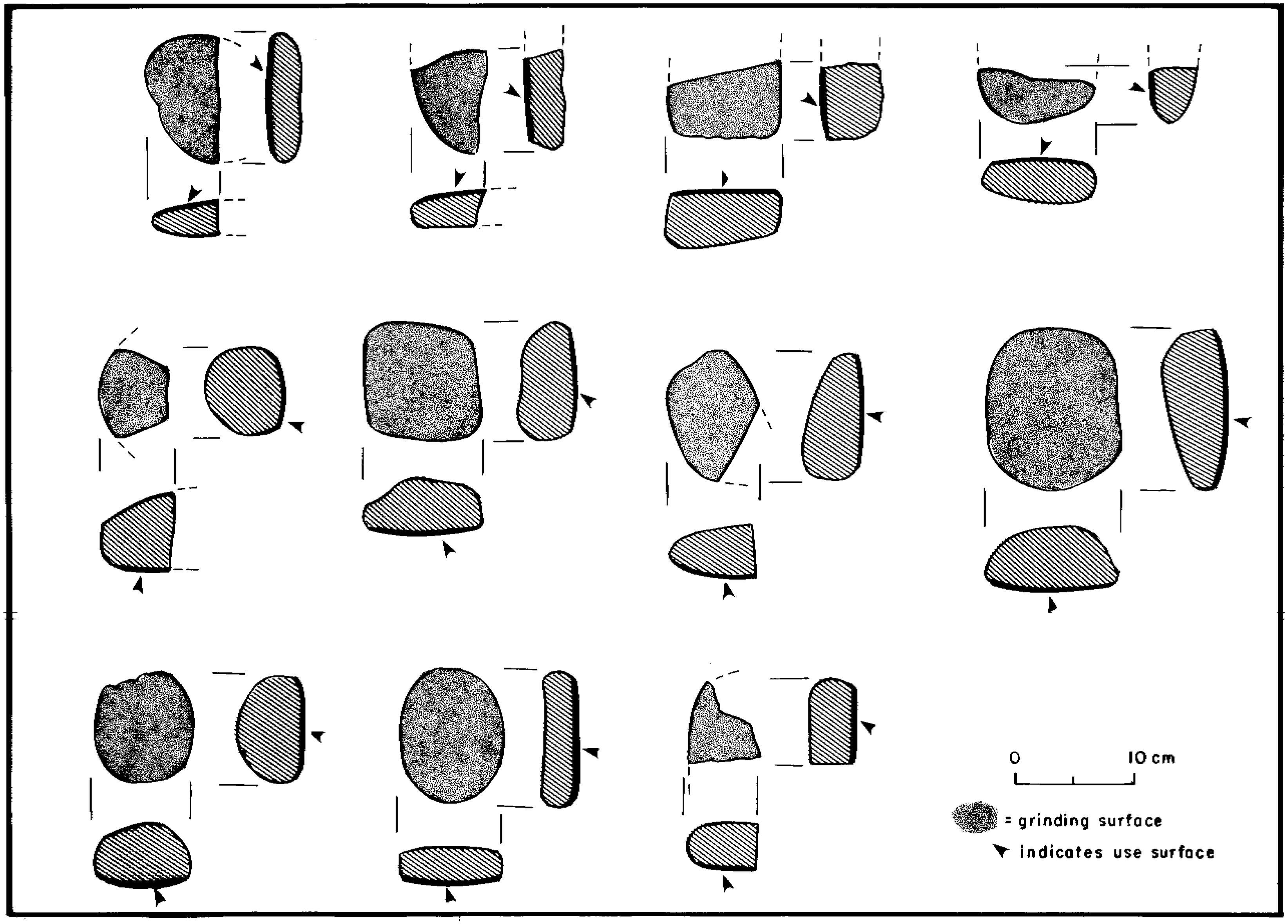

Figure 49. Manos from the Sunset Shelters.

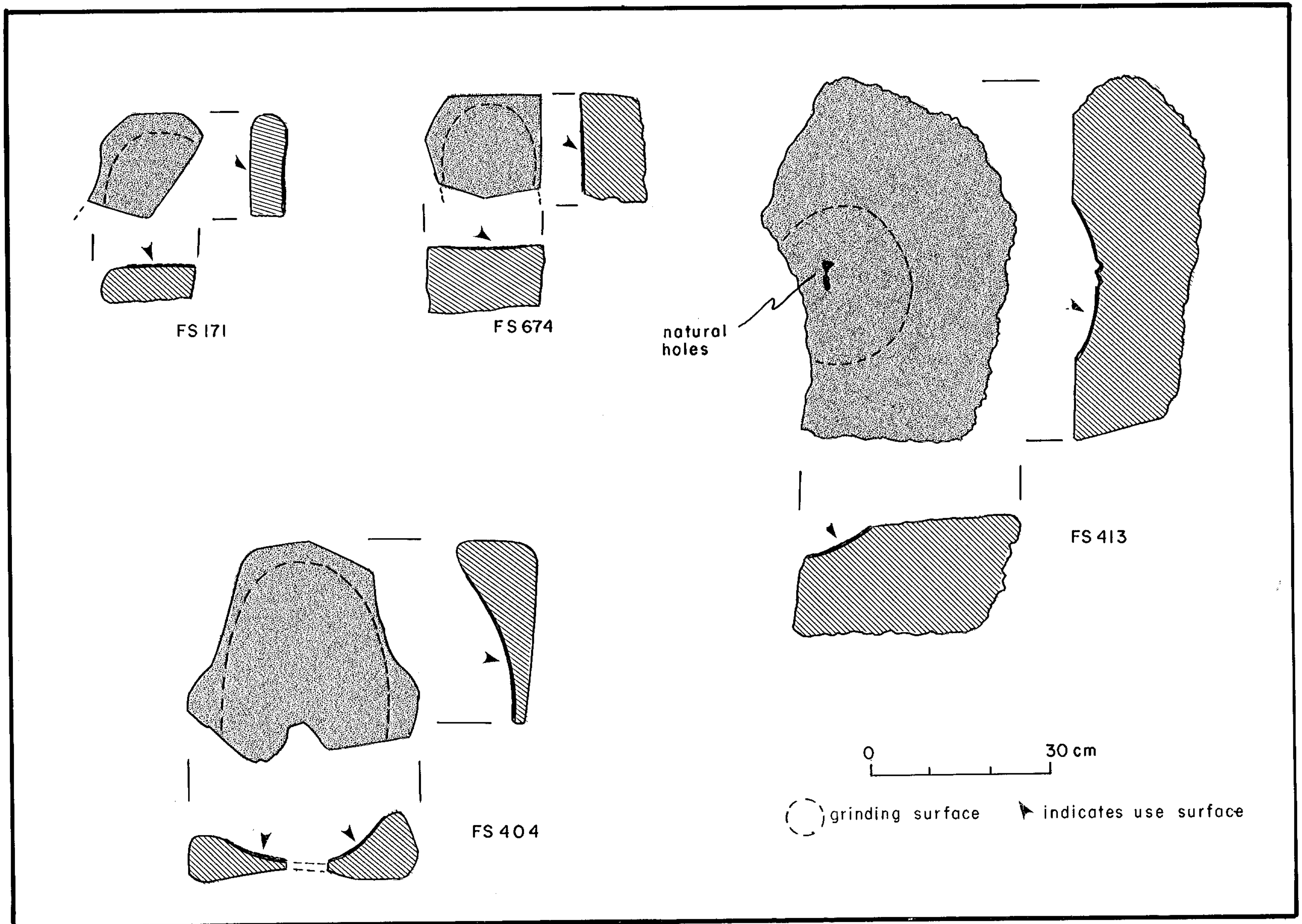

Figure 50. Metates from the Sunset Shelters.

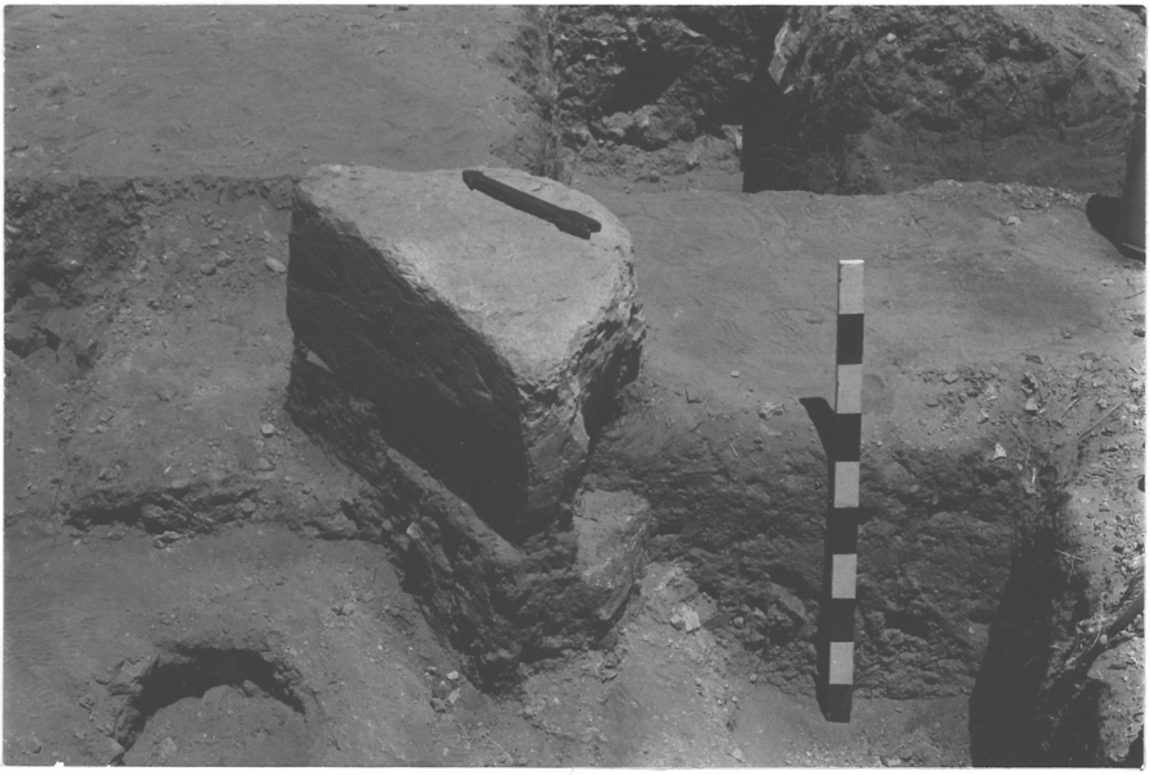

Figure 51. Boulder metate at Tintop Cave.

The basin of No. 413 is 26 by 19 by 4 cm, and that of the boulder metate (Fea. 5) is 31 by 23 by 3 cm. The only complete dimension of the grinding basins of the fragmentary metates is depth: No. 171 is 0.1 cm, No. 404 is 7 cm, and No. 674 is 11 cm. The basin of No. 171 is shallow because the metate was new when it was broken.

The proveniences of the metates were as follows: No. 404, Tintop Cave, 5N/2W, S.4; No. 413, 5N/2W, S.4; No. 171, 5N/0W, S.4 (level of Hearth 2); and Feature 5, S.3 (bottom sat *on* upper surface of S. 4); No. 674, North Shelter, 2N/0W, S.4.

Hunting Artifacts

Projectile Points. The 15 projectile points from Tintop Cave and the North and South Shelters include 4 dart points and 11 arrow points (Fig. 52; Appendix 4). The dart points, all from Tintop Cave, include two San Pedro (Figs. 52g-52h), one Hueco (Fig. 52i), and one indeterminate (not shown) (Dick 1965; MacNeish and Beckett 1987). The indeterminate specimen is a blade fragment of a large point. All four are made from various shades of gray cherts and presumably were manufactured locally.

The two San Pedro points are broken. However, at 37 and 40 mm, they are long compared to similar points recovered from Bat Cave (range 22 to 53 mm). But since Dick does

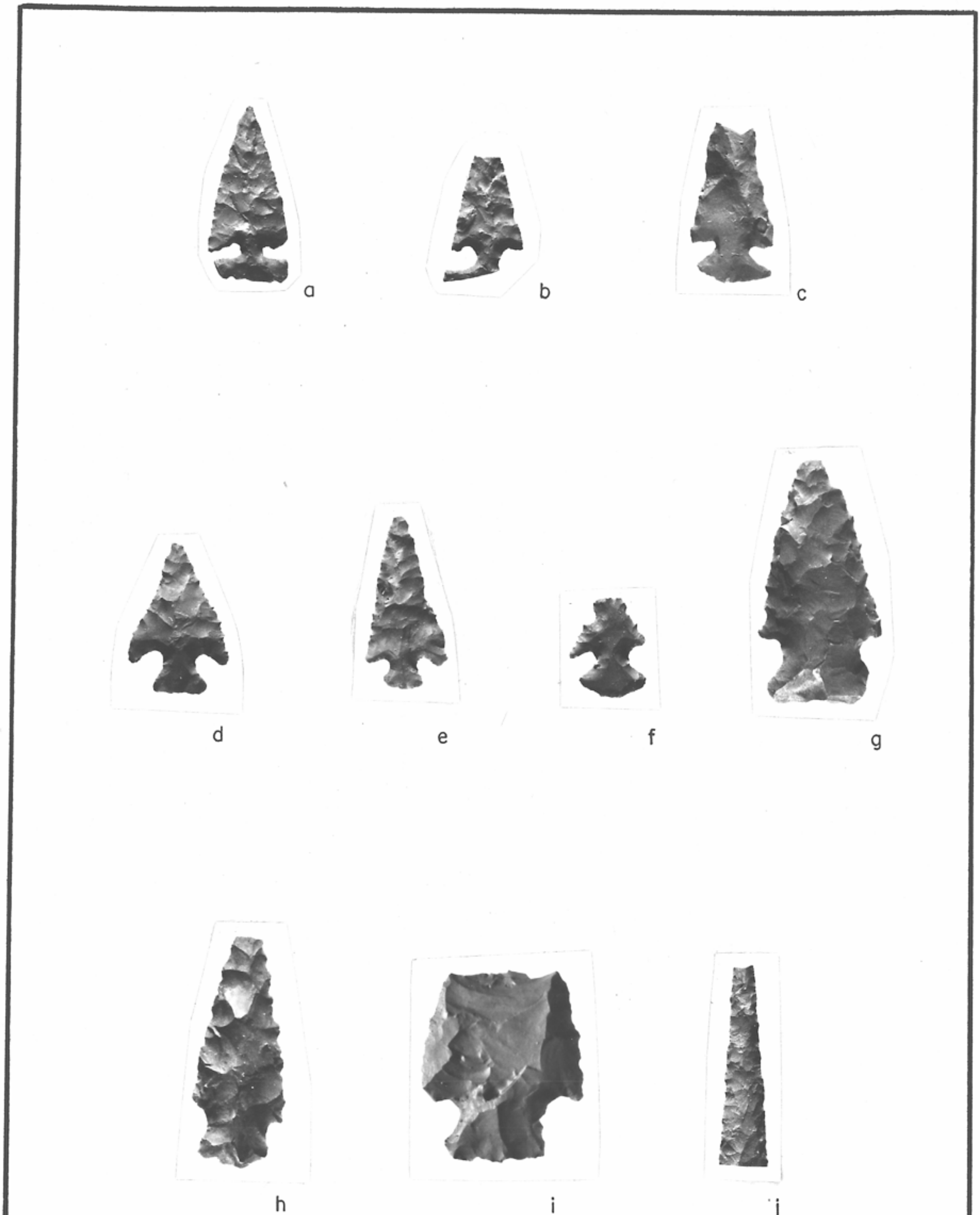

Figure 52. Projectile points from the Sunset Shelters: (a-b) side-notched, Reed-like; (c) corner-notched, Scallorn; (d-e) corner-notched; (f) Livermore, Neff style; (g-h) San Pedro; (i) Hueco; (j) blade fragment.

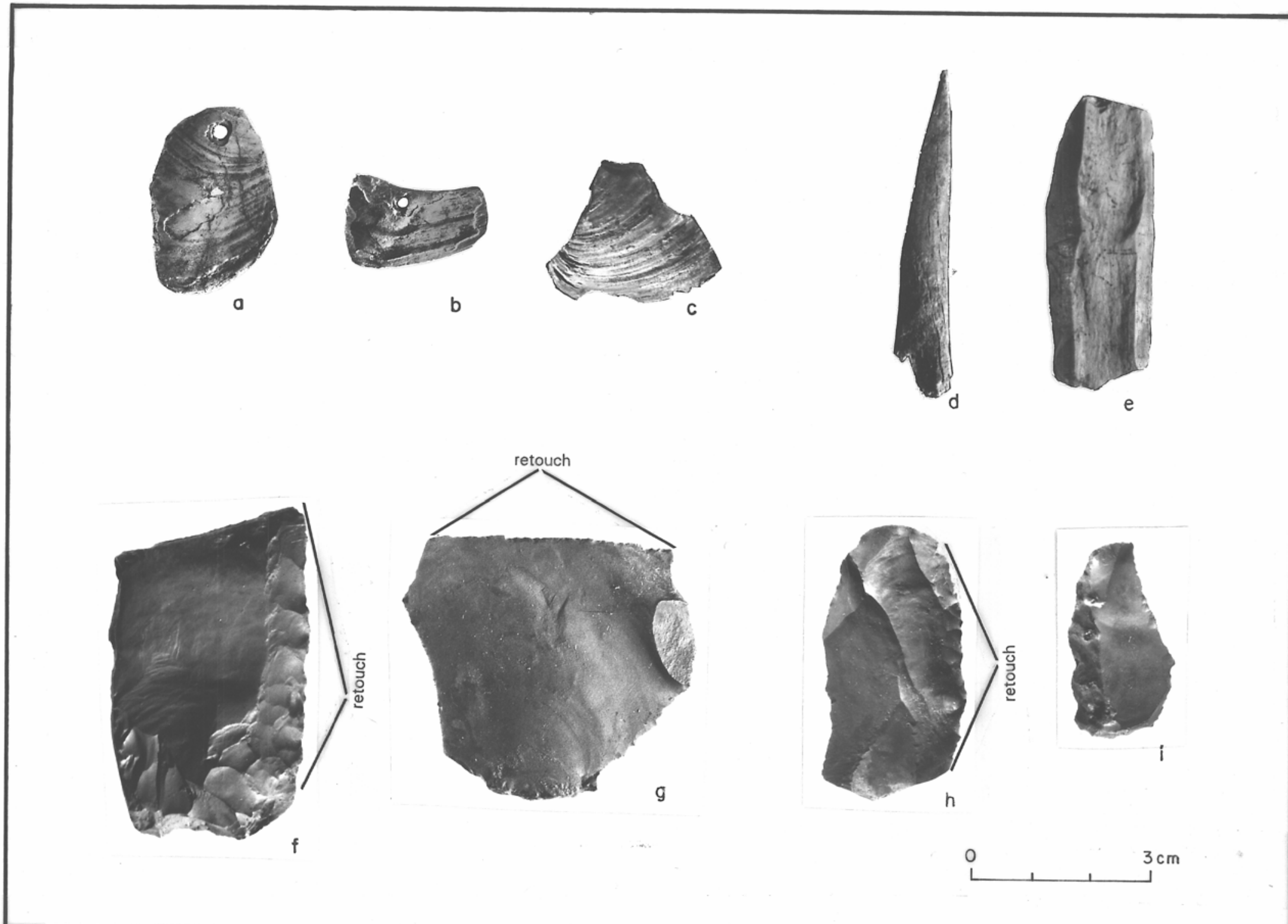

Figure 53. Small artifacts from the Sunset Shelters: (a-b) mussel-shell beads/pendants; (c) mussel-valve scraper; (d) awl tip; (e) bone tablet; (f-h) flakes with intentional retouch; (i) end scraper.

not give the size ranges for his San Pedro Large and San Pedro Small points, it is not certain how the Tintop specimens compare to either variety or whether the distinction even applies to southeastern New Mexico.

The arrow points are both corner-notched (4) and side-notched (4) and include three named styles: Scallorn (Fig. 52c); Reed-like (Figs. 52a-52b); and Livermore, Neff style (Fig. 52f) (Bell 1958; Suhm and Jelks 1962; Wiseman 1971). Three specimens, while finely flaked and "finished" in appearance (and therefore probably points rather than preforms), are too fragmentary to type. The materials are all varieties of the local off-white, gray, and brownish-gray cherts. Workmanship varies from rather crude to quite skilled, and most examples are intermediate.

The Neff-style Livermore points are not altogether unexpected, given the low-frequency, yet ubiquitous distribution of the style (Wiseman 1971; Kelley 1984; Mera 1938). No. 315, a blade fragment, is provisionally assigned to this type on the basis of its unusually long, slender shape (Fig. 52j). Perhaps the most important aspect of the Tintop Cave finds is that absolute dates are now available for the style.

Manufacturing Tools

Awls. Bone tools are limited to two awl tips from Tintop Cave, one from 6N/3E, S.3, and the other from 5N/0W, S.4 (Fig. 53d; other not shown). Both are made from fragments of large mammal long bones.

Fletching Tool. A single flake has two rather large notches with short projections in the center of each. The projections were made by chipping two contiguous notches and leaving the high point in between them partially intact. The projections, guided by the notches, could be used to make shallow seating grooves for fletching feathers in the proximal ends of arrow (or dart) shafts. The flake has overall measurements of 18 by 22 by 5 mm and weighs 1.7 g. It is made of local gray chert. Both pairs of notches have overall diameters of 10 mm, and both projections are 1 mm long. It was found in Stratum 4 of the North Shelter.

Hammerstones. The 12 hammerstones are spherical to tabular pieces of gray limestone (10), medium gray chert (1), and black igneous rock (1). The largest is 101 by 91 by 48 cm, and the smallest is 63 by 53 by 48 cm. Weights in grams are: 181, 206, 208, 219, 247, 301, 311, 317, 348, 391, 542, and 616 (mean 315.58; S.D. 148.06). The heavily battered edges, angles, and ridges of these tools suggest that they were used primarily for producing and maintaining ground stone artifacts (manos and metates in particular), and perhaps the initial reduction of cores. All came from Tintop Cave, Stratum 4, in 4N/0W (2), 4N/2W (2), 4N/1E (1), 5N/1W (3), 5N/2W (1), 6N/0W (1), 6N/1W (1), and 6N/2W (1).

Scrapers. Only two formal scrapers were recovered from the Sunset Shelters. One, from 4N/1W or 5N/1W, S.4, is a tear-drop-shaped end scraper (Fig. 53i). However, the outline is that of the original flake and is *not* the result of marginal retouching. The material is dark gray-brown chert, and its dimensions are 34 by 18 by 6 mm.

The second scraper is a freshwater mussel valve with the distal edge serrated by incised "ticks" (Fig. 53c). From North Shelter, Test Pit 1, 30 to 50 cm below surface, this fragmentary specimen measures 26 by 26 by 2 mm. Mussel-shell scrapers have been found in a number of Pecos Valley sites, notably the Fox Place (LA 68188) at Roswell. The large collection of these artifacts from that site will provide the basis of a comprehensive description and discussion (report in preparation). Evidently, these scrapers were used for a variety of tasks normally performed by stone scrapers.

Ceremonial, Recreational, or Ornamental Artifacts

Arrow Point. A tiny haftable biface appears to be a reworked projectile point. Its diminutive size (14 by 10 by 3 mm) and especially its dull tip preclude its functioning as an arrow point. Thus, we suggest that it was used to tip a child's arrow. The material is medium gray chalcedonic chert, and it came from Tintop Cave, 6N/1E, Stratum 3.

Finger Ring. Perhaps the most unusual ornament is the fragment of a finger ring recovered from Tintop Cave, 6N/0W, S.4. Made of white, crystalline calcite or aragonite, it originally measured about 15 mm in inside diameter, 13 mm wide, and 2.5 mm thick.

Tubular Bead. A short section of bird long bone was cut and polished at both ends for use as a bead (too fragmentary to illustrate). It measured about 18 by 3 by 3 mm and came from the North Shelter, 3N/0W, S.3/4.

Mussel-Shell Beads/Pendants. Two sections of freshwater mussel shells were ground to irregular oval and rectangular shapes and drilled for suspension (Figs. 53a-53b). No. 193 measures 24 by 16 by 1 mm, and No. 240 is 32 by 22 by 1 mm. Both came from Stratum 4, the level of Hearth 2, in squares 6N/0W and 6N/1E of Tintop Cave.

Miscellaneous Artifacts

Choppers. One and possibly two choppers were recovered from Tintop Cave, Stratum 4. One, from 6N/2W, is a felsic igneous cobble split in half and otherwise unmodified except for the working edge. This edge, 77 mm long, is the unmodified edge created when the cobble split and is heavily battered from use. The chopper is 97 by 72 by 35 mm and weighs 262 g.

The second artifact is a limestone cobble with a bifacially modified edge at one end; the remainder of the cobble is unmodified. The sinuous, bifacial edge lacks evidence of use, thereby raising the possibility that the artifact is a core and not a chopper. The artifact came from 6N/0W, measures 120 by 104 by 58 cm, and weighs 1097 g.

Flakes with Intentional Retouch. Three flakes, all from Tintop Cave, each have one intentionally retouched edge (Figs. 53f-53h).

The edges of two flakes have marginal bifacial retouch. Flake 107 is local gray chert, measures 43 by 49 by 9 mm, has 41 mm of retouch along one edge, and came from Stratum 3; all other edges show minor use-wear. Flake 312 is local gray chert, measures 55 by 33 by 11 mm, has 50 mm of retouch along one edge, and came from Stratum 3. The remaining three edges are naturally blunt.

The third flake (241) has marginal unifacial retouch. It is local gray chert, measures 46 by 24 by 6 mm, has 35 mm of retouch along one edge, and came from Stratum 4. A second edge has limited use-wear.

Flakes with Use-Wear Retouch. Eighty-eight flakes from three of the Sunset Shelters possess evidence of use-wear or very fine intentional retouch (Table 13) in the form of unifacial or bifacial edge damage, notches, or projections. While most of the flakes have only one edge with use-wear, some have two, three, or even four edges displaying use-wear.

The most variable aspect of the used flakes is the length of the use-wear along the edges. Of 70 unifacial edges of all configurations (except notches and projections) from all shelters, the mean length of use-wear is 9.97 mm (S.D. 7.01; range 3-46 mm). The mean length of use-wear on the nine bifacial examples is 12.67 (S.D. 6.93; range 5-29). The dimensions of the seven notches are also variable: diameters are 3 to 8 mm and average 5.29 mm, and depths range 1 to 2 mm with an average of 1.14 mm.

The functions of use-worn debitage are mainly conjectural, but we believe that various cutting and scraping tasks were involved. Given the nature of the "tools" (i.e., the flakes) and the limited evidence for use, the flakes were probably picked up at random, used for the moment, then discarded. It is not clear whether flakes bearing two or more use-wear features were used for a consecutive series of tasks before being discarded or whether they were fortuitously picked up for use on more than one occasion. The low frequency of multiple-feature flakes suggests that the latter situation was the case.

Manufacturing Debris

Bone Tool Blanks. Two pieces of bone were partially worked into artifact shapes but never completed (not shown). One, from Tintop Cave, 4N/1W, S.4, is an awl blank or a broken awl partially reworked to a new form. One lateral edge of this split deer metatarsal and the tip have been roughly flaked to shape but not finished to a point. The other lateral edge lacks flaking but retains a luster reminiscent of use-polish (a shine derived from human skin oil). The artifact measures 103 by 19 by 13 mm.

The second piece of bone is a tabletlike section of a large mammal long bone shaft (Fig. 53e). A piece of the bone was split off and roughly shaped into a rectangle, and two flakes were struck from the rounded exterior surface by percussion. The result is reminiscent of fluting on Folsom points. This item measures 49 by 18 by 5 mm and came from Tintop Cave, 4N/1W, S.4. The final form and function are unknown.

Table 13. Distribution of use-worn flakes, Sunset Shelters

Type	Tintop Cave		North Shelter		South Shelter		Totals	
	N	%	N	%	N	%	N	%
Number of Flakes by Type								
One-edge flakes	40	78	6	86	5	71	51	78
Two-edge flakes	10	20	-	-	2	29	12	18
Three-edge flakes	1	2	-	-	-	-	1	2
Four-edge flakes	-	-	1	14	-	-	1	2
Total flakes	51	100	7	100	7	100	65	10
Number of Edges by Type								
Unifacial Wear:	56	82	8	80	7	70	71	81
Straight edge	22	-	3	-	4	-	-	-
Convex edge	22	-	3	-	4	-	-	
Concave edge	6	-	2	-	1	-	-	-
Sinuous edge	1	-	-	-	-	-	-	-
Serrated edge	4	-	-	-	-	-	-	-
Irregular edge	10	-	2	-	1	-	-	-
Bifacial Wear:	6	9	1	10	2	20	9	10
Straight edge	4	-	1	-	2	-	-	-
Convex edge	1	-	-	-	-	-	1	-
Irregular edge	1	-	-	-	-	-	1	-
Notch	6	9	-	-	1	10	7	8
Projection	-	-	1	10	-	-	1	1
Total Edges	68	100	10	100	10	100	88	100

Bifaces. Five bifaces may be early-stage projectile point preforms, "knives," or some other tool (Figs. 54f-54i). Shapes range from oval to subtriangular to diamond. Size variation is large, though the largest specimens are broken. Widths range from 25 to 36 mm. Thicknesses are more variable and range from 7 to 13 mm. Materials include light gray, dark gray, dark gray-brown, and light to dark gray cherts. The bifaces came from Tintop Cave, 4N/1W, S.4; 6N/1W, S.4; 6N/2W, S.3; and 4N/0W, S.4; and North Cave, Test Pit 1, 50 to 60 cm below surface (Biface X-7).

Projectile Point Preforms. Six small bifaces are probably projectile point preforms broken during manufacture (Figs. 54a-54e). Shapes range from elongate triangular (5) to oval (1); cross

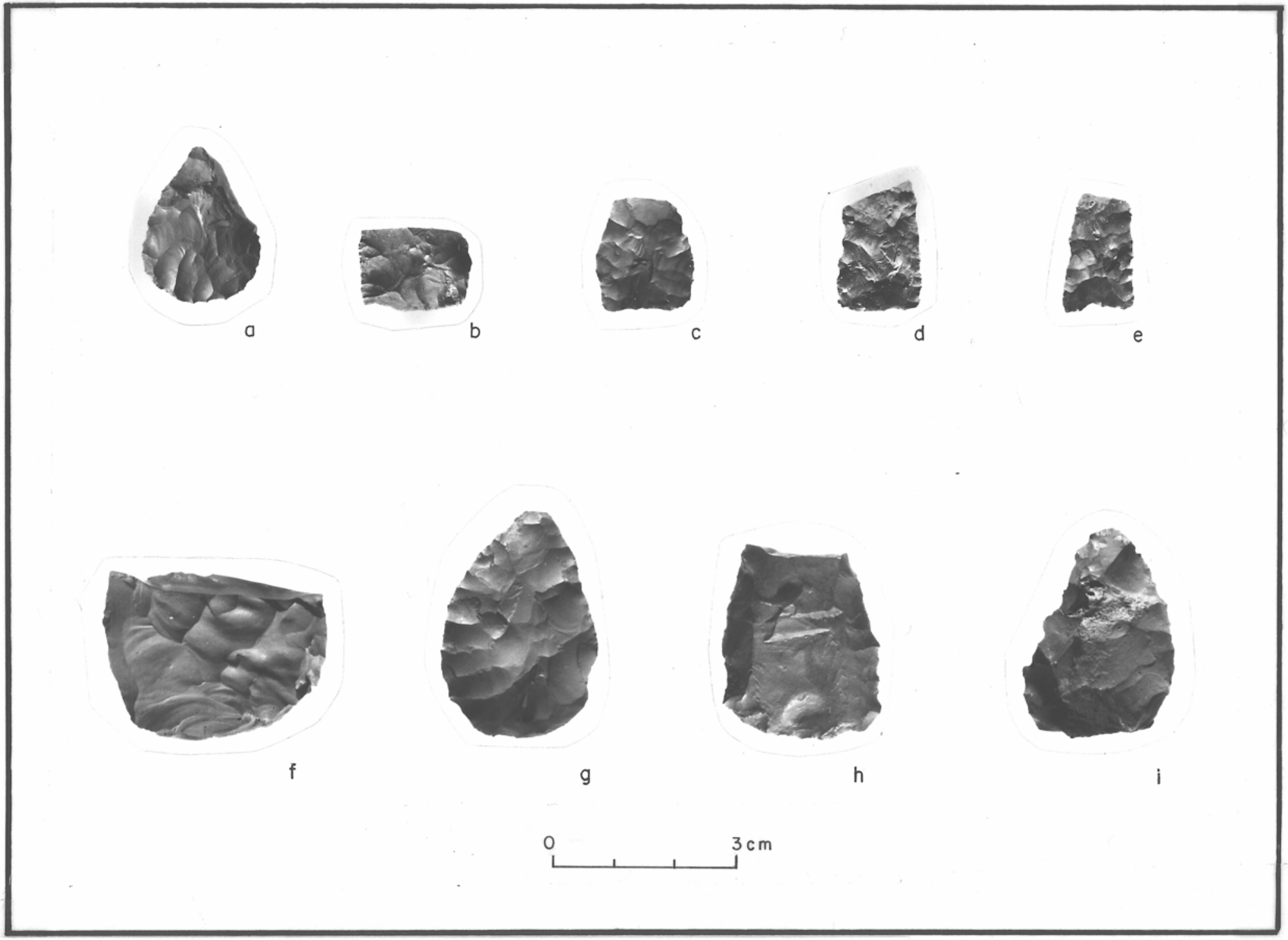

Figure 54. Projectile point preforms (a-e) and bifaces (f-j) from the Sunset Shelters.

sections are lenticular. Basal width ranges from 12 to 20 mm (mean 16.33), and thickness, with one exception, is 3-4 mm. Materials include various shades of brownish-gray chert (5) and light gray chert (1). The preforms came from Tintop Cave, 6N1W, S.4; 5N/0W, S.4; 6N/2E, S.3; 6N/2E, S.3; and 6N/2E, S.3; and the South Shelter, 5N/0W, S.2.

Chipped Stone Debitage. Chipped stone debitage, the waste generated during the manufacture of projectile points and other tools, includes cores, flakes, shatter, and pieces of material (Table 14). The raw materials and definitions used to classify and analyze chipped lithic debris are described in Appendix 5. The cores, core reduction flakes, biface thinning flakes, and exotic materials are described in detail below. Pieces of debitage bearing use wear or intentional retouch are described in the section on tools.

Tintop Cave. A total of 339 pieces of lithic debitage was recovered from Tintop Cave. The initial analysis of the two largest flake classes--complete core reduction flakes and biface thinning flakes--subdivided the flakes according to horizontal proveniences (west and east) and four vertical proveniences. Since no significant differences could be detected among these subsets, all flakes were pooled and analyzed. The sample of cores from the cave was too small, and these are likewise analyzed as a single sample.

The 25 cores include four types (Table 15), but only the two-platforms-adjacent and two-platforms-parallel types are relatively common (Table 16). They were present in all four proveniences of Tintop. The cores are generally small and are mostly made of local gray cherts (Table 17). Up to 36 percent of the cores were heat treated.

The core reduction flakes from Tintop Cave include complete and fragmentary specimens (Table 17). Summary statistics of the dimensions of the complete core reduction flakes (Table 18) show that they are fairly short (mean length of 22 mm), about as wide as they are long, and rather thick. A Pearson Correlation matrix (one-tailed) (Table 18) indicates that flake length, width, and thickness are correlated at the .001 level of significance, though the actual values are somewhat low (range = .6645 to .7546). Overall, the latest prehistoric occupants of Tintop Cave were not successful in obtaining long, narrow, thin flakes.

Other characteristics of the core reduction flakes from the Tintop Cave are as follows (Table 19). Local gray cherts (71 percent) and gray to brown limestones (up to 22 percent) comprise the majority of the materials. Single-flake-scar platforms are the most common (57 percent), closely followed by multiple-flake-scar, cortex, and pseudodihedral platforms. The incidence of hinged and stepped flakes is high (42 percent). Up to 18 percent of the core reduction flakes were heat treated.

The cortex profile indicates that the full core reduction sequence--decortication through production of usable flakes--is represented in the assemblage. That is, cortex categories 0 (0 percent cortex) through 7 (100 percent cortex) are represented in the assemblage. Moreover, category-0 flakes are in the clear majority, indicating that cores were reduced more or less completely, resulting in large quantities of interior flakes compared to the expectably fewer decortication flakes.

Table 14. Summary of chipped stone debitage classes, Sunset Shelters

Type	Tintop Cave	North Shelter	South Shelter	North Cave	Site Total		Class Total
	N	N	N	N	N	%	%
Cores:							
Single-platform	3	3	-	-	6	20	
Two-platform-adjacent	8	1	-	-	9	30	
Two-platform-parallel	7	1	-	-	8	27	
Three-platform	4	-	-	-	4	13	
Four-platform	-	-	-	-	-	-	
Indeterminate	1	-	-	-	3	10	
Core total	25	5	-	-	30	100	7
Flakes:							
Decortication	2	-	-	-	2	<1	
Platform preparation	-	-	-	-	-	-	
Core reduction	283	30	33	2	348	90	
Platform Rejuvenation:							
From top	-	-	-	-	-	-	
From side	-	-	-	-	-	-	
Biface thinning	22	6	3	-	31	8	
Biface notching	-	-	-	-	-	-	
Hammerstone	-	-	-	-	-	-	
Potlid	-	-	-	-	-	-	
Indeterminate	5	1	-	-	6	2	
Flake total	312	37	36	2	387	100	92
Shatter	1	1	-	-	2	100	<1
Pieces of material	1	-	1	-	2	100	<1
Total debitage	339	43	37	2	421	-	99+

Table 15. Summary of complete cores, Tintop Cave

	Length	Width	Thickness	Weight
A. Single-platform Cores				
N	3	3	3	3
Mean	46.67	38.33	16.67	37.57
Range	37-64	25-52	12-21	14.3-82.7
B. Two-platforms-adjacent Cores				
N	8	8	8	8
Mean	42.38	37.25	21.75	91.53
Range	23-78	19-76	9-54	3.7-424.1
C. Two-platforms-parallel Cores				
N	7	7	7	7
Mean	41.14	29.14	14.71	36.01
Range	31-60	19-50	7-45	6.4-189.9
D. All Other Cores				
N	7	7	7	7
Mean	37.29	27.57	13.57	22.17
Range	24-53	14-39	3-38	1.8-101.8

Table 16. Summary of certain debitage classes, Tintop Cave

	Cores		Core Reduction		Biface Thinning Flakes		Other Flakes		Shatter and Other		Site Totals	
	N	%	N	%	N	%	N	%	N	%	N	%
Materials:												
Gray chert	19	76	200	71	20	91	2	29	2	100	241	72
Other cherts	-	-	4	1	-	-	-	-	-	-	4	1
Chalcedony	-	-	7	3	2	9	4	57	-	-	13	4
Limestones												
Siltstone/Quartzite	-	-	9	3	-	-	-	-	-	-	9	3
Other	6	24	63	22	-	-	1	14	-	-	70	21
Totals	25	100	283	100	22	100	7	100	2	100	337	101
Heat Treatment:												

None	16	64	232	82	12	55	7	100	1	50	267	79
Yes	4	16	32	11	7	32	-	-	1	50	43	13
Possibly	5	20	19	7	3	14	-	-	-	-	27	8
Totals	25	100	283	100	22	101	7	100	2	100	337	100

Table 17. Summary of core reduction flakes, Tintop Cave

Type	N	%
Complete flakes	189	67
Fragments:		
Proximals	38	13
Distals	28	10
Medials	11	4
Laterals	7	2
Indeterminate	10	4
Total flakes	283	100

Table 18. Complete core reduction flakes, Tintop Cave

Descriptive Statistics				
	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
N	189	189	189	189
Mean	21.72	21.92	5.35	7.05
S.D.	9.02	8.30	2.66	51.83
Range	8-56	8-58	1-15	0.2-705.0
Correlation Matrix of Dimensions				
	Length	Width	Thickness	Weight
Length	1.0000			
Width	.6653	1.0000		
Thickness	.6654	.7546	1.0000	
Weight	.1925	.0830	.1750	1.0000

Table 19. Summary of core reduction flakes from three localities, Sunset Shelters

	Tintop Cave		North Shelter		South Shelter	
	N	%	N	%	N	%
Materials:						
Local gray cherts	200	71	26	87	31	94
Other cherts	4	1	-	-	-	-
Local chalcedonies	7	3	-	-	-	-
Siltites and quartzites	9	3	-	-	-	-
Other materials	63	22	4	13	2	6
Materials totals	283	100	30	100	33	100
Platform Types:						
Cortex	51	23	5	25	3	14
Single-flake-scar	57	25	5	25	6	27
Multiplle-flake-scar	56	25	8	40	11	50
Pseudodihedral	50	22	2	10	2	9
Edge or ridge	10	5	-	-	-	-
Platform totals	224	100	20	100	22	100
Distal Termination Types:						
Feathered	100	44	10	67	14	82
Modified-feathered	33	14	2	13	1	6
Hinged and stepped	95	42	3	20	2	12
Termination totals	228	100	15	100	17	100
Cortex:						
0%	105	48	8	57	7	54
1-10%	49	22	1	7	2	15
11-25%	31	14	1	7	1	8
26-50%	16	7	1	7	1	8
51-75%	7	3	1	7	-	-
76-90%	5	2	1	7	-	-
91-99%	4	2	1	7	-	-
100%	3	1	-	-	2	15
Cortex totals	220	99	14	99	13	100

Heat Treatment:						
None	232	82	18	60	27	82
Yes	32	11	7	23	4	12
Possibly	19	7	5	17	2	6
Heat treatment totals	283	100	30	100	33	100

Table 20. Summary of complete biface thinning flakes, Tintop Cave

	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
A. All Biface Thinning Flakes				
N	16	16	16	16
Mean	14.19	11.31	1.69	0.38
S.D.	5.90	4.24	0.70	0.31
Range	9-28	7-19	1-3	0.1-1.2
B. Sample of Biface Thinning Flakes				
N	15	15	15	15
Mean	13.53	9.80	1.60	0.33
S.D.	5.48	3.23	0.63	0.24
Range	9-28	7-9	1-3	0.1-0.9

The 22 biface thinning flakes came from Strata 3 (3) and 4 (19). Half (10) of those from Stratum 4 came from depths exceeding 135 cm, the depth of the lowest fire area. A statistical summary of the 16 complete flakes shows that they are longer than they are wide (Table 20a). Elimination of an unduly heavy flake accentuates the length:width ratio (Table 20b). Fully 91 percent are local gray chert, and up to 45 percent are heat treated (Table 16).

The single piece of shatter is gray chert, measures 19 by 5 by 4 mm, weighs 0.8 g, and came from Stratum 2.

The one piece of material is gray chert, measures 42 by 22 by 11 mm, weighs 6.1 g, and came from Stratum 4.

One core, 51 core reduction flakes, 1 biface thinning flake, and 1 indeterminate flake have use-wear and are described in the tool artifact section.

Exotic raw materials recovered from Tintop Cave include one flake of clear black obsidian and one flake of Alibates material (purple variety). Both are core reduction flakes from Stratum 4.

North Shelter. A total of 43 pieces of lithic debitage were recovered from the North Shelter, most from Strata 3 and 4 (Table 14). Given the small sample sizes per stratum, the items are pooled by class for descriptive and discussion purposes.

All but one of the five cores also came from Strata 3 and 4; the exception was from Stratum 1. Three have single striking platforms, one has two platforms parallel, and the last has two platforms adjacent. Three are complete and range in size from 32 by 20 by 12 cm (8.4 g) to 47 by 37 by 9 cm (14.1 g). All are of local gray chert and are either possibly (2) or definitely (3) heat treated.

Fourteen of the 30 core reduction flakes are complete. The fragmentary specimens include seven proximals, two distals, five medials, and two small or indeterminate fragments. Summary statistics of the dimensions of the complete core reduction flakes (Table 21) show that they are nearly as wide as they are long. Overall, the knappers who occupied the South Shelter were not successful in obtaining long, narrow, thin flakes.

Table 21. Summary of core reduction flakes, North Shelter

	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
N	14	14	14	14
Mean	22.50	22.29	4.93	2.89
S.D.	5.32	6.52	3.00	3.77
Range	17-34	14-36	2-13	0.5-15.3

Table 22. Summary of core reduction flakes, South Shelter

	Length (mm)	Width (mm)	Thickness (mm)		Weight (g)
N	13	13	13	12	13
Mean	23.69	21.92	7.54	6.17	3.12
S.D.	8.12	5.92	5.78	3.13	3.27
Range	11-36	11-30	3-24	3-14	0.6-12.3

Other characteristics of the North Shelter core reduction flakes are summarized in Table 14. Only local materials are represented, and 87 percent are gray cherts. Multiple-flake-scar platforms are the most common (27 percent), followed by cortex and single-flake-scar platforms (each 17 percent). The incidence of hinged and stepped flakes is relatively low (10 percent). The cortex profile indicates that the full core reduction sequence (decortication through production of usable flakes) is present. Up to 40 percent of the core reduction flakes were heat treated.

The six biface thinning flakes came from Strata 3 (1), 3/4 (4), and 8 (1). The complete example measures 19 by 17 by 2 mm and weighs 0.7 g. Five are local gray chert, and one is medium gray-brown chalcedony. Four flakes from the deepest proveniences are heat treated.

The one piece of shatter is local gray chert, measures 20 by 13 by 7 mm, and weighs 2.0 g.

Six core reduction flakes, one biface thinning flake, and one core have use-wear and are described in the formal artifact section.

No exotic raw materials were recovered from the North Shelter.

South Shelter. A total of 37 pieces of lithic debitage were recovered from the South Shelter: 9 from Stratum 1 and 28 from Stratum 2 (Table 14). Given the small sample sizes per stratum, all items are pooled by class for descriptive and discussion purposes. No cores were recovered from the South Shelter.

Thirteen of the 33 core reduction flakes are complete. The fragmentary specimens include 10 proximals, 2 distals, 2 medials, and 6 small or indeterminate fragments. Summary statistics of the dimensions of the complete core reduction flakes (Table 22) show that they are generally a little longer than wide. Although the thickness data suggest that the flakes are fairly thick, the statistics are strongly skewed by an outlier at 24 mm; all other flakes fall within the range of 3 to 14 mm. Overall, the knappers who occupied the South Shelter were not particularly successful in obtaining long, narrow, thin flakes.

Other characteristics of the South Shelter core reduction flakes are summarized in Table 14. Only local materials are represented, and 94 percent are gray cherts. Multiple-flake-scar platforms are the most common (33 percent), followed by single-flake-scar platforms (18 percent). The incidence of hinged and stepped flakes is low (6 percent). The cortex profile indicates that the full core reduction sequence (decortication through production of usable flakes) is present even though no cores were recovered. Evidently, heat treating was done sparingly.

The three biface thinning flakes, all from Stratum 2, are fragmentary and of local gray chert. None is heat treated.

The one piece of material is of local gray chert, measures 43 by 26 by 12 mm, and weighs 11.5 g.

Seven flakes have use-wear and are described and discussed in the formal artifact section.

No exotic raw materials were recovered from the South Shelter.

North Cave. Two core reduction flakes and no other pieces of lithic debitage were recovered from North Cave (Table 14). Both are heat-treated gray chert and have pseudodihedral platforms and hinged distal terminations. They came from Stratum 3. The complete flake measures 15 by 9 by 3 mm, weighs 0.3 g, and has 90 to 99 percent dorsal cortex. The broken flake is a proximal portion. Neither is use-worn.

No exotic raw materials were recovered from the North Cave.

Pottery

Pottery was recovered from the Sunset Shelters, most of it (N = 874, or 92 percent) from Tintop Cave. No pottery was recovered from the Sunset Archaic site.

The 950 potsherds are dominated by plain brownwares, followed by various types of Three Rivers ware, Chupadero Black-on-white, El Paso Polychrome, northern Mexican types, and miscellaneous pottery types (Table 23).

Plain Brown Wares. The plain brown sherds presented a greater problem in classification than anticipated. Up until recently, the writer believed that, in spite of the chaos in the literature, certain previously described pottery types in the Sierra Blanca country were, and perhaps still are, reasonably well founded. Types in this category include Jornada Brown, El Paso Brown, and South Pecos Brown. The Picacho project material, however, adds a new twist to the situation, requiring a somewhat different approach to the analysis.

The problems revolve around the fact that the pottery attributes do not co-occur as they need to in order to make the assumptions behind the notion of pottery types valid. Rather than a simple hodgepodge of traits, the Picacho pottery mixes or matches paste types with surface treatments. The problem can be illustrated with two types common to Southeastern New Mexico: Jornada Brown and South Pecos Brown. The descriptions that follow are based primarily on the writer's experience and conceptions of what good examples look like.

Jornada Brown has fairly well- to well-polished surfaces that have been floated to a smoothness which completely covers the temper grains. Sometimes the polishing luster is lost because of clay shrinkage, but the smoothness of the surface or the streaks left by the polishing stone attest to the diligence of the work. The fine-grained paste contains a profusion of small, more or less equally sized grains of crushed rock temper, though occasional large grains which somehow escaped grinding are also seen. Variously altered rocks high in white, off-white, and hematite stained (orangish to reddish), angular (well-formed) to rounded (poorly formed, eroded, or highly altered) feldspar crystals are typical. Vessel walls are generally thick (6-8 mm). Jornada sherds tend to have simple geometric outlines because of constraints imposed by the thickness, and they tend to remain intact (i.e., they thwart erosion more than El Paso Brown) because of the polishing. Thickness, surface finish (float and polish), and sherd shape facilitate rapid initial identification.

Table 23. Summary of pottery, Sunset Shelters

	North Shelter	North Cave	South Shelter	Tintop Cave	
	N	N	N	N	%
Chupadero Black-on-white:					
Jar	-	-	2	62	7.1
Bowl	-	-	1	21	2.4
El Paso Polychrome	-	-	-	24	2.8
Victoria/Anchondo Red-on-brown	-	-	-	2	0.2
Babicora Polychrome	-	-	-	9	1.0
Three Rivers Red-on-terracotta	-	-	3	56	6.4
San Andres Red-on-terracotta	-	-	-	15	1.7
Broad-line Red-on-terracotta	-	1	-	12	1.4
Red-slipped Brown	5	-	-	37	4.2
Three Rivers ware	-	-	-	45	5.2
Jornada Brown and Thin Jornada Brown	42	4	1	265	30.3
South Pecos Brown and South Pecos-like Brown	4	2	4	245	28.0
El Paso Brown	1	3	1	55	6.3
Playas Incised	-	-	-	1	0.1
Jornada Corrugated	-	-	-	5	0.6
McKenzie Brown	-	-	-	3	0.3
Unidentified brown	2	-	-	17	2.0
Totals	54	10	12	874	100.0

South Pecos Brown, on the other hand, has fairly well smoothed and at least partially floated surfaces. However, the largest temper grains frequently show through the surface, are usually slightly elevated, and are surrounded by radial cracks because of clay shrinkage during firing. A streaky polish is normal, though polishing may be absent altogether. The paste in cross section has a blocky to platy appearance, probably because of the shapes and sizes of temper particles. The temper is usually crushed igneous rock containing gray feldspar as the common or the predominant mineral. Temper grains (other than dust from the grinding process) are on the order of three to five times larger and much fewer in number than the average grains in Jornada. When a South Pecos sherd is broken, many of the temper grains fall out, leaving comparatively large, rectangular voids and a ragged fracture to the edges. Sherd shapes can be as geometrically simple as Jornada, but they are usually much more irregular.

A large number of the Picacho project sherds possess different combinations of the Jornada and South Pecos traits. The most frequent combination is Jornada surfaces with South Pecos pastes and tempers. That is, the surfaces are well smoothed (floated, completely hiding the temper grains) and well polished. In other instances, otherwise typical Jornada and South Pecos sherds lack a diagnostic trait. A common example is the Jornada sherd with surfaces that were never polished (i.e., not surfaces which lost their luster because of clay shrinkage). Another example is the El Paso Brown sherd with South Pecos temper.

In the final analysis, all sherds were assigned to named types using paste and temper characteristics as the initial determinant of membership. Other attributes of many sherds may differ from those normally associated with the particular pottery type. These exceptions are noted on the analysis sheets as "El Paso-like," meaning all other attributes such as surface colors and finish are typical of El Paso.

In the descriptions to follow, common deviations are noted for each type, and the important ones are tabulated. Only those types which are herein used with modification are discussed. Those not discussed can be considered typical of the established types. The reader should keep in mind the fact that these comments pertain to the Sunset Shelters pottery and not necessarily to pottery from other sites.

Jornada Brown and Thin Jornada Brown. The difference between Jornada and Thin Jornada is simply the thickness of the vessel walls. The cutoff point of 5.5 mm is purely arbitrary and was monitored because classic Jornada is normally thought of as a thick pottery. Thicknesses of both groups together range from 3.5 to 9.0 mm, with 90+ percent ranging from 4.5 to 6.5 mm. Otherwise, the pottery in the two groups is identical and clearly part of the same type.

The temper most readily identified with Jornada Brown in this study is a variety in which the grains are profuse, very small, and of equal size. Occasionally, a larger grain is seen. Minerologically, they appear to be mostly rounded crystals of feldspar and perhaps quartz and either lack or have only trace amounts of mafic minerals. This temper criterion is more restricted than normal, but it seems justified because it is readily recognizable. Other temper types were occasionally included under Jornada primarily because of the size and profusion criteria. The minerology of these examples is a general suite from the Sierra Blanca country and is shared to some extent by many of the other pottery types.

Minor deviations from the established descriptions include sherds with a carbon streak and crushed rock temper that create an El Paso-like appearance. The carbon streak is especially striking when combined with reddish-orange interior and exterior surfaces colors. The crushed rock temper appears to be mainly white and colorless feldspar, sometimes with rounded, clear quartz grains. The main difference between these sherds and true El Paso Brown is that the temper grains are generally small, of equal size, and profuse. Large grains of crystalline mass are rare. It also should be noted, however, that rare sherds possess temper grain sizes between those of Jornada and South Pecos, making type assignment arbitrary in some instances.

Surface finish varies widely. Most sherds are fairly well polished to well polished both inside and out. Both surfaces of one sherd are not always equal in degree of polish. A number of sherds (10-15 percent) have very streaky polishes (less than 50 percent of surface is polished). Also, most of the sherds typed as Jornada and thin Jornada were well floated prior to polishing. The few sherds lacking the good float have temper grains showing on the surfaces.

A major point of confusion in attempting to distinguish between Jornada and El Paso sherds is the matter of polishing streaks and a seemingly matte (nonshiny) finish. In these instances (about 15 percent), the clay shrank sufficiently during drying or firing or both, destroying the luster but leaving the marks of the polishing stone very much in evidence. The writer considers this effect to be typical of El Paso, especially of El Paso Polychrome, and the matter becomes critical when it co-occurs with temper that may or may not be Jornada (i.e., the crushed crystalline rock described above).

Curiously, rim sherds other than small, undiagnostic pieces are rare in the Sunset Shelters pottery assemblage. Only one rim sherd of thin Jornada is present, and it belongs to a jar with a short neck (13 mm), a moderately flared rim, and a rounded lip.

<u>South Pecos Brown and South Pecos-like Brown</u>. The difference between South Pecos and South Pecos-like is that the former has moderate to dominant quantities of Sierra Blanca gray feldspar temper, and the latter has none. All of the temper in South Pecos-like is off-white and/or derived from hematite-stained feldspars and similar rocks from the Sierra Blanca region. Otherwise, the various attributes and ranges of attributes of the two are the same. The reason for making the distinction in the first place is that in the Roswell area, for instance, sherds fitting the description of South Pecos Brown nearly always have the gray feldspar temper.

The segregation of the South Pecos and South Pecos-like sherds from many of those typed as Jornada Brown, and to a lesser extent those typed as El Paso Brown, is based mostly on the nature of the temper and its effect on the appearance of the clay body. That is, the coarser grind and smaller number of temper grains in the South Pecos are characteristic. However, the South Pecos from the Sunset Shelters differs from the classic description (Jelinek 1967) in that almost none of the sherds have the characteristic surface finish. The clays rarely shrank enough during firing to leave the larger temper grains protruding through the surface and cracks radiating outward across the clay. In fact, most of the sherds are so well floated and in many cases so well polished that, except for temper type and sparsity, the sherds are difficult to distinguish from Jornada Brown.

A small percentage of sherds assigned to South Pecos and South Pecos-like have remnant scrape marks on the interior surfaces. They were incompletely obliterated by the smoothing and polishing process. They are reminiscent of El Paso Brown and, accordingly, cause some confusion in the classification process.

Virtually all of the diagnostic rim sherds in the Sunset Shelters pottery assemblage belong to these groups. The two general types of jar rims are a medium length neck (23-26 mm), slightly flared rim, and rounded to slightly flattened lip; and a short neck and rim characteristics like those of Jornada Brown. The one bowl rim is slightly tapered with a rounded lip.

El Paso Brown. Sherds belonging to this type are probably more common in the assemblage than the tables indicate. As with the Jornada and South Pecos types, there are several points of confusion among the three types because the sherds do not neatly segregate according to the established criteria.

Also, an unknown number of the sherds typed as El Paso Brown may actually belong to polychrome vessels. However, if no polychrome sherds were found in the provenience, these sherds were typed as brown ware.

Playas Incised. The one sherd of Playas Incised has a single, deeply incised line and temper typical of the general Sierra Blanca country. Off-white feldspar is dominant, perhaps with minor quartz and occasional mafic minerals.

The Jornada Corrugated sherds have the temper described above for Jornada Brown. The grains are profuse, very small, of equal size, and rounded or angular. The coils have variable widths (3-6 mm), both within the same coil and in adjacent coils. The indentations, made with the fingers, are moderately deep (2 mm). Their placement is not patterned. The indentations of most of the sherds were not smeared or polished, but a couple were lightly and inconsistently treated in this manner.

Chupadero Black-on-white. For the most part, the sherds of Chupadero Black-on-white appear to be local to the Sierra Blanca country. That is, the dominant tempering material is moderately to coarsely ground sherd (Kelley 1979:121-130), crushed alaskite, or a combination of the two.

Several sherds are profusely tempered with very finely crushed sherd that is partially or totally vitrified. These sherds may derive from Pueblo Colorado in central New Mexico (Hayes 1981:70; Kelley 1979:128). The latter sherds are all jar sherds and come from Level 4 (75-95 cm), 6N/2E; Level 5 (95-115 cm), 5N/3E; Level 6 (115-135 cm), 4N/0W; and Level 8 (155-175 cm), 4N/2E, all from Tintop Cave.

One jar sherd from Level 6 (115-135 cm), 4N/0W, at Tintop Cave has sparse sherd and "caliche" temper and other paste characteristics reminiscent of Chupadero made at or very near Gran Quivira (Hayes et al. 1981:179ff.). The absence of clay pellets, however, makes this identification doubtful.

The quantity of clay contained in the "average" jar and bowl of Chupadero is unknown. However, experience suggests that the average Chupadero jar has two to three times the amount of clay as the average bowl. Thus, the 62 jar sherds and 21 bowl sherds from Tintop Cave suggest that jars and bowls are approximately equally represented in the assemblage.

El Paso Polychrome. This type is sparsely represented in the deposits. The configuration of the only jar rim recovered is uncertain. The degree of swelling of the lip is transitional between the early and the late forms defined by Whalen (1981).

Victoria/Anchondo Red-on-brown. Two sherds belong to the same jar. Assignment to one or the other type is not possible. The paste and surface colors are appropriate for Victoria, but the surface is well polished, like Anchondo. The absence of texturing is inconsequential since, on Victoria, texturing is in the rim area, not the body (DiPeso et al. 1974).

Babicora Polychrome. The nine sherds attributed to this type all belong to the same jar. The designs correspond best to the Paquime variety (DiPeso et al. 1974).

Three Rivers Red-on-terracotta. Most of these sherds conform well with the established descriptions. Quite a few are misfired and various shades of gray or brown. A small number would be classified by Jelinek (1967) as red line variants of one or more brown types, but this course was not taken here because misfiring is so common in the assemblage.

Broad-line Red-on-terracotta. These sherds possess simple red line decoration on light orange to brown surfaces. The lines are from 9 to 17 millimeters wide. Pastes and tempers were not systematically monitored, but it is apparent that most or all of the sherds checked are from vessels made in the greater Sierra Blanca region. Other than a single jar sherd from Level 7, 4N/1E, Tintop Cave, all sherds are from bowls. This style of pottery presumably is antecedent to, and in part coeval with, the San Andres and Three Rivers types.

Red-slipped Brown. These sherds from Tintop Cave and the North Shelter are either thinly or thickly slipped with fine red clays. As a group, they are very striking and distinctive from most red-slipped browns. Most of the pottery was produced in the greater Sierra Blanca region, but four sherds represent vessels that may have been imported from the west.

The pastes and tempers of all but the four possible imports are familiar and can be categorized into three groups. The best represented group is the Jornada paste, with its profuse, fine, equal-sized grains (N = 26). The majority of these are tempered with alaskite (N = 15); the rest have a mixture of alaskite and gray feldspar or some other Sierra Blanca temper (mainly white to off-white feldspars with few, if any, other minerals).

The second most numerous group is the South Pecos paste, with its relatively large-grained, sparse temper (N = 10). Eight of these have gray feldspar as the only or the dominant mineral; the other two have off-white feldspars, perhaps a grain or two of gray feldspar, and few, if any, other minerals. The third recognizable group is a series of tempers that probably come from the Sierra Blanca country (N = 2). The four sherds that probably represent imports have what appears to be crushed rock of extrusive igneous origin. One or more may be welded tuff from southwestern New Mexico, but this is not certain.

Paste colors vary greatly. Some are a single color throughout, but many have two or three colors in distinct zones. The zonation is caused in some by a carbon streak and in others by differences in oxidation and reduction during firing. Colors include light brown to very dark brown and gray brown, medium to dark gray, gray-orange, and grayish or brownish red-orange.

The degree of smoothing, slipping, and polishing varies widely, but most sherds are well slipped and finished like brown wares from the Sierra Blanca. Slips were applied to all bowl interiors, two bowl exteriors, and jar exteriors. The slipped surfaces are generally well smoothed and fairly even (i.e., they have few, if any, small depressions). All but half a dozen sherds are thickly slipped and well polished. The half dozen exceptions are thinly, streakily slipped and are more typical of red-slipped (or "washed") brownware sherds in the Sierra Blanca country. The slips are restricted in hue and chroma; the most common is weak red (Munsell 10R 4/4). The full range includes another version of weak red and red (10R 4/3 and 4/6), reddish-brown (2.5YR 4/4), and reddish-gray (5YR 5/2). The latter two are represented by one sherd each.

The surface finish on bowl exteriors is surprisingly variable and appears to bear no relationship to the degree of finish on the interiors. As mentioned above, two bowl sherds have smoothed, slipped, and polished exteriors. Other variations include smoothed and polished but not slipped; polished but poorly smoothed and unslipped; and scraped or otherwise rough and unslipped. However, none, including the possible imports, have the dimpling so characteristic of San Francisco Red.

The colors of unslipped surfaces vary considerably. Aside from the two bowl exteriors which were slipped red, the colors include light brown, dark brown, dark gray-brown, light orange, and reddish-orange. Fire clouds are common and lend more variation to the coloring of the exteriors.

All but two of the sherds are from bowls. The two exceptions are jar sherds with tempers suggestive of western origins. Both are from Tintop Cave, one from Level 5 (100-115 cm) of 6N/0W, and the other from Level 6 (115-135) of 3N/3E. None of the sherds are large enough to reveal details about vessel form beyond basic types.

Several comments about the red-slipped pottery are in order. At first it was thought that the red-slipped sherds from Picacho could be San Francisco Red from southwestern New Mexico. Examination of the pastes and tempers indicate that all but four were locally made. It is not surprising that several different local paste types are involved, for Jelinek (1967) found red-washed/red-slipped varieties of all of his paste types along the middle Pecos River. The important point is that the Picacho sherds show a degree of slipping and polishing not common to red-washed and red-slipped brownwares in the Sierra Blanca region. They introduce questions about the relationship, if any, to San Francisco Red of the western Mogollon.

One of the more recent studies from the Mimbres area divides the red-slipped pottery into two groups, San Francisco Red and Miscellaneous Red (Anyon and LeBlanc 1984:151-158). The San Francisco Red has a highly polished, deep red slip (orange red to maroon) on bowl interiors and jar exteriors. Bowl exteriors are either unslipped or perfunctorily slipped in red over a shallowly indented (dimpled) surface. Miscellaneous Red pottery has a thin red slip or wash, is poorly polished, and lacks the dimpling on bowl exteriors. Both types were made during the early phases (Georgetown through Three Circle, or A.D. 550 to about 1000), but their frequency, individually and together, diminishes through time. In the earliest phases, San Francisco is dominant, but later, the relative abundance reverses in favor of Miscellaneous Red.

Closer to the Sierra Blanca region, a red-slipped pottery from certain Mesilla Valley (Rio Grande) sites has been identified as San Francisco Red. O'Laughlin (1985:58) describes this pottery as having a red to maroon slip and a perfunctory to lustrous polish. Bowl exteriors may or may not be dimpled. He recognizes a regular variant (my term) and a coarsened variant, though he does not know whether they were imported or made locally or both.

Clearly, the red-slipped pottery from the Sunset Shelters is essentially the same as that described for the Galaz Ruin and the Mesilla Valley. This, in combination with the plain brown pottery (Jornada Brown, South Pecos Brown, etc.), serves to underscore the overall similarities in pottery trends between the two regions as initially propounded by Mera (1943). However, the virtual duplication of San Francisco Red and Miscellaneous Red at the Sunset Shelters suggests that more than simple copying was going on.

Notes on the Ceramic Assemblages

Several aspects of the assemblages are noteworthy (Table 23). The assemblages from the North Shelter and the North Cave are very similar in their dominance of plain brown pottery and virtual absence of decorated types. Although sample size could be affecting the presence/absence of painted pottery in the North Cave assemblage, this is not the case with the North Shelter assemblage. The fact that the decorated sherds are broad-line red-on-terracotta and red-slipped brown suggests that the two assemblages are early.

The assemblages from the South Shelter and Tintop Cave are also dominated by plain brown types, but painted types are fairly common. Among the latter, the numerically most important are Chupadero Black-on-white and Three Rivers Red-on-terracotta. These are followed by red-slipped brown and El Paso Polychrome. Especially noteworthy is the fact that the Three Rivers group--Three Rivers Red-on-terracotta, San Andres Red-on-terracotta, Broad-line Red-on-terracotta, and red-slipped brown--are all common and generally co-occur throughout the deposits, indicating contemporaneity. The absence of later types such as St. Johns Polychrome, Heshotauthla Polychrome, Lincoln Black-on-red, and the Rio Grande glazes indicates that these assemblages are not among the latest in the Sierra Blanca region.

The general absence of intrusive types, as mentioned above, is believed to be a temporal phenomenon. The two vessels from northern Mexico--Victoria or Anchondo Red-on-Brown and Babicora Polychrome--are intriguing because the site is so small. Pottery from northern Mexico is a consistent but low-frequency intrusive in the large Sierra Blanca villages that postdate the Sunset Shelter occupations. The Victoria/Anchondo sherds are believed to be the first examples of these early types to be found in the Sierra Blanca region.

Four sherds of red-slipped brown pottery may be imports to the Sierra Blanca. Although the indentifications are highly tentative, if correct, they suggest connections with southwestern New Mexico. This is basically in line with the Mexican vessels, which, in the absence of types from elsewhere (west-central and northern New Mexico, for instance), indicate primary outside connections with peoples southwest of the Sierra Blanca region. While this seems to be the case for earlier periods in the Sierra Blanca (the presence of Mimbres sherds in early Glencoe sites), it is somewhat surprising at the relatively late date indicated by the rest of the assemblage at Tintop Cave. Normally, a sherd or two of St. Johns Polychrome, Heshotauthla Polychrome, and perhaps some of the carbon-paint black-on-white types from the Rio Abajo and middle districts of the Rio Grande are found in assemblages of this general date.

Dating the Occupations

Three types of dating were applied to the Picacho project sites--pottery types, artifact types, and radiocarbon assays. Each method has problems that are, in many ways, accentuated by archaeological materials and conditions in southeastern New Mexico. The combined result of these methods at Picacho are viewed as somewhat successful, but much more needs to be done before the dating situation in southeastern New Mexico can be considered reasonably controlled.

Each sample to be considered for radiocarbon dating was first sorted into species and categories by Mollie Toll (this report). Species such as mesquite are notorious for their long-term natural preservation in nature and consequently skew radiocarbon dates (i.e., the "old wood" effect). In an attempt to circumvent this problem, the greasewood, creosote, and mesquite charcoal was deleted from the largest sample (Level 5, 5N/2E) prior to dating. The two remaining samples were too small to permit deletion of any taxa. Three other samples were too small for conventional radiocarbon dating and were not submitted for assay.

Ceramic Dating

Four techniques of dating by pottery are attempted here: dates of indigenous types, presence/absence of dated intrusives, rim profiles, and assemblage comparisons with other regions. The assemblages from the North Cave, North Shelter, and South Shelter are so small and contain so few types that dates for these loci are attempted through assemblage comparisons only.

Indigenous Pottery Method. The indigenous pottery types of the Sierra Blanca region are poorly dated, in part because many are long-lived, and in part because few chronometric dates are available. While at present there seems to be little that can be done regarding longevity of pottery types, dating can be vastly improved by instituting an intensive chronometric program.

Four indigenous pottery types present in the Sunset Shelters have been dated with varying degrees of success (Table 24). Three of these, El Paso Polychrome, Jornada Brown, and El Paso Brown, are dated by rim forms and discussed below. Of the other two, Chupadero Black-on-white is long-lived, and Three Rivers Red-on-terracotta is not well dated. By combining them, occupation dates between A.D. 1100 or 1150 and 1350 can be postulated.

One other pottery type, Jornada Brown, needs to be discussed with regard to dating. The type itself has not yet been directly dated in its region of manufacture, the Sierra Blanca. Pottery recovered from Deadmans Shelter in the Texas Panhandle and typed as Jornada Brown has been dated to first few centuries A.D. (Hughes and Willey 1978). El Paso Brown has been assigned an equally early date in the El Paso region by Whalen (1981). One might logically assume that a similar date applies to brownwares in the Sierra Blanca. However, not a single sherd was recovered from the Sunset Archaic site, nor was pottery observed on those parts of the site not excavated by the project. Since the Sunset Archaic site dates at least into the A.D. 400s, a date for Jornada Brown previous to this time is currently untenable, the Deadmans Shelter situation notwithstanding. At present, we estimate a beginning date for Jornada Brown of A.D. 500.

Table 24. Summary of major pottery groups, Tintop Cave

Group	N	%
Chupadero Black-on-white	83	9.5
El Paso Polychrome	24	2.7
Mexican types	11	1.3
Three Rivers types	165	18.9
Plain Brown types	565	64.6
Miscellaneous	26	3.0
Totals	874	100.0

Presence/Absence of Intrusive Pottery Types. Cross-dating by means of imported pottery types has been used on occasion for Jornada assemblages, but nowhere has the validity of the technique been adequately evaluated. A major problem in using this technique is that of time lag--the time it may have taken a specific pottery vessel to move from the point of manufacture to the place where it was broken. While this may not be a great problem over short distances, many of the imported pottery types found in southeastern New Mexico sites came distances of 200 to 300 km or more. Given these distances, and the added importance presumably imparted to the vessels by the prehistoric Jornadans, the possibility of long-lived heirloom pieces adds yet another dimension of difficulty to the cross-dating technique.

Another major problem with cross-dating in southeastern New Mexico is that, even in large pottery assemblages, the overall proportion of imported types is quite low, frequently 1 to 3 percent of the total. In instances where an imported type is present, it can, with care, be used for cross-dating. But the opposite technique, the use of negative ceramic evidence to infer beginning or ending dates of an occupation, can be very dangerous under these circumstances, especially when assemblage size is small. Clearly, caution must be taken when employing both positive and negative cross-dating.

Positive evidence of intrusives involves two pottery types from northern Mexico. Both types, Anchondo or Victoria Red-on-brown and Babicora Polychrome, represent single vessels and together encompass the period A.D. pre-600 to 1450 (Table 24). Neither type is useful for dating purposes because they come from mixed proveniences, as follows: Anchondo or Victoria, 115-135 cm (4N/0W, one sherd) and 135-155 cm (4N/0W, one sherd); Babicora, 95-115 cm

(4N/1W, one sherd; 6N/1W, two sherds), and 115-135 cm (5N/1W, two sherds; 4N/1E, one sherd; 3N/3E, three sherds).

Negative evidence from intrusives (and one indigenous type) is more prevalent and very intriguing. Regarding the early end of the spectrum, two pottery types that frequently occur in Sierra Blanca sites, albeit in small quantities, are Mimbres Black-on-white (A.D. 1000-1150) and St. Johns Polychrome (A.D. 1175-1300) (Table 24). Neither were present in any of the Sunset Shelters, though we might logically expect them if the deposits date between A.D. 1000 and 1300.

Regarding the late end of the spectrum, two pottery types that frequently occur in small quantities in Sierra Blanca sites are Heshotauthla Black-on-red and/or Polychrome (A.D. 1275 or 1300 to 1400) and Rio Grande Glaze A Red (A.D. 1300-1450) (Table 24). The indigenous type Lincoln Black-on-red is a companion to Rio Grande Glaze A and is also a good indicator of A.D. 1300s occupations. None of the three types were present in any of the Sunset Shelters, though one or more of them could logically be expected in deposits dating after A.D. 1300.

In summary, intrusive pottery types normally present on Sierra Blanca sites are noticably lacking in the Sunset Shelters. This is true for the early types as well as the late types, depriving us of an often-used technique for estimating occupation spans. This problem requires an explanation.

Rim Profiles. Another means of dating, rim profile dating, has recently come to the fore, especially in the Hueco Bolson and southern Tularosa Basin. This method relies on the profiles of El Paso Polychrome and plain brown jar rims (Whalen 1981). Although Whalen discourages casual application of his results to other areas, it is tempting to try his technique in the Sierra Blanca.

Unfortunately, the only El Paso Polychrome rim sherd recovered on the project is from a small jar; the profile is not clearly early or late by Whalen's criteria (1981). However, it is slightly thickened, suggesting a date in the mid A.D. 1200s (Table 24).

The Sunset Shelters produced six brownware rim sherds. However, two are from jars with short necks and sharply everted rims. Since there is no counterpart in the brownware of the El Paso region, these rims cannot be used for dating at the present time. Of the remaining four rims, one is slightly tapered but probably not enough for so it to be classified as an early rim. The last three rims are parallel sided and have rounded to squarish lips, all traits of late rims. According to Whalen's scheme, these rims belong to the late form, dated A.D. 800 to 1100.

Since we do not yet have accurate dates for the Sierra Blanca plain brown pottery, it is premature to assume on the basis of El Paso data that the production of plain brown pottery in the Sierra Blanca ceased at A.D. 1100. In fact, Kelley's definition of the Glencoe phase, which ended well after A.D. 1100, differentiates it from the contemporary Lincoln phase in part because of the continued manufacture of plain brown pottery. Thus, we cannot assume that the plain brown pottery at the Sunset Shelters indicates a pre-1100 date.

Comparative Pottery Assemblages. Pottery assemblages from four regions in southeastern New Mexico are pertinent to our discussion here: the greater El Paso region or Jornada branch of the Mogollon defined by Lehmer (1948), the Sierra Blanca region defined by Kelley (1984), the Middle Pecos region defined by Jelinek (1967), and the Brantley locality at Carlsbad (Katz and Katz 1985). The sequences and dates for each region are in Table 25, and the salient features of their pottery assemblages are in Table 26.

Table 25. Occupation sequences and dates of four regions in southeastern New Mexico

Region	Phase	Dates A.D.
Greater El Paso (Jornada Mogollon) (Lehmer 1948; this report)	Mesilla Doña Ana El Paso	ca. 500*-1100 1100-1200 1200-1400
Sierra Blanca (Kelley 1984)	northern part: Corona Lincoln southern part: early Glencoe late Glencoe	 ca. 1100-1200 1200-1450 ca. 1100-1200 1200-1350
Middle Pecos (Jelinek 1967)	Early 18 Mile Late 18 Mile Early Mesita Negra Late Mesita Negra Early McKenzie Late McKenzie Post-McKenzie	700s-900 900-1000 1000-1100 1100-1200 1200-1250 1250-1300 1300-?
Brantley locality (Carlsbad) (Katz and Katz 1985)	Globe Oriental Phenix	750-1150 1150-1450 1450-1540

* this report

The Sunset Shelters assemblages generally reflect pottery assemblages in southeastern New Mexico. The assemblage from Tintop Cave--with its dominance of brownware, presence of Chupadero Black-on-white, minor occurrence of intrusives, and absence of Heshotauthla, Rio Grande glazes, and Lincoln Black-on-red--is most similar to assemblages of the Doña Ana phase in the El Paso region; the Corona phase in the Sierra Blanca region; the Early Mesita Negra, Late Mesita Negra, and Early McKenzie phases of the Middle Pecos region; and the early part of the Oriental phase in the Brantley locality. Since Lincoln Black-on-red dates after A.D. 1300 and occurs in the Oriental phase at Brantley, we divide that phase in half, giving the early Oriental phase a date of A.D. 1150-1300. Thus, the inclusive dates for all of the phases are A.D. 1000 to 1300 with emphasis on the period A.D. 1100-1200.

The assemblage of the South Shelter is very similar to that of Tintop Cave. The occupation probably dates within the same period, A.D. 1000 to 1250.

The assemblages from the North Shelter and the North Cave are also dominated by brownwares. However, the later-dating painted types like Chupadero, Heshotauthla, Rio Grande glazes, and Lincoln are lacking. These assemblages are most similar to those of the Mesilla phase in the El Paso region, the early Glencoe phase in the Sierra Blanca region, the Early 18 Mile and Late 18 Miles phases of the Middle Pecos, and the Globe phase at Brantley. Inclusive dates for these phases are ca. A.D. 300 to 1150. We believe that the actual dates of the occupations are toward the later end of this span, but we have no corroborating evidence.

Table 26. Comparison of Sunset Shelters pottery assemblage with adjacent regions

Region	Brownware	Chupadero	El Paso Polyxchrome	Hesho Polychrome	Rio Grande Glaze	Lincoln Black-on-Red	Other Intrusives
El Paso:							
Mesilla	D						s
Doña Ana	p	p	p				s
El Paso		s	D	s	s	s	s
Sierra Blanca, north:							
Corona	D	p					
Lincoln		p	p	s	s	p	s
Sierra Blanca, south:							
Early Glencoe	D						s
Late Glencoe	D	p	p	s	s	s	s
Middle Pecos:							
Early 18 Mile	D						
Late 18 Mile	D						s
Early Mesita Negra	D	s					s
Late Mesita Negra	p	p					s
Early McKenzie	p	p					s
Late McKenzie	s	D					s
Post- McKenzie		D			s		s
Brantley:							
Globe	D						
Oriental	p	p	p			p	
Phoenix							
Sunset Shelters	D	p	s				s

Key: D = dominant; p = present; s = very small quantities

Artifact Dating

Projectile Points. The projectile points recovered from the Sunset Shelters and especially Tintop Cave include a variety of dart and arrow-point styles. The dart points, San Pedro and Hueco, have been dated elsewhere to the Late Archaic period. In southeastern Arizona, San Pedro points date from approximately 1500 B.C. to about the time of Christ or perhaps a little later (Sayles 1983). MacNeish and Beckett (1987) attribute both San Pedro and Hueco points to the Hueco phase of the Chihuahua Tradition, dated 900± 200 B.C. to A.D. 250 ± 200.

The neck widths may be a little more informative. According to a study for Brantley Reservoir (Katz and Katz 1985:83), the minimum width of projectile points at the notches is temporally diagnostic. Projectile points with neck widths less than 9 mm are arrow points; those 9 to 14 mm are Transitional-period points; and points 13 mm or greater are Late Archaic period or earlier. The two San Pedro points from Tintop, with neck widths of 10 and 11.5 mm, clearly fall within the Katz Transitional period (or Terminal Archaic Brantley phase, A.D. 1 to 750). The Hueco point, on the other hand, has a neck width of 13.5 mm and falls within the overlap (13 to 14 mm) between the Late Archaic and Transitional values. A late McMillan-phase (1000 B.C. to A.D. 1) or early Brantley-phase age is likely.

The Tintop Cave dart points, then, indicate Late to Terminal Archaic use of the eastern slopes of the Sierra Blanca. Given the association of the points with Stratum 3, and possibly Stratum 4 in Tintop Cave, a Ceramic-period association is indicated. It is possible that the points were picked up as curiosities and brought into the site by the Ceramic-period occupants, or that they were actually made and used by the Ceramic-period occupants of Tintop Cave.

The arrow points, on the other hand, suggest a much later date for the site, more in line with the pottery. Of the three types--Scallorn, Reed-like, and Neff-style Livermore--the Scallorn point is generally considered the earliest. Suhm and Jelks (1962) assign the dates of A.D. 500 to 1200 to the type in Texas, while Bell (1960) suggests A.D. 700 to 1500. Bell (1958, 1960) dates Reed points to A.D. 500-1500 and Livermore points to A.D. 800 to 1200.

Basin Metates and One-Hand Manos. The manos and metates recovered from the Sunset Shelters are basically the same, or very similar, from all periods represented. However, two basin metates (404 and 413) and one one-hand mano (80) came from the lowest (aceramic) deposits of Tintop Cave (155 to 175 cm), and a one-hand mano (672) came from the lowest deposits (also aceramic) of the North Shelter (80 to 100 cm), suggesting that these tools may have been left by Archaic-period peoples. These proveniences are well below the main pottery levels, and the occasional sherd recovered from these depths was undoubtedly introduced through rodent action.

Radiocarbon Dating

Three radiocarbon dates were obtained with wood charcoal (Appendix 6; Toll, this report) from three different proveniences in Tintop Cave. The samples were selected on the basis of quantity and suitability of available material.

The earliest date, calibrated at A.D. 1169 ± 50, came from the lowest position, Level 8 (Stratum 4) in 3N/3E. This location probably *does not* represent the earliest occupation of the cave because it is outside the primary living space of the cave and adjacent exterior area.

The other two dates, calibrated at A.D. 1267± 60 (general trash in level 5 of 5N/2E) and A.D. 1427 ± 70 (Hearth 2 fill), are ambiguous because they came from similar positions: the 1427 date from the near the top of Stratum 4 and the 1267 date from near the bottom of Stratum 3 (later date with earlier stratum and earlier date from later stratum). Three possible explanations are: (1) one or the other date is incorrect; (2) the dates are both correct and essentially the same, as suggested by the overlap at two standard deviations; (3) both dates are correct but *not* the same, indicating that the interior and exterior areas of the cave were being used with different intensities at different times. The third possibility, if true, would indicate that the lowest cultural lens assigned here to Stratum 3 actually belongs to Stratum 4.

While the third alternative is not surprising in itself, this particular expression of it is somewhat perplexing because of the problems with interpreting the dates. The dilemma is this: if the dates are accurate, then a relatively short occupation took place just outside the shelter about A.D. 1267, and a more intensive one (continuation of a previous occupation) took place inside the cave and at the same elevation about the year A.D. 1427. Thus, to accept the third alternative we must be willing to believe that two deposits dating 160 years apart can accumulate within a horizontal distance of three meters in a very small site! This stretches the imagination too far, causing us to question the validity of the A.D. 1427 date.

Thus, at the current time, we suggest that the A.D. 1169 and 1267 dates are probably correct, but that the A.D. 1427 date is questionable.

Discussion

The use of pottery recovered from the Sunset Shelters as a means of dating the occupations has its problems. The primary indigenous types are either long-lived or poorly dated. The brownware rims differ enough from those of the El Paso region that the use of rim profiles for dating at Picacho can be legitimately questioned. Negative evidence (absence of certain late-dating types in this instance) has some merit but cannot be considered definitive because certain early-dating trade types are also missing. The assemblage comparison is about equally as good, but is no better. In view of these problems, all we can conclude about the occupation dates from the standpoint of pottery is that Tintop Cave and the South Shelter were used during the A.D. 1100s and 1200s, and the North Cave and North Shelter were used some time between A.D. 500 and 1100.

The projectile points are also of limited help in dating the shelters. The San Pedro and Hueco points are suggestive of Archaic occupations dating to the time of Christ. However, since all were recovered from pottery-period contexts, it is likely that the points were brought into the site by pottery-period occupants, or they were made and used by these people. Either way, dart-point style in this case has no use for dating the occupations. The arrow points recovered from the shelters are in general agreement with a pottery-period occupation. However, because the types are long-lived, they have only general utility for dating purposes.

Basin metates and one-hand manos were recovered from throughout the Tintop Cave deposits and from a deep context at the North Shelter. This finding, that basin metates and one-hand manos were used in pottery-period contexts, concurs with similar findings elsewhere in southeastern New Mexico. Two metate fragments and a mano from deep, non-pottery contexts at Tintop Cave and the mano from the North Shelter suggest Archaic-period occupations. However, in the absence of datable materials (wood, charcoal), there is no way to confirm this possibility.

The A.D. 1169 and A.D. 1267 radiocarbon dates are believed to accurately reflect occupation of Tintop Cave between about A.D. 1100 or 1150 and 1300. The A.D. 1427 date is questionable for several reasons and is not further considered here.

The combination of these dating indicators--especially the radiocarbon, pottery, and arrow-point data--provides a much more satisfactory approach to dating the occupations of the Sunset Shelters. Although the pottery and arrow-point types are long-lived, they all overlap with the radiocarbon dates. While the various data are complementary and increase our confidence in the identification of a general period of occupation, the dates are still not precise. Thus, we can conclude that Tintop Cave and the South Shelter were occupied in the A.D. 1100s and 1200s, and the North Shelter and North Cave were occupied between A.D. 500 and 1100. We cannot define either upper or lower limits to either range.

POLLEN ANALYSIS OF LA 58971 AND LA 71167

Richard G. Holloway

Thirty-six samples collected from LA 71167 and LA 58971 were submitted for pollen analysis to the Castetter Laboratory for Ethnobotanical Studies by OAS. Several features from each site were intensively sampled for pollen (Tables 27a and 27b).

Methods and Materials

Initially, 25 ml of soil were subsampled, and, before chemical extraction, three tablets of concentrated *Lycopodium* spores, each containing 12,077 spores, were added to each subsample. This was done to permit the later calculation of pollen-concentration values and to serve as a marker against accidental destruction of the pollen assemblage by laboratory methods. The samples were initially treated with 35 percent HCl to remove carbonates and to disperse the marker grains. The residues were then treated with cold 70 percent HF overnight, and then washed with a 1 percent solution of trisodium phosphate (Na_3PO_4) to remove humates. Other inorganic particles were removed using a heavy density separation with zinc chloride (S.G. 1.99-2.00). The lighter, organic portion was removed by pipet, concentrated, and subjected to a ten minute acetolysis (Erdtman 1960) to remove extraneous organic matter. The residue was dehydrated, stained with safranin, and transferred to a mounting media of 1,000 centistoke silicon oil using methanol.

A drop of the polliniferous residue was mounted on a microscope slide for examination. The slide was examined using 250x magnification and 1 mm transect intervals. A minimum count of 200 grains/sample was attempted for each sample, as suggested by Barkley (1934). As recommended by Brookes and Thomas (1967), either one-half or full slides were counted to minimize the effects of nonrandom distribution. For these preliminary scans, after a single slide was examined, counting was terminated if 50 or more *Lycopodium* spores had been counted; otherwise a second slide was examined. This was done to estimate pollen-concentration values in the sediments and prepare for further examination.

Pollen concentration values were computed for each sample using the following formula:

$$PC=\frac{K*\Sigma_P}{\Sigma_L*S}$$

Where:
- PC = pollen concentration
- K = *Lycopodium* spores added
- $\sum_p$ = fossil pollen counted
- $\sum_L$ = *Lycopodium* spores counted
- S = sediment volume

Statistically, the concentration values provide a more reliable estimate since a minimum number of marker grains were counted rather than relying upon the fossil grains. The percentage calculations, since they are based on counts of less than 200 grains, should be viewed with caution.

Clumps of four or more grains seen in the transects were tabulated as single grains and marked in the tables to denote their presence. Clumps often reflect the collection of flowers or plant parts, and thus, human behavior.

After completing the scans, the remainder of the slides were examined at 100x magnification for the larger pollen grains of cultivated plants, including corn and squash. Two types of cactus (cholla and prickly pear) were also tabulated if encountered.

Results

LA 71167

South Cave. Eight of the twelve samples collected from site LA 71167 were from the South Cave. The raw pollen counts and concentration values are presented in Tables 28a and 28b. *Pinus* pollen, although present in amounts greater than 100 grains/ml (4/8 samples), was very weakly represented, and was most likely transported a long distance. All assemblages are dominated by cheno-am pollen. Asteraceae pollen is fairly consistent throughout the samples. Cactaceae pollen was present in three of the eight samples and absent from the other two components of the site. *Cylindropuntia* (cholla cactus) was present in FS 368 and absent from all other samples. *Ephedra* pollen was present in a trace amount from three samples. Interestingly, two taxa of economic importance were present, both in sample FS 358. Pollen of both *Zea mays* and Solanaceae were located in this sample, but in very small quantities. Indeterminate pollen was quite high throughout the samples. Total pollen concentration was higher than expected, ranging from a low of 750 grains/ml to a high of 2518 grains/ml.

North Shelter. The background pollen from the North Shelter was very similar to that from South Cave. Cheno-am and indeterminate were dominant, with high quantities of high spine Asteraceae pollen. Again, both Solanaceae and *Zea mays* pollen occurred in the upper level of one sample, as in South Cave. The pollen-concentration values of the sample from this component (FS 676) showed much greater amounts of both taxa than from South Cave.

North Cave. Only a single sample (FS X-14) was recovered from North Cave. The assemblage was dominated by cheno-am, *Poaceae*, and indeterminate pollen, although the latter was less abundant than in South Cave and North Shelter.

LA 58971

Feature 1a. A single pollen sample was obtained from the fill of this hearth feature (FS

1a-61). Very little pollen was present (Table 29) and only two taxa: cheno-am and indeterminate. This suggests a very severely altered assemblage.

Feature 1w. Four samples were taken from this large pit (Table 29). The fill samples (FS 1-54, FS 1-52, FS 1-53) showed increasing quantities of both *Pinus* and cheno-am pollen. High spine Asteraceae pollen was relatively high, with low values of both low spine Asteraceae and *Artemisia.* The total pollen-concentration values were above 1,000 grains/ml in the upper and lower samples of the fill. The bottommost sample from this pit (FS 1-56) contained a much smaller quantity of indeterminate pollen and was again dominated by cheno-am. A significant amount (155 grains/ml) of *Sphaeralcea* pollen was also present in this sample.

Feature 1e. Three samples were obtained from Feature 1E, which was also a large pit. No pollen of economic plants were present in these assemblages. The assemblages were dominated by cheno-am pollen and indeterminate pollen, and the pollen-concentration values were quite low. Pine pollen was present in trace amounts.

Feature 3. This feature was also a large pit, and four samples were recovered. As in Feature 1W, the fill sequence shows a gradual increase in *Pinus* and cheno-am concentration values toward the base of the feature. Small amounts of both *Cylindropuntia* and Cactaceae pollen were recovered from this feature, but no other types of economic pollen.

Feature 4b. This feature was represented by a single sample (FS 4b-63) and was identified as a hearth. The pollen-concentration values were low (500 grains/ml), and the assemblage was dominated by cheno-am pollen and high spine Asteraceae pollen. Interestingly, this sample also contained pollen of *Sphaeralcea* (57 grains/ml).

Feature 5a. Two samples were taken from this medium pit. The upper sample contained rather high amounts of high spine Asteraceae (153 grains/ml). While the cheno-am concentration values were the same, this is a low value for this taxon. *Pinus* values were also higher than in the bottom sample but reflect long-distance transport of this taxon. In the basal sample (FS 5a-25), cheno-am pollen is almost three times as abundant as in the overlying sample. Pollen of *Zea mays* was extremely high (237 grains/ml).

Feature 7a. Six samples were taken from this feature, a large pit. *Pinus* pollen was low throughout, although the two bottom samples did contain higher concentrations. Cheno-am pollen was moderate to low throughout the fill, and cheno-am anther fragments appear to concentrate in the lower samples. *Zea mays* pollen was quite high in a number of samples throughout the fill but was highest in the bottom sample (279 grains/ml). The pit bottom contact contained low quantities of corn pollen.

Feature 8a. One sample (FS 8a-45) was recovered from this medium pit. The assemblage was dominated by high spine Asteraceae and contained small quantities of *Pinus,* cheno-am, and *Cylindropuntia.*

Feature 8b/8c. A single sample was taken from this feature, a medium pit. Cheno-am and high spine Asteraceae pollen dominated the assemblage. A small quantity of *Zea mays* pollen

(55 grains/ml) and a trace of Cactaceae pollen were also present.

Feature 8d. This sample was obtained from the fill of a medium pit. Pollen was virtually nonexistent, with a concentration value of only 92 grains/ml. Only four grains were recovered from the scan.

Discussion

LA 71167

Although *Pinus* pollen occurs consistently throughout most samples, the pollen-concentration values for this taxon are quite low and indicate that its presence is the result of long-distance transport. Pine produces enormous quantities of wind-borne (anemophilous) pollen, and if the source of these grains were local, much higher concentration values would be expected. Also, the site is at the eastern terminus of the Hondo Valley, and pines are present at higher elevations within this region. Thus, pine pollen carried on wind currents eastward through the valley could easily explain its presence in the assemblages in such quantities. The quantity of *Pinus* pollen brought in by long-distance transport also suggests that the local assemblage may have been more of a grassland type environment. This is indicated by the consistent presence of taxa, such as Asteraceae (high and low spine), Poaceae, *Ephedra,* and Cactaceae, which are normal components of such an environment.

The distribution of the higher pollen-concentration values is interesting. In general, the higher values appear in the upper levels and decrease towards the base within the excavation units (northing and easting). Samples reported from hearth contexts also appear to have slightly higher pollen-concentration values. In all cases, however, due to the high values of indeterminate pollen, the assemblages have been so weathered that positive interpretation is impossible.

Samples containing economic pollen are found consistently in the upper levels of the unit (55-80 cm). If preservation of the assemblages was better, we might argue for the later presence of cultigens such as corn, but due to the deterioration of the assemblages, this hypothesis cannot be supported at this time.

LA 58971

More samples were collected from this site than from LA 71167. The samples were also collected from designated features, providing us with a more meaningful type of analysis. As at LA 71167, the samples collected from hearth fill were generally less productive than those from pits. There does appear to be a distinct difference in the pollen assemblages of fill samples as opposed to the basal levels. That these differences were apparent in the pollen record is an indication of careful archaeological excavation.

From examination of the pollen assemblages it appears likely that Pits 1w, 3, 5a, 7a, 8a, and 8b/8c were utilized for storage. It is perhaps significant that each feature was utilized for a particular type of plant material. Pits 3, 8a, and 8b/8c contained evidence of only Cactaceae pollen. Pollen of both *Cylindropuntia* (cholla) and other members of the Cactaceae are large grains, and the plants are insect pollinated. It is possible that pollen was deposited in these features on the fruits, which may have been stored. Macrobotanical analyses may indicate if this was indeed the case.

Pit 1w was probably used to store *Sphaeralcea* (globemallow). Pollen concentrations of this taxon are extremely high (155 grains/ml), especially when compared to the total pollen concentration, only 802 grains/ml. Since this plant is also insect pollinated, the high concentration values suggests that actual flower materials were present, rather than pollen brought in via fruits.

Pits 5a and 7a were probably used to store Zea mays. The pollen-concentration values for this taxon are quite high. Interestingly, the highest concentration values from Pit 7a occur above the pit bottom contact, which is typical of corn storage.

Pit 4b was identified as a hearth, and the low pollen-concentration values tend to support this hypothesis. However, a significant concentration value for *Sphaeralcea* is also present. *Sphaeralcea* is an herbaceous plant, and its presence in these quantities indicate an alternative use for the feature. It is entirely possible that this feature was a burned storage pit rather than a true hearth, or that the hearth was a secondary use of the feature. Neither of these hypotheses may be confirmed by the pollen analysis alone, but the flotation data may introduce more convincing data.

LA 71167 is younger (ca. A.D. 1100-1200) than LA 58971, which is Archaic in age, dating to the first four centuries A.D. LA 58971 is also an open site, whereas LA 71167 is a rockshelter, open to the southeast. The age and orientation of the site may explain differences in pollen-concentration values recovered from these samples. An open site is not conducive to pollen preservation because the grains are exposed to various weathering agents, and much of the organic remains can be leached out of the soil. At LA 71167, the wind normally flows down the Hondo Valley but turns abruptly at the site. When wind currents are turned, the velocity decreases, causing particulate matter to be deposited in the sediments (Tauber 1965). This may explain, in part, higher concentration values recovered from the rockshelter site as opposed to the open site.

Probably the most intriguing and interesting aspect revealed by this analysis is the discrete storage function assigned to the features. Most features contained only a single taxon of economic type pollen, the exceptions being Pits 8b/8c and 7a, which contained both *Zea mays* and Cactaceae pollen, although in low amounts. This was totally unexpected. The discrete nature of this distribution is presented in Figure 55. *Zea mays* pollen appears distributed at either end of the site, with other types of remains in the center. All pits with economic remains appear to be in the southern portion of the site. Distribution of the macroremains should reveal if this is indeed patterned behavior or circumstantial.

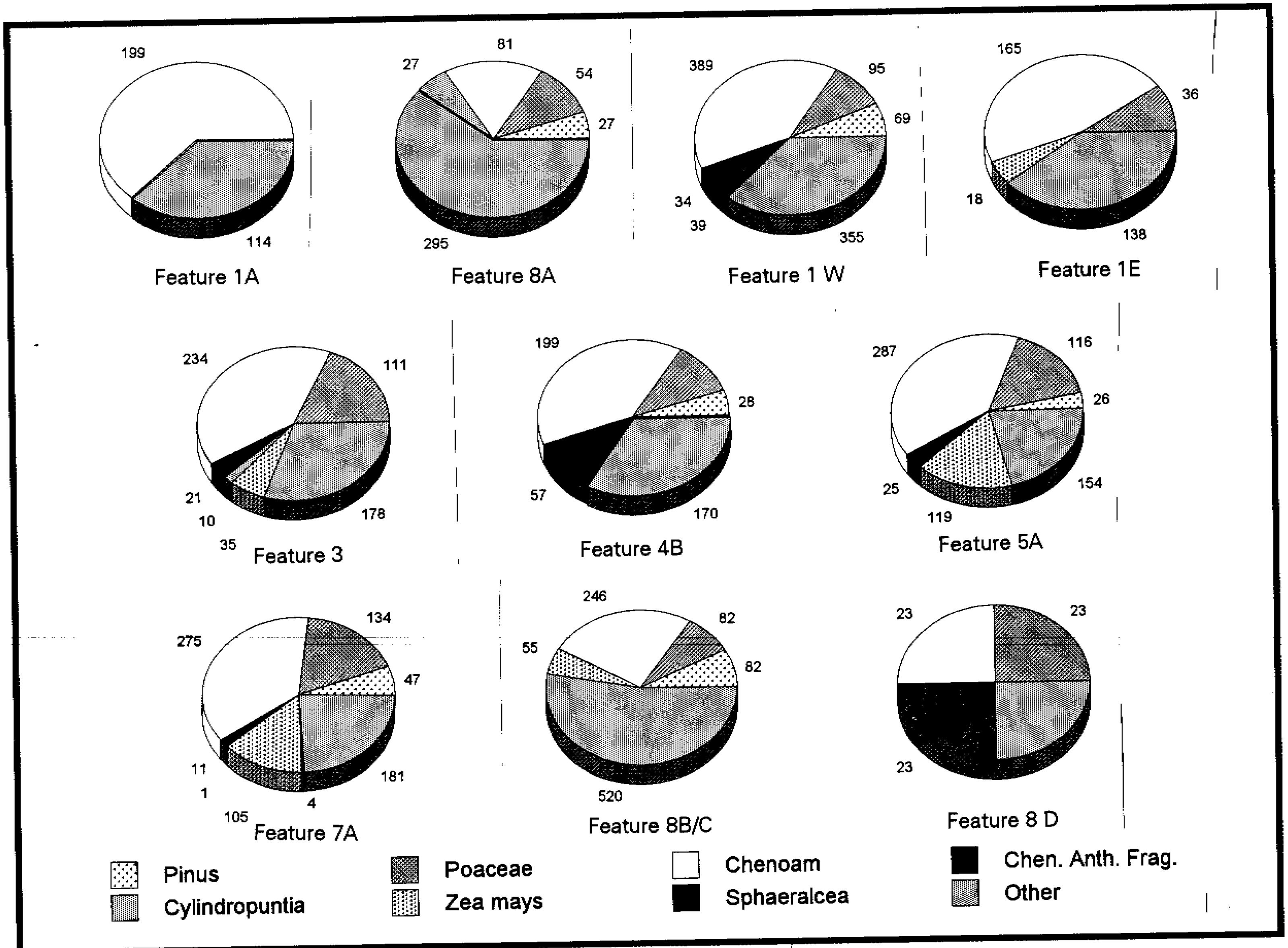

Figure 55. Mean pollen concentration values by feature, LA 58971.

Conclusions

Analysis of pollen samples from the two sites revealed distinctly different assemblages, which can be viewed as representing two discreet blocks of time. The younger, pottery-period samples contained higher concentrations of pollen than the older material, recovered from an open site. Both sites contained evidence of cultivated plants in association with probable wild type plants. This mix supports the interpretation of an early subsistence based on plant collection and supplemented by agriculture, a broad-spectrum adaptation. Pine pollen is consistently present throughout these samples but in such small quantities as to be interpreted as long-distance transport. The presence of pine in the vicinity is not surprising given its presence in the upper elevations of the Hondo Valley and Lincoln County today. Due to the low pollen-concentration values of both sites, the local environment is interpreted as consistent with the northern extremes of the Chihuahua desert.

Table 27a. Pollen sample provenience data, LA 71167

Sample	Grid	Level (cm)	Field Specimen
South Cave (Tintop Cave)			
90128	4n/1w	3 (55-75 BLD)	355 (from flotation sample)
90155	4n/1w	6 (115-125 BLD; upper half of level)	356 (from flotation sample)
90144	4n/1w	7 (135-145 BLD; upper half of level)	357 (from flotation sample)
90145	5n/1w	3 (55-75 BLD)	358 (from flotation sample)
90146	5n/1w	6 (115-135 BLD)	359 (from flotation sample)
90147	5n/1w	7 (135-155 BLD)	360 (from flotation sample)
90148	6n/1w	Fea. 2 (hearth) and adjacent use-surface in Level 6, SW quarter of square (115-120 cm BLD)	382 (from flotation sample)
90149	6n/1w	Fea. 3 (hearth) fill, in Level 6 (120-130 cm BLD)	364 (from flotation sample)
North Shelter			
90157	2n/1w	4 (60-80 BS)	676
90158	2n/1w	5 and 6 (80-120 BS)	675
90159	3n/1w	5 (80-100 BS)	677
North Cave			
90160	Test Pit 2	ash lens (extramural hearth)	X-14

Table 27b. Pollen sample provenience data, LA 58971

Feature	Level (cm BLD)	Field Specimen
1w fill (large pit)	4 (90-105)	1-54
	5 (120-135)	1-52
	6 (135-150)	1-53
	7 (150-bottom; 12e/6.5s)	1-56
1e fill (large pit)	4 (90-105)	1-49
	5 (120-135; 14e/6.5s)	1-51
	6 (135-145; 14e/6.5s)	1-48
3 fill (large pit)	2 (50-60)	3-35
	3 (65-80)	3-39
	4 (80-95)	3-38
	5 (95-110)	3-37
4b fill (hearth)		4b-63
5a fill (medium pit)	upper fill (0-20)	5a-27
	lower fill (at or near bottom)	5a-25
7a fill (large pit)	4 (75-90)	7a-45
	7 (120-135)	7a-47
	8 (135-150)	7a-46
	9 (150-165)	7a-49
	10 (165-bottom)	7a-50
	pit bottom contact	7a-42
8a fill (medium pit)	3 (60-75)	8a-45
8b/8c fill (medium pit)	4/5 (70-bottom)	8c-50
8d fill (medium pit)	pit bottom contact	8d-69

Table 28a. Raw Pollen Counts, LA 71167

Field Specimen	*Pinus*	*Juniperus*	*Quercus*	Solanaceae	Poaceae	Cheno-am	Cheno-am, anther fragments	Asteraceae, high spine	Asteraceae, low spine
South Cave									
355	20	0	0	0	13	97	2	4	9
356	19	0	3	0	8	87	0	8	17
357	2	0	0	0	1	12	0	2	1
358	17	0	0	1	8	101	2	17	3
359	0	0	0	0	0	20	0	0	1
360	6	0	1	0	1	21	0	5	4
382	1	0	0	0	2	11	1	2	3
364	2	0	0	0	0	11	1	5	2
North Shelter									
676	19	0	0	8	16	89	0	18	7
675	1	0	0	0	1	8	0	1	0
677	7	0	2	0	2	7	0	3	0
North Cave									
X-14	11	0	0	0	5	21	0	1	1

Field Specimen	*Artemisia*	*Platyopuntia*	Cactaceae	*Ephedra*	Indeterminate	Zea *mays*	Marker Grains	Pollen Sum	Concentration grains/g
South Cave									
355	3	0	3	0	54	0	118	205	2518
356	4	0	0	0	105	0	213	251	1708
357	0	0	0	0	19	0	63	37	851
358	1	0	1	7	51	2	122	211	2506
359	1	0	0	0	12	0	53	34	930
360	2	1	1	1	25	0	54	68	1825
382	0	0	0	1	15	0	54	36	966
364	1	0	0	0	22	0	85	44	750
North Shelter									
676	6	0	0	8	30	1	113	202	2591
675	0	0	0	0	15	0	54	26	698
677	5	0	0	0	9	0	55	35	922
North Cave									
X-14	3	0	0	3	9	0	54	54	1449

Table 28b. Pollen-Concentration Values, LA 71167

Field Specimen	*Pinus*	*Juniperus*	*Quercus*	Solanaceae	Poaceae	Cheno-am	Cheno-am, anther fragments	Asteraceae, high spine	Asteraceae, low spine
South Cave									
355	246	0	0	0	160	1191	25	49	111
356	129	0	20	0	54	592	0	54	116
357	46	0	0	0	23	276	0	46	23
358	202	0	0	12	95	1200	24	202	36
359	0	0	0	0	0	547	0	0	27
360	161	0	27	0	27	564	0	134	107
382	27	0	0	0	54	295	27	54	81
364	34	0	0	0	0	188	17	85	34
North Shelter									
676	244	0	0	103	205	1141	0	231	90
675	27	0	0	0	27	215	0	27	0
677	184	0	53	0	53	184	0	79	0
North Cave									
X-14	295	0	0	0	134	564	0	27	27

Field Specimen	*Artemisia*	*Platyopuntia*	Cactaceae	*Ephedra*	Indeterminate	*Zea mays*	Marker Grains	Pollen Sum	Concentration grains/g
South Cave									
355	37	0	37	0	663	0	118	205	2518
356	27	0	0	0	714	0	213	251	1708
357	0	0	0	0	437	0	63	37	851
358	12	0	12	83	606	24	122	211	2506
359	27	0	0	0	328	0	53	34	930
360	54	27	27	27	671	0	54	68	1825
382	0	0	0	27	403	0	54	36	966
364	17	0	0	0	375	0	85	44	750
North Shelter									
676	77	0	0	103	385	13	113	202	2591
675	0	0	0	0	403	0	54	26	698
677	132	0	0	0	237	0	55	35	922
North Cave									
X-14	81	0	0	81	242	0	54	54	1449

Table 29. Pollen-Concentration Values, LA 58971

Field Specimen	*Pinus*	*Juniperus*	*Quercus*	Solanaceae	*Eriogonum*	Poaceae	Cheno-am	Cheno-am, anther fragments	Asteraceae, high spine	Asteraceae, low spine	*Artemisia*
1a-61	0	0	0	0	0	0	199	0	0	0	0
1-54	0	0	0	0	0	28	597	57	114	28	28
1-52	57	0	0	0	0	0	256	0	85	0	28
1-53	195	0	0	0	28	223	446	28	195	28	0
1-56	129	0	0	0	0	26	259	52	78	0	26
1-49	54	0	0	0	0	0	161	0	0	0	0
1-51	55	0	0	0	0	55	164	0	27	0	0
1-48	0	0	0	0	0	0	170	0	57	0	0
3-35	0	0	0	0	0	0	328	82	164	55	0
3-39	56	14	28	0	0	84	127	0	14	0	0
3-38	142	0	0	0	0	0	483	0	142	85	0
3-37	246	0	0	0	0	55	0	0	27	27	0
4b-63	57	0	0	0	0	28	199	0	142	0	0
5a-27	153	0	0	0	0	0	153	51	153	0	0
5a-25	79	0	26	0	0	53	422	0	26	26	0
7a-45	49	0	0	0	0	49	147	0	0	49	0
7a-47	23	0	0	0	0	46	138	0	138	69	0
7a-46	78	0	0	0	0	26	595	26	26	52	0
7a-49	78	0	0	0	0	26	362	0	26	26	0
7a-50	390	0	0	0	0	84	307	28	139	56	28
7a-42	187	0	3	0	0	52	101	10	35	10	0
8a-45	54	0	0	0	0	27	81	0	242	0	0
8c-50	82	27	55	0	0	82	246	0	301	27	0
8d-69	23	0	0	0	0	0	23	23	23	0	0

Field Specimen	Liguliflorae	*Platyopuntia*	*Cylindropuntia*	Cactaceae	*Ephedra*	Indeterminate	Zea *mays*	Sphaeralcea	Marker	Sum	Concentration (grains/g)
1a-61	0	0	0	0	0	114	0	0	51	11	313
1-54	0	0	0	0	28	256	0	0	51	40	1137
1-52	0	0	0	0	0	142	0	0	51	20	568
1-53	28	0	0	0	0	251	0	0	52	51	1421
1-56	0	0	0	0	0	78	0	155	56	31	802
1-49	0	0	0	0	0	81	0	0	54	11	295
1-51	0	0	0	0	0	137	0	0	53	16	438
1-48	0	0	0	0	0	114	0	0	51	12	341
3-35	0	0	0	0	0	0	0	0	53	23	629
3-39	0	0	14	14	0	84	0	0	103	31	436
3-38	0	0	0	0	0	57	0	0	51	32	909
3-37	0	0	27	0	0	0	0	0	53	14	383
4b-63	0	0	0	0	0	28	0	57	51	18	511
5a-27	0	0	0	0	0	51	0	0	57	22	559
5a-25	0	0	0	0	0	26	237	0	55	34	896
7a-45	0	0	0	0	0	74	0	0	59	15	368
7a-47	0	0	0	0	0	23	138	0	63	25	575
7a-46	0	0	0	0	52	52	181	0	56	42	1087
7a-49	0	0	26	0	0	52	0	0	56	23	595
7a-50	0	0	0	0	0	111	279	0	52	51	1421
7a-42	0	0	0	0	28	38	31	3	418	144	499
8a-45	0	0	27	0	0	54	0	0	54	18	483
8c-50	0	0	0	27	0	82	55	0	53	36	984
8d-69	0	0	0	0	0	0	0	0	63	4	92

PICACHO: A RECORD OF DIVERSE PLANT USE IN A DIVERSE ECOLOGICAL SETTING

Mollie S. Toll

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Introduction

Flotation samples and charcoal analysis from these two sites in the Hondo Valley provide some timely insights into prehistoric plant use in an area of the state with little previous archeobotanical work and many questions as to broad patterns of economic adaptation. At LA 58971, the Sunset Archaic site, 26 flotation samples documented a variety of hearths and pits (Table 30). None of the flotation samples from this site contained enough charcoal to permit identification of a 20-piece subsample, but charcoal for carbon-14 dating, collected in the field from seven proveniences, provided a clear view of the broad array of wood types utilized during this early occupation. At LA 71167, the Sunset Shelters, protected deposits contained abundant plant remains, both prehistoric and intrusive. The 27 flotation samples documented several hearths (5 samples) and Levels 3 to 8 in fill from specific grid squares throughout the shelters (22 samples). Charcoal from 22 of the flotation samples and six other proveniences collected for carbon-14 dating recorded again the astonishing variety of woody species tapped by the occupants.

Several factors are probably at work in producing the multiplicity of plant taxa utilized here in the Hondo Valley, at two sites of very different age. The challenge is to sort out the relative weight and interplay of these factors in specific proveniences and in each site as a whole. The diversity of the surrounding vegetation in a valley with a steep elevational gradient, marked effects from exposure, and a perennial watercourse has provided a long list of available plant resources. Human adaptive strategies over time may have capitalized on this diversity, in effect trading economic security for the higher production levels possible from intensive specialization in agriculture. And taphonomic attributes of shelters (better preservation, mixing of recent deposits with prehistoric levels) have surely added to the list of taxa recovered here.

The Hondo Valley in the vicinity of Picacho provides a rich array of plant taxa known through the archeological and ethnobotanical records to have been utilized by human inhabitants prehistorically and historically. While the Picacho project location falls squarely within Brown and Lowe's (1982) semidesert grassland (see Brown 1982: 123), variation in elevation, exposure, and access to permanent water provide for the close juxtaposition of several other associations, dominated by various woody perennials. Elevations in the immediate site environs range from 1,500 m in the streambed to 1,670 m on hilltops and ridges above the sites. Early settlers reported ash (Fraxinus), elm (Ulmus), hackberry (Celtis pallida or C. reticulata), walnut (Juglans), and boxwood[1] growing along the Río Hondo. Cottonwood (Populus fremontii, Martin and Hutchins 1981:507-508) may have been introduced by these settlers (Hodson et al. 1980:116). Areas with northern exposures contain creosotebush (Larrea), juniper (Juniperus), oak (Quercus), several species of yucca and agave, several cacti genera (Echinocereus, Mamillaria, and Opuntia), and many grasses. A few kilometers up the Hondo Valley to the northwest, higher elevations support the piñon-juniper woodland characteristic of more mesic situations in the foothills of the Capitan Mountains and Sierra Blanca to the west (Martin 1964; Tierney 1971). Valley sides with southern exposures enjoy warmer and drier conditions, and are home to such Chihuahuan Desert species as sotol (Dasylirion spp.), acacia (Acacia spp.), and mesquite (Prosopis spp.).

Methods

The 53 soil samples collected during excavation were processed at the Office of Archeological Studies by the simplified "bucket" version of flotation (see Bohrer and Adams 1977). Each sample was first measured for volume in a large graduated cylinder. Samples ranged in size from 325 to 7500 ml. Only 10 percent were less than 4000 ml, however, and 73 percent fell within the 4,000-6,000 ml range. Average size was 4,990 ml (cv .265). The measured soil sample was immersed in a bucket of water, and a 30-40 second interval was allowed for settling out of 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 the recovered material dried. Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, 0.5 mm mesh) and then viewed under a binocular microscope at 7-45x.

Many of the "floated" samples were very large, requiring subsampling some screen sizes in 50 samples. The estimated number of seeds for the total sample was calculated (for instance, if three seeds were encountered in a one-half subsample, the estimated number of seeds present would be six), then adjusted to reflect the estimated number of seeds per liter of original soil sample. To provide some order to the jumble of plant remains from mixed sources, tables of flotation results are sorted by potential cultural specimens vs. probable intrusives (utilizing some undoubtedly autocratic determinations). Taxa and seeds are totaled for each category. Individually described unknown types were counted as taxa contributing to diversity, and unidentifiable specimens were omitted from taxa counts (because of the possibility of their being damaged specimens of already-recognized taxa).

From each flotation sample with sufficient charcoal, a sample of 20 pieces of wood was identified (10 from the 4 mm screen, and 10 from the 2 mm screen). Each piece was snapped

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[1] Boxelder, Acer negundo, is more likely. Aside from the classic boxwood, which occurs only as a horticultural species here, *boxwood* is a common name for shadblow serviceberry (Amelanchier arborea) and flowering dogwood (Cornus florida). Neither grows in southeast New Mexico (Vines 1960:416, 795).

to expose a fresh transverse section and identified at 45x. Charcoal specimens examined prior to submission for radiocarbon dating were examined in the same fashion, but selection was adapted to securing a minimal sufficient sample (the objective was 5 grams) with the fewest pieces, rather than aiming to examine both large and small pieces. 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. Species composition of charcoal was recorded both by number of pieces and by weight, but caution with respect to weight measures is appropriate. Individual pieces of wood were very small, and many taxa were present, so the total weight for a given taxon within any one sample was often less than 0.2 g. Our perception of variability from one taxon to another is thus considerably muddled by the business of rounding to the nearest tenth of a gram (this is the accuracy limit of the triple beam balance used). The 440 pieces of charcoal examined from flotation samples totaled only 13.8 g, so each piece averages about .03 g.

Results

LA 58971 (Late Archaic Open Site)

Pits 1e and 1w were large and had heavy trash concentrations at their bottoms. Cultural plant remains, too, were concentrated in the lower fill strata (Levels 5 and 6 of Pit 1e, and Levels 6 and 7 of Pit 1w; Tables 31 and 32). In 1e, goosefoot and corn cupules were common to both levels productive of cultural plant remains, while tansymustard, piñon nutshell, dropseed grass, cultivated bean, and Unknown 9113 all occurred in one or the other level. Charcoal in 1e included principal elements of creosotebush, sage, oak, and mesquite, plus smaller components of a wide variety of coniferous, riparian, and shrubby species (Table 33). Pit 1w contained squawberry seed in Levels 5 and 7, and corn in the two deepest levels. Goosefoot, piñon, mesquite, and Unknown 9113 were restricted to Level 6.

The slightly smaller Pit 3a contained a lighter concentration of trash distributed throughout fill, and fewer archeobotanical remains. Corn cupules were present in Level 2, and goosefoot seeds in Level 3 (Tables 32 and 34). Of 10 taxa, juniper was the principal wood in this pit (Table 33).

Pit 7a contained corn remains in all three sampled levels, plus small numbers of burned seeds (Tables 35 and 36). The goosefoot and squawberry seeds are reasonable economic remnants, while a single charred spurge seed in the deepest level may be an intrusive contemporary with the cultural occupation because the genus is of little known economic utility.

Pit 7a produced the only measurable corn cob fragment (FS 7A-43) from any of the Picacho sites. With 14 rows, this cob overlaps with only a fraction of cobs seen at nearby sites of Beth Cave, where 10 percent, or 15 of the cobs had this many rows (Adams 1986); and Henderson Pueblo, where only 2 percent, or three cobs, had 14 rows (Dunavan 1989). At both these sites, 10 and 12 rowed cobs predominated. The cob from Pit 7a was larger in cob diameter and cupule width than the average at Beth Cave or Henderson, especially when shrinkage during carbonization is taken into account.

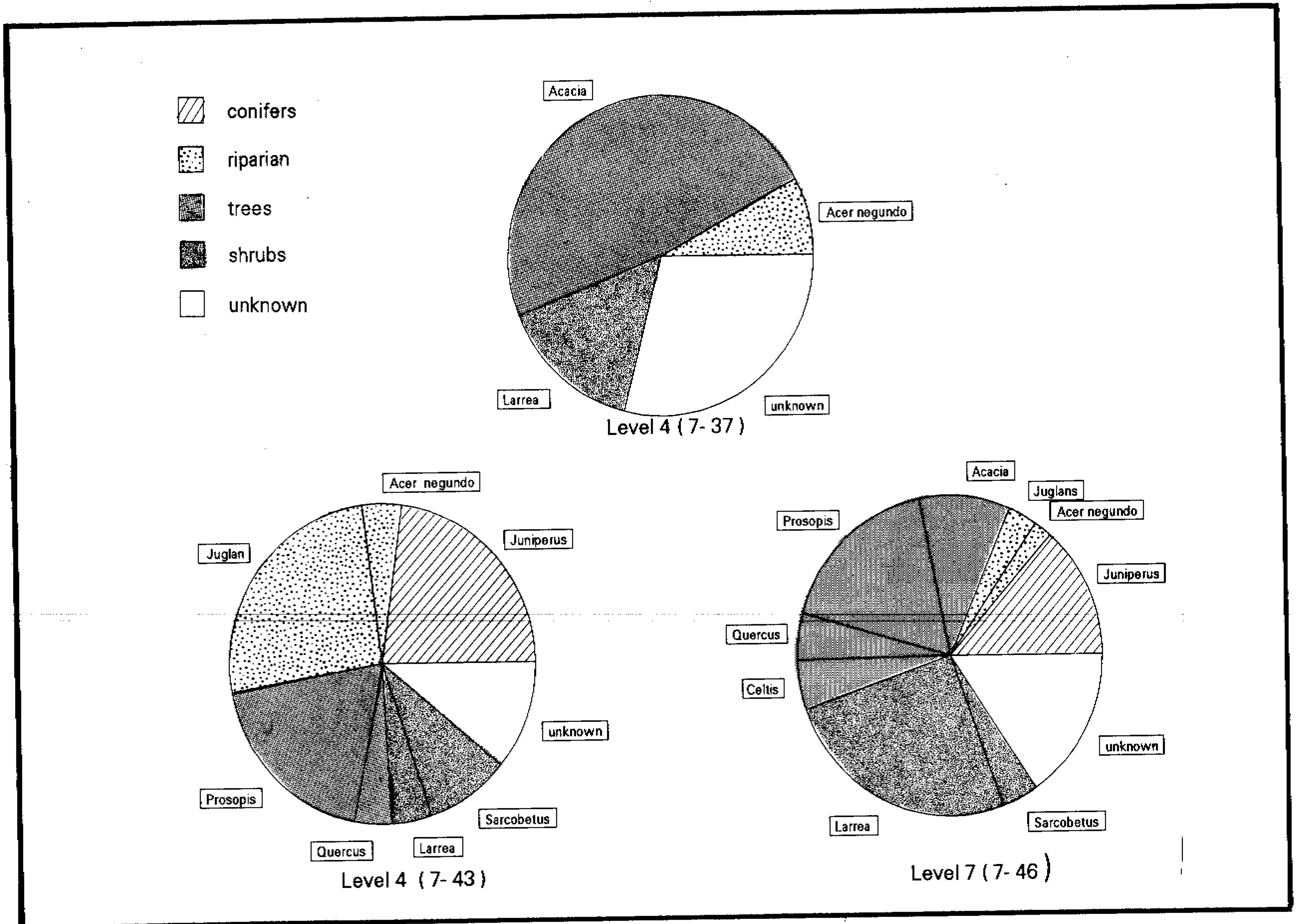

Figure 56. Percent species composition of charcoal by level, Pit 7a, LA 58971.

Given the great morphometric variability inherent in all dry-farmed corn populations, no serious importance can be attached to the eccentric location of the Pit 7a cob with respect to population parameters at Beth Cave and Henderson Pueblo. Charcoal was more diverse in deeper levels of Pit 7a (Table 33). Levels 4 and 7 had significant components of juniper and mesquite, while several other taxa varied considerably from level to level (Fig. 56). Pit 5a, the smallest and least-belled of the storage pits on the north side of the highway, contained only two badly damaged, charred seeds, along with a few probable postcultural intrusives (Table 35).

Pits 8a, 8b/8c, and 8d shared some unique attributes of construction and placement, suggesting contemporary use by a single family or group (Wiseman, this report). Both 8a and 8b/8c contained goosefoot and corn (Table 36). An unburned, whole hackberry seed in 8b is probably intrusive. While sweet and figlike in taste, and contributing usable calcium, hackberries have usually been pounded whole (Yanovsky et al. 1952:565), so that cultural debris of hackberry use should be fragmentary.

Of the four rock hearths encountered at LA 58971, three (1a, 4a, and 4b) were grouped together and appeared to be part of a living area bordered by midden and two large storage pits (1e and 1w). These hearths were small shallow oval basins with burned rock and charcoal-stained fill. While 1a contained no charred plant remains (Table 31), 4a had corn debris, and 4b goosefoot, tansymustard, and piñon in addition to corn (Table 34).

Table 30. Proveniences sampled for botanical remains, LA 58971

Provenience	Flotation	Carbon-14	Pollen
Number of samples	26	7	24
Midden	none	none	none
Pits			
1e	1E-48, 49, 51	1E-48/58, 51/55	1E-48, 49, 51
1w	1W-52, 54, 56, 68	56/64	1W-52, 53, 54, 56
3	3-35, 37, 38, 39	3-13/33/37	3-35, 37, 38, 39
5a	5A-25, 26		5A-25, 27
7a	7A-45, 46, 47, 48, 49, 50	7A-37, 43, 46	7A-42, 45, 46, 47, 49, 50
8a	8A-45, 48	8A-38	8A-45
8b/8c	8B/C-50		8B/C-50
8d			8D-69
Hearths			
1a	1A-61		1A-61
4	4-63, 65, 71		4-63

Table 31. Flotation results, Feature 1, LA 58971

Taxa	Hearth fill FS 1A-61	Large Pit Level 4 FS 1E-49	Large Pit Level 5 FS 1E-51	Large Pit Level 6 FS 1E-48	Large Pit Level 4 FS 1W-54
WEEDY ANNUALS: *Chenopodium* (goosefoot)			1/0.9*	1/1.2*	
Descurainia (tansymustard)			2/4.6*		
PERENNIALS: *Pinus edulis* (piñon pine)				1/0.2*	
GRAMINEAE: *Sporobolus* (dropseed)			1/2.3*		
CULTIVARS: *Zea mays* (corn)			c*	c*	
Phaseolus (bean)			1/0.3*		
UNKNOWN 9113				2/1.6*	
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	0	0	5	4	0
Total burned taxa	0	0	5	4	0
Total seeds	0	0	5/8.1	3/3.0	0
PROBABLE CONTAMINANTS: *Chenopodium* (goosefoot)	3/2.6				
Juniperus (juniper)	tw				
TOTAL CONTAMINANTS: Total taxa	2	0	0	0	0
Total seeds	3/2.6	0	0	0	0

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter (taking into account subsampling and original volume of soil sample)
* some or all items burned
c = cupule; k = kernel; tw = twig

Table 32. Flotation results, Features 1 (cont.) and 3, LA 58971

Taxa	FS 1W-52 Feature 1 (pit) Level 5	FS 1W-68 Feature 1 (pit) Level 6	FS 1W-56 Feature 1 (pit) Level 7	FS 3-35 Feature 3 (pit) Level 2	FS 3-39 Feature 3 (pit) Level 3
WEEDY ANNUALS: *Chenopodium* (goosefoot)		1/1.3*			2/1.5*
PERENNIALS: *Rhus trilobata* (skunkbush)	1/0.3*		2/0.4*		
Pinus edulis (piñon pine)		1/0.2*			
Prosopis (mesquite)		1/0.2*			
CULTIVARS: *Zea mays* (corn)		c*	c* 1/0.2*	c*	
UNKNOWN 9113		4/0.8*			
Unidentifiable	1/0.3*		2/0.4*		
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	1	5	2	1	1
Total burned taxa	1	5	2	1	1
Total seeds	2/0.6	7/2.5	3/0.6	0	2/1.5
PROBABLE CONTAMINANTS: *Euphorbia* (spurge)					1/0.8
Compositae (sunflower family)					1/0.8
Melilotus (clover)		1/0.2			
Atriplex canescens (saltbush)					2/1.5
Bromus (bromegrass)					
Setaria (bristlegrass)		2/0.4		6/5.6	
Unknown 9114					1/0.8
TOTAL CONTAMINANTS: Total taxa	0	2	0	1	5
Total seeds	0	3/0.6	0	6/5.6	8/6.2

Table 33. Species composition of charcoal samples for C-14 analysis, LA 58971

Taxa	1E-48, 58 # g	1E-51, 55 # g	1E-56, 64 # g	3-13, 33, 37 # g	7A-37 # g	7A-43 # g	7A-46 # g	8A-38* # g	Total Pieces %	Total Weight %
CONIFERS: *Juniperus* (juniper)	5 0.2 g	3 0.4 g	4 0.4 g	12 1.4 g		5 3.2 g	8 1.5 g	27 1.0 g	64 14%	8.1 g 10%
Pinus edulis (piñon)	2 0.2 g	1 0.1 g							3 1%	0.3 g <1%
Undetermined conifer	1 0.1 g								1 <1%	0.1 g <1%
NON-CONIFERS: (Riparian) *Populus/Salix* (cottonwood/ willow)	4 0.3 g		2 0.1 g					1 0.1 g	7 2%	0.5 g 1%
Acer negundo (box elder)	2 0.1 g	7 1.0 g	2 0.2 g	2 0.2 g	1 1.4 g	4 0.6 g	2 0.2 g		20 5%	3.7 g 4%
Juglans (walnut)	5 0.6 g	3 0.2 g	6 1.2 g	3 0.5 g		6 3.6 g	1 0.3 g		24 5%	6.4 8%
(Arboreal) *Prosopis* (mesquite)	8 0.7 g	9 1.2 g	4 0.4 g	1 0.4 g		4 2.6 g	7 1.9 g	15 0.8 g	48 10%	8.0 g 10%
Quercus (oak)	11 2.7 g	3 0.3 g	3 0.4 g	4 1.0 g		2 0.6 g	4 0.4 g		27 6%	5.4 g 7%
cf. *Acacia* (acacia)		1 <0.1 g			5 8.6 g		6 1.1 g		12 3%	9.7 g 12%
cf. *Celtis* (hackberry)		1 <0.1 g		2 0.2 g			2 0.3 g		5 1%	0.5 g 1%
(Shrubby) *Atriplex* (saltbush)								6 0.3 g	6 1%	0.3 g <1%
Sarcobatus (greasewood)	1 0.1 g		1 0.2 g			2 1.3 g	3 0.4 g	7 0.2 g	14 3%	2.2 g 3%
Larrea (creosotebush)	19 1.9 g	29 3.5 g	19 3.2 g	4 0.8 g	1 2.7 g	1 0.5 g	8 2.7 g	4 0.3 g	85 18%	15.6 g 19%
cf. *Artemisia* (sage)	15 1.2 g	3 0.4 g	2 0.3 g	6 1.0 g				12 0.5 g	38 8%	3.4 g 4%
UNKNOWNS: Unknown B	15 2.1 g	1 0.1 g							16 3%	2.2 g 3%
Unknown C	1 0.1 g								1 <1%	0.1 g <1%
Unknown E	1 0.1 g					1 0.2 g	1 0.1 g		3 1%	0.4 g <1%

Taxa	1E-48, 58 # g	1E-51, 55 # g	1E-56, 64 # g	3-13, 33, 37 # g	7A-37 # g	7A-43 # g	7A-46 # g	8A-38* # g	Total Pieces %	Total Weight %
Unknown F		5 0.3 g	5 1.1 g	1 0.1 g	1 2.0 g				12 3%	3.5 g 4%
Unknown G			4 0.9 g			1 0.4 g	1 0.3 g		6 1%	1.6 g 2%
Unknown H			1 0.1 g				1 0.3 g		2 1%	0.4 g <1%
Unknown I			1 0.1 g						1 <1%	0.1 g <1%
Unknown L								1 0.2 g	1 <1%	0.2 g <1%
Undetermined nonconifer	20 2.3 g	14 1.3 g	7 1.1 g	5 0.5 g	2 3.1 g	2 0.6 g	6 1.0 g	7 0.1 g	63 14%	10.0 g 12%
Total pieces Total weight	110 12.7 g	80 8.8 g	60 9.7 g	40 6.1 g	10 17.8 g	30 14.0 g	50 10.5 g	80 3.5 g	459 100%	82.7 g 100%
Total taxa (undetermined)	13 +2	12 +2	12 +1	10 +1	4 +1	10 +1	12 +1		20 +2	

Unknown C: Ring-porous, but most of ring made up of similar-sized vessels, fairly closely packed. Multicellular rays. Cf. Prunus.
Unknown E: Very ring-porous. Initial row of substantial vessels, followed by wide band with no vessels, and then several parallel rows of conjoined parenchyma. Rays 2-3 cells wide.
Unknown F: Vessels change gradually in size and fill in most of area between the wide rays.
Unknown G: Vessels are few and tiny. Very wide rays.
Unknown H: Similar to Unknown F, but bigger vessels.
Unknown I: Small vessels, solitary or in pairs. Very wide rays.

Note: The following species and categories were *not* included in the actual dated samples: juniper, greasewood, mesquite, all unknowns, and all undetermined.

* The following species and categories were *not* included in the actual dated samples: saltbush, Unknown L, undetermined nonconifer.

Table 34. Flotation results, Features 3 (cont.) and 4, LA 58971

Taxa	FS 3-38 Feature 3 (pit) Level 4	FS 3-37 Feature 3 (pit) Level 5	FS 4A-71 Feature 4A (hearth)	FS 4B-63 Feature 4B (hearth)	FS 4B-65 Feature 4B (hearth)
WEEDY ANNUALS: *Chenopodium* (goosefoot)				1/0.7*	
Descurainia (tansymustard)		1/1.7*		1/0.7*	
Oenothera (evening primrose)		1/1.7*			
PERENNIALS: *Rhus trilobata* (squawberry)		3/0.8*			

Taxa	FS 3-38 Feature 3 (pit) Level 4	FS 3-37 Feature 3 (pit) Level 5	FS 4A-71 Feature 4A (hearth)	FS 4B-63 Feature 4B (hearth)	FS 4B-65 Feature 4B (hearth)
Pinus edulis (piñon pine)					1/0.2*
CULTIVARS: *Zea mays* (corn)		c* 1/0.3*	c*	c*	c*
UNKNOWN 9113		1/1.0*			1/1.6*
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	0	5	1	3	3
Total burned taxa	0	5	1	3	3
Total seeds	0	7/5.5	0	2/1.4	2/1.8
PROBABLE CONTAMINANTS: *Euphorbia* (spurge)			3/4.1		
Chenopodium (goosefoot)	1/1.5				
Kallstroemia		2/2.0			
Opuntia (pricklypear cactus)		1/0.3			
Bromus (bromegrass)				3/0.5	
Setaria (bristlegrass)		13/12.1			
Unknown 9114		1/1.0			
Unidentifiable		1/0.3			
TOTAL CONTAMINANTS: Total taxa	1	4	1	1	0
Total seeds	1/1.5	18/15.7	3/4.1	3/0.5	0

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter (taking into account subsampling and original volume of soil sample)
* some or all items burned
c = cupule; k = kernel; tw = twig

Table 35. Flotation results, Features 5 and 7, LA 58971

Taxa	FS 5A-25 Feature 5 (pit) Lower Fill	FS 5A-26 Feature 5 (pit)	FS 7-45 Feature7 (pit) Level 4	FS 7-48 Feature7 (pit) Level 4	FS 7-47 Feature7 (pit) Level 7
WEEDY ANNUALS: *Chenopodium* (goosefoot)					1/2.0*
Euphorbia (spurge)					1/0.6*
PERENNIALS: *Rhus trilobata* (squawberry)				2/0.3*	
CULTIVARS: *Zea mays* (corn)			c*	c*	c*
Unidentifiable	2/0.4*				
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	0	0	1	2	3
Total burned taxa	0	0	1	2	3
Total seeds	2/0.4	0	0	2/0.3	2/2.6
PROBABLE CONTAMINANTS: *Chenopodium* (goosefoot)		1/0.6			
Euphorbia (spurge)	2/1.5		1/0.8		
TOTAL CONTAMINANTS: Total taxa	1	1	1	0	0
Total seeds	2/1.5	1/0.6	1/0.8	0	0

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter (taking into account subsampling and original volume of soil sample)
* some or all items burned
c = cupule; k = kernel; tw = twig

Table 36. Flotation results, Features 7 (cont.) and 8, LA 58971

Taxa	FS 7A-46 Feature7 (pit) Level 8	FS 7A-49 Feature 7 (pit) Level 9	FS 7A-50 Feature 7 (pit) Level 10	FS 8A-45 Feature 8 (pit) Level 3	FS 8A-48 Feature 8 (pit) Level 3	FS 8B-50 Feature 8 (pit) Levels 4-5
WEEDY ANNUALS: *Chenopodium* (goosefoot)	6/5.9*			3/2.2*	14/2.3*	2/0.3*
Portulaca (purslane)	2/2.0*					
CULTIVARS: *Zea mays* (corn)	c*	c* 1/0.2*	c* 1/0.2*		c*	c*
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	3	1	1	1	2	2
Total burned taxa	3	1	1	1	2	2
Total seeds	8/7.9	1/0.2	1/0.2	3/2.2	14/2.3	2/0.3
PROBABLE CONTAMINANTS: *Celtis* (hackberry)				1/0.2		
Juniperus (juniper)		tw				
TOTAL CONTAMINANTS: Total taxa	0	1	0	1	0	0
Total seeds	0	0	0	1/0.2	0	0

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter (taking into account subsampling and original volume of soil sample)
* some or all items burned
c = cupule; k = kernel; tw = twig

Discussion: LA 58971

At LA 58971, pollen results from pits seem to sort out nicely by major taxonomic groups, suggesting specific uses for individual pits (Holloway, this report). Pollen is certainly the marker of choice for utilization of storage pits, insofar as these features are repositories for unburned food materials (though it may be inappropriate to expect uniformity of use over long stretches of time). Flotation will pick up charred food remains that are presumably cultural intrusives (associated in time, but not use) and uncharred remains of economic species (ambiguous as to time, and hence as to functional association, too). It is not surprising, then, that flotation remains from these pits show very different patterning from pollen remains (Table 37). Pits 3, 8a, and 8b/8c contained predominately cacti pollen, but only one of the seven analogous flotation samples (FS3-37 from Pit 3) contained cactus seed (unburned pricklypear). Charred corn remains were present in five of the seven flotation samples, representing each of the three pits. Pit 1w was notable for globemallow pollen, which did not occur as seed remains in this or any other pit sample. Charred squawberry, piñon, and mesquite/acacia seeds occurred, as well as corn debris. Pits 5 and 7a were distinguished by abundant corn pollen, while Pit 5 was one of the few proveniences in the site that had no corn flotation remains at all. Pit 7a contained burned corn cob parts in five of the seven samples; these increased in frequency in deeper levels of the pit, where a few kernel fragments were also found. One Pit 7a flotation sample contained charred squawberry remains as well.

With respect to storage pits, flotation remains could neither confirm taxonomic specificity of individual storage pits, nor, in the case of Pits 3, 8a, and 8b/8c, give more specific direction as to which cactus taxa may have been involved. To provide substantive support evidence of storage pit use, flotation would need to produce unburned economic plant remains close to the bottom of pits. Charred economic plant remains help define storage pit use only where a pit and contents have burned prior to secondary filling. We have no such scenario here, so flotation remains can only contribute to a general picture of plant species manipulated in and around burn features at this site.

Hearths produced poor records of both pollen and larger, charred plant remains. Ironically, the best record of what plant-related activities took place in hearths at this site is probably located outside of the shallow hearths, in secondary deposits of the deeper, more protected storage pits. In the site as a whole, charred corn remains were the most widespread plant artifact, occurring in density in storage Pit 7a, and in low frequency in most other proveniences (Table 38). Far rarer beans were the only other indicator of cultivated crops. It is well to keep in mind that taphonomy dictates a good deal of the low profile of beans in archeological contexts (e.g., Kaplan 1956:199). Beans were likely of secondary but not minuscule significance next to corn. Among wild plant resources, goosefoot was most widespread at LA 58971, as it is at sites of all ages in much of the Southwest. Others included tansymustard, purslane, an unidentified weedy annual (Unknown 9113), piñon, squawberry, mesquite, and dropseed grass. All are available in the immediate site area except piñon, whose high energy value (635 calories per 100 grams; Ford 1968a:158, 160) would make the few-kilometer collection journey well worth while.

From observations of pollen results, Holloway (this report) notes that proveniences with economic remains appeared to be located in the southern portion of the site. Looking at flotation results, a similar pattern is indeed present, but I see this as a spatial patterning of suitable preservation loci, rather than as a clustering of plant processing activities. Macrobotanical remains are most abundant and diverse in the large storage pits, which happen to be in the southern part of the site. Hearths, which frequently are poor retainers of cultural pollen due to taphonomic factors, are poor for macrobotanical remains as well at this site, apparently because few primary deposits remain in these shallow features.

Table 37. Comparison of pollen and flotation remains by feature, LA 58971

Pit	Pollen (principal taxon)	Flotation (principal economic taxa present)
3	Cactaceae	pricklypear, squawberry,* corn*
8a	Cactaceae	no cacti; corn*
8b/8c	Cactaceae	no cacti; corn*
1w	globemallow	no globemallow; squawberry,* piñon,* mesquite/acacia,* corn*
5	corn	no corn
7a	corn	corn* in all 6 samples, squawberry*
1e	no pollen of economic species	goosefoot,* tansymustard,* piñon,* dropseed,* corn,* bean*

*Some or all specimens carbonized

Table 38. Ubiquity of economic plant taxa in flotation samples by feature type, LA 58971

Taxa	Storage Pits		Hearths		Total Site
	% pits (n=7)	% samples (n=22)	% hearths (n=3)	% samples (n=4)	% samples (n=26)
Chenopodium (goosefoot)	86	41	33	25	38
Descurainia (tansymustard)	29	9	33	25	12
Portulaca (purslane)	14	5			4
Unknown 9113	43	14	33	25	15
Pinus edulis (piñon)	29	9	33	25	12
Rhus (squawberry)	43	18			15
Prosopis (mesquite)	14	5			4
Sporobolus (dropseed grass)	14	5			4
Zea mays (corn)	71	64	67	75	65
Phaseolus (bean)	14	5			4

Taxa	Storage Pits		Hearths		Total Site
	% pits (n=7)	% samples (n=22)	% hearths (n=3)	% samples (n=4)	% samples (n=26)
Additional unburned taxa present	*Melilotus*, *Euphorbia*, Compositae, *Celtis*, *Juniperus*, *Opuntia*, *Larrea*, *Atriplex*, *Setaria*, Unknown 9114		*Euphorbia*, *Bromus*		

LA 71167 (Ceramic-Period Shelters and Caves)

Most of the flotation, pollen, and wood samples from LA 71167 originate from Tintop or South Cave (Table 39).

Tintop (South Cave)

The original overhang covered most grids with a west designation; this segment of the site includes all major occupation debris, as well as the heating features. Highway construction in 1938 removed about 1 m of this overhang, so that only samples from square 6N/1W (FS 364 and 367) came from the part of the site that continues to be protected by a roof.

Hearth 1 was a small circular charcoal lens with no associated use-surface. Botanical remains were very scanty (Table 40) and of little help in pinning down any use attributes.

Hearths 2 and 3 each represented an area of the floor used repeatedly for campfires over an extended period of time. Surrounding earth was burned orange-red, and ash and/or charcoal accumulated in the center. Charred corn cupules were present in Feature 2, and bean in Feature 3. Other economic plant taxa included purslane and pricklypear cactus in Feature 3, skunkbush or squawberry in Feature 2, and tobacco in both hearths. Charcoal included major elements of juniper, greasewood, mesquite, and creosotebush (Tables 41 and 42). Pollen from Hearths 2 and 3 showed no significant departures from the background spectrum dominated by cheno-ams and the weak presence of Asteraceae (Holloway, this report).

Two samples belonging to a level spanning the lower realms of Stratum 2 and upper Stratum 3 contained charred goosefoot seeds and unburned seeds of several taxa likely to be economic (Table 40). Tobacco, hedgehog cactus, and walnut grow in limited or specialized habitats and have strong records of being sought out by humans for food, medicinal puposes, or recreational pursuits. Charcoal from FS 358 was predominately box elder, a tree species with riparian proclivities (Table 42). Both corn and Solanaceae pollen were recovered from FS 358, the only occurrence for either taxon at this site (Holloway, this report).

The single flotation sample representing Stratum 3, the layer highest in artifact density, contained only one charred purslane seed (FS 394; Table 40). Charcoal was diverse in this location, including juniper, walnut, box elder, creosotebush, and mesquite (Table 42). Three samples in the eastern end of Tintop, spanning Strata 3 and 4, contained few economic remains (Table 43). These were tobacco in 2N/2E, and the site's only occurrence of (possible) globemallow in 5N/2E. Charcoal was diverse in each of these samples, and varied as well between samples: juniper, walnut, box elder, creosotebush, mesquite, and cottonwood/willow were all represented (Table 42).

Starting in Stratum 4, flotation remains get more interesting. All cultivar remains are relegated to Stratum 4 hearths (Table 40) and fill (Tables 43, 44, 45). Several perennials (squawberry, pricklypear, yucca, and grape) make their only appearances in Stratum 4, and weedy annuals (goosefoot, purslane, and tobacco) continue their activity. Our perception of increased diversity of woody species utilized in Stratum 4 proveniences may be augmented by the larger sample size available (Table 42). Two shrub species, saltbush and greasewood, make their appearance at this depth, whereas box elder and cottonwood/willow seem to be fading out. The continued picture is one of considerable diversity of wood utilization.

North Shelter

The North Shelter, while protected by overhanging bedrock, was open on three sides and received runoff diverted by the steep talus. This explains why the botanical assemblage lacks the abundant cultural materials (especially unburned, nonreproductive parts) characteristic of dry shelter deposits. Excavation was restricted to the slope outside the overhang. Flotation remains were few and consisted of more likely intrusives than cultural remains (Table 47).

Finally, it is worth looking separately at the few samples from the deepest levels of Stratum 4 to explore the possibility of their representing an earlier occupation in the Late Archaic era. Keeping in mind that we have 4 flotation samples from Levels 8 and 9, compared to 12 from higher up in Stratum 4, there are some simple trends in plant utilization apparent (Table 46). A wider range of weedy annuals occur (the only occurrences of carbonized pigweed and sunflower at Tintop are at this depth), and perennials fall off to a single occurrence of hedgehog cactus (FS 387; Table 45). There is one incidence of corn (two cupules in FS 390). Wood use is diverse, and not appreciably different from higher up in Stratum 4 (Table 42).

North Cave

This small cave (less than 1 m tall) lay outside the right-of-way, and excavations took place on the talus slope below. Thinly scattered artifacts imply repeated, very short-term use of the shelter during the prehistoric Ceramic period. At least one overnight stay in these cramped quarters is suggested by a gray ash lens (18-26 cm below present ground surface) outside the cave. Carbonized flotation remains indicate a variety of plant materials were either manipulated here or blew into the fire from the environs. These include weedy annuals (tobacco, goosefoot, primrose), pricklypear cactus, and a grass (Table 47). Charred Oenothera is a curious inclusion here. This herbaceous plant prefers sandy soil and is found in "dry, grassy, and disturbed places"

(Kearney and Peebles 1960:596). The plant is of minimal ethnobotanical importance, although Castetter mentions that the Mescalero Apache ate the fruits of the evening primrose (1935:17). Primrose seeds rarely are found charred in archeological contexts, implying a minimal or incidental role in economic systems. Unburned seeds in the North Cave hearth include some species unlikely to have been used as food (spurge, carpetweed). Chiefly mesquite (70 percent of pieces), and some walnut, was burned in this hearth.

Discussion

Sampled locations in Tintop Cave and outside North Cave continue the record of prehistoric utilization of a wide diversity of plant types. At Tintop, weedy annuals are found throughout but are relatively low in frequency and diversity. These include goosefoot, purslane, and tobacco (most ubiquitous in terms of provenience type and the full time range represented by fill strata), followed by isolated appearances of globemallow (Stratum 3/4) and pigweed and sunflower (deepest levels of Stratum 4). Perennial species are present in upper fill (Stratum 2/3: walnut and hedgehog cactus) and the major deposition stratum (Stratum 4, including its deepest levels: pricklypear, yucca, grape, and hedgehog cactus). While the only occurrence of corn *pollen* is in Stratum 2/3 (two grains; Holloway, this report), cultivars recovered by flotation are found only in Stratum 4. Charred corn cupules and beans are not abundant anywhere at Tintop but occur in enough different locations (three proveniences for each taxon) to imply that farming products were an actual, though minor, part of the subsistence mode. Contaminants are not numerous in any Tintop provenience, though the array is fairly diverse in a few Strata 2/3 and 3/4 samples. Likely contaminant taxa include goosefoot, spurge, tansymustard, purslane, carpetweed, saltbush, pricklypear, hackberry, nightshade family, dropseed, and bristlegrass.

Utilized plant food species show some variation over time at Tintop. Upper fill levels (Strata 2/3, 3, and 3/4) show relatively little economic plant activity. Ceramic-period Stratum 4 is characterized by records of a number of perennials (cacti and yucca, squawberry and grape) and some annuals (goosefoot, purslane, and tobacco). In the deepest levels of Stratum 4, *possibly* associated with the Late Archaic era, annuals are more diverse and more prominent, and hedgehog cactus is the only perennial. Cultivars are associated with both the perennial-rich Stratum 4 and the annual-rich Levels 8 and 9.

Wood use at Tintop encompasses a variety of wood and shrub species from throughout the elevational gradient in this segment of the Hondo Valley, plus conifers brought in from higher up. From flotation, dominant types are creosotebush (27 percent), mesquite (20 percent), and juniper (17 percent). At least 18 taxa are represented (average = 4.7 per sample). Carbon-14 wood is dominated by mesquite and juniper, with less creosotebush, and a significant component of greasewood (localized in the Feature 2 hearth). The considerable variability from provenience to provenience evens out somewhat when looked at on a stratum-by-stratum basis (Table 42).

North Cave contained remains of three weedy annuals, pricklypear, and a grass, in an outdoor hearth fueled mostly by mesquite.

Table 39. Proveniences sampled for botanical remains, LA 71167 (field specimen numbers)

Provenience	Flotation	Wood Flotation (Carbon-14)		Pollen
Number of samples	27	22	6	12
SOUTH CAVE: Hearths: 1 (Stratum 4)	397	397		
2 (Stratum 4)	362	362	363/382	382
3 (Stratum 4)	365	365	351	364
Fill: Level 3 (Stratum 2/3)	355, 358	358		355, 358
Level 4 (Stratum 3)	394	394		
Level 5 (Stratum 3/4)	383, 391, 395	383, 391, 395	371, 392	
Level 6 (Stratum 4)	356, 359, 364, 384, 388	356, 359, 364, 384, 388		356, 359
Level 7 (Stratum 4)	360, 367, 385, 389	360, 367, 385, 389	398	357, 360
Level 8 (Stratum 4)	361, 386, 390	361, 388, 390	399	
Level 9 (Stratum 4)	387	387		
NORTH SHELTER: Hearth (Stratum 4)	654			
Level 4 (Stratum 4)	676			676
Level 5, 5/6 (Stratum 4)	675, 677			675, 677
NORTH CAVE: Hearth? (Stratum 2)	686	686		x-14

Table 40. Flotation results, hearths and Stratum 2/3, Tintop Cave, LA 71167

Taxa	FS 397 Feature1 (hearth)	FS 362 Feature2 (hearth)	FS 365 Feature3 (hearth)	FS 355 4N/1W Stratum 2/3	FS 358 5N/1W Stratum 2/3	FS 394 6N/2E Stratum 3
WEEDY ANNUALS: *Chenopodium* (goosefoot)				3/21.0*		
Nicotiana (tobacco)		2/14.7	1/3.3*	10/174.7	11/153.5	
Portulaca (purslane)			1/0.7*			1/1.3*
PERENNIALS: *Echinocereus* (hedgehog cactus)				1/3.5	2/8.1	
Opuntia (pricklypear cactus)			1/0.7*			
Yucca (yucca)						
Rhus trilobata (skunkbush)		1/0.2*				
Juglans walnut				1/0.2		
CULTIVARS: *Zea mays* (corn)		c*				
Phaseolus (bean)			2/0.3*			
UNKNOWNS: 9115			1/0.7*			
9117		1/0.2*				
Unidentifiable	1/2.4*			1/3.5*		
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	0	4	5	4	2	1
Total burned taxa	0	3	5	1	0	1
Total seeds	1/2.4	4/15.1	6/5.7	16/202.9	13/161.6	1/1.3
PROBABLE CONTAMINANTS: Chenopodium (goosefoot)			2/6.6		1/8.1	
Euphorbia (spurge)		1/3.7			1/8.1	1/1.3

Taxa	FS 397 Feature1 (hearth)	FS 362 Feature2 (hearth)	FS 365 Feature3 (hearth)	FS 355 4N/1W Stratum 2/3	FS 358 5N/1W Stratum 2/3	FS 394 6N/2E Stratum 3
Descurainia (tansymustard)		1/7.3				
Portulaca (purslane)		1/3.7			1/8.1	
Mollugo					1/4.0	
Atriplex canescens (saltbush)		3/0.6				
Opuntia (pricklypear)				2/3.7	5/1.0	
Celtis (hackberry)						1/0.2
Unidentifiable		1/0.2				
TOTAL CONTAMINANTS: Total taxa	0	4	1	1	5	2
Total seeds	0	7/15.5	2/6.6	2/3.7	9/29.3	2/1.5

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter (taking into account subsampling and original volume of soil sample)
* some or all items burned
c = cupule; k = kernel; tw = twig

Table 41. Species composition of dated* and nondated charcoal samples, Tintop Cave, LA 71167

Taxa	363/382 Stratum 4 Feature 2 (hearth)* # g	351 Stratum 4 Feature 3 (hearth) # g	371 Stratum 3/4 5N/0W 6N/0W # g	392 Stratum 3/4 5N/2E* # g	398 Stratum 4 3N/3E* # g	399 Stratum 4 Level 8 3N/3E # g	TOTAL	
							Pieces %	Weight %
CONIFERS: *Juniperus* (juniper)	4 0.3 g	12 0.1 g	14 0.2 g			10 0.4 g	40 15%	1.0 g 6%
Undetermined conifer	1 0.1 g				1 0.1 g		2 <1%	0.2 g 1%
NON-CONIFERS: (Riparian) *Populus/Salix* (cottonwood/ willow)		2 <0.05 g		17 2.9 g			19 7%	2.9 g 17%

Taxa	363/382 Stratum 4 Feature 2 (hearth)* # g	351 Stratum 4 Feature 3 (hearth) # g	371 Stratum 3/4 5N/0W 6N/0W # g	392 Stratum 3/4 5N/2E* # g	398 Stratum 4 3N/3E* # g	399 Stratum 4 Level 8 3N/3E # g	TOTAL	
							Pieces %	Weight %
Juglans (walnut)	1 <0.05 g			19 3.1 g			20 7%	3.1 g 18%
(Arboreal) *Prosopis* (mesquite)	8 0.2 g	18 0.2 g	14 0.5 g	11 3.2 g	9 1.7 g	3 0.3 g	63 24%	6.1 g 35%
Quercus (oak)		7 0.1 g			2 0.1 g		9 3%	0.2 g 1%
(Shrubby) *Sarcobatus* (greasewood)	44 0.3 g	1 <0.05 g					45 17%	0.3 g 2%
Larrea (creosotebush)	10 0.3 g	4 <0.05 g		11 0.5 g			25 10%	0.8 g 4%
cf. *Artemisia* (sage)			3 0.1 g	2 0.8 g	8 0.8 g	7 0.2 g	20 7%	1.9 g 11%
Unknown C	1 0.1 g						1 <1%	0.1 g <1%
Undetermined nonconifer	1 <0.05 g	6 0.2 g	22 0.7 g				29 11%	0.9 g 5%
Total pieces Total weight	70 2.3 g	50 0.6 g	53 1.5 g	60 10.5 g	20 2.7 g	20 0.9 g	263 100%	17.5 g 100%
Total taxa (undetermined)	6 (+2)	6 (+1)	3 (+1)	5	3 (+1)	3	9 (+2)	

Table 42. Species composition (percent pieces) of flotation and C-14 charcoal by stratum, Tintop Cave, LA 71167

Taxa	Stratum 2/3	Stratum 3	Stratum 3/4	Stratum 4	Stratum 4 Levels 8, 9
Flotation: Number samples/pieces	1/20	1/20	3/60	12/240	4/80
Carbon-14: Number samples/pieces	0/0	0/0	2/113	3/140	1/20
Juniperus (juniper)	20	25	14	15	24

Taxa	Stratum 2/3	Stratum 3	Stratum 3/4	Stratum 4	Stratum 4 Levels 8, 9
Artemesia (sage)			3	2	9
Atriplex (saltbush)				1	2
Sarcobatus (greasewood)				20	2
Larrea (creosotebush)		35	14	21	31
Acer negundo (box elder)	80	5	2	<1	
Juglans (walnut)		10	17	2	6
Prosopis (mesquite)		5	24	22	10
Populus/Salix (cottonwood/willow)			12	1	1
Others/Unknowns		20	14	16	15

Table 43. Flotation results, Strata 3/4 and 4, Tintop Cave, LA 71167

Taxa	FS 383 2N/2E Stratum 3/4 Level 5	FS 391 5N/2E Stratum 3/4 Level 5	FS 395 6N/2E Stratum 3/4 Level 5	FS 356 4N/1W Stratum 4 Level 6	FS 359 5N/1W Stratum 4 Level 6	FS 364 6N/1W Stratum 4 Level 6
WEEDY ANNUALS: *Chenopodium* (goosefoot)					2/3.5*	
Nicotiana (tobacco)	6/31.2					
Opuntia (pricklypear cactus)						1/0.2*
Yucca (yucca)				1/0.2*		
Phaseolus (bean)					2/0.3*	
Unknown 9116					1/0.2*	
Unidentifiable		1/10.0*[1]			1/0.7*	1/0.2*
Total taxa	1	1	0	1	3	1
Total burned taxa	0	1	0	1	3	1
Total seeds	11/34.7	1/10.0	0	1/0.2	4/4.4	2/0.4

Taxa	FS 383 2N/2E Stratum 3/4 Level 5	FS 391 5N/2E Stratum 3/4 Level 5	FS 395 6N/2E Stratum 3/4 Level 5	FS 356 4N/1W Stratum 4 Level 6	FS 359 5N/1W Stratum 4 Level 6	FS 364 6N/1W Stratum 4 Level 6
Chenopodium (goosefoot)						1/1.7
Euphorbia (spurge)	1/0.7					
Descurainia (tansymustard)	5/22.7					
Mollugo	1/2.8					
Atriplex canescens (saltbush)			1/0.2			
Unknown 9117	5/3.5					
TOTAL CONTAMINANTS: Total taxa	4	0	1	0	0	1
Total seeds	8/29.0	0	1/0.2		0	1/1.7

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter
* some or all items burned
c = cupule; k = kernel; tw = twig
[1] Cf. *Sphaeralcea* (no seed coat)

Table 44. Flotation results, Stratum 4 (cont.), Tintop Cave, LA 71167

Taxa	FS 384 3N/2E Stratum 4 Level 6	FS 388 4N/2E Stratum 4 Level 6	FS 360 5N/1W Stratum 4 Level 7	FS 367 6N/1W Stratum 4 Level 7	FS 385 3N/2E Stratum 4 Level 7	FS 389 4N/2E Stratum 4 Level 7
WEEDY ANNUALS: *Chenopodium* (goosefoot)		2/3.7*	8/22.2*	37/43.0*		
Portulaca (purslane)				4/2.8*	1/7.5*	
Nicotiana (tobacco)	1/6.3	1/3.5			1/18.9	
PERENNIALS: *Vitis* (grape)			1/0.2*			
CULTIVARS: *Zea mays* (corn)			c*			
Phaseolus (bean)				2/0.3*		

Taxa	FS 384 3N/2E Stratum 4 Level 6	FS 388 4N/2E Stratum 4 Level 6	FS 360 5N/1W Stratum 4 Level 7	FS 367 6N/1W Stratum 4 Level 7	FS 385 3N/2E Stratum 4 Level 7	FS 389 4N/2E Stratum 4 Level 7
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	1	2	3	3	2	0
Total burned taxa	0	1	2	3	1	0
Total seeds	1/6.3	3/7.2	9/22.4	43/46.1	2/26.4	
PROBABLE CONTAMINANTS: *Euphorbia* (spurge)						1/7.5
UNKNOWN 9117	3/4.8				3/0.6	
UNKNOWN 9118					1/1.9	
TOTAL CONTAMINANTS: Total taxa	1	0	0	0	2	1
Total seeds	3/4.8	0	0	0	4/2.5	1/7.5

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter (taking into account subsampling and original volume of soil sample)
* some or all items burned
c = cupule; k = kernel; tw = twig

Table 45. Flotation results, Stratum 4 (cont.), Levels 8 and 9, Tintop Cave, LA 71167

Taxa	FS 361 5N/1W Stratum 4 Level 8	FS 386 3N/2E Stratum 4 Level 8	FS 390 4N/2E Stratum 4 Level 8	FS 387 3N/2E Stratum 4 Level 9
WEEDY ANNUALS: *Chenopodium* (goosefoot)	7/13.7*		5/9.3*	
Portulaca (purslane)			4/22.4*	
Amaranthus (pigweed)			3/5.6*	
Nicotiana (tobacco)				1/7.4
Helianthus (sunflower)	1/2.0*			
PERENNIALS: *Echinocereus* (hedgehog cactus)				1/1.9*

Taxa	FS 361 5N/1W Stratum 4 Level 8	FS 386 3N/2E Stratum 4 Level 8	FS 390 4N/2E Stratum 4 Level 8	FS 387 3N/2E Stratum 4 Level 9
GRAMINEAE: *Sporobolus* (dropseed)				1/1.9*
CULTIVARS: *(Zea mays)* corn			c*	
Unidentifiable			1/1.9*	
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	2	0	4	3
Total burned taxa	2	0	4	2
Total seeds	8/15.7	0	13/39.2	3/11.2
PROBABLE CONTAMINANTS: *Chenopodium* (goosefoot)				1/1.9
Euphorbia (spurge)		1/1.9		
Descurainia (tansymustard)		1/7.6		
Sporobolus (dropseed grass)		1/7.6		
Solanaceae (nightshade family)				1/0.5
Celtis (hackberry)				1/0.2
Unknown 9117		1/0.2		
TOTAL CONTAMINANTS: Total taxa	0	4	0	3
Total seeds	0	4/17.3	0	3/3.0

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter (taking into account subsampling and original volume of soil sample)
* some or all items burned
c = cupule; k = kernel; tw = twig

Table 46. Percent occurrence of economic plants in flotation samples by stratum, Tintop Cave, LA 71167

Taxa	Stratum 2/3	Stratum 3	Stratum 3/4	Stratum 4	Stratum 4 Levels 8 and 9
Number of samples	2	1	3	12	4
ANNUALS: *Chenopodium* (goosefoot)	50			33	50
Portulaca (purslane)		100		25	25
Nicotiana (tobacco)	100		33	42	25
Amaranthus (pigweed)					25
Cf. *phaeralcea* (globemallow)			33		
Helianthus (sunflower)					25
GRASSES: *Sporobolus* (dropseed)					25
PERENNIALS: *Rhus trilobata* (squawberry)				8	
Juglans (walnut)	50				
Echinocereus (hedgehog cactus)	100				25
Opuntia (pricklypear)				17	
Yucca (yucca)				8	
Vitis (grape)				8	
CULTIVARS: *Zea mays* (corn)				17	25
Phaseolus (bean)				25	

Table 47. Flotation results, North Shelter and North Cave, LA 71167

Taxa	FS 654 Hearth North Shelter	FS 676 Stratum 4 2N/1W North Shelter	FS 677 Stratum 4 3N/1W North Shelter	FS 675 Stratum 4 3N/1W North Shelter	FS 686 Hearth Stratum 2 North Cave
WEEDY ANNUALS: *Chenopodium* (goosefoot)	1/3.1*				7/19.3*
Nicotiana (tobacco)					1/13.8
Oenothera (evening primrose)					1/2.8*
PERENNIALS: *Opuntia* (pricklypear cactus)					2/1.4*
GRAMINEAE (grass family)					1/2.8*
Unknown 9119					1/0.7*
Unidentifiable				1/0.8*	
TOTAL PROBABLE ECONOMIC SPECIES: Total taxa	1	0	0	0	6
Total burned taxa	1	0	0	0	5
Total seeds	1/3.1	0	0	1/0.8	13/40.8
PROBABLE CONTAMINANTS: *Chenopodium* (goosefoot)		1/0.2	4/1.0	1/0.8	
Portulaca (purslane)		2/0.4			6/14.5
Euphorbia (spurge)		11/2.0		1/0.8	5/13.8
Descurainia (tansymustard)				4/10.0	
Compositae (sunflower family)				1/0.2	
cf. *Mollugo* (carpetweed)					2/1.4
Opuntia (pricklypear)			1/0.2		
Echinocereus (hedgehog cactus)				1/0.8	
Celtis (hackberry)				1/0.2	

Taxa	FS 654 Hearth North Shelter	FS 676 Stratum 4 2N/1W North Shelter	FS 677 Stratum 4 3N/1W North Shelter	FS 675 Stratum 4 3N/1W North Shelter	FS 686 Hearth Stratum 2 North Cave
Sporobolus (dropseed grass)		2/3.7		3/6.9	1/2.8
Setaria (bristlegrass)				1/0.2	
TOTAL CONTAMINANTS: Total taxa	0	4	2	8	4
Total seeds	0	16/6.3	5/1.2	13/19.9	14/32.5

a/b number before slash indicates actual number of seeds recovered/ number after slash indicates adjusted number of seeds per liter (taking into account subsampling and original volume of soil sample)
* some or all items burned
c =cupule; k = kernel; tw = twig

Prehistoric Plant Use in Southeastern New Mexico

Of considerable interest in the archaeobotanical records at these Picacho sites is the clear and repeated association of cultivars with Archaic- and Ceramic-period proveniences. Cultivar remains do not occur in high density, but they occur in enough locations to indicate that corn and bean farming contributed to subsistence at both sites. Cultivar remains are most ubiquitous at LA 58971, the Late Archaic site; and in deeper levels at Tintop Cave, LA 71167, including levels potentially Archaic in date. The absence of cucurbit remains at Picacho sites is by no means an indicator of this crop's absence from the farming repertoire. Both beans and squash are rare in archaeobotanical assemblages from agricultural sites, and several taphonomic factors can be cited in explanation (Kaplan 1956:199; Gasser and Adams 1981:183; Cutler and Whitaker 1961:477).

Elsewhere in the Sierra Blanca-Roswell region, corn remains show up in all but one place (King Ranch site near Roswell) in the small sample of nine Archaic- and Ceramic-period sites for which we have specific botanical data available (Table 48). The eight sites with corn, however, include three with beans, two with squash, and only two (Beth Cave and Robinson Pueblo) with all three taxa, which are thought to form the basis of Southwestern prehistoric farming. There are other records of Ceramic-period cultivars in the region: corn at Henderson Pueblo (Dunavan 1989), and all three taxa variously at nine sites sampled by Adams (1991:226-27).

Subsistence at Picacho's small, structureless sites is otherwise characterized by tapping of the broad spectrum of wild plant products available in the Hondo Valley, with some signs of an emphasis on perennials in the Ceramic period and annuals in the Archaic. Use of the riparian habitat alongside the Río Hondo for food is indicated by mesquite pods and walnuts; and, for wood, by the presence of cottonwood/willow, box elder, mesquite, and walnut (but not reedgrass for construction and manufacturing, though this taxon is found at several other sites in the area;

see Table 19). Local valley-side species exploited at Picacho sites include goosefoot, mustard, purslane, pigweed, globemallow, sunflower, squawberry, hedgehog and pricklypear cactus, yucca, and grape for food; tobacco for "recreation"; and shrubby woods (saltbush, greasewood, creosotebush, sage). From higher elevations up the valley, piñon nuts and juniper and piñon wood were imported. The diversity of available and utilized plant resources is amply demonstrated in the archaeobotanical assemblages from Picacho and other area sites. Of particular interest is the repeated occurrence of an array of wild plant foods, with a significant component of perennial species. Perennial food products, with large carbohydrate or oil reserves in fruit or root tissues, may offer greater nutritive return for harvesting and processing energy expended. As food resources, perennials also offer greater dependability in time and space. Ethnographic studies (e.g., Baseheart's studies [1973] of the Mescalero Apaches) confirm that these taxa have constituted the botanical focus of local hunter-gatherer economics in the historic period.

Table 48. Economic plant taxa at sites in southeastern New Mexico

Site	Flotation and Macrobotanical (number of flotation samples)	Wood
ARCHAIC PERIOD: Beth's Cave (LA 47481), A.D. 600-700 (?), shelter, 1890 m, Río Bonito (Wiseman 1988)	(0) A: P:Pied, Yucca, Jug, Querc G: C:Zea, Cuc, Phas	?
Picacho (LA 58917), A.D. 1-400 (?), open site, 1515 m, Río Hondo	(26) A:Ch, Port, Desc, 9113 P:Pied, Rhus, Pros G:Spor C:Zea, Phas	creosotebush 21% juniper 10% mesquite 9% plus 17 other taxa
Picacho (LA 71167), Levels 8 and 9, shelter; 1487 m, Río Hondo	(4) A:Ch, Port, Nicot, Am, Hel P:Echin G:Spor C:Zea	creosotebush 31% juniper 24% mesquite 10% plus 10 other taxa
CERAMIC PERIOD: King Ranch (LA 26764), A.D. 1150-1250/1300, pithouse village, 1,053 m, Río Pecos south of Río Hondo (Toll 1986; Minnis n.d.)	(1) A:Plan P:Pros G: C:	mesquite, saltbush present
Bloom Mound (Kelley 1984)	(0) A: P:Celtis G: C:Zea, Phas	?

Site	Flotation and Macrobotanical (number of flotation samples)	Wood
Picacho (LA 71167), A.D. 1100 (?)-1250, shelters, cave, 1,487 m, Río Hondo	(23) A:Ch, Port, Nicot, Sphaer P:Rhus, Jug, Echin, Opun, Yucca, Vitis G: C:Zea, Phas	creosotebush 27% mesquite 20% juniper 17% plus 15 other taxa
Abajo de la Cruz (LA10832), A.D. 1150-1350, roomblock; 1,700 m, Río Tularosa (Minnis et al. 1982; Ford 1975)	(17) A:Ch, Port (10% of seeds) P:Pied, Pros, Atrip, Opun, Echin, Vitis (62% of seeds) G: C:Zea, Cuc	juniper 35% piñon 32% ash (walnut??) 17% saltbush 11%
Bent (LA 10835), A.D. 800-1000, 1100-1200, fieldhouse, large pits, 1,700 m, Río Tularosa (Minnis et al. 1982)	(8) A: P:Pros G:Phrag C:Zea	?
Angus North (LA 16297, LA 2315), A.D. 1150-1350, pithouse villages, roomblock, 2,134 m, Río Bonito (Struever and Donaldson 1980)	(30) A:Ch, Am, Port, Hel P:Pied, Jun, Echin G:Spor, Phrag C:Zea, Cuc	?
Block Lookout = Smokey Bear (LA 2112), A.D. 1250/75-1325/50, roomblock/kiva, 1,865 m, Capitan Mountains (Ford 1976)	(0) A:Hel P:Jun, PiPo, Quer G:Spor, Phrag C:Zea, Cuc	?
Robinson Pueblo (LA 46326), A.D. 1150-1400, pueblo, Capitan Mountains (Adams 1991)	(38) A:Ch, Am, Port, Comp, Desc, Hel, Phys P:Jun, Pied, Jug, Atrip, Opun, Yucca G:Phrag C:Zea, Cuc, Phas	?

Annuals: Chenopodium, Portulaca, Descurainia, Nicotiana, Amaranthus, Helianthus, Sphaeralcea, Plantago, Compositae, Physalis
Perennials: Pinus edulis, Pinus ponderosa, Rhus trilobata, Prosopis, Echinocereus, Opuntia, Yucca, Juglans, Quercus, Vitis, Atriplex
Grasses: Sporobolus, Phragmites
Cultivars: Zea, Cucurbita, Phaseolus

Note that annuals at sites without flotation analyses (Beth's Cave, Block Lookout) are underrepresented.

The Chihuahuan Desert floristic community of southern New Mexico and the Río Abajo appear to provide a resource base with some distinctive qualities (Toll 1983a). In cooler deserts to the north, many perennial resources are restricted to specialized soil and drainage conditions, which tend to occur in higher elevations, toward the upper altitudinal limits for these species. In southern New Mexico, greater profusion of gravelly outwashes and other coarse-textured soils, together with milder winters and a longer growing season (180 to 200 or more days), favors denser and more widely distributed populations of various cacti and broad-leaf yucca. Mesquite and certain species of agave are restricted almost exclusively to this zone. Along the Río Hondo and its tributaries, human inhabitants took advantage of a richness of species in the riparian habitat for food, fuel, and manufacturing plant resources.

Though the Picacho sites provide some time depth (at least the Archaic manifestations at LA 58971 against the Ceramic period occupation at LA 71167, and possibly both time periods at Tintop), we must be careful in assessing changes in cultural plant remains over time. The clear time associations are at two different sites, introducing the factor of differential preservation bias, since better preservation boosts taxonomic diversity in the archaeobotanical record. The sheltered early deposits at LA 58971, though higher in corn ubiquity, are generally lower in diversity of economic plants than the exposed Ceramic-period deposits at Tintop. *If* the deepest levels (8 and 9) at Tintop represent an earlier, Archaic occupation, the sequence within Tintop illustrates a taxonomic expansion over time, clearest in the realm of perennials.

Perhaps the biggest hole in our perception of subsistence adaptations in the Roswell area over time is direct archaeobiological evidence of species utilized in the Archaic. Without knowing the array of taxa used at several sites, we can't characterize the transition from this era to the later Ceramic period. In northwestern New Mexico, for instance, data from several hundred sites tells us quite repetitively that Archaic and Basketmaker sites were focused closely on a limited array of food and fuel taxa from the immediate site environs, involving a good deal of moving around from one locus to another over the annual cycle, while later Anasazi occupations evidenced considerable aggregation in time and space, and drew from a much wider catchment area (Toll 1983b). Black Mesa, in the Kayenta area of northeast Arizona, shows a complete reversal of this pattern, with highly diverse Basketmaker subsistence regimes followed by more focused Puebloan economic strategies (Cowan et al. 1978:138). In southeast New Mexico, perhaps the question of greatest interest is not even the *direction* of change in diversity, but the *degree.*

The themes of multiple adaptive strategies, overlapping or occurring simultaneously in time and space, recur in several authors' efforts to make sense of prehistoric economy in southeastern New Mexico. Stuart and Gauthier (1981:289) toy with the possibility of an agricultural strategy and a hunter-gatherer adaptation coexisting in the eastern portions of the Sierra Blanca-Guadalupe highlands at an earlier point in time (ca. A.D. 400-500) than agriculture is seen in most of southeastern New Mexico. By and large, however, few see any basis for viewing agriculture as a significant part of local economies before A.D. 850. Low population pressure allowed the late addition of farming to the subsistence repertoire, and then the contemporaneous existence of wandering hunter-gatherers and sedentary farmers until ca. A.D. 1100 (Stuart and Gauthier 1981:289). Lord and Reynolds (1985:237) refer to these late, mobile foragers, who appear to have pursued an Archaic adaptation with benefit of ceramics and the bow and arrow, as "Neoarchaic." Sebastian and Larralde (1989:83) suggest that Ceramic-period agriculturalists may have been "much less dependent on agriculture and far more mobile than their contemporaries elsewhere." The Picacho data emphasize the adaptive complexity in the broader region by providing evidence of horticulture in conjunction with small, structureless sites.

Summary

Plant remains from the Picacho sites present a clear picture of a subsistence pattern that included horticulture in both the Archaic and Ceramic periods, heavily supplemented by a broad spectrum of gathered wild plants. In this highly diverse environmental setting, both floristics and energetics favor a dependence on perennial plant products, including cacti, leaf succulents, and fruits and nuts of trees (piñon, walnut, hackberry?), shrubs (squawberry), and vines (grape). This study provides data for two significant observations at issue in this area of New Mexico: farming was practiced early on, in the Archaic era; and farming contributed to subsistence at some very small sites, occupied at least into the A.D. 1200s.

ANALYSIS OF FAUNAL REMAINS FROM THE PICACHO PROJECT

Linda Mick-O'Hara

The Picacho project included excavation at two sites in southeastern New Mexico. One site, LA 58971, has been dated to the Late Archaic period (approximately A.D.225) and may be the result of three Archaic occupations that are temporally separate but have overlapping standard deviations. This site is an open-air occupation marked by heavily rodent-disturbed ash stains and numerous storage cysts. The other site, LA 71167, is composed of two cave areas and two shelters that date from approximately A.D.1200 to A.D.1400. The majority of artifactual material was recovered from the South Cave at this site, though small samples were recovered from the other locales.

Faunal remains were recovered from both sites and all locales during the course of the excavations. The majority of the bone, however, was recovered from the South Cave at LA 71167. The faunal remains recovered were analyzed by all significant units of association and are presented by these categories where possible.

Available within close proximity to these sites were numerous animal species that could have been taken by the occupants. The faunal remains from both sites indicate that a diversity of animals were used, but the emphasis on different species changed over time. This report describes the diversity of animals at both sites, as well as significant patterns of burning, butchering, and animal alteration of the bones.

Methodology

All of the faunal material recovered from the Picacho project was sorted and cleaned by dry brushing prior to analysis. Identifications were done using comparative osteological collections housed at the Museum of New Mexico, Office of Archaeological Studies, Santa Fe, and at the University of New Mexico, Museum of Southwest Biology, Albuquerque. In addition, preliminary identifications of some small mammals and birds were aided by the use of guides to the identification of mammals (Olsen 1964; Gilbert 1980) and birds (Olsen 1979; Gilbert et al. 1981). All bone fragments were identified to the most specific level possible given the state of preservation and the size of each fragment.

Faunal remains were identified at least to class, and all mammal fragments were divided into small, medium, and large categories according to the thickness of the compact tissue. Small mammals are defined as jackrabbit size or smaller, medium mammals are larger than a jackrabbit but smaller than an antelope, and large mammals are defined as mammals antelope size or larger. When possible, elements were identified to order, family, genus, or species. Each bone fragment was then identified to element, completeness, portion, side, and relative age and development. Along with this basic identification, all bone was evaluated for weathering, animal alteration, degree of burning, and indications of processing (including spiral fractures, cutmarks, and splitting). All attributes were recorded in a DBase III+ file, and summaries of that basic data were used in analyzing the faunal materials from LA 58971 and LA 71167.

LA 58971

During the excavation of LA 58971, also known as the Sunset Archaic site, 1,018 pieces of bone were recovered from general refuse areas and pit fill. This open-air Archaic site consisted of general trash and refuse areas along with a number of isolated features. The number of remains of desert cottontail and other species recovered suggests that the occupation at this site was of only limited duration and that it was the reoccupation of this locale over time that built up the observable deposits analyzed in this report. The majority of the bones (500 fragments, or 49.1 percent of the site sample) were recovered from the general trash, but fairly good samples were recovered from two storage features (253 fragments, or 24.8 percent, from Feature 1E, and 120 pieces, or 11.8 percent, from 1W). Smaller samples, also having some diversity of taxa, were recovered from Storage Features 3 and 7A (Table 49). The remaining features produced minimal bone, and the samples were clearly dominated by small and large mammal bone fragments identifiable only at that general level.

Table 49 presents a summary of the taxa identified at LA 58971 by area, thus generally showing the distribution of recovered bone along with the total number of elements assigned to each taxa. Most of the features, outside of those mentioned above, contained few bone fragments and little diversity, while the site as a whole produced a fair number of faunal taxa. The fill of these features may be refuse from the surrounding area biased to smaller, less identifiable fragments that could be more easily washed into that context. It will be most fruitful to first review the faunal remains recovered from LA 58971 as a whole and then discuss the four features that produced adequate amounts of bone to warrant subdivision and more intense scrutiny.

Table 50 presents a summary of the faunal remains identified for the site as a whole and their percent of contribution. Bone that could only be identified as small, medium, or large mammal represents 60.3 percent (614 bone fragments) of the overall sample recovered from this site. The remaining 39.6 percent could be identified to 11 species, 5 genera, 1 family, and 1 order. Of the taxa identified, a number of the smaller mammalian species are only represented by one or two elements. The majority of these elements were recovered from the general trash and primary features. The fact that only a few elements of each of these taxa were represented suggests that they were all part of the cultural deposits and not intrusive into this site context, given that intrusive species represented by burrow deaths would exhibit a more complete array of skeletal elements (Thomas 1971). The fact that rodent disturbance at this site is heavy in all contexts but esspecially so in the midden and larger storage pit features suggests that some burrow deaths may have been subsequently disturbed by other rodent activity scattering those intact skeletons. There is no way to clearly tell at this point, so these few remains will be included with the cultural component. Since the use of numerous small mammals in the diet of Archaic populations has been noted throughout the Southwest (Stiger 1977; Lord and Reynolds 1985), the inclusion of these taxa are supported both as nonintrusive and as fairly common components of the Archaic diet.

Table 49. Taxa by area of recovery, LA 58971

Taxon	Frequency (NISP)														Total
	GEN	1A	1E	1W	3	4	4B	4C	5A	7A	8	8A	8C	8D	
Small mammal	276	1	124	74	6	1			8	29		12	14		545
Medium mammal	4		7	1						1		1			14
Large mammal	23		2	5		2	3	1		3	4		9	3	55
Spermophilus sp. (ground squirrels)	3				1		1			1					6
Spermophilus variegatus (rock squirrel)			1												1
Cynomys ludovicianus (black-tailed prairie dog)	9		1	2						2					14
Geomyidae (pocket gophers)										1					1
Thomomys bottae (Botta's pocket gopher)				1											1
Peromyscus sp. (field mouse)			1												1
Neotoma sp. (woodrats)	1		1												2
Neotoma albigula (white-throated woodrat)	1														1
Neotoma mexicana (Mexican woodrat)	4		6												10
Ondatra zibethicus (muskrat)	2														2
Sylvilagus audubonii (desert cottontail)	132		82	17	5					1					237
Lepus sp. (jackrabbits)	5		2												7
Lepus californicus (black-tailed jackrabbit)	35		18	16	2					6					77
Artiodactyla (even-toed hooved mammals)	2		6	1	21					5					35
Odocoileus sp. (deer)	2														2
Antilocapra americana (pronghorn)			1	2											3

Birds															
Callipepla squamata (scaled quail)			1	1						1					3
Meleagris gallopavo (turkey)	1														1
Totals	500	1	253	120	35	3	4	1	8	50	4	13	23	3	1018

Table 50. Taxa from LA 58971

Taxon	NISP	Percentage
Small mammal	545	53.54
Medium mammal	14	1.37
Large mammal	55	5.40
Spermophilus sp. (ground squirrels)	6	0.59
Spermophilus variegatus (rock squirrel)	1	0.10
Cynomys ludovicianus (black-tailed prairie dog)	14	1.37
Geomyidae (pocket gophers)	1	0.10
Thomomys bottae (Botta's pocket gopher)	1	0.10
Peromyscus sp. (field mouse)	1	0.10
Neotoma sp. (woodrats)	2	0.20
Neotoma albigula (white-throated woodrat)	1	0.10
Neotoma mexicana (Mexican woodrat)	10	0.98
Ondatra zibethicus (muskrat)	2	0.20
Sylvilagus audubonii (desert cottontail)	237	23.28
Lepus sp. (jackrabbits)	7	0.69
Lepus californicus (black-tailed jackrabbit)	77	7.56
Artiodactyla (even-toed hooved mammals)	35	3.44
Odocoileus sp. (deer)	2	0.20
Antilocapra americana (pronghorn)	3	0.29
Birds		
Callipepla squamata (scaled quail)	3	0.29
Meleagris gallopavo (turkey)	1	0.10
Totals	1018	100.00

These small utilized taxa include the ground squirrels, pocket gophers, field mouse, and woodrats identified in small numbers. All of these species occur in the project area and often burrow into softer disturbed soils (Findley et al. 1975). Trash areas and storage features at human habitations would provide this disturbed soil and make these mammals available to the seasonal occupants. Two other small rodents occur in the overall assemblage in larger numbers, and one species (muskrat) is clearly large enough to be of economic importance. These species will be reviewed separately with the other dietary species.

Cynomys ludovicianus *(Black-tailed Prairie Dog)*

Black-tailed prairie dogs are inhabitants of shortgrass plains and are and were abundant in southeastern New Mexico (Findley et al. 1975:130). They frequent elevated or open margins but are numerous in all locales. Prairie dogs can become very fat in the fall to sustain them through the winter months and would provide a good source of protein for an Archaic population. Fourteen elements could be assigned to this species. Elements were isolated from the general trash and from three features (see Table 49). Almost all of the elements exhibited some weathering from exposure of the bone on the surface prior to deposition. This, along with some discoloration of the bone from cooking, indicate that this species was used in the diet of the former Archaic occupants.

Neotoma mexicana *(Mexican Woodrat)*

The range of this species is disjunct throughout the state. Though it prefers more montane settings, it occurs in pockets surrounded by white-throated woodrat (Findley et al. 1975:248). Mexican woodrats can vary greatly in size and often penetrate into cultural remains in sheltered areas. They were commonly used as an economic species from the Archaic period on in the Southwest.

Ten elements were assigned to this species from the general trash area and Feature 1E (1.0). Since eight of these elements are mandibular or cranial, and two of the postcranial exhibit some discoloration from cooking, this species was certainly economic in nature. The dominance of cranial fragments may indicate the removal of the head and skin prior to the introduction of this species into the cooking pot.

Ondatra zibethicus *(Muskrat)*

A cranial and mandibular fragment of one individual was isolated from the east trash stain (see Table 49). The muskrat occurs in marshy areas and along rivers throughout the state and may have a much wider range than is noted in Findley et al. (1975:264). The individual isolated from this Archaic site context suggests that marshy areas were utilized by the former inhabitants of this site.

Sylvilagus audubonii *(Desert Cottontail)*

This species is ubiquitous throughout the state in the piñon-juniper woodlands and below (Findley et al. 1975:83). Desert cottontails were one of the most important economic species during any of the prehistoric periods in the Southwest.

The faunal sample from LA 58971 is clearly dominated by the contribution of bones from this species. The 237 bone fragments assigned to this species constitute 23.3 percent of the site sample and 58.7 percent of the identified sample (Table 50). Elements represented include long bones, innominates, cranial fragments, and very few vertebrae. When element frequency and side are considered, the isolated desert cottontail remains represent at least fifteen individuals (left tibiae used) recovered from the general trash and four other features (see Table 49). These would have been taken during a number of seasonal occupations over an considerable time period, so the actual representation of individuals is unclear.

Figure 57 displays the element distribution of cottontails and jackrabbits at LA 58971. Since cottontail and jackrabbit were the primary species isolated at this site, it is informative to note the elements identified from each taxa. Though most skeletal segments of cottontail (e.g., front limbs, hind limbs, cranium, axial skeleton) are represented in the recovered materials, there is a disproportionate recovery of cranial and mandibular remains and an underrepresentation of vertebral remains. The large number of crania and mandibles suggest that processing of these animals included removal of the head and loosely attached skin prior to cooking. The chalky appearance of some remains indicate that boiling was one cooking technique used, and the lack of vertebrae may be the result of further segmentation of the carcass or the greater reduction of these less substantial elements during a long cooking period, making them less likely to survive in the archaeological record (Binford and Bertram 1977). The tanned appearance of cranial and postcranial elements would also suggest that some cottontails were roasted rather than boiled. The fact that a large percentage of the discolored long bones exhibit snap breaks at the midshaft suggests that elements were broken during consumption to extract the small amount of marrow in the diaphysis, indicating the intensive use of each individual that fits into the general Archaic subsistence pattern (Sebastian and Larralde 1989; Lord and Reynolds 1985). These various preparation and cooking techniques could have taken place during the same occupation or during different occupations at LA 58971.

There appears to be no significant distributional differences in the cottontail elements retrieved from the general trash and those from the specific features. The cranial and postcranial elements occur in both trash and features, and the differences in surface discoloration associated with cooking are also randomly distributed. This information supports the premise that both processing and cooking techniques varied with need and not through time.

Lepus *sp. (Jackrabbits) and Lepus californicus (Black-tailed Jackrabbit)*

There are four species of jackrabbit in the state of New Mexico, but the black-tailed jackrabbit is the most common. It is found in almost all areas below the ponderosa forests and reaches its greatest densities in the grasslands (Findley et al. 1975:93). Seven bone fragments could be positively identified only to the genus and were isolated from the general trash and Feature 1E, while seventy-seven pieces of bone could be assigned to black-tailed jackrabbit and were recovered from the general trash area and the four primary features at LA 58971 (Table 49).

The element distribution of black-tailed jackrabbit remains varies between features and general trash area. The overall distribution of recovered elements (Figure 57) shows a slightly

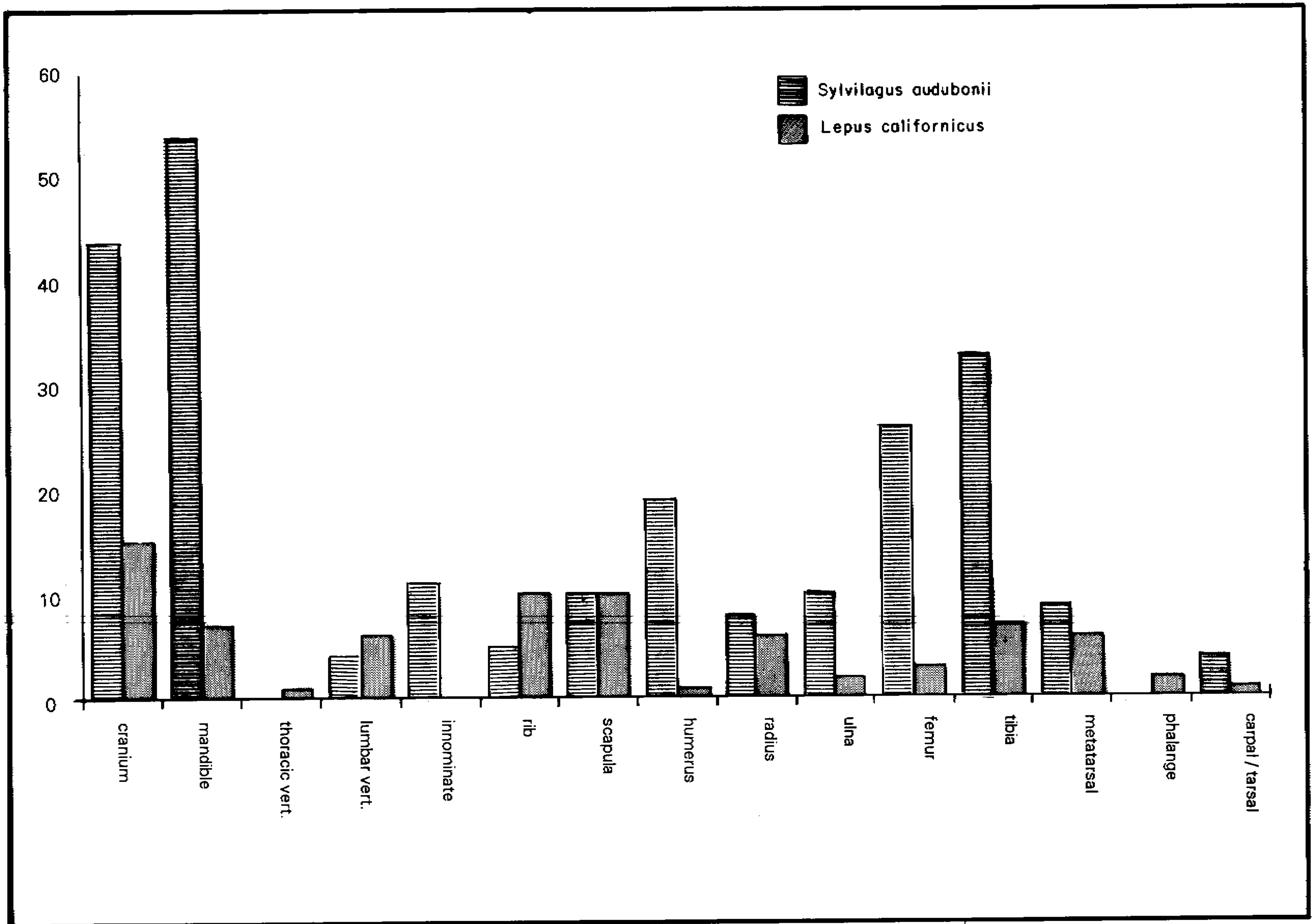

Figure 57. Element distribution of Lepus californicus and Sylvilagus audubonii, LA 58971.

higher number of cranial and mandibular fragments than corresponding postcranial remains. Though there were cranial and postcranial remains from both deposit types, there were more long bones with snap breaks from feature context than from the general trash area. These snapbreaks suggest that food remains from activities associated with the hearths to the north of major features 1W and 1E were selectively being discarded into those features after their initial use as storage pits but before any natural filling had occurred. This bone was broken during consumption and then discarded into these features as primary or secondary disposal areas. The deposits containing these remains were mounded refuse at the bottom of these features.

Within the order Artiodactyl, 34 tooth fragments and 1 fragment of mandible could be assigned only to the order. A radius and a scapula could be assigned to *Odocoileus* sp. (deer), and two molars and a phalange were identified as *Antilocapra americana* (pronghorn). The faunal remains identifiable only as Artiodactyl were recovered from a number of different areas on the site (Table 49) and are weathered. This indicates that the remains were exposed on the surface for a considerable length of time and could possibly be the scattered fragments of the same individual. The remains identified as deer were recovered from the general trash and may or may not represent the same individual. The scapula was burned black, suggesting that it was discarded into a hearth or ash area. The pronghorn remains were recovered from Feature 1E and 1W and from age estimates appear to be the remains of two different individuals. There were, then, at least three artiodactyls represented in this sample.

Only two species of birds were recovered during excavation at LA 58971. Three wing elements identified as *Callipepla squamata* (scaled quail) were recovered from three different features (Table 49). Only one sternal fragment from the general trash could be assigned to *Meleagris gallopavo* (turkey), at least suggesting its occasional use by the former inhabitants. The paucity of avian species as a whole would suggest that a strategy for acquiring birds was not often used at this site and that these species were taken only occasionally by the site occupants.

Table 49 presents the species identified by feature or area of recovery. Along with the differential recovery of the same species from different features, as mentioned above, this table shows that different taxa were recovered from features. This may have implications for the season of use of these features as discard areas relative to the different times at which this site may have been occupied. Small mammals dominate the identified materials from both the general trash and all features except Feature 3. Artiodactyl remains were the material most frequently identified from this context but are represented solely by tooth fragments. The small amount of bone recovered from this feature is probably more indicative of the amount this feature was filled by trash than any change in procurement behavior of the former inhabitants. However, this concentration of teeth along with all of the heavily reduced long bone at the site supports the intense utilization of all resources. The sporatic occurrence of large mammal bone suggests that these animals were being taken incidentally and not through a strategy focused on large-mammal hunting. The large-mammal along with all small-mammal and bird remains were used intensively through all of the site occupations. The Feature 8 sequence from the south side of LA 58971 shows greater use of larger mammals along with smaller forms, but the identification level and the number of recovered remains precludes any other interpretation. The differences in recovered taxa from feature to feature indicates some differences in use and disposal patterns and along with the various radiocarbon dates obtained from this site suggest that, as at many Archaic sites, there are a number of discrete occupations represented at LA 58971.

The taxon taken by the various occupants of this site and the intense use of all animal resources is similar to other Archaic subsistence adaptations (Sebastian and Larralde 1989:52). Lord and Reynolds (1985) suggest that Archaic sites do occasionally focus on large mammal procurement, but in general the Archaic subsistence adaptation focuses on the intense use of a wide variety of smaller mammalian forms (Cordell 1979; Stuart and Gauthier 1981). LA 58971 exhibits these patterns. There was an overall predominance of mammalian forms rabbit size or smaller, and cottontails clearly dominate in the subsistence remains. There is an overall cottontail to jackrabbit ratio in the faunal assemblage of 3.08, indicating a clear dominance in the use of cottontails. Only 2 percent of the total sample exhibited evidence of burning, and this was primarily confined to the mottled tanning on some cottontail cranial and postcranial fragments.

In deference to the use of cottontail as a strong overlying pattern, Feature 3 and Feature 8 show the important use and disposal of large animals, probably pronghorn, from the same general area. This suggests that one or more of the occupations at this site resulted in the procurement and processing of larger species.

LA 71167

The two small caves and two small shelters that make up this site produced 3,725 pieces of bone. Faunal materials were recovered from each of these areas, but the largest amount of material (3,658 bone fragments, or 98.2 percent of the sample) was isolated from South or Tintop Cave, while only small samples were recovered from the other localities (Table 51). Since Tintop Cave produced the most remains, it will be the central focus of the following report. The other localities at LA 71167 will be discussed briefly, but the small amount of bone recovered from these areas precludes any extensive analytical discussion or interpretation.

Table 51. Taxa from LA 71167

Taxon	South Cave NISP/Percent	South Shelter NISP/Percent	North Cave NISP/Percent	North Shelter NISP/Percent
Mammal	34/ 0.93			
Small mammal	253/ 6.92			4/ 36.36
Medium mammal	100/ 2.73		7/ 12.73	
Large mammal	2266/61.95	1/100.00	38/ 69.09	4/ 36.36
Sciuridae (chipmunks, marmots, squirrels)	6/ 0.16			
Spermophilus sp. (ground squirrels)	5/ 0.14			

Spermophilus variegatus (rock squirrel)	7/ 0.19			
Cynomys sp. (prairie dogs)	22/ 0.60			
Cynomys ludovicianus (black-tailed prairie dog)	25/ 0.68			
Cynomys gunnisoni (Gunnison's prairie dog)	9/ 0.25			
Geomyidae (pocket gophers)	4/ 0.11			
Thomomys bottae (Botta's pocket gopher)	17/ 0.46			
Pappogeomys castanops (yellow-faced pocket gopher)	16/ 0.44			
Heteromyidae (pocket mouse, kangaroo rats)	1/ 0.03			
Peromyscus leucopus (white-footed mouse)	2/ 0.05			
Sigmodon hispidus (Hispid's cotton rat)	2/ 0.05			
Neotoma sp. (woodrats)	9/ 0.24			
Neotoma albigula (white-throated woodrat)	35/ 0.96			
Neotoma mexicana (Mexican woodrat)	7/ 0.19			
Ondatrea zibethicus (muskrat)	15/ 0.41			
Leporidae (rabbits)	12/ 0.33			
Sylvilagus audubonii (desert cottontail)	311/ 8.50			
Lepus californicus (black-tailed jackrabbit)	108/ 2.95			
Canidae (dog, coyote, fox, wolf)	4/ 0.11			
Canis sp. (dog, coyote, wolf)	18/ 0.49			
Spilogale putorius (spotted skunk)	1/ 0.03			
Lynx rufus (bobcat)	1/ 0.03			
Artiodactyla (even-toed hooved mammals)	75/ 2.05		1/ 1.82	
Odocoileus sp. (deer)	43/ 1.18		2/ 3.64	1/ 9.09

Antilocapra americana (pronghorn)	22/ 0.60			
Bovidae (cattle, bison)	20/ 0.55		1/ 1.82	
Bison bison (bison)	85/ 2.32		5/ 9.09	
Aves (birds)	10/ 0.27			
Anas sp. (river and pond ducks)	1/ 0.03			
Accipiter striatus (sharp-shinned hawk)	1/ 0.03			
Centrocercus urophasianus (sage grouse)	3/ 0.08			
Callipepla squamata (scaled quail)	4/ 0.11			
Meleagris gallopavo (turkey)	10/ 0.27			
Zenaidura macroura (mourning dove)	3/ 0.08			
Asio flammeus (short-earred owl)	1/ 0.03			
Aphelocoma coerulescens (scrub jay)	1/ 0.03			
Troglodytidae (wrens)	1/ 0.03			
Fringillidae (grosbeaks, finches, sparrows)	1/ 0.03			
Reptiles				
Colubridae (nonvenomous snakes)	1/ 0.03			
Crotalus sp. (rattlesnakes)			1/ 1.82	
Amphibians				
Urodela (salamanders)	1/ 0.03			
Bufonidae (true toads)	26/ 0.71			
Fish	9/ 0.25			
Ictaluridae (catfishes)	19/ 0.52			
Ictalurus sp. (catfish)	28/ 0.76			
Ictalurus punctatus (channel catfish)	3/ 0.08			
Totals	3658/100.0	1/100.00	55/100.01	11/99.99

South Shelter

Only one piece of bone was recovered from the limited excavations on the talus slope in front of this small shelter. This bone fragment could only be identified as large mammal and was probably part of incidental food refuse related to a very limited occupation in this area.

North Cave

Excavation was limited to the lower talus slope at this locality but produced 55 pieces of bone. The bone represents the use of large and medium mammals at this locality (Table 51), and the staining on the roof of the cave suggests that these animals were reduced and consumed in this area. The large- and medium-mammal bone fragments indicate that elements were reduced to access marrow in the long bone cavities, leaving these highly fragmented remains. The specimens identifiable to order, genus, or species include rib segments, teeth, and long bone fragments.

Both bison and deer are represented in this sample. Four rib fragments and a phalange could be identified as bison, while fragments of a tibia and humerus were assigned to deer. In addition, one vertebra of a rattlesnake was also isolated from these deposits.

Most of the bone recovered was highly fragmented and burned. Burning was documented on 52 specimens, or 94.5 percent of the sample (Table 52), and was primarily reflected as tanning on fragments, although a few pieces were burned black. This tanning may be a byproduct of roasting meat segments, causing discoloration to the bone. The black fragments were probably discarded into a hearth after the the bone had been split to access the marrow cavity.

Table 52. Burned bone from North Cave, LA 71167

Element	Large Mammal	Medium Mammal	Artiodactyl	*Odocoileus*	Bison
Long bone	13 tanned	6 tanned			
Rib	25 tanned	1 tanned			4 mottled
Tooth			1 black		
Tibia				1 tanned	
Sesamoid				1 black	
Totals	38	7	1	2	4

The North Cave assemblage clearly emphasizes the organized procurement and use of large mammals. Though the rattlesnake vertebra was burned, and that reptile was probably an incidental part of the diet, the majority of the faunal remains reflected the use of bison and deer.

From the discoloration of these remains, animals were usually roasted, and the fragmentation of these remains indicates their long bones were fractured, probably to obtain marrow. This is an intensive use strategy for large game and suggests that though large game was a focus for the occupants of this locality, not many of these animals were taken during any occupation to make a more selective use strategy (i.e., gourmet strategy) possible.

The hearth and low artifact density at this locality suggest rather short-term campsites. If camps at this locality were processing stations where carcasses were reduced to lighten the load before transporting meat to a main habitation, one would expect to see the roasting of long bones and the fracture of these elements to consume the marrow (Binford 1978, 1983). However, such camps usually have cranial remains as well, and this locality lacks those fragments entirely.

North Shelter

The excavation of the area in front of this slight overhang produced only 11 pieces of bone. Eight of these fragments could only be identified as small or large mammal, while a burned tibia and radius were assigned to black-tailed jackrabbit, and one partial humerus could be identified as deer (Table 51). Eight out of the 11 bone fragments (72.7 percent of this sample) exhibited some tanning or mottling, which suggests roasting as one cooking technique utilized by the former occupants (Table 53).

Table 53. Burned bone from North Shelter, LA 71167

Element	Large Mammal	Small Mammal	*Lepus*	*Odocoileus*
Long bone	1 tanned	4 mottled		
Humerus				1 mottled
Radius			1 mottled	
Tibia			1 black	
Totals	1	4	2	

The few faunal remains recovered indicate that both small and large animals were being taken, perhaps on an encounter basis. As in the other sample localities, roasting seems to have been a primary cooking process, and all remains, especially large mammal remains, were fragmented, indicating intensive use of these resources.

South Cave (Tintop Cave)

This locality was the largest of those investigated at LA 71167 and the most intensively excavated. The excavation of 24 sq m in this area resulted in the recovery of 3,658 pieces of

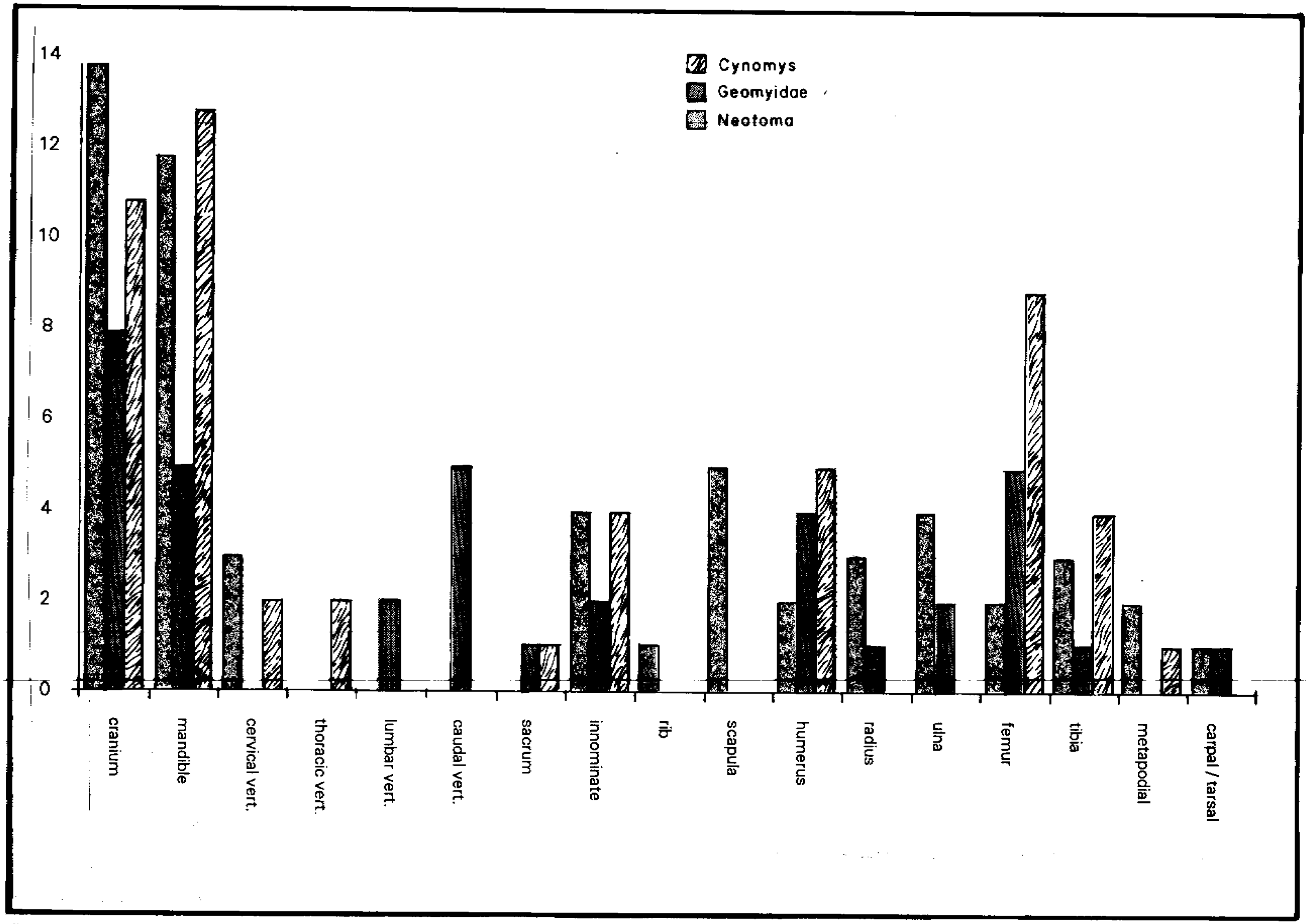

Figure 58. Element distribution of Cynomys, Geomyidae, and Neotoma, Tintop Cave.

bone, predominately from Strata 3 and 4 of the excavation area. Of the total sample from this important locality, 2,663, or 72.8 percent of the bone, could be assigned only to the general categories of small, medium, and large mammal or bird. The remaining 995 pieces of bone, or 27.2 percent of the sample, were identified to two orders, ten families, seven genera, and 24 species (Table 51). The large variety of faunal resources accessed included rodents, rabbits, large mammals, birds, and fish.

Of the 3,658 pieces of bone isolated from Tintop Cave, 2,139, or 58.5 percent of the sample, exhibited some form of thermal alteration (Table 54). The most significant form was tanning, present on fragments as a result of cooking. The amount and type of thermal alteration will be addressed as each faunal group is discussed.

A number of rodent species were identified from the sample recovered from Tintop Cave. Most of these species are avid burrowers into disturbed soil areas and were present in and around this locality. Though rodent burrowing was evident throughout the site, the remains of these small animals indicate that they were utilized as an important part of the diet by the former inhabitants. Table 51 gives the frequency (number of identified specismens, or NISP) and percentage occurrence of these small rodents that include all of those families, genera, and species from ground squirrels through muskrat. A number of these taxa were only identified from a few elements or bone fragments, while others occurred in larger numbers and in rather interesting element distributions. These small species will be reviewed as a group, and combined genera will be used to show element distributions.

The bone counts for all prairie dogs, all pocket gophers, and all woodrats were combined by genera and family to observe any element occurrence patterns for these groups. Figure 58 displays the results of that analysis. It shows a clear dominance of cranial and mandible fragments for both *Cynomys* (prairie dogs) and *Neotoma* (woodrats) and slightly lower numbers for Geomyidae (pocket gophers).

The postcranial element distribution suggests that these rodents were not intrusive (Thomas 1971). The majority of the postcranial elements that would correspond with the cranial fragments found were not present in the sample. No vertebrae were identifiable as *Cynomys*, only four identifiable as *Neotoma*, and seven that could be assigned to Geomyidae. The most frequently isolated postcranial element was the scapula for *Cynomys*, and the femur for both Geomyidae and *Neotoma*. Each group had a number of postcranial remains represented, and with *Cynomys* and Geomyidae, enough elements were identified to suggest that at least one individual from each group may have been intrusive into cultural context. The majority of these remains, however, represent animals that were used as part of the diet. This is supported by the amount of thermal alteration noted on the rodent bone (approximately 90 percent display some degree of discoloration), consistent with cooking these specimens as whole or dismembered carcasses (see Table 54). This color change and color variation on the small animal bone is consistent with discoloration on modern comparative samples that were stewed until the meat came away from the bone.

The postcranial elements of these rodent taxa exhibited spiral fractures and snap breaks on most of the long bones isolated and lacked the polish of coyote or other canid scat. These

Table 54. Burning by taxon, Tintop Cave, LA 71167

Taxon	Mottled	Tanned	Graded	Black	Calcined
Small mammal	54	81		23	
Medium mammal	24	25		4	1
Large mammal	42	1322		37	8
Sciuridae (chipmunks, marmots, squirrels)		4			
Spermophilus sp. (ground squirrels)	4	5			
Cynomys sp. (prairie dogs)	13	13		1	
Geomyidae (pocket gophers)	4	28			
Neotoma sp. (woodrats)	20	15		1	
Ondatrea zibethicus (muskrat)	9	3	1		
Sylvilagus audubonii (desert cottontail)	73	66	5	3	1
Lepus californicus (black-tailed jackrabbit)	51	25	2	3	
Canidae (dog, coyote, fox, wolf)	7	2			1
Artiodactyla (even-toed hooved mammals)	4	3	14	1	
Odocoileus sp. (deer)	13	16	2	2	
Antilocapra americana (pronghorn)	2	6	2		
Bovidae (cattle, bison)	8	3			
Bison bison (bison)	42	18			
Aves (birds)	1				
Centrocercus urophasianus (sage grouse)	1				
Meleagris gallopavo (turkey)	3	1		1	
Ictaluridae (catfishes)		15			
Totals	375	1,651	26	76	11

breaks suggest that these elements may have been broken before the individual was added to the cooking pot to augment calories by adding marrow cooked out of these bones to the stew (Binford 1981).

Another rodent of economic importance was the muskrat (*Ondatra zibethicus*). Only 15 elements could be assigned to this species, but the larger body size of this taxa would provide more meat per individual than a number of smaller rodents gathered at the same time. Since muskrats occur in marshy areas along the Pecos River (Findley et al. 1975:264), use of this species also indicates use of marshy areas near rivers by the former occupants. This environmental use strategy is also supported by the occurrence of fish and amphibians in the sample.

Small rodents were contributors to the diet but the most significant individual species isolated from Tintop cave was the desert cottontail (*Sylvilagus auduboni*). There were 311 pieces of bone assigned to this species, which amounted to 8.5 percent of the sample for this locality. This species is ubiquitous around the state in areas of piñon-juniper and below (Findley et al. 1975:83). All but a few of these bone fragments exhibit the same discoloration noted for the smaller species (Table 54) along with a chalky texture and color that results from prolonged boiling of this high calcium content material (Binford and Bertram 1977). About 3.5 percent of the cottontail remains also exhibited some carnivore gnawing on specimens that were thermally altered. This would suggest that this stew pot bone, once discarded, was disturbed and redistributed by dogs belonging to the occupants or by other scavenging carnivores.

The cottontail remains isolated from Tintop Cave represent at least 36 individuals when left tibiae are considered. These animals were probably taken incidentally while the site occupants were hunting for larger mammals or by women while out gathering (Beaglehole 1936). All of the cottontail remains isolated show similar process breaks and cooking discoloration. The discoloration of this bone ranges from mottled to tanned, with a few specimens burned black (see Table 54). This coloring is similar to that observed on other mammal bone from all body sizes and suggests that similar cooking processes were used.

The second most abundant remains recovered from Tintop Cave were those of black-tailed jackrabbit (*Lepus californicus*). There were 108 pieces of bone, or 2.9 percent of the sample, that could be identified to this species. The jackrabbit remains show the same breakage and thermal alteration patterns that were noted for cottontails. The site inhabitants were processing this larger lagomorph in much the same way they were dealing with all other small mammals. The long bones exhibit snap breaks, and most elements show mottled to tanned discoloration from cooking (see Table 54).

These elements, though in smaller numbers, exhibit a similar element distribution to that for desert cottontail (Figure 59). Only one vertebral element was isolated, while a number of cranial fragments and mandibles were recovered, suggesting that the head was removed and the carcass segmented prior to cooking. The most frequently represented postcranial element was the tibia. When right tibiae are considered, this sample represents at least 13 individuals of widely ranging age and size. Only a few elements exhibited gnawing by carnivores, which may indicate the redistibution of some of these remains.

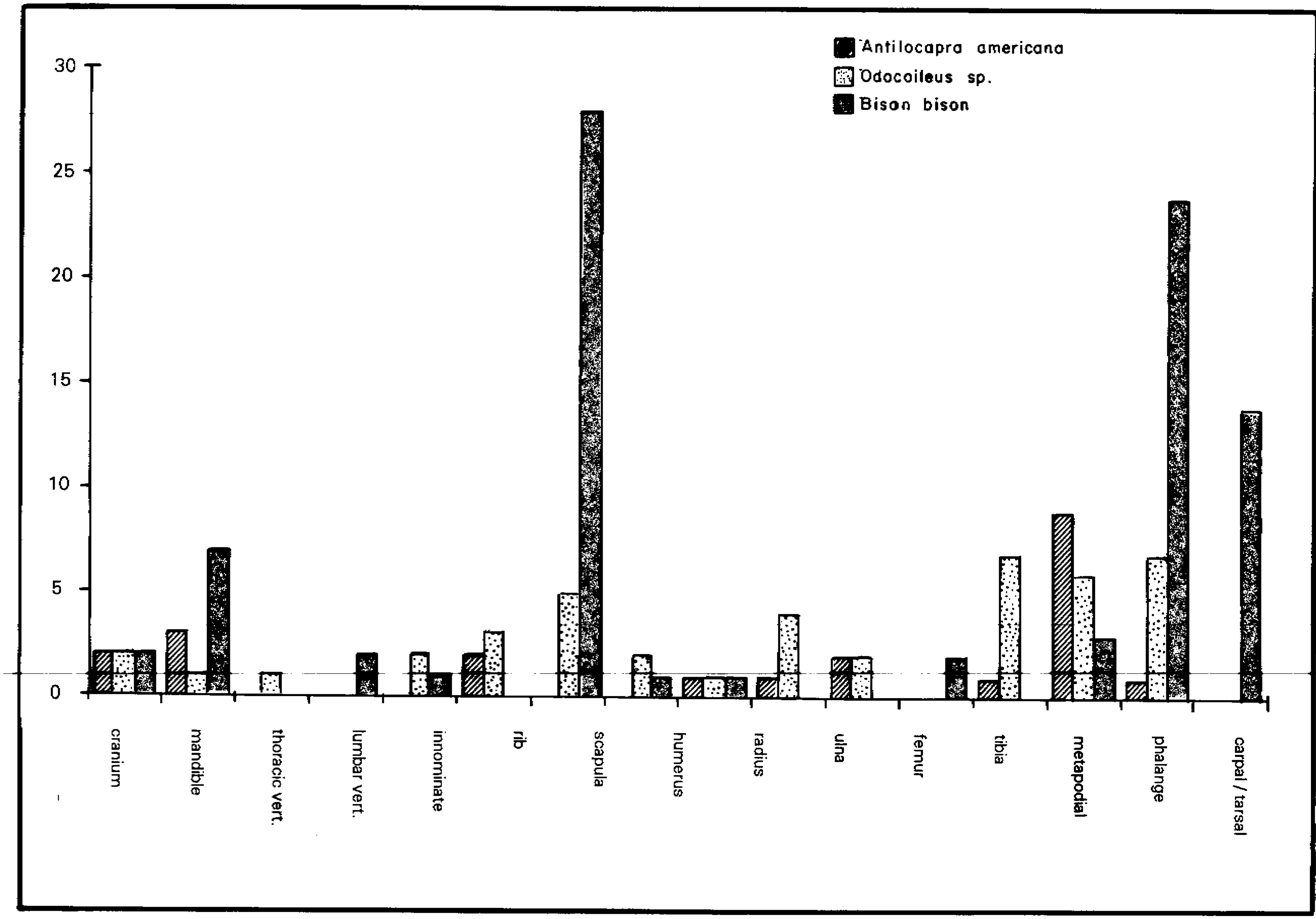

Figure 59. Element distribution of Lepus californicus and Sylvilagus audubonii, Tintop Cave.

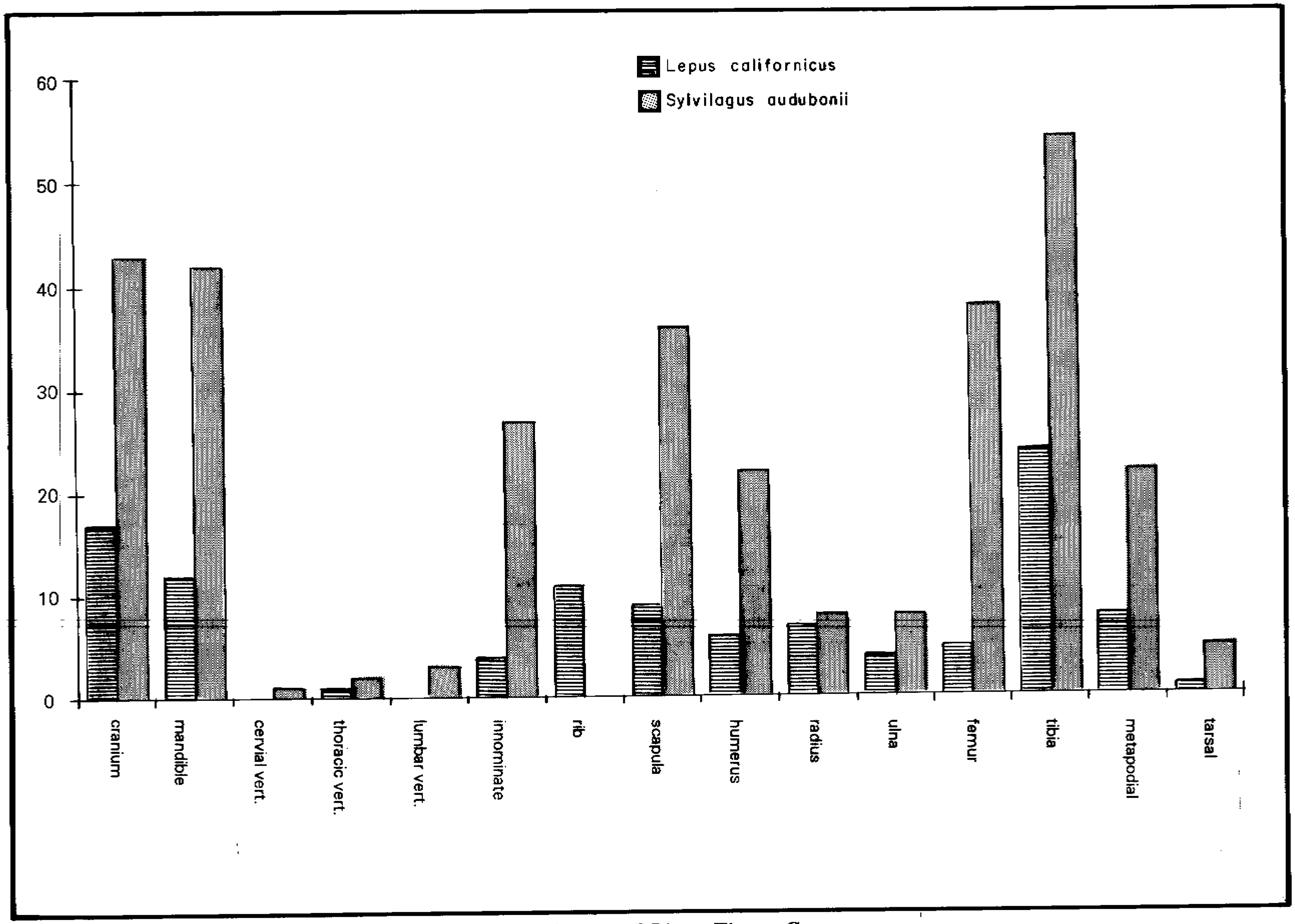

Figure 60. Element distribution of Antilocapra, Odocoileus, and Bison, Tintop Cave.

The canids are represented by both Canidae and *Canis* sp., with 4 and 18 elements, respectively (Table 51). These ribs, vertebrae, and long bones exhibit impact fractures and discoloration similar to that of the larger mammal bone (Table 54). Even though dogs may have accompanied the former occupants to LA 71167, they or their wild counterparts sometimes became part of the diet.

One mandible could be identified as spotted skunk (*Spilogale putorius*), and a proximal ulna was assigned to bobcat (*Lynx rufus*). Both of these species occur in the general area and were probably taken during the search for other game. Both of these species may have been consumed but were probably taken for their skins as well as for food.

During the series of occupations that contributed to the archaeological deposits at Tintop Cave, three main large mammal taxa were hunted: deer (*Odocoileus* sp.), pronghorn (*Antilocapra americana*), and bison (*Bison bison*), all of which occurred in the general site area. Table 51 shows the frequency and levels of identification for this body-size group. Other than the general category of large mammal bone belonging to this group, bone was identified to the order Artiodactyla, and bison-size remains were assigned to the family Bovidae as well as to the species level. Spread across these taxa, the frequencies seem less than impressive, but 245 bones were assigned to these large mammal taxa, constituting 6.7 percent of the sample from Tintop Cave. Bison bone alone comprises 2.3 percent of that sample, and all large mammal remains, including those only generally identifiable, compose 68.6 percent of the sample. Thus, large mammal remains dominate this sample, but the fragmentation of this bone during processing prevented a large portion of it from being more than generally identified. This dominance of large-mammal bone suggests that the occupants were organized to exploit that body-size range but did not ignore opportunities to exploit any other animal resources in the area. The degree of fragmentation in the large-mammal component indicates that all large mammals taken were intensively used and long bones were reduced to access the marrow cavity. Even in the identified component of this faunal sample, bison was the third most frequently identified species in this locality assemblage, adding support to that conclusion.

Since deer, pronghorn, and bison represent the large mammals taken, an analysis of the element distributions of the bone identified to these taxa can be used to inform us about processing and cooking patterns used by the former occupants of Tintop Cave. Figure 60 displays the element distribution for all three taxa and the differences in those distributions. *Antilocapra americana* (pronghorn) has a rather sporadic element distribution dominated by metapodials. This element was apparently not subjected to the cooking processes reflected in the discoloration of the other long bone. Since this bone was not jepardized by cooking, its chance for survival in these archaeological deposits were increased (Binford and Bertram 1977). The frequency of metapodials could partially be explained by this preservation phenomena. All other elements for this species were represented by one or two bone fragments that represent the remains of at least one adult and one juvenile pronghorn. These bones all exhibit mottled discoloration from cooking and display impact fractures from processing activities.

Deer remains (*Odocoileus* sp.) occurred in greater numbers than those of pronghorn in these deposits (43 pieces versus 22) and are heavily represented in the component identifiable only to the order Artiodactyla. At least five mature deer are represented in this sample if right tibiae are considered, and an additional two individuals if the pieces of fetal/neonate and juvenile bone are taken into account. Tibiae, metapodials, and phalanges were the most frequently isolated elements for this taxa. All are low meat utility elements, suggesting that other elements were fragmented to extract the marrow or sections of meat with bone were taken to other localities. The large mammal bone and the bone identified to the order Artiodactyla would indicate that at least some of the other long bones were fractured and reduced to smaller less identifiable pieces (Grayson 1984). The remaining elements identified were represented by only a few bone fragments each but suggest that these elements did remain at the site, supporting the thesis that these elements were reduced to a point that they were no longer specifically identifiable. All of these remains showed mottled discoloration from having been roasted with the meat mass still attached (Table 54).

Bison was the most frequently identified large mammal species at Tintop Cave, with 85 pieces of bone assigned to that taxon. Bone that could not be specifically assigned to this taxon was placed in the family Bovidae, and thus this taxon and the large mammal category contain the highly fragmented bone. The majority of the elements assigned to bison were rib sections and phalanges (Fig. 60). The rib sections suggest the intentional segmentation of side meat into units that could be more easily handled for cooking. The phalanges are low meat utility discard elements and show little of the discoloration noted on the higher meat utility bone. The phalanges along with the long bones present were derived from the butchering of two individuals: one mature bison and a juvenile, perhaps a mother and calf. During the processing of these animals the mandibles were fractured, probably to get at the tongue, and the resultant identifiable fragments are represented in the mandible frequency distribution in Figure 60. The long bones were fragmented to access the marrow cavities, and the ribs were segmented into smaller cooking units. The hooves, phalanges, and carpals and tarsals appear to have been discarded directly. This type of processing indicates the intensive use of bison that may have been taken incidentally in the vicinity of LA 71167.

Large mammal use at this locality appears to have been on an encounter basis, and several taxa and age groups show up in these deposits. The fact that both mature and juvenile animals were taken suggests that most of the procurement of large mammals was on an encounter basis, and any age or sex was taken. The occurrence of a fetal/neonate deer in the assemblage indicates that this locality was occupied during May and/or June for at least one occupation.

The bird remains recovered from Tintop Cave represent seven species, one genus, and two families and include raptors, game birds, and small perching birds (Table 51). All of the taxa isolated occur in the area, though ducks (*Anas* sp.) usually nest in the area and overwinter to the south (Ligon 1961:44). The scapula assigned to that genus would suggest that at least one of the occupations at this locality was during the spring, summer, or early fall. The turkey and grouse bone exhibited evidence of discoloration from cooking and burning, but the other bird remains did not (Table 54). This probably means that the raptors were only used for their feathers and that the owls may have occupied the site after human occupations and introduced the smaller perching birds as their prey.

One nonvenomous snake vertebra was isolated from Tintop Cave. The specimen shows no discoloration and may be the remains of a canid meal rather than part of the human diet.

The amphibian remains are of interest here only as intrusive species. These specimens were probably attracted to Tintop Cave when the deposits were moist and died there. The 26 bones assigned to the family Bufonidae (true toads) are probably the remains of only two individuals, which also suggests that this taxon was intrusive (Thomas 1971).

The fish remains, though level of identifiability varied, were predominately of the catfish family (Ictaluridae) (see Table 51). These remains, like those of the other dietary species, exhibited some mottled to tan discoloration from cooking (Table 54). These remains also indicate that the occupants of Tintop Cave had a strategy for exploiting aquatic resources in the nearby Río Hondo. The fact that the catch was brought back to Tintop Cave suggests the occupations at that locality were not temporary encampments but longer-term seasonal habitations.

The various shelters and small caves that make up LA 71167 were occupied at various times and for different purposes. The North Cave seems to have been occupied for short periods, but large mammals were the focal resources. The North Shelter was also used for short periods, and both small and larger mammals were used as food resources. The primary habitation area was Tintop Cave, where a diversity of animal resources were utilized during the several occupations represented there. The number of taxa used, the processing techniques used, and the element distributions indicate that this locality had longer seasonal occupations than the other locales. The inhabitants of Tintop Cave were organized to exploit large and small mammals, birds, and aquatic resources. They procured most of this game on an encounter basis. This provided a varied diet for the occupants, who were primarily using this locality during the spring and summer seasons.

Conclusions

The Picacho project produced faunal samples from both an Archaic-period open-air site (LA 58971) and a Glencoe-phase site (LA 71167) consisting of four sheltered localities. The Archaic site was dominated by smaller animal forms, especially cottontail and jackrabbit. Large mammal bone occurred infrequently in the assemblage and represented only three or four individuals. All bone was broken and reduced to fragments, suggesting that an intensive-use strategy was being applied to all animal resources. The discoloration on the bone recovered also suggests that both boiling and roasting were desirable cooking processes. The storage pits excavated at this Archaic site show mounded trash deposits during their initial filling that was probably a result of refuse being thrown into them from the activity areas nearby. There are differences in recovered taxa from feature to feature at LA 58971, indicating differing use and disposal patterns from one occupation to the next. The large sample of bone recovered from LA 71167 presents a somewhat different picture for the later period in this area.

At LA 71167, various localities present differing views of short- and longer-term seasonal occupations. The South Shelter, North Shelter, and North Cave produced small bone samples and reflect limited occupations that may have been hunting and processing encampments used when larger mammals were taken or some processing activities needed to be accomplished.

South Cave, or Tintop Cave, represents a locale with longer-term occupations. Though the main faunal sample came from one area of the cave, a diversity of resources were used during the occupation periods there. The occupants were obviously organized to exploit a wide variety of animal resources. The age groups of the large mammals taken (e.g., fetal/neonate deer) indicate that the primary occupation was during the spring and summer, also a time when the widest variety of resources would be available to the occupants.

Both sites from the Picacho project show the intensive use of available animal resources, but smaller forms were emphasized at the Archaic-period site (LA 58971), while a greater variety of animal taxa and more large mammals were utilized at the Glencoe-phase site (LA 71167). The faunal remains at both sites exhibit evidence that animals were butchered, cooked, and consumed anytime they could be taken. Encounter-basis hunting and gathering seems to have been practiced during both time periods.

DISCUSSION

Sunset Archaic Site

Subsistence

Sebastian and Larralde's discussion of Archaic subsistence data for southeastern New Mexico (1989:52-54) leaves one major impression: virtually every project has come up with a different interpretation of what the subsistence "pattern" might have been. It is probably safe to say, given the size and biogeographic diversity of southeastern New Mexico and the current state of thinking on such matters, that no single pattern predominated at any point in time over the entire area. Our knowledge of southeastern New Mexico archaeology is too minimal to permit adequate characterization of Archaic subsistence. As in the case of cultural affiliations and projectile point types discussed elsewhere in this report, every time we dig a site, we get a new piece of a very large puzzle.

Instead of talking about a single pattern for all of southeastern New Mexico, it would be more sensible to speak of at least four cultural/physiographic subregions. To a large degree, the proposed subregions are equivalent to those used by Sebastian and Larralde (1989), but modified as follows: (1) Sierra Blanca region (including the Sacramento, Capitan, and Jicarilla mountains and the piedmont to the east [Kelley 1984]); (2) the Middle Pecos region (Roswell north [Jelinek 1967]); (3) the Brantley/Guadalupe Mountains region (Katz and Katz 1985; Henderson 1976; Gallagher and Bearden 1980); and (4) the Hobbs region (the country between the Pecos Valley on the west and the "Caprock" of the Llano Estacado on the east. Some archaeological justification for delimitation of these areas already exists, but we need better definition of the boundaries. Of these subregions, the Sunset Archaic site lies within the Sierra Blanca.

The skeptical reader will quickly point out that historical and modern hunter-gathers typically used territories that were larger or else biotically more diverse than these subregions. The point is well taken. The perspective taken here is that each Archaic group in southeastern New Mexico probably used one or more of these subregions to different extents and with varying intensity. Further, the "formula" of use by most or all groups may have changed on an almost yearly basis according to group needs and restrictions imposed by nature and other human groups. Under these conditions, it seems more appropriate to characterize each subregion and assess the potential "mix" for human adaptation. This avoids the problems of characterizing a single, large, diverse region and then having to make sense of the contradictions.

Like many projects before it, the Sunset Archaic site contributes much new information. The site fits the general pattern of the Southwestern Archaic in that the primary foods were small mammals and wild plants (Sebastian and Larralde 1989:52). However, corn pollen and ubiquitous corn cupule fragments at the site leave no doubt that horticulture was practiced in this part of southeastern New Mexico as early as the time of Christ, several centuries earlier than was previously thought (Stuart and Gauthier 1981:267; Sebastian and Larralde 1989:52).

Although it comes as no surprise that a variety of plant and animal remains was recovered from the Sunset Archaic site, the number of taxa is extraordinary. It should be noted that, today and probably in the past (Wills 1988:51-54), all of the plant and animal taxa are or were present within a few kilometers of the site. All of the food items could have been exploited by work parties and returned to the site on a daily basis. The corn could have been grown in the alluvial soils of the well-watered Hondo Valley, immediately south of the site.

The availability of deer and antelope in the vicinity of the site was probably seasonal. During the cool months, both species were probably near the site in the valleys of the Hondo and adjacent drainages and in the piñon-juniper woodlands to the west, where they could find food, water, and shelter from cold winds (Bailey 1971). During the warm months, both species were probably farther afield. Antelope probably roamed the Sierra Blanca piedmont, south of the Hondo Valley, where, during the nineteenth century, they were a much prized resource of the Mescalero Apaches (Basehart 1973:152). Most of the deer probably moved to summer ranges in the higher elevations (Mierau and Schmidt 1981).

From the standpoint of biotic resources, the Sunset Archaic site could have been occupied through much of the year, especially in the wetter years. Wild plant foods were available locally during the warm season, animal foods were locally available year round, and cultigens could be grown in the valley. Pits for winter storage of food were constructed at the site.

Site Function

The total feature inventory of the Sunset Archaic site will never be known because a large part of the site is now gone. What was the full range of feature types? Are all feature types represented in the excavation sample? Were houses present? What features are to be found in the unexcavated portions of the site?

The four large and four smaller bell-shaped pits would have served one purpose quite well: storage of large quantities of food. The large pits, as discussed above, are unique for Archaic sites in southeastern New Mexico, and for the rest of the state. Although it is possible to argue that smaller pits might be used to store things other than foodstuffs, it is difficult to imagine that the large pits at the Sunset Archaic site were designed to store things other than food as a matter of course. The ubiquity of corn cupule fragments at the site and the pollen evidence indicate that corn and perhaps cholla were stored in two of the pits (Toll, this report; Holloway, this report).

The hearths, grinding equipment, projectile points, chipped lithic debris, and midden demonstrate that other activities were conducted at the site. The hearths imply time spent at the site but say little about the length of time and periodicity. Grinding equipment implies processing of vegetal foods, whether for storage, immediate consumption, or both. Projectile points imply medium- to large-mammal hunting, though so few points were found that this activity was probably minor. The faunal assemblage confirms this inference. The amount of chipping debris, indicative of time spent in the manufacture of stone artifacts, and the accumulation of enough vegetal detritus to create the dark-soiled midden suggest one or more occupations longer than overnight or a few days.

Storage features imply one of two types of behavior: (1) storage of foodstuffs with periodic returns through the winter and spring to retrieve and transport them to residence elsewhere (a strategy evidently employed at the ceramic-period Bent site [Wiseman 1991a]); or (2) overwintering at the site to have a supply of food near at hand. Given the capacities of the storage pits, option 2 seems more likely because of the sheer bulk of the stored materials. It would be easier to live at the site of storage than to move large amounts of food or anything else any but the shortest of distances. It therefore seems logical, given the added time spent at the site during the growing and collecting seasons, that the Sunset Archaic site was used and/or inhabited year round or nearly so.

Consequently, we believe that LA 58971 served as a central place, probably as a residence, two or more periods. We believe that each episode lasted for one to a few years. If the pairings of radiocarbon dates truly indicate separate uses of the site (see section on dating), then at least three such episodes of occupation took place, each separated by hiatuses lasting several decades or even centuries. Additional support for this interpretation is seen in the lower fill of Pit 7, where trash from an earlier episode was removed from elsewhere on the site and redeposited in partially filled Pit 7.

What advantages might the Picacho area have that would result in its selection as a central place? In the absence of detailed data on Archaic site settlement patterns west of the Pecos River and in the mountains, we can only make suggestions. Climatically speaking, the Picacho area is superior to both the mountains and the Pecos Valley for year-round human occupation. According to a comparative climate graph (see Fig. 2), the Picacho area is warmer in the winter than either the mountains or the Pecos Valley and cooler than the Pecos Valley during the summer. It has more precipitation than the Pecos Valley but lacks the snows of the mountains.

The Sunset Archaic site is unlike most recorded and excavated Archaic sites in southeastern New Mexico. Although several types of Archaic sites have been recorded, the vast majority are open-air lithic artifact scatters with diagnostic projectile points (Sebastian and Larralde 1989:48ff.). Some have scattered burned rock and/or hearths. But until a site is excavated, it is frequently impossible to detect other features such as cooking pits, storage pits, and structures (the Sunset Archaic site is a good example, but see also Simmons et al. 1989:561-562). Archaic components also occur in rockshelters and caves.

Pits have been encountered at only a few excavated Archaic sites in New Mexico (Simmons et al. 1989:49). The pits vary in size, shape, number, and function, but in a cursory review of the literature, few are similar in size and capacity to those at the Sunset Archaic site.

LA 18091, in northwestern New Mexico, dates between about 1100 and 800 B.C. Excavations uncovered a dozen pits of various sizes and shapes, but only three (numbers 7, 8, and 9) are bell-shaped (Simmons 1982:530-562). The descriptions of these three pits suggest they were used for cooking. However, in a later discussion (Simmons et al. 1989), the pits are assigned a storage function. Whatever the case, the bell-shaped pits at LA 18091, about 1 m in diameter, are the same size and capacity as the medium pits (8a, 8b/8c, and 8d) at the Sunset Archaic site.

Bell-shaped storage pits have been excavated in sites assigned to the San Pedro stage of the Cochise in southeastern Arizona (Sayles 1983:125-131). These, too, are about the size and capacity of the medium pits at the Sunset Archaic site.

Closer to southeastern New Mexico, a single bell-shaped storage pit was uncovered at the pre-Christian era Keystone Dam site (O'Laughlin 1980:129). This pit was nearly 1 m in diameter but only 37 cm deep.

Storage pits are evidently more common in pottery-period sites of the Jornada-Mogollon culture area. A literature survey shows 16 excavated sites having one to nine medium or large storage pits, totaling 38 pits (Wiseman 1991a:Table 8). Twenty-four are bell-shaped, but in no instance is the degree of "belling" as great as in Pits 8a, 8b/8c, and 8d at the Sunset Archaic site. Several pits at LA 10835, the Bent site, are particularly noteworthy because of their lateral entries and the fact that all but one of the pits occur in two clusters.

In summary, extramural pits, especially those of the size and capacity of the Sunset Archaic site pits, are uncommon during the Archaic period in the eastern Southwest. However, during the succeeding pottery period, large storage pits were more common, though their overall distribution is poorly known.

Cultural Relationships

How does the Sunset Archaic site fit in with what little is known about the Archaic of southeastern New Mexico? Since the Archaic period has been investigated in depth only in the Carlsbad region, 100 km south of our project area, those remains are the only ones with which can profitably compare the Sunset Archaic site.

From the standpoint of dating and the San Pedro point, the Sunset Archaic site partly meets the criteria for the Brantley phase. However, the presence of corn at LA 58971 differs significantly in that cultigens have not yet been unambiguously identified in any prehistoric context in the Carlsbad region. Also, the base-camp function attributed to the Sunset Archaic site and the faunal assemblage differ from the Brantley pattern in that they indicate a focus on the upland zone rather than the riverine zone for this time period in the Carlsbad region. At Carlsbad, the shift to the upland zone for primary occupation and food resources took place after A.D. 1150, several centuries after the final occupation of LA 58971.

How does the Sunset Archaic site relate to regions outside of southeastern New Mexico? Decades of research in Texas and western New Mexico have produced well-defined phase sequences, none of which are wholly applicable to southeastern New Mexico. The main problem is that the data base for southeastern New Mexico is small and lacks coherency (Sebastian and Larralde 1989:41-42), and the region is large.

Many archaeologists rely on projectile point types for assessing cultural relationships over space and through time. Perhaps not surprisingly, southeastern New Mexico Archaic assemblages, close to the better-known regions of western New Mexico and Texas (Table 55), frequently are a composite of types from both. The Sierra Blanca is no exception. In part, the problem stems from the fact that some styles or types of points occur in all of these regions. In other cases, types are characteristic of specific regions and rare or absent in others.

Predictably, Archaic remains in southeastern New Mexico have been attributed to conflicting cultural origins (see Sebastian and Larralde 1989:42). The main contenders in this taxonomic tug-of-war are the Cochise culture of southwestern New Mexico and southeastern Arizona (Sayles 1983), the Chihuahua tradition of south-central New Mexico and northern Mexico (MacNeish and Beckett 1987), and various cultures in Texas, including those in the Southern Plains, Lower Pecos, and West-Central and Central regions (Creel 1990; Turpin 1991; Turner and Hester 1985).

The Sunset Archaic site is no exception in this regard. The San Pedro Large point is characteristic of the San Pedro stage of the Cochise culture and the Hueco phase of the Chihuahua tradition. It is also reminiscent of the Godley point, a type common in Late Archaic and Late Prehistoric contexts in central, south, and lower Pecos Texas (Turner and Hester 1985). The San Pedro Small point appears to have been more common in post-Archaic (early Mogollon or pottery-period) contexts in southwestern New Mexico (Dick 1965:30).

One of the Sunset Archaic site points has been identified as Hueco point (Patrick H. Beckett, pers. comm., 1989), one of the primary types of the Hueco phase, Chihuahua tradition (MacNeish and Beckett 1987). And finally, the small corner-notched point from the Sunset Archaic site is most similar to the Bulbar Stemmed point of the South Texas Coast. In the latter region, the point dates to the Late Prehistoric (post-Archaic) and Historic periods (Turner and Hester 1985).

So what region does the Sunset Archaic site projectile point assemblage most closely resemble? If proximity is the deciding factor, then it most closely resembles the Chihuahua tradition and the Cochise culture to the west and southwest. However, at least two Texas connections are possible, though they are clearly more tenuous, especially the one with the Texas coast.

To further complicate the situation, the Sunset Archaic site overlaps in time with the earliest pottery manifestations in the El Paso region (Jornada-Mogollon proper; Whalen 1981) and in southwestern New Mexico (Mimbres-Mogollon; Anyon et al. 1981; Deaver and Cïolek-Torrello 1995). This brings up another problem that has appeared over the past decade: the possibility that full-time hunter-gatherer groups may have lived in many parts of the Southwest during the late prehistoric (pottery) period.

A. E. Dittert, Jr. (1959), and Reynold Ruppé (1953) were among the first to suggest the presence of full-time, pottery-period hunter-gatherers in the Acoma culture province of west-central New Mexico. They found lithic artifact sites emanating from the Archaic San Jose period, which lasted as late as A.D. 700, to judge by the presence of small amounts of White Mound Black-on-white pottery. They applied the name "Lobo Complex" to these sites but did not follow up on the archaeology or the implications beyond the suggestion that these hunter-gatherers were "civilized" by pottery-producing peoples to the northwest (cf. Tainter and Gillio 1980:58).

Since the appearance of the Dittert and Ruppé dissertations, an increasing number of archaeologists have grappled with similar phenomena at various locations in the Southwest. Eschman (1983:375-384) discusses several radiocarbon dates that are too recent for the San Juan Basin Archaic occupations that produced them. Traditionally, archaeologists have treated such dates as erroneous, but Eschman suggests that they may not be. He suggests instead that the sites may have belonged to full-time hunter-gatherers.

Table 55. Archaic and early-pottery manifestations of New Mexico, Texas, and northern Mexico contemporaneous with the Sunset Archaic site

Culture	Dates	Reference
Archaic		
Northwestern New Mexico Oshara tradition En Medio phase	800 B.C.-A.D. 400	Irwin-Williams (1973:11-15)
Southwestern New Mexico Cochise culture San Pedro stage	1500 B.C.-A.D. 100	Sayles (1983:46) Dick (1965:30)
Northern Mexico Chihuahua tradition Hueco phase	900 B.C.-A.D. 250	MacNeish and Beckett (1987:16)
Southeastern New Mexico Brantley locality Brantley phase	A.D. 1-750	Katz and Katz (1985:400-402)
West-Central Texas Uvalde phase Twin Sisters phase	 300 B.C.-A.D. 150 A.D. 150-550	Creel (1990:13-15)
Lower Pecos region of Texas Blue Hills phase	350 B.C.-A.D. 650	Turpin (1991)
Pottery Period		
Southwestern New Mexico Mimbres-Mogollon culture Early Pithouse period	A.D. 200-550	
Southeastern New Mexico Jornada-Mogollon culture Mesilla phase	A.D. 250-1100	Lehmer (1948); Whalen (1981)

Oakes (1982:46) and Lord and Reynolds (1985:227) have made similar suggestions in their discussions about pottery-bearing campsites east of the Pecos River. It is also possible that these sites were the result of hunting and gathering expeditions by agriculturists from the Sierra Blanca. At this juncture we have no criteria for distinguishing between the "special-activity sites" of horticulturists and those of hunter-gatherers, but we must start developing them. This subject is treated more thoroughly with regard to the cultural identity of the occupants of the Sunset Shelters, as discussed below.

Finally, it is important to note that the Sunset Archaic site shares a number of similarities with Late Archaic sites in southeastern Arizona, especially the Tucson Basin. Huckell's (1988) summation characterizes the Late Archaic sites in the river floodplain and river terrace settings as follows:

> . . . the products of relatively long-term residential use by large (band-sized, 50-75 people?) population aggregates. The presence of thick, highly organic midden deposits with very high artifact densities, containing pit structures, extramural storage and cooking features, and relatively abundant burials in apparently spatially segregated portions of the site areas, are all qualitative attributes that imply a developing trend toward sedentism by approximately 2400 Y.B.P. (Huckell 1988:64)

These sites also produced evidence of maize horticulture, a factor that Huckell believes was the primary cause of placing the sites along the river margins (see also Ciolek-Torrello 1995:534-535).

Pithouses, cooking pits, and specific burial areas have not been documented for the Sunset Archaic site in particular or for the Sierra Blanca region in general. However, the other attributes--thick midden deposits, high artifact density, extramural storage pits--*are* present at the Sunset Archaic site. Given the large portion of the site removed by the 1938 road building and the remaining unexcavated site area, it is entirely possible that one or more of the "missing" attributes may still be found at the site. In this connection, it should be remembered that several burials were recovered by the road construction crews in 1938. Although it has been suggested that these burials are historic, it is by no means certain. The remains are currently reburied in a common, concrete-curbed grave north of the highway fence, but still within the site perimeter.

Thus, it is clear that the Tucson Basin Late Archaic and the Sunset Archaic site are similar, with only the dating lacking accord. The Tucson Basin Late Archaic dates 3500 or 3000 B.P. to about 1800 B.P. and is somewhat earlier than the Sunset Archaic site, which dates about 1950 to 1500 B.P.

Initial Pottery Production in the Sierra Blanca Region

The total absence of pottery at the Sunset Archaic site raises an intriguing question. Given its status as a recurrent base camp used for several months or a few years at a time, its occupations dating to the first four to five centuries A.D., and its location on the eastern flanks of the Sierra Blanca, the Sunset Archaic site should contain at least a few sherds if pottery was being made in the Sierra Blanca region.

Yet, Jornada Brown, the first pottery made in the Sierra Blanca region, has been recovered from Deadman's Shelter in the Texas Panhandle (Hughes and Willey 1978).

Radiocarbon dates associated with these sherds indicate use of Deadman's Shelter during the same period of occupation at the Sunset Archaic site. While it is risky to make hard and fast assumptions about the matter, the radiocarbon dates from Deadman's Shelter are brought into question. If the Sunset Archaic site dates and our assumptions are correct, pottery manufacture in the Sierra Blanca probably started some time after A.D. 450 or 500. As matters now stand, this is late relative to other regions of the Southwest (Deaver and Cïolek-Torrello 1995).

Sunset Shelters

Subsistence

A wide variety of plants and animals was used by the occupants of the caves and shelters of LA 71167, especially Tintop Cave. Seasonal indicators show spring, summer, and fall occupations. Clearly, two or more major late prehistoric occupations took place in Tintop. The later one, represented by Stratum 3, produced very little in the way of subsistence remains and cannot be profitably discussed in the current context.

The earlier stratum (#4) produced most of the plant and animal remains recovered from the cave and contained at least three partly superimposed hearths. Although these hearths indicate different but closely sequent occupations of the cave, we were unable to discern stratigraphic subunits corresponding with the individual hearths. Consequently, we are unable to determine whether more than one seasonal indicator occurred with a given occupation.

A major uncertainty about Tintop Cave is whether an Archaic occupation is also present in Stratum 4. The deepest levels produced a few flakes and two basin metates but no pottery. Toll's floral study (this report) provides corroborative information in that the samples from the lowest levels (8 and 9) emphasize annual species, thus paralleling the floral assemblage from the Sunset Archaic site. By way of contrast, the floral assemblage from the overlying levels at Tintop contain more perennials. It is unfortunate in this regard that all of the Archaic-looking points (two San Pedro Smalls and one Hueco) came from the upper deposits, which also produced the A.D. 1427 radiocarbon date (but see discussion of dating elsewhere in this report).

Site Function

Of the four shelters and caves at this site, Tintop Cave is the best known because most of it was excavated. It had the most extensive and darkest deposits and considerably more cultural materials. The North Cave, North Shelter, and South Shelter were only sampled, in part because they were much smaller than Tintop Cave, in part because they apparently contain shallower, lighter-colored deposits and many fewer cultural materials, and in part because major sections of all three will not be involved in the proposed construction.

The features of Tintop Cave included five hearth areas, one boulder metate, portable grinding equipment, projectile points, pottery, chipping debris, one major midden, and minor middens. Aside from a deep hearth at the North Shelter, nothing other than a few artifacts and faint occupation lenses were noted at the other shelters and caves of LA 71167.

At Tintop Cave, the main midden (Stratum 4) reflects a fairly continuous and perhaps relatively long occupation. The superpositioning of hearths demonstrates that Stratum 4 was actually created through several sequent, closely spaced occupations that, because of the lack of intervening deposits, followed one another rather closely in time. Though we lack direct evidence, we believe that the breaks in occupation were short, perhaps one season or at most one year. The assumption is that occupational breaks longer than one year would result in an accumulation of sterile rock fall like that separating the overlying deposits.

Conversely, the minor middens, which overlie the main midden and those outside of the cave, indicate a series of later occupations that were of shorter intensity and/or duration. Each of these minor middens is separated by layers of sterile rock fall. We believe these sterile layers indicate the breaks in occupation were on the order of several years or even several decades.

As at the Archaic site, the hearths imply time spent at the site, but say little about the length of occupation. Grinding equipment implies processing of vegetal foods, whether for storage, immediate consumption, or both. Projectile points imply hunting, and the amount of chipping debris and preforms indicate that considerable time was spent in the manufacture and maintenance of stone artifacts and hunting equipment.

In Tintop Cave, vegetal detritus and other organics from the earliest occupations accumulated in large enough quantities to create a nearly black fill, indicating stays longer in duration than overnight or a few days. By way of contrast, the later, minor middens in Tintop Cave and all of the middens in the other shelters and caves are much lighter in color. This implies shorter, less intense occupations involving much less of the materials (grass for bedding, residues from plant and animal foods, etc.) that produce organic coloration. Fewer artifacts also characterized these light-colored strata.

Comments about the color intensity of the cultural deposits in the Sunset Shelters are in order. The dark deposits in the western half of Tintop Cave were sheltered from the elements by the cave roof, and one would expect these strata to retain their intensity of coloration. However, the eastern strata were not covered by the cave roof, and they were still darker than the cultural strata of the South Shelter, the North Cave, and the North Shelter. Thus, while exposure to rain and the process of leaching may account for some of the differences in intensity of color in the cultural deposits, natural processes do not account for all of these differences. Intensity of human occupation appears to be the main cause. This interpretation is further buttressed by the observation that, in general, the lighter-colored the stratum, the fewer the artifacts recovered.

In summary, all of the Sunset Shelters were occupied intermittently. However, the larger cave, Tintop, was occupied more intensively and/or for a longer period of time. This can be seen in the relatively large quantities of occupational debris that accumulated in the single, thick Stratum 4. Even this stratum is comprised of debris from several occupations. The difference is that these occupations occurred in such rapid succession that no intervening natural deposits accumulated between them. Subsequent occupations in Tintop and all occupations at the other shelters were shorter and/or less intensive, to judge by the light fill colors and scarce artifacts.

Cultural Relationships

Cultural similarities between the Jornada-Mogollon villages both east and west of the Sunset Shelters are to be found in most categories of artifacts, including pottery and projectile point styles. But these similarities can arise under several different conditions and therefore do not necessarily tell us whether or not the people were related. Cultural relationship does not automatically mean sanguinal or affinal relatedness.

The subsistence data suggest differences between the Sunset Shelters occupants and the villagers, though no quantitative characterizations of nearby Jornada-Mogollon sites are available for comparison. Data from the few pithouse and pueblo excavations indicate that cultigens, especially corn, were an important but not necessarily dominant component of the diet. This contrasts with the Sunset Shelters, where, in spite of the organic richness of the deposits, corn could only be documented through microscopic examination of flotation and pollen samples. Clearly, corn was more important to the village-dwelling Jornada-Mogollones than to the occupants of the Sunset Shelters. Still, these data do little to help us answer the question of cultural relationships between the village-dwellers and the shelter-dwellers.

The Cultural Identity of LA 71167

In an excellent overview of the prehistory and history of southeastern and east-central New Mexico, Sebastian and Larralde (1989) discuss the possibility that a full-time hunter-gatherer culture may have existed side by side with the agricultural, village-dwelling Jornada-Mogollon during late prehistoric times. In contrast to northwestern New Mexico, the climate, landscape, and prehistoric archaeological remains in southeastern New Mexico suggest that the region was not suitable for a widespread agricultural existence or the comparatively denser population that an agricultural region implies.

For years archaeologists have debated whether the myriad sherd and lithic scatters, particularly those in the Pecos Valley and eastward, represent southwestern or Plains peoples. At historic contact, as yet unidentified peoples, possibly including Apaches, were present in the area (Schroeder and Matson 1965:60). We have virtually no details about these people, who lived in *rancherías* along the Pecos River, and archaeologists have yet to identify their sites. Only J. Charles Kelley (1986, and various papers cited therein) has tackled the problem, but his work pertains most directly to the La Junta district of far western Texas, some 425 km south of Picacho.

The material culture and absolute dates from the Sunset Archaic site and the Sunset Shelters indicate a clear temporal difference between the two sites. Yet, the artifactual, floral, and faunal data demonstrate more similarities than dissimilarities. Previous to the excavation of the sites we had assumed that the Archaic peoples were hunter-gatherers, that the occupants of the Shelters were agriculturists, that the two sites (and the periods they represent) were culturally sequent, and that the inhabitants of both sites *may* have been genetically related. Thus, the occupants of the Shelters were assumed to be agriculturist Jornada-Mogollones (Lehmer 1948).

From some time before A.D. 900 to about 1100 or 1200 the Jornada-Mogollones lived in pithouses, made brownware pottery, and grew small quantities of corn and perhaps beans and squash. By the late A.D. 1200s or early 1300s, they were living in large pueblo-style dwellings, made large quantities of pottery, participated in farflung exchange networks, and subsisted on farm products supplemented by animal and wild plant foods (Lehmer 1948). We now know from Kelley's work (1984) that the prehistoric Glencoe-phase peoples in the Sierra Blanca region deviated somewhat from this scenario in that they never built pueblos, preferring to live in pithouses throughout the centuries.

The assumption underlying Lehmer's concept of cultural development in the Jornada-Mogollon area, following the work of others elsewhere in the Southwest, involved an evolutionary path from food collector to food grower; from nomadic lifestyle to sedentary lifestyle; from small groups living in temporary camps to larger groups living in permanent villages; from simple to complex.

This section of the report will explore the similarities and differences of the archaeological remains from the Sunset Shelters with other archaeological manifestations of southeastern New Mexico in an attempt to define the basic cultural identity of the occupants. In so doing, we will look at the dichotomy between hunter-gatherers and farmers and attempt to develop a means for distinguishing the two through the material culture and other remains.

To assess these questions, we make two sets of comparisons involving the Sunset Shelters: (1) to the Sunset Archaic site, to gain perspective on the Shelter data as the possible remains of hunter-gatherers; and (2) to Jornada-Mogollon sites and assemblages, to gain perspective on the Shelter data as the possible remains of Jornada-Mogollones.

Comparison with the Sunset Archaic Site

Residential Sites

It is difficult to discuss residential status in the absence of architecture. Nonetheless, the Sunset Archaic site was probably a residential site, even though it may not have been occupied year round. This interpretation rests on the presence of the numerous large storage pits, the variety of artifacts and the variety of activities implied therefrom, and the variety of plant and animal species in the archaeological record and their implications for multiseasonal occupation of the site.

Similar arguments can be made for Tintop Cave. While storage pits are lacking, the pottery jars represented in the ceramic assemblage could have served the same function. Certainly, a variety of artifacts and plant and animal remains was present at Tintop; the implications of these factors apply equally well to the occupations, especially that represented by Stratum 4, at Tintop Cave.

Chipped Stone Technology

Chipped stone debitage, one of the few kinds of remains common to both the Archaic site and the Sunset Shelters, must be assessed with regard to the overall composition of the assemblages, the lithic materials, and several aspects of the cores and flakes.

Assemblage Composition. A comparison of Tables 4 and 14 shows great similarities among the various class totals for the Archaic site and the Shelters as a group. Flakes comprise 94 percent and 92 percent of the assemblages, respectively, followed by cores (3 percent and 7 percent), and shatter and pieces of material (3 percent and 1 percent). Given the near equivalence of percentages in all categories, the two assemblages are essentially the same.

Materials. The proportions of lithic raw materials at the Archaic site and Tintop Cave are generally similar (Tables 9 and 16). Local gray cherts are the primary materials (54 percent and 72 percent, respectively), and "other" materials are a distant second. Other cherts and chalcedonies are absent to negligible.

Major differences between the two assemblages are in the actual quantities of local gray chert and siltites/quartzites. It is not possible to ascertain whether the disparity in the siltites/quartzites is due to cultural or natural reasons because of the situations of the sites. The Shelters were situated at the bottoms of low cliffs and steep slopes, which introduced large quantities of natural spalls of these materials into the cultural deposits. Since it is very difficult to discern natural from cultural spalls under these circumstances, flakes of siltite and quartzite are doubtlessly underrepresented in the Shelters assemblages. If siltites and quartzites are eliminated from the comparison, the gap between the percentages of local gray chert decreases to about 9 percent, making the overall profiles from both sites very similar. Thus, the material profiles for the two sites are so similar that any differences are probably meaningless from a cultural perspective.

Core Assemblages. The core assemblages are somewhat different for each site (Tables 4 and 14). Single-platform (SFS) and 2-platforms-adjacent (2PA) cores, with 33 percent and 32 percent, respectively, clearly dominate at the Archaic site. At the Shelters, 2PA cores (30 percent) and 2-platforms-parallel cores (2PP; 27 percent) are dominant, followed closely by SFS cores (20 percent). The difference probably relates to greater reduction of cores at the Shelters, resulting in slightly more complex core morphology.

This interpretation is supported by the fact that 2PP cores are smaller than SFS and 2PA cores at the Archaic site (Tables 15a-15c) and 2PA cores at the Shelters (Tables 15a-15c). The smallness of the SFS cores at the Shelters (and therefore the seeming contradiction with the interpretation) may be due to sample sizes (SFS N = 3), since very small SFS cores are also present in the Archaic site assemblage (Table 15a).

Flake Assemblages. Core reduction flakes form the bulk of the chipped lithic assemblages at both the Archaic site and the Shelters (see Appendix 7 for an operational model of core reduction and a discussion of its relevancy to Picacho project materials). Of interest here is the question of how efficiently the core reduction was carried out with regard to flake sizes and cortex removal.

Overall flake sizes and shapes are readily compared by reference to Tables 7, 8, and 18. Compared to the Archaic flakes, the Tintop flakes are a little longer, a little wider, nearly twice as thick, and twice as heavy. Curiously, except for weight, the standard deviations of the Tintop dimensions are lower, suggesting better standardization of flake size along the dimensions of length, width, and thickness. However, the correlation matrixes (Tables 8 and 18) indicate that the dimensions of Archaic flakes are more closely correlated (length to width to thickness) than the Tintop flakes; thus, Tintop flakes are more variable in shape than the Archaic flakes.

Flake length is assessed by comparing complete flakes grouped in 5 mm increments for each site as a whole (Fig. 61). The Archaic flakes peak in t he 11 to 15 mm category and rapidly fall away thereafter. The Tintop Cave flakes, on the other hand, have a broad peak from 11 mm to 25 mm. For whatever reason, the pottery-period peoples were more successful in producing longer flakes.

An assessment of percentage of cortex and flake length is also instructive. Given sample-size problems, only flakes with 50 percent or less cortex can be meaningfully compared (Fig. 62). In viewing the graphs, the important aspect with respect to the ideal model (Appendix 7) is the position of the peak; in general, it should shift from left to right as the percentage of cortex and flake length increase.

The line for the Archaic flakes generally follows our expectations, though not quite as predicted. The peak does not move incrementally as expected, but drops in graph B, and the curve becomes more curtose ("fatter"). In graph C, the peak bifurcates and spreads toward the right. In graph D a single peak appears to the right of the peak in graph A and centers on 16 to 20 mm. This "delay" in movement to the right is probably largely attributable to the small raw material unit sizes, but it does fit the expectation that larger flakes have more cortex.

The graphs for Tintop differ in several ways. In graph A, the peak is fairly low (24 percent), but the curve is curtose: more and larger flakes from Tintop have no cortex. The trend is continued in graph B, where the peak centers farther right *and* constitutes the highest peak for the Tintop assemblage.

The curve in graph C does not fit the trend established in graphs A and B, nor does it comply with expectations derived from the ideal model. One or more explanations may be responsible. Possibly, the sample size (N = 27) is too small. Or perhaps an important stage in decortication, resulting in a large number of small flakes with 11 percent to 25 percent cortex, is implicated.

Finally, the Tintop curve for category 4 cortex (26-50 percent) may be a combination of two trends: in the left peak, a continuation of the trend in graphs A and B; and in the right peak, a partial fulfillment of expectations derived from the ideal model (i.e., the tendency for cortex to be on larger flakes). Or, the curve may be due to small sample size (N = 15) and therefore may not accurately reflect the realities of the assemblage dynamics.

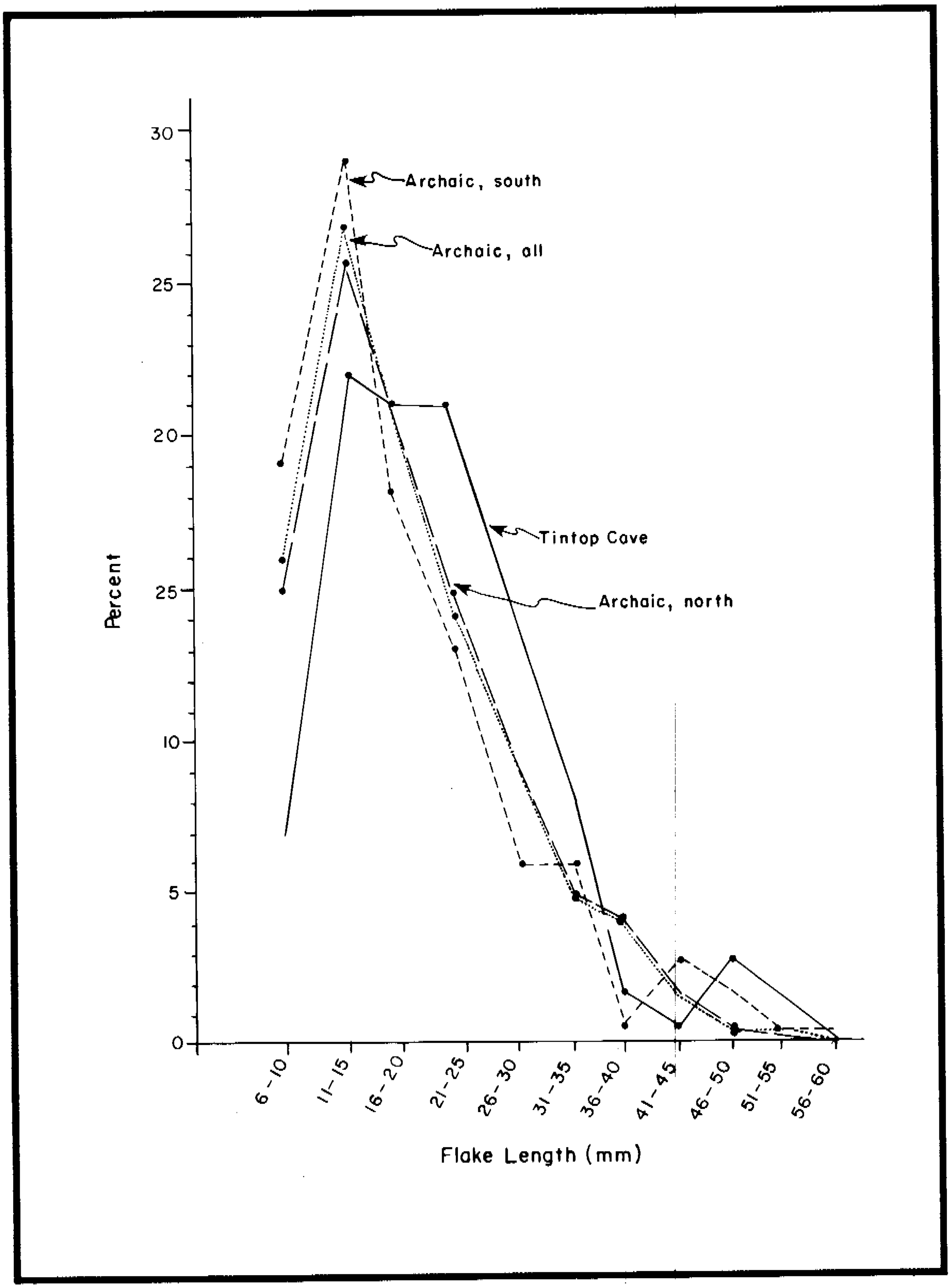

Figure 61. Comparison of complete Archaic and pottery-period flakes.

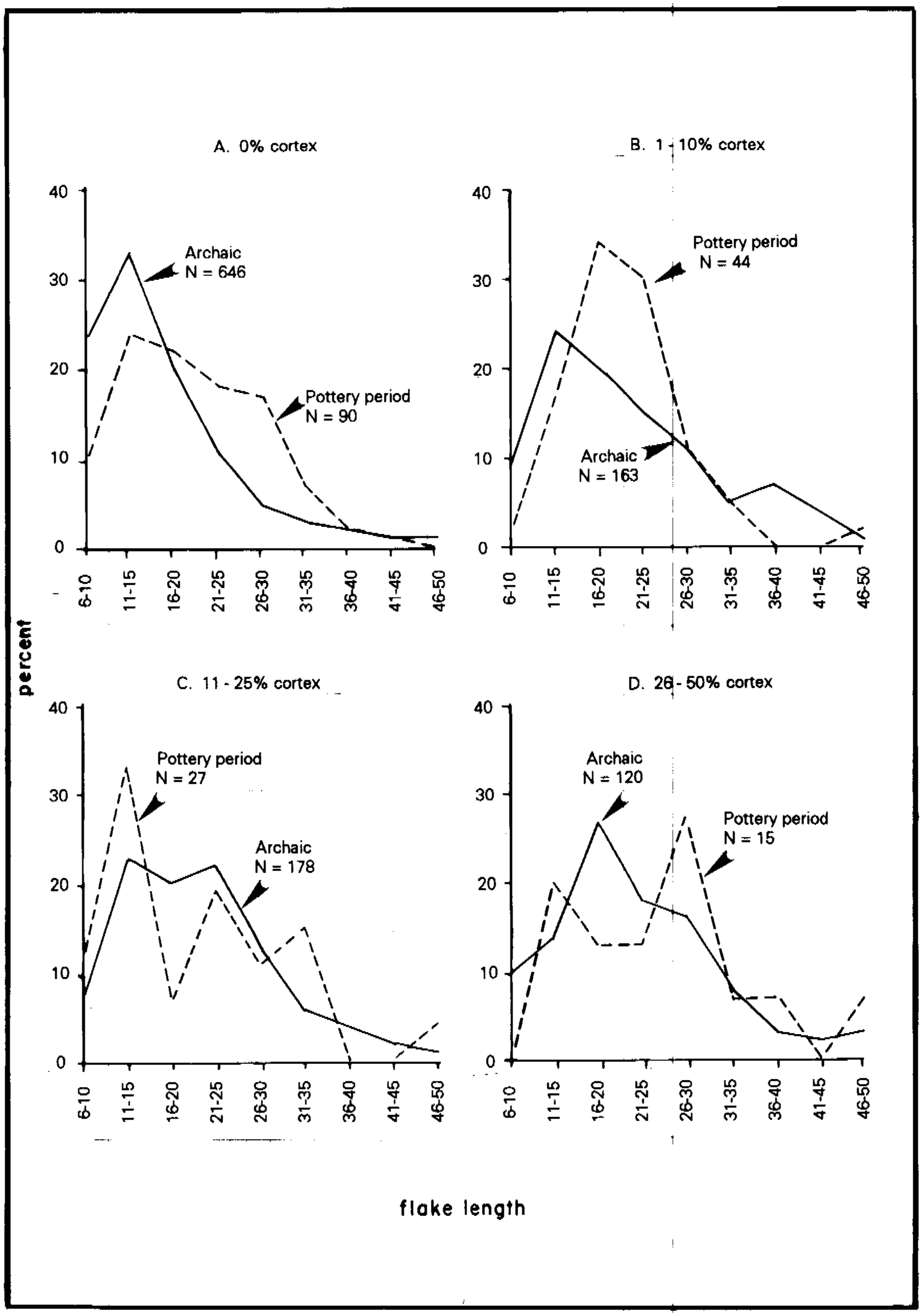

Figure 62. Comparison of Archaic and pottery-period assemblages, cortex category by flake length.

In summary, the Archaic-period knappers conformed more closely to the ideal model (Appendix 7) and produced flakes that had greater standardization in flake shapes (better correlation of dimensions). The pottery-period knappers of Tintop Cave, compared to the Archaic knappers, deviated more from the ideal model, produced longer flakes, and produced more large flakes bearing little or no cortex. Since the two groups had equal access to the same lithic resources, we conclude that the occupants of Tintop Cave were more successful knappers than the occupants of the Sunset Archaic site. The difference may be related to two things: the greater use of chert by the occupants of the Shelters; and longer experience with the materials, resulting in greater efficiency in obtaining larger flakes. The longer experience, of course, includes the experience of generations stretching back to, and including, the Archaic period.

If this perspective is accurate, then the improvements in knapping technology through time are reasonable and expectable. But, it is uncertain whether this is a reflection of genetic relationships between the occupants of the two sites or merely a widespread phenomenon shared throughout the region.

Biface thinning flakes are of particular interest. A number of investigators have suggested that the relative frequency of these items is a good discriminator between Archaic and pottery-period sites (Sullivan and Rozen 1985:766-767) with regard to flakes produced by soft hammer percussion. Interestingly, more biface thinning flakes were identified from the Shelters than at the Archaic site (8 percent versus 5 percent). In both instances, however, the percentages are rather low, and the spread between them is small enough to be inconsequential.

Grinding Tools

The manos and metates from the Sunset Archaic site and the Sunset Shelters are virtually identical in size and shape. One-hand manos and basin metates are the only forms of grinding tools of which we can be certain from the two sites.

Regarding the metates, the stones themselves and the grinding surfaces are quite similar in spite of the fact that most of the Archaic-site specimens are very fragmentary. Except for the boulder example from Tintop Cave, all of the metate stones were relatively thin to start with. By the time the metates were broken, the remaining material between the bottom of the grinding surface and the bottom of the stone was usually remarkably thin or even worn through.

The grinding basins of the Archaic and Shelters metates are also similar in size, though the Shelters metates appear to be a little larger on the average. The two Archaic metates for which these measurements are either complete or can be confidently calculated are 22 to 25 cm long and 12 to 15 cm wide. With one exception, the basins of the Shelters metates are 26 to 31 cm long and 15 to 22 cm wide. The basin of the exception was an estimated 50 cm long and 28 cm wide. As discussed below, the metates and grinding basins of both sites are considerably smaller than the metates of contemoporary and later-dating, pottery-period metates from the Sierra Blanca.

Subsistence

The Sunset Archaic site and the Sunset Shelters (Tintop Cave in particular), only 1.5 km apart, share several general aspects of location, resource access, and plant and animal assemblages (Table 56). Both sites are in the Hondo Valley and have equal access to the riparian and grassland plant communities. Both are near or in a relict patch of the Chihuahua Desert. The archaeological plant and animal assemblages of the sites are highly diverse, suggesting that the sites were not limited activity loci established for the exploitation of specific resources. Instead, this great diversity more likely indicates the sites were used during two or more seasons in a given year or years, and therefore the sites served as base camps or even residences (Toll, pers. comm., 1992). The use of cultigens was limited at both sites, though corn remains were much less common in the Shelters.

Potentially significant differences between the two sites appear when details of the archaeological plant and animal assemblages are considered (Table 56). Although many of the same species of wild plants and animals were exploited, different species were emphasized in each period, indicating differing adaptations in a similar environment. Annuals were more important during the Archaic, and perennial species were more important in the pottery period. Even the degree of use of cultigens appears to have differed somewhat: evidently more corn was used at the Sunset Archaic site (to judge by the of ubiquity of corn remains in the sites), and lesser quantities of corn and some beans were used in the pottery period.

Given the fact that cultigens, especially corn, were present in limited quantities at both sites, it is logical to ask whether this plant was being grown at the sites or was brought in from elsewhere. As Toll (this report) mentions in her discussion, pollen, particularly of the nonarboreal species like corn, is probably the best indicator that a specific plant was available locally and (in the case of cultigens) probably grown locally. Corn pollen was found in both the Sunset Archaic site and Tintop Cave, making it very likely that the occupants of both sites grew the plant.

Summary

The Sunset Archaic site and Sunset Shelters assemblages are more similar than they are dissimilar. In the chipped lithic debris, the artifact class distributions (flakes vs. cores vs. shatter) are virtually identical. The materials classes, when adjusted for excavation bias, are similar. The incidence of biface thinning flakes is generally low for both sites, with a somewhat larger number of these items in the Shelters assemblage.

Differences between the assemblages of chipped stone debris include: (1) dominance of two core types at the Archaic site and three at the Shelters; (2) better conformation to the core reduction model and greater standardization of flake sizes by the Archaic people; and (3) production of longer flakes bearing less cortex by the occupants of the Shelters. It is worth noting that the difference in core types might be related to a greater degree of core reduction at the Shelters. And the generally longer, relatively cortex-free flakes of the Shelters may be the result of increased ability to obtain such flakes as a consequence of slow improvements in knapping skills.

Table 56. Locational and biological attributes of LA 58971 and LA 71167

Attribute	LA 58971 Archaic Site	LA 71167 Tintop Cave
Located on/in north terrace of Hondo Valley	yes	yes
Situated within or very near relict patch of Chihuahua Desert?	yes (near)	yes (within)
Archaeological animal assemblages diverse? See chapter by Mick-O'Hara for details.	yes (1018 bones in 21 taxa; ratio 48:1)	yes (3658 bones in 50 taxa; ratio 73:1)
Archaeological plant assemblages diverse? See chapters by Toll and Holloway for details.	yes (31 taxa)	yes (28 taxa)
Were cultigens used?	yes (limited)	yes (even more limited)
Hunting emphasis on small mammals?	yes	yes
Hunting emphasis on large mammals?	no	yes
Wild plant emphasis on annuals?	yes	no
Wild plant emphasis on perennials?	no	yes

The grinding equipment at both sites is virtually the same: oval to short, subrectangular one-hand manos and shallow to deep basin metates.

Regarding subsistence, both sites share a number of similarities. By virtue of the site locations, the occupants of each site had basically equal access to the various resource zones of the area, especially the riparian, patch of relict Chihuahuan Desert, and grasslands. Floral and faunal species diversity was high. Corn was grown in limited quantities at each site but seems to have been somewhat more important at the Archaic site. The two main differences in the subsistence assemblages are the focus on small animals at the Archaic sites and a greater emphasis on large animals at the Shelters; and the focus on annual plants at the Archaic site and greater emphasis on perennial plants at the Shelters.

Comparison with Jornada Mogollon Manifestations in Southeastern New Mexico

The late prehistoric period has been studied in five regions of southeastern New Mexico (Table 57). Three of the regions--the Sierra Blanca, Middle Pecos, and Hobbs--are characterized by pithouses and/or pueblo-style structures during most of the pottery-producing period. The fourth--the Brantley/Guadalupe Mountains region at Carlsbad--lacks any form of permanent manmade structures during the entire prehistoric period. The comparisons made in the following paragraphs apply mainly to the occupations represented by Stratum 4 of Tintop Cave. All other remains at Tintop and all occupations represented in the North Cave, the North Shelter, and the South Shelter at LA 71167 evidently were shorter and more narrowly focused.

Table 57. Archaeological manifestations in southeastern New Mexico that are pertinent to the Sunset Shelters

Region	Dates (A.D.)	Reference
Sierra Blanca: Glencoe phase Corona phase Early Lincoln phase	 1100-1450 1100-1200 1200-1300	Kelly (1984); Wiseman (1983:8)
Roswell: Early Lincoln phase (?) Glencoe phase (?)	 1200?-1300 1100-1450	Kelly (1984); Rocek and Speth (1986); Wiseman (1985)
Middle Pecos: Late Mesita Negra phase Early McKenzie phase Late McKenzie phase	 1100-1200 1200-1250 1250-1300	Jelinek (1967:65)
Hobbs: Maljamar phase	 1100-1300	Leslie (1979:190-191)
Brantley/Guadalupe Mountains: Globe phase Oriental phase	 750-1150 1150-1450	Katz and Katz (1985:402-405)

Residential Sites

The construction and use of pithouses, the first form of permanent structure used in southeastern New Mexico, began in the Sierra Blanca, Middle Pecos, and Hobbs regions by A.D. 1000 or earlier, well before commencement of pottery-period occupations at the Sunset Shelters. We currently lack information about structural sites in the Roswell area before about A.D. 1200 or 1250, but after that date, both pithouses and pueblos were present. Although we have suggested that the Stratum 4 occupations of Tintop Cave were essentially residential (see discussion above), the differences between the occupations at Tintop and sites with architecture are qualitatively and perhaps culturally significant.

The pottery-period occupation of the Brantley/Guadalupe Mountains region was another matter altogether. No architecture has yet been identified in the region, a factor that has led Katz and Katz (1985:421) and Roney (1985:54-55) to suggest that the region was used only seasonally by peoples residing in nearby regions such as the Sierra Blanca, the Pecos Valley in Texas, and the Plains.

This interpretation has two basic tenets: (1) if an area is used only as a resource exploitation zone, then the people must have had their residences nearby; and (2) since pottery occurs at these special activity sites, it is the key to the identity and residential location of the people. While these assumptions are logical under the circumstances, they are nevertheless untested and therefore unproven.

Grinding Tools

Two traits characterize the grinding stone assemblages of all five of the regions under discussion here: one-hand manos (including short two-hand manos) and basin metates (Kelley 1984; Jelinek 1967:112-113; Katz and Katz 1985:86). That is not to say that other forms of these artifacts do not exist in one or more of the regions, for they do.

More importantly, the relative sizes of the manos and metates and the characteristics of both types of artifacts vary from region to region. But before discussing these, it is necessary to clarify some of the confusion in terminology that currently exists in southeastern New Mexico archaeology.

A type of grinding stone called a "slab" metate or "grinding slab" is herein included under basin metate because it is not a true slab metate. On a true slab metate, the entire upper surface was used for grinding and is evenly worn over the entire surface. This metate, either singly or in multiples, was plastered into slab-lined mealing bins and was the main metate type in the late prehistoric pueblos of the Rio Grande Anasazi (see Kidder 1932:68). By way of contrast, the grinding slab of southeastern New Mexico has a comparatively small, oval grinding area towards the middle of one or both surfaces. On the metate showing greater use, the grinding area developed into a true basin that is still shallow simply because the stone was thin to begin with.

Our statement about the primacy of basin metates in all regions is at variance with Kelley (1984:89), who states that trough metates are the most common form in Sierra Blanca sites in all time periods except the early Glencoe. By our definition, as based on common usage elsewhere in New Mexico, a trough metate is one having an elongate trough-like grinding groove or trough that is basically rectangular in shape and has parallel lateral ridges. One or both ends of this trough may be "open" in the sense that the trough cuts through the end or ends of the stone. The juncture of the sides with the grinding surface is sharply curved and is not a continuation of the gentler curve of the grinding surface.

By way of contrast, basin metates have shallow to deep, bowl-shaped grinding surfaces that curve gently, evenly, and continuously up to the margins all around. The deeper ones, especially those in the Sierra Blanca, give an initial impression of trough-like ridges along the lateral edges, but scrutiny shows an absence or near absence of the break in curve between the side wall and the grinding surface. Most importantly, the ends of the basin of this metate gently curve upward to the top of the stone, as in shallower basin metates. In the most worn examples, the top surface of the stone at one end is actually a centimeter or two lower than the surrounding top surface, but this is the result of use-wear and not a specific functional attribute as in trough metates.

The distinction between basin and trough metates is important when considering the evolution of efficiency in grinding equipment and especially when exploring the role of corn in the subsistence mix the perspective of grinding equipment. As Hard (1990) has shown, grinding surface area on manos, as measured by mano length, increases as dependence on corn increases. It therefore stands to reason that there is a corresponding increase in the areas of the grinding surfaces of metates. Although the grinding surface area of many of the late basin metates in the Sierra Blanca is similar to that of trough metates elsewhere in the Southwest, the Sierra Blancans were still mostly using one-hand and short two-hand manos. This, coupled with concave grinding surfaces on basin metates that are wider than the manos are long, constitutes a loss in efficiency in that the mano must be moved laterally (left and right) across the grinding surface as well as longitudinally.

Grinding motions on basin metates are necessarily more complex than on other types of metates because the one-hand mano normally does not cover the entire grinding surface in a single stroke. To develop and maintain an even grinding surface, the mano must be moved laterally on alternate strokes as well as longitudinally. On true trough metates, a simple longitudinal or forward-and-backward motion is all that is necessary because the mano spans the width of the grinding surface and the lateral ridges guide the action. In grinding large quantities of corn or any other material, fatigue becomes a critical factor (Dora Montoya, pers. comm., 1968). Simplicity of movement in the grinding process is the best way to reduce fatigue and thereby increase efficiency.

This brings up an ancillary problem. In 25 years of examining the grinding surfaces of one-hand manos for use-striae, I have seen only one instance in which a rotary motion could be demonstrated. In every other example where striae were present, the motion was clearly longitudinal. In order to cover the entire grinding surface of a basin metate using longitudinal motion, it would also be necessary to shift the mano left and right (laterally) as well as back and forth (longitudinally).

Getting back to the problem at hand, the majority of Sierra Blanca metates I have seen, including two large private collections, as well as those pictured by Kelley (1984:Figs. 44, 60, 64, 68, and Plates 52 and 53), are here termed large-basin metates. Of those figured by Kelley, only Figure 58 and possibly Figure 37 are trough metates. Judging by the few true trough metates and true two-hand manos (as opposed to the more common short two-hand form) occasionally found at Sierra Blanca sites (Farwell et al. 1991), the Sierra Blancans were probably on the verge of making corn an important, though not necessarily dominant, component of their diet.

The metates in the two collections mentioned above came from surface and subsurface sites in two spatially discreet but contiguous areas: Lincoln County (N=96; Pfingsten Collection) and eastern Otero County (N=38; Wunder Collection). Most of the metates in both collections are of the large-basin type and derive from late pottery-period architectural sites in the Orogrande, Alamogordo, Three Rivers, and Capitan Mountains areas.

Although the study of these 134 whole metates is not yet completed, it is clear that the mean average dimensions of the grinding basins are 31 to 35 cm long, 22 to 28 cm wide, and 2.5 to 5.5 cm deep. Thus, these basins are a little larger than the basins of all but one of the Sunset Shelters metates, which average 29 cm long, 20 cm wide, and 2 cm deep. It is therefore accurate to characterize the Shelters metates as somewhat smaller than the slightly later Jornada-Mogollon metates. Barring the possibility that the size difference relates to available stone size for making metates, it appears that the occupants of the Sunset Shelters were less dependent on corn than the Jornada-Mogollones.

Subsistence

The pottery-period subsistence picture for southeastern New Mexico has two major aspects: we know very little about the subsistence practices and mixes of plants and animals previous to A.D. 1250 or 1300; and the subsistence practices and species mixes after 1300 evidently differed considerably from region to region within southeastern New Mexico. Accordingly, we will first recapitulate the Tintop Cave subsistence picture and then describe the subsistence practices on a region-by-region basis as we currently conceive them.

The subsistence strategy of the occupants of the Sunset Shelters has been characterized as one of hunting and gathering of wild plants and animals, supplemented to a small degree by the cultivation of corn and beans. The variety of plant and animals species is noteworthy, as are the facts that perennial plants and larger animals figured rather prominently.

In the Sierra Blanca region, the subsistence strategies of pottery-period sites predating A.D. 1250 or 1300 are poorly defined at best (Vierra and Lancaster 1987; Del Bene et al. 1986). Scholars assume that early pottery-period peoples had a modified hunter-gatherer diet characterized by wild plant and animal foods supplemented by cultigens. The only recent data derive from Kelley and Stewart's work in the northern Sierra Blanca region. In a preliminary statement, Adams (1991) outlines the plant taxa used during the Corona phase. The plant component of the diet includes a number of mostly perennial wild taxa (walnut, yucca, piñon, etc.), some annual wild taxa (cheno-ams), and corn and beans. The cultigens evidently did not dominate the diet. At a minimum, the prominence of perennials and limited use of cultigens is reminiscent of the Tintop Cave diet.

During the late Glencoe and Lincoln phases, two major shifts occurred in some areas of the Sierra Blanca region. Corn and large mammals (deer, antelope, and/or bison) took dominant or nearly dominant positions in the vegetal and meat components of the diet (Adams 1991; Driver 1990; Speth and Scott 1989; but see Driver 1985). In other areas, frequent use of large mammals evidently occurred during the Corona phase and simply continued into the Lincoln phase (Driver 1989). If Robinson Pueblo is an indication, the use of wild annual plant species may have increased in the Lincoln phase (Adams 1991), though perennial species were still used as well. Since taphonomic problems may be skewing the results, we must await publication of Adams's full report to assess the validity of this trend.

Recent work in the Roswell region has not yet been fully reported. The preliminary indications are that corn was grown at the sites, but otherwise we do not yet have a perspective on the plant assemblage as a whole. The faunal assemblage is a different matter. All animal assemblages from late pottery-period contexts examined thus far share the same general characteristics: large quantities of bones and high species diversity. At both Rocky Arroyo (LA

25277; Wiseman 1985) and the Fox Place (LA 68188; Wiseman 1991b), freshwater mussel, many species of fish, migratory waterfowl, and small, medium, and large mammals, including bison, are well represented.

Subsistence data for the Middle Pecos region are meager because the primary work done in the region (Jelinek 1967) preceded the advent of flotation analysis of sediments. Most of our inferences are based on nonbiological criteria such as the presence/absence of structures, pottery, settlement patterns, and comparison of cultural developments in this region with cultural developments in other, better-known regions.

Pollen samples were studied for Jelinek's project, and corn pollen was identified in several samples, including deep contexts, where contamination from modern sources is unlikely. Lacking the necessary information, Jelinek was unable to address questions of subsistence mix with plant data. In an interesting interpretation of the pollen, coupled with faunal and abandonment data, Jelinek suggests that the Middle Pecos people gave up their farming lifestyle for a bison-hunting economy some time around A.D. 1200. Before 1200, small mammals (especially cottontail and jackrabbit) and turtles comprised the faunal component of the diet.

Pottery-period architectural occupations in the Hobbs region (Leslie 1979) are the least known of the four regions. Lacking data from flotation and pollen analysis of sediments, we must rely on the impressions of the field workers. Collins (1968:159-160) sums up the situation by stating that hunting appeared to be more important than farming in the subsistence system throughout the pottery period. A variety of small, medium, and large animal species was recovered from the Salt Cedar site southeast of Hobbs, New Mexico. It is important to note that bison hunting became important after about A.D. 1250 or 1300, and that corn remains have never been found, even in the latest sites. Beckett (1976), among others, postulates that acorns took the place of corn in the prehistoric diet.

In the Brantley/Guadalupe Mountains region, human use of the Pecos River zone was at an all-time high during the Globe phase (A.D. 750-1150) (Katz and Katz 1985:402-404). In spite of this, the subsistence strategy shifted *away* from the riverine orientation of earlier phases and toward resources along the Pecos River breaks and in the foothills of the Guadalupes. Artifact and feature data indicate that processing perennial succulents (sotol, agave, etc.) continued from earlier times, and hunting increased in importance. Corn remains are so scarce in these sites (see Roney 1985:44) that most researchers assume that no farming took place in the region (Katz and Katz 1985:409). This is particularly interesting in light of the widespread belief among archaeologists that pottery, which appears for the first time during the Globe phase, is closely related to the use of corn. The Globe-phase subsistence pattern continued into the the succeeding Oriental phase (A.D. 1150-1450).

Summary

Overall, our knowledge of prehistoric subsistence systems in southeastern New Mexico is uneven and mostly preliminary in nature. Architecture aside, the Tintop Cave assemblage is most similar to the assemblages of the Corona phase of the Sierra Blanca region and the Late

Mesita Negra and Early McKenzie phases of the Middle Pecos region. Similarities include residential occupations that are multiseasonal (though not necessarily year-round), grinding equipment comprised mainly of one-hand and short two-hand manos and basin metates, and corn horticulture. However, once we learn more about the Brantley/Guadalupe Mountains region and especially the Hobbs region, greater similarities may be found with these regions as well.

To the degree that region-wide trends may be detectable, preliminary indications regarding dietary mix and shifts in emphasis, are as follows:

A.D. 1000-1200 or 1250	A.D. 1250-1400 or 1450
wild plant species supplemented by limited use of cultigens	cultigens important, though not necessarily dominant
wild perennials somewhat more important than wild annuals	wild annuals increase in number of species and overall importance
small animal species mmore important than large species	shift in most areas to reliance on large mammals

Discussion

What does all of this tell us about whether the occupants of Tintop Cave were hunter/gatherers or agricultural Jornada-Mogollones? To make a case for their being hunter-gatherers we would have to be able to show that they were more similar to known hunter-gatherer sites and reasonably different from the Jornada-Mogollones. We cannot do that using the regional comparative approach. Comparative analysis with the Sunset Archaic site shows both similarities and dissimilarities in the material culture and subsistence systems of the two sites. The archaeological record for southeastern New Mexico shows wide variation in local adaptations. However, many of the subsistence trends tentatively identified within the regions of southeastern New Mexico are in general agreement with trends noted elsewhere in the Southwest. On this basis, the answer is that the occupants of the Shelters were Jornada-Mogollones.

On the other hand, the line of interpretation pursued here suggests that the site was a base camp and that corn and beans were being grown nearby. This contradicts expectations that the Shelters served as a hunting and gathering camp of Jornada-Mogollon agriculturists.

The corn remains at both the Archaic site and the Shelters indicate that the Picacho area was suitable for growing cultigens at the times of the occupations. Certainly the modern growing season of 160 to 180 days is long enough, but the modern normalized precipitation of 356 mm (14 in) is either deficient or at best marginal. Minimum requirements for modern corn are a 120 day growing season and 380 mm (15 in) of annual precipitation, with at least 200 mm (8 in) falling in the growing season (Martin and Leonard 1949:337).

Although some groups like the Hopi of northeastern Arizona are famous for their ability to grow corn under more stringent conditions--perhaps as little as 10 inches of annual precipitation (Bradfield 1971; Green and Sellers 1964)--their success is variable and depends on careful siting of fields, variable planting dates, and the acceptance of frequent crop losses, either partial or total. We do not know at this time to what degree the Hopi development of their agricultural techniques was necessitated by their being restricted to a relatively small land area during the historic period. Would they have developed these techniques had they been free to move about the landscape?

If our impressions are correct, then it is possible that Hopi agriculture developed from unique circumstances that would not have pertained to southeastern New Mexico under aboriginal conditions. It is therefore reasonable to assume that the requirements and restrictions for prehistoric agriculture in the Picacho area were fairly similar to those of modern times. If so, then the Picacho area was marginal for nonirrigation farming in the past, as it is today. Today, water wells and ditch irrigation make the Hondo Valley highly productive, but we have no data nor do we have reason to believe that the prehistoric peoples of southeastern New Mexico had irrigation technology.

If the data accurately reflect the relative amounts of cultigens grown by the occupants of the two sites, then the Archaic people grew as much corn as or more than the occupants of the Shelters and did so more frequently. Judging by the criterion of ubiquity as well as by overall numbers, the Archaic people evidently grew corn during most or all occupations, but the Shelter occupants did so only sporadically. The Shelters, especially the covered areas, should provide better conditions of preservation than the open-air Archaic site, indicating that the differences are real. What can account for the apparent inconsistencies in the archaeological data and the climatic marginality of the Picacho area? The answers might be quite simple, as follows.

According to the radiocarbon dates, the Sunset Archaic site was occupied during the first four and one-half centuries A.D. As discussed in the section on paleoclimate, this period was at the end of a 2,000 year long wetter period. Thus, ground moisture and climatic conditions at the time of the Sunset Archaic site occupations should have been somewhat superior to modern conditions, though throughout the first five centuries A.D., they should have been deteriorating to some degree.

Climatic conditions during the occupations of the Sunset Shelters are another matter. By then--the 1300s and 1400s A.D.--the modern climate with its agriculturally borderline precipitation should have been in full force. An examination of weather records (Gabin and Lesperance 1977) reveals an interesting characteristic of the modern Southwestern climate. Although the overall and "average" patterns indicate precipitation deficiency, the record is a composite of periods with above average precipitation as well as periods of below-average precipitation. These periods may be as short as two or three years and as long as a decade or more. It should have been possible to grow corn and beans at Picacho during these wetter-than-average years. This characteristic may help explain why corn was present in some deposits and absent in others and could be a clue to which occupations occurred during wet periods and which during dry ones.

In highly tentative conclusion, we believe on the basis of the subsistence data that the occupants of the Sunset Shelters were hunter-gatherers, not Jornada-Mogollones. Their diet consisted of numerous species of wild plants and animals supplemented by small quantities of corn and beans grown locally. The level of horticulture may have been nothing more than planting the crops and then leaving to hunt and gather wild resources. Under these circumstances, little or no effort would go into tending the crops before returning to harvest whatever had grown (see Ford 1968b). The presence of pottery is not a problem with a hunter-gatherer scenario because of the proximity to Jornada-Mogollon sites and the usefulness of pottery for both storing and preparing food. The shelters and caves would make fairly ideal places for storage if the group knew it would be returning to the area on a periodic basis. The earliest pottery-period occupations were probably seasonal and probably occurred on a yearly or nearly yearly basis. The later occupations, however, were less frequent and may have involved hiatuses of several years or more between them.

Summary and Conclusions

Excavations near the village of Picacho in Lincoln County, southeastern New Mexico, recovered information on a Late Archaic site and a series of small, pottery-period caves and shelters. The project results include significant new information on early horticulture in this part of the state and the opportunity to look at the question of whether late prehistoric hunter-gatherers were present in the foothills of the Sierra Blanca.

The Sunset Archaic site (LA 58971) evidently was a base camp with a series of large and medium bell-shaped storage pits, hearths, rather deep trash deposits (for a hunter-gatherer site), very diverse plant and animal assemblages, and surprisingly ubiquitous remains of corn (both pollen and microscopic cob fragments). The diet centered on small animal species and wild plants with a consistent but low-level component of cultigens. Wild plant use focused on annual species, though some perennials were also used. Seven radiocarbon dates span the period A.D. 1 to 425, with an average of A.D. 221. Projectile point styles indicate a cultural affiliation closer to the Cochise and Chihuahua traditions than to the Oshara or any of the Texas traditions.

The radiocarbon dates demonstrate that the Sunset Archaic site is a composite of multiple occupations rather than a single, long occupation. While these occupations were probably not year-round, they probably covered two or more seasons, most likely, the late summer/early fall and winter/spring. The late summer/early fall period would have been necessary for final care and harvest of corn, and the winter/spring is likely because of overwintering at the locus of stored foods and spring planting.

The Picacho area has a milder climate than either the mountains to the west or the Pecos Valley to the east. The modern average annual precipitation of 38 mm (15 in) is a little too low to allow consistent dry farming success over long periods of time. Consensus on climatic change in this part of the Southwest suggests that modern climatic conditions prevailed at the time the site was used. If true, then the occupations probably took place in years of above-average precipitation, and occupational hiatuses probably occurred during the drier-than-average periods.

The primary importance of the Sunset Archaic site is that we can now demonstrate that corn was grown on the east slopes of the Sierra Blanca at a date earlier than previously thought (Stuart and Gauthier 1981:267; Sebastian and Larralde 1989:52). Corn remains were ubiquitous at the site and may have been the major material stored in two of the large storage pits. These factors alone demonstrate that this plant was an established part of the diet and part of an overwintering strategy.

Regarding cultural affiliation, the Sunset Archaic site does not appear to belong to the Archaic sequence established for the Carlsbad region, 100 kilometers to the south. The projectile points and dating generally agree with a Brantley-phase assignment, but the corn, upland site location, and faunal assemblage do not. In the absence of specific data, we suggest that the geographic space used by the occupants of LA 58971 encompassed at least the terrain bounded by the Pecos River on the east and the Sierra Blanca on the west.

Relationships with Archaic manifestations outside southeastern New Mexico appear to be with the Hueco phase of the Chihuahua tradition in south-central New Mexico and adjacent parts of Texas and northern Mexico. The principal criteria suggestive of this relationship are San Pedro and Hueco projectile points, limited farming, and the fact that Chihuahua-tradition sites are situated on the west slopes of the Sierra Blanca.

The Sunset Shelters (LA 71167) include two tiny caves and two tiny shelters. The largest cave (Tintop Cave) was thoroughly excavated, but the other three loci were tested because most of each lies outside the proposed highway project. Tintop Cave contained one major and several minor prehistoric pottery-period strata with five hearth areas, a boulder basin metate, and a variety of artifacts. The lowest deposits may date to the Late Archaic, and the uppermost deposit, containing a hearth, belongs to the first half of the 1900s. Excavations in the talus areas of the other loci produced a few artifacts and scanty evidence for prehistoric and historic occupations. The only feature, a hearth that may date to the Late Archaic, was uncovered in the North Shelter. The summary remarks in the following paragraphs pertain mostly to Tintop, though they may also apply, at least in part, to the other loci.

The possible Late Archaic remains in the bottom deposits of Tintop Cave and the North Shelter are minimal. In Tintop, they consist of a couple of basin metate fragments and a few flakes. Perhaps the most convincing evidence is that the floral samples, like those from the Sunset Archaic site, emphasize annual species. Possible Archaic remains in the North Shelter include a few flakes, a small hearth, and a one-hand mano that is more reminiscent of Archaic one-hand manos from the Cochise than the one-handers from either the Sunset Archaic site or Tintop Cave.

The Late Prehistoric period remains constitute the majority of cultural materials recovered from all of the loci at LA 71167. At each locus, the pottery sherds represent a number of individual vessels. The assemblage of grinding equipment consists entirely of basin metates and one-hand manos. The average size of the grinding basins of the Shelters metates fall midway between the sizes of the Archaic and the Jornada-Mogollon grinding basins. A study of the knapping debris suggests that the only difference between the Shelters and the Sunset Archaic site is that the occupants of the Shelters were probably better knappers. The subsistence remains, while greatly varied taxonomically, reflect a preference for large mammals and perennial wild plant species. Corn and beans were grown nearby, but these plants formed only a minor part of the diet.

To judge by the Late Prehistoric plant and animal assemblages, Tintop Cave was used more like a base camp than a special-activity site. The stratigraphy indicates several separate occupations, the earliest being the most intense and/or longest. The later occupations were more ephemeral. Dating is rather poor, but most of the occupations appear to have taken place during the 1100s and 1200s. The cultural affiliation is still in question, but limited evidence suggests that the inhabitants of the Sunset Shelters may have been hunter-gatherers who traded with their Jornada-Mogollon neighbors for pottery and other items.

The primary importance of the prehistoric pottery-period occupations of the Sunset Shelters is that we *may* have evidence of people who followed a hunting and gathering lifestyle. Contacts with neighboring horticulturists, the Jornada-Mogollones of the Sierra Blanca and Roswell regions, may have resulted in exchange for pottery and the adoption of limited horticulture to supplement the diet.

The historic period is represented by a hearth and wire nails in Tintop Cave and a hearth, a few historic artifact fragments, and a 1910 coin in the North Shelter. The remains in both loci obviously derive from temporary encampments, probably by herders, travelers, or road construction crews during the first half of the 1900s.

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APPENDIX 2: ONE-HAND MANO ATTRIBUTES

Artifact Number	Provenience	Material	Length (cm)	Width (cm)	Thickness (cm)	Number of Grinding Surfaces	Grinding Surface Degree of Use	Edge Modification
Sunset Archaic Site (LA 58971)								
0-97	bulldozer backdirt	tan sandstone	16.4	9.0	3.9	2	heavy	partial
0-98	bulldozer backdirt	gray sandstone	15.1	10.4	4.6	2	heavy, light	full
0-99	bulldozer backdirt	vesicular gray sandstone	13.0	10.5	5.1	1	heavy	full
0-6	surface	fossiliferous limestone	9.9+	11.4	6.1	2	heavy	full
1-11	1w, Level 5	gray limestone	12.1	11.1	5.6	1	heavy	partial
1-16	1e, bottom contact	gray quartzitic sandstone	4.3+	8.4+	4.2+	2	heavy	full
1-33	1w, Level 7	burned (?) sandstone	9.6	5.2+	5.6+	2	heavy, light	partial
3-3	3a, Level 3	tan sandstone	14.1	10.3	3.7	2	heavy	full
3-6/20	3a, Level 4	yellow sandstone	15.1	10.0	3.2	1	heavy, light	full
3-24	3a, side fill	gray sandstone	19.2	10.0	7.5	1	heavy	partial
4-49	extramural refuse	burned (?) sandstone	8.1+	9.3+	7.1+	1	heavy	none
4-50	extramural refuse	tan sandstone	5.7+	9.9+	4.7+	1	heavy	full
4c-59	4c, fill	granodiorite (?)	7.4+	8.9+	4.8+	1	heavy	full
7a-31	7a, Level 8	yellow sandstone	7.3+	8.7+	4.7+	1	light	partial
8-10	extramural refuse	fine grained white sandstone	16.2	9.8	4.1	1	heavy	partial
8d-63	8d, Level 3	aplite (?)	14.9	10.9	4.3	2	heavy, moderate	full
Sunset Shelters (LA 71167)								

Tintop Cave									
31	5N/2W, Stratum 4	green porphyry	6.6+	9.5+	5.0+	2	heavy, moderate	full	
55	6N/2W, Stratum 4	igneous	4.8+	9.7+	4.2+	1	light	none	
80	4N/1W, Stratum 4	sandstone (?)	10.8	6.1+	3.1+	1	light	none	
121	6N/1W, Stratum 4	limestone (?)	8.5+	6.3+	4.7+	1	heavy	full	
172	5N/0W, Stratum 4	igneous	7.9+	5.9+	6.4+	1	moderate	partial	
195	6N/0W, Stratum 4	andesite (?)	9.9	9.9	5.0	1	heavy	none	
196	6N/0W, Stratum 4	sandstone (?)	11.1+	8.0+	4.8+	1	heavy	none	
208	4N/2E, Stratum 4	sandstone	13.8	11.1	5.6	1	heavy	full	
344	6N/3E, Stratum 3	aplite	6.9+	5.9+	3.9+	1	moderate	full	
412	unknown	unknown	99.2	8.7	5.6	1	moderate	partial	
North Shelter									
672	3N/2W, Stratum 4	sandstone (?)	11.4	8.8	3.4	1	heavy	full	

+ incomplete

APPENDIX 3: METATE ATTRIBUTES

Artifact Number	Provenience	Material	Artifact Length (cm)	Artifact Width (cm)	Artifact Thickness (cm)	Grinding Surface Length (cm)	Grinding Surface Width (cm)	Grinding Surface Depth (cm)	Remarks
Sunset Archaic Site (LA 58971)									
1-46	1w, Level 5	gray sandstone cobble	26+	20+	8+	16+	11+	0.5	
3-10	3a, Level 4	gray sandstone slab	26+	21+	7+	20+	15+	6+	
3-12	3a, Level 5	gray sandstone cobble	24+	21+	9+	17+	14+	6+	
3-15	3a, side fill	gray sandstone slab	19+	12+	10+	13+	8+	2+	
6-11	extramural refuse	white quartz sandstone cobble	12+	14+	5.8	10+	10+	2	
8a-42	8a, Level 2	gray sandstone slab	24+	20+	9+	14+	10+	1+	
8a-43	8a, Level 3	yellow sandstone boulder	49	26	24	25	13	1	
8a-44	8a, Level 3	gray sandstone slab	27+	22+	6+	18+	9+	1+	
8d-64	8d, Level 3	white sandstone slab	36	24	3	22	12	0.3	
Sunset Shelters (LA 71167)									
Tintop Cave									
171	5N/0W, Stratum 4	burned sandstone cobble	17+	17+	6	14+	15+	<1	late Stratum 4
404	5N/2W, Stratum 4	gray sandstone cobble	33+	38+	12	27+	28	7	possible Archaic
413	5N/2W, Stratum 4	limstone and tuffa talus fragment	61	43+	22	26	19	4	possible Archaic
North Shelter									
674	2N/0W, Stratum 4	burned limestone	17+	19	11	15+	15	1	

+ incomplete

APPENDIX 4: PROJECTILE POINT ATTRIBUTES

Artifact Number	Provenience	Type	Material	Length (mm)	Width (mm)	Thickness (mm)	Neck Width (mm)
Sunset Archaic Site (LA 58971)							
1-12	extramural refuse	Hueco	gray chalcedony	23+	24+	5+	13+
4-26	extramural refuse	unnamed	brown-gray chert	27	19	3	7
7-51	extramural refuse	San Pedro (?)	gray and white chert	20+	13+	7+	10
8b-35	8b, Level 4	San Pedro	red and gray chalcedony	44	18	7	11.5
9-9	extramural refuse	unnamed	gray rock	32+	19	6	10
Sunset Shelters (LA 71167)							
Tintop Cave							
108	6N/1W, Stratum 4	side-notched	medium dark gray chert	20+	13+	3	3.5
127	4N/0W, Stratum 3	reed (?)	medium gray-brown chert	28	13	2	3
128	4N/0W, Stratum 4	Scallorn	off-white chert	25+	13	4	5
156	5N/0W, Stratum 4	Livermore, Neff style	gray-brown chert	16+	12+	3+	5
188	6N/0W, Stratum 4	blade fragment	gray-brown chert	20+	9+	3+	-
236	6N/1E, Stratum 4	San Pedro	coarse gray chert	37+	15	6	10
248	3N/2E, Stratum 4	San Pedro	off-white chert	40+	19	5	11.5
265	4N/2E, Stratum 4	blade fragment	white and gray chert	24+	10+	3	-
279	5N/2E, Stratum 4	side-notched	brown-gray chert	20+	11+	3	-
289	6n/2e, Stratum 3	Archaic (?)	brown-gray chert	28+	19+	4+	-

289	6n/2e, Stratum 3	Archaic (?)	brown-gray chert	28+	19+	4+	-
315	4N/3E, Stratum 4	Livermore, Neff style (?)	gray-brown chert	32+	8+	3+	-
337	6N/3E, Stratum 2	Hueco	gray-red chert	31+	26+	5	13.5
341	6N/3E, Stratum 3	Scallorn	medium gray chert	27	13	3	4.5
North Shelter							
670	3N/2W, Stratum 3	Scallorn	gray-brown chert	24+	16	3	5
South Shelter							
620	5N/0W, Stratum 2	Scallorn (?)	gray-brown chert	26+	13+	3	4

+incomplete

APPENDIX 5: CHIPPED STONE DEBITAGE TERMS

Material Types

Gray Cherts

A variety of gray cherts suitable for knapping are available in the Roswell region. The raw material units are commonly found as concretions or nodules up to 10 or 15 cm long, eroding out of San Andres limestone in the hill country west of Roswell (Hannaford 1981; Phillips et al. 1981).

Colors include off-white, various shades of gray and brownish-gray, and black. The gray and brownish-gray shades are the most common. Individual pieces frequently possess two or more shades or colors. The transitions from one shade to the other may be gradual or they may be abrupt, as in striping or mottling. Numerous pieces of off-white and gray (or light gray and dark gray) striped material, sometimes referred to as "fingerprint" or "zebra" chert, were noted in the collections. I have seen these materials among those found eroding out of the San Andres limestone. Ten sorting varieties were tabulated during the analysis, though all were pooled for presentation here.

Variable percentages of knapping debris recovered from the Sunset Archaic site and the Sunset Shelters show the effects of heat treatment. Phillip Shelly informed me that the gray cherts showing different degrees of orange coloration indicate intentional heating, probably to improve the knapping quality of the pieces. These pieces also have a good luster equal to or better than that normally seen in untreated (e.g., strictly gray) examples.

The knapping quality of the local gray cherts varies from grainy (transitional to a siltite) to fine, cryptocrystalline. Perhaps the greatest problems to knappers are the small sizes and the internal fractures and textural irregularities common to a large percentage of the nodules.

Other Cherts

This catchall category includes varieties of cherts that probably belong to the local gray category as well as some that evidently derive from other sources. The former group includes grainy cherts or silicious siltstones which embody many of the colors and color combinations of the local gray cherts described above. The grainy structure of these cherts requires greater strength and therefore imposes greater difficulty for knapping. These materials comprise the majority of the "other chert" category.

A few cherts of radically different colors and which do not derive from the same sources as the gray cherts include dark red and black jasper, white and brown chalcedonic chert, tan chert, medium brown chert, dark brown chert, and medium brown chert with black speckles. All of these cherts have a fine, cryptocrystalline structure which enhances their knapping utility. However, the writer suspects that the raw material units for these materials are generally small (i.e., 10 cm or less in maximum dimensions), and some are obviously riddled with internal fractures and other flaws which make knapping difficult. These cherts occur in low frequencies in the Picacho assemblages. The Pecos River terrace gravels are the suspected source area for all of this last group of cherts. However, a local collector once told me that the Cedar Hills area, 10 to 15 km north of the project area, is a possible source of tan chert.

Chalcedonies

These slightly to greatly transluscent, cryptocrystalline materials include 8 sorting varieties with gray and brownish-gray colors. The colors of most pieces are the same as for the local gray cherts, including a "fingerprint" variant. A San Andres limestone origin for these materials seems likely.

Two varieties of chalcedony which probably do not derive from the local San Andres are clearish white with traces of brown and red, and light gray with profuse red. The Pecos River gravels are the suspected source for these uncommon material types.

Quartzites, Fine Quartzites, and Siltites

Siltites, or silicified siltstones and shales, are a common component of the San Andres formation in the project area. Not surprisingly, flakes of this material were frequently found in the cultural assemblages as well. Grain sizes include true siltstones and mudstones. Both light gray and light brown colors are represented. A slight brownish cast was occasionally observed in these materials in the rock outcrops around the Sunset Shelters, indicating that some of the coloring is natural. However, the frequent occurrence of light brown examples among the debitage in the sites also suggests some of the specimens may have been heat treated in an attempt to make them more knappable. Clearly, a specially designed study will be necessary before the matter is resolved.

Both fine- and coarse-grained quartzites in several colors were recorded. The fine light gray and light brown quartzites are probably related to the siltite described above and therefore of local origin. Several flakes of a fine white quartzite are probably burned examples of these materials. Varieties of quartzites that are not immediately available in the vicinity of the sites include a true off-white variety, brown and gray, a fine medium brown and dark gray (not the same as the previous brown and gray variety), dark gray-green, orange-red to orange (burned?), and dark purple. The Pecos River gravels may be the source of some or all of these materials.

Other Materials

The miscellaneous category includes a wide variety of local and exotic stones. The local ones are light gray, medium gray, and medium brown sandstones, medium gray and medium brown limestones, white to clearish-white massive quartz, and a black siltite (silicified shale). The black siltite may have originated in the Sacramento, Sierra Blanca, or Jicarilla Mountains to the west, where it is common in prehistoric sites. Quarries of black siltite and silicified shale fracture scars on the other. The apex on the rejuvenation flake removed from further back on the platform is perpendicular to the long axis of the flake. That of the flake removed from the side of the core is parallel to the long axis (i.e., forms a prominent spine down the dorsal surface).

Platform Types

Multiple-Flake-Scar Platforms

Multiple-flake-scar (MFS) platforms differ from faceted platforms in several important ways. MFS platforms simply have two or more scars of previously removed flakes on them. While the flake scars may have been the result of core platform preparation (i.e., removal of cortex to improve flake production), the procedure was to remove the cortex from the platform of the core in an expedient manner and without any intention other than to remove that cortex. To this end, the decortication flakes may be and often were removed from any convenient direction on the core. Thus, reduction flakes from these cores can have flake scars which obviously emanated from more than one direction.

A faceted platform, as the term is used by Old World lithic technologists, involves more than simple decortication. A series of small flakes was sequentially removed from the same edge of the core, resulting in parallel flake scars and flake scar ridges. Moreover, the flake removal is done in such a way that a convex platform, rather than a flat one, is created. This convex surface permitted easier isolation of an aiming point for flake detachment and therefore greater control over the final product. My experience with southwestern lithic assemblages, particularly those from the pottery periods, is that true faceted platforms are rarely found. However, the fact that they do exist indicates that this sophisticated technique was known to prehistoric knappers even though it was not widely used.

Pseudo-Dihedral Platforms

The term *pseudo-dihedral* is modified from the Old World concept of dihedral platforms. This method of core platform preparation involved the removal of two series of flakes, one down each side of the core. The distal ends of one row of flakes intersected those of the other row, resulting in a single tentlike ridge down the center of the core platform. This ridge was then used as an aiming point for regular flake detachment. This ridge permited easier isolation of an aiming point for flake detachment and therefore greater control over the final product. Flakes produced from dihedral cores display two flake scars ending in a central peak on their platforms. Ideally, ripples and other landmarks show that the two flakes were removed from opposite directions, terminating in the peak.

In southwestern assemblages, true dihedral platforms are rare, but prehistoric knappers employed a similar (or "pseudo") approach. They frequently aimed their hammers at ridges between adjacent flake scars, or at edges between flake scars and cortex, or at the edge of a core platform. Such aiming points had the same effect as the dihedral ridge--limiting the place where the blow could land, thereby creating greater control over the size and shape of the new flake. The resulting flake platforms have a peak between two flake scars or between a flake scar and cortex.

Distal Termination Types

Modified-Feathered Termination

Only one distal termination type, modified-feathered termination, needs explanation. This type of termination occurred when the flake was so thick that a portion of the opposite side of the core was carried away with the flake, resulting in a blunt distal edge.

Shatter

Shatter is any piece of material derived from the knapping process which cannot be classified as a core or flake. In general, shatter results from uncontrolled breakage of the core, usually because of naturally occurring internal fractures or other inconsistencies in the material.

Pieces of Material

This category refers to chunks of knappable material brought into the site by the occupants. However, for reasons unknown, they were not knapped or otherwise intentionally fractured.

Use-Wear on Debitage

The unifacial and bifacial types of edge-wear are found on several kinds of edge configurations, which might reflect function. These configurations, as seen from the dorsal or ventral surfaces of the flakes, are straight, convex, concave, sinuous, irregular, and projections. The distinction between use-wear on concave edges and notches can be somewhat arbitrary in some instances. For the most part, notches have small diameters and configurations that set them apart from the remainder of the edges on which they are located.

Two basic types of use-wear are represented: marginal unifacial wear and marginal bifacial wear. Very conservative criteria were used in deciding whether edge damage is attributable to use-wear. Generally speaking, a number of contiguous scars had to be present for a given manifestation to be designated use-wear. In a number of instances, the flake scars were sufficiently long and regular that they may have been the product of minute intentional retouch.

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REPORT OF RADIOCARBON DATING ANALYSES

FOR: David A. Phillips, Jr.
Museum of New Mexico

DATE RECEIVED: June 17, 1991
DATE REPORTED: July 12, 1991
SUBMITTER'S PURCHASE ORDER #

OUR LAB NUMBER	YOUR SAMPLE NUMBER	C-14 AGE YEARS B.P. ± 1σ	C13/C12	C13 adjusted age
Beta-45645	LA 58971 FS 1-48/58 (charcoal)	1600 +/- 80 BP	-22.9 0/00	1640 +/- 80 BP
Beta-45646	LA 58971 FS 1-51/55(58)? (charcoal)	1690 +/- 80 BP	-27.0 0/00	1660 +/- 80 BP
Beta-45647	LA 58971 FS 1-56/64 (charcoal)	1830 +/- 90 BP	-26.1 0/00	1820 +/- 90 BP
Beta-45648	LA 58971 FS 7A-37 (charcoal)	1950 +/- 60 BP	-23.5 0/00	1980 +/- 60 BP
Beta-45649	LA 58971 FS 7A-43 (charcoal)	1760 +/- 70 BP	-24.1 0/00	1780 +/- 70 BP
Beta-45650	LA 58971 FS 7A-46 (charcoal)	1960 +/- 80 BP	-24.6 0/00	1960 +/- 80 BP
Beta-45651	LA 71167 FS 363/382 (charcoal)	540 +/- 70 BP	-27.8 0/00	490 +/- 70 BP
Beta-45652	LA 71167 FS 392 (charcoal)	800 +/- 60 BP	-27.8 0/00	750 +/- 60 BP
Beta-45653	LA 71167 FS 399 (charcoal)	860 +/- 50 BP	-24.4 0/00	870 +/- 50 BP

These dates are reported as RCYBP (radiocarbon years before 1950 A.D.). By international convention, the half-life of radiocarbon is taken as 5568 years and 95% of the activity of the National Bureau of Standards Oxalic Acid (original batch) used as the modern standard. The quoted errors are from the counting of the modern standard, background, and sample being analyzed. They represent one standard deviation statistics (68% probability), based on the random nature of the radioactive disintegration process. Also by international convention, no corrections are made for DeVries effect, reservoir effect, or isotope fractionation in nature, unless specifically noted above. Stable carbon ratios are measured on request and are calculated relative to the PDB-1 international standard; the adjusted ages are normalized to -25 per mil carbon 13.

UNIVERSITY OF WASHINGTON
QUATERNARY ISOTOPE LAB
RADIOCARBON CALIBRATION PROGRAM 1987
REV. 2.0

```
Calibration file(s): ATM20.14C
Listing file: C14FIL.TXT
Plot file: C14FIL.PLT


Beta-45645
 Radiocarbon Age BP  1640.0  ± 80.0                          Reference(s)
  Calibrated age(s) cal AD   411                         (Stuiver and Pearson)
                    cal BP  1539
  cal AD/BC (cal BP) age ranges obtained from intercepts (Method A):
   one Sigma**   cal AD  264- 282(1686-1668)  332- 465(1618-1485)
                  475- 530(1475-1420)
   two Sigma**   cal AD  230- 600(1720-1350)

   Summary of above ---
   minimum of cal age ranges (cal ages) maximum of cal age ranges:
      one sigma   cal AD  264 (  411)  530
                  cal BP 1686 ( 1539) 1420
      two sigma   cal AD  230 (  411)  600
                  cal BP 1720 ( 1539) 1350

  cal AD/BC age ranges (cal ages as above) from probability distribution
    (Method B):
   % area enclosed      cal AD (cal BP) age ranges      relative area under
                                                        probability distribution
    68.3 (one sigma)    cal AD  265- 281(1685-1669)             .07
                                333- 464(1617-1486)             .71
                                476- 530(1474-1420)             .22
    95.4 (two sigma)    cal AD  229- 595(1721-1355)            1.00
```

```
RADIOCARBON CALIBRATION PROGRAM
Calibration file(s): ATM20.14C

Beta-45646
 Radiocarbon Age BP  1660.0  ± 80.0+                          Reference(s)
  Calibrated age(s) cal AD    398                          (Stuiver and Pearson)
                    cal BP  1552
  cal AD/BC (cal BP) age ranges obtained from intercepts (Method A):
   one Sigma**   cal AD  257- 297(1693-1653)  320- 441(1630-1509)
   two Sigma**   cal AD  210- 560(1740-1390)

   Summary of above ---
   minimum of cal age ranges (cal ages) maximum of cal age ranges:
      one sigma    cal AD  257 (  398)  441
                   cal BP 1693 ( 1552) 1509
      two sigma    cal AD  210 (  398)  560
                   cal BP 1740 ( 1552) 1390

  cal AD/BC age ranges (cal ages as above) from probability distribution
    (Method B):
   % area enclosed     cal AD (cal BP) age ranges      relative area under
                                                       probability distribution
    68.3 (one sigma)    cal AD  252- 309(1698-1641)             .25
                                311- 451(1639-1499)             .74
                                489- 492(1461-1458)             .01
    95.4 (two sigma)     BEYOND CALCULABLE RANGE


Beta-45647
 Radiocarbon Age BP  1820.0  ± 90.0+                          Reference(s)
  Calibrated age(s) cal AD    214                          (Stuiver and Pearson)
                    cal BP  1736
  cal AD/BC (cal BP) age ranges obtained from intercepts (Method A):
   one Sigma**   cal AD   82- 261(1868-1689)  288- 328(1662-1622)
   two Sigma**   cal AD    1- 410(1949-1540)

   Summary of above ---
   minimum of cal age ranges (cal ages) maximum of cal age ranges:
      one sigma    cal AD   82 (  214)  328
                   cal BP 1868 ( 1736) 1622
      two sigma    cal AD    0 (  214)  410
                   cal BP 1950 ( 1736) 1540

  cal AD/BC age ranges (cal ages as above) from probability distribution
    (Method B):
   % area enclosed     cal AD (cal BP) age ranges      relative area under
                                                       probability distribution
    68.3 (one sigma)    cal AD   84- 260(1866-1690)             .86
                                291- 326(1659-1624)             .14
    95.4 (two sigma)    cal AD    3- 410(1947-1540)            1.00
```

```
RADIOCARBON CALIBRATION PROGRAM
Calibration file(s): ATM20.14C


Beta-45648
 Radiocarbon Age BP  1980.0  ± 60.0                          Reference(s)
  Calibrated age(s) cal AD    15                           (Stuiver and Pearson)
                    cal BP  1935
  cal AD/BC (cal BP) age ranges obtained from intercepts (Method A):
   one Sigma**   cal BC   56-cal AD  78(2005-1872)
   two Sigma**   cal BC  152- 147(2101-2096)  120-cal AD 130(2069-1820)

   Summary of above ---
   minimum of cal age ranges (cal ages) maximum of cal age ranges:
      one sigma   cal BC   56 ( cal AD   15) cal AD   78
                  cal BP 2005 ( 1935) 1872
      two sigma   cal BC  152 ( cal AD   15) cal AD  130
                  cal BP 2101 ( 1935) 1820

  cal AD/BC age ranges (cal ages as above) from probability distribution
    (Method B):
   % area enclosed      cal BC (cal BP) age ranges      relative area under
                                                        probability distribution
    68.3 (one sigma)    cal BC   60-cal AD  78(2009-1872)       1.00
    95.4 (two sigma)    cal BC  160- 138(2109-2087)              .02
                                124-cal AD 134(2073-1816)        .98


Beta-45649
 Radiocarbon Age BP  1780.0  ± 70.0                          Reference(s)
  Calibrated age(s) cal AD   239                           (Stuiver and Pearson)
                    cal BP  1711
  cal AD/BC (cal BP) age ranges obtained from intercepts (Method A):
   one Sigma**   cal AD  134- 269(1816-1681)  272- 338(1678-1612)
   two Sigma**   cal AD   80- 410(1870-1540)

   Summary of above ---
   minimum of cal age ranges (cal ages) maximum of cal age ranges:
      one sigma   cal AD  134 (  239)  338
                  cal BP 1816 ( 1711) 1612
      two sigma   cal AD   80 (  239)  410
                  cal BP 1870 ( 1711) 1540

  cal AD/BC age ranges (cal ages as above) from probability distribution
    (Method B):
   % area enclosed      cal AD (cal BP) age ranges      relative area under
                                                        probability distribution
    68.3 (one sigma)    cal AD  140- 265(1810-1685)              .70
                                281- 333(1669-1617)              .30
    95.4 (two sigma)    cal AD   86- 400(1864-1550)             1.00
```

```
RADIOCARBON CALIBRATION PROGRAM
Calibration file(s): ATM20.14C


Beta-45650
 Radiocarbon Age BP  1960.0  ± 80.0┼                          Reference(s)
  Calibrated age(s) cal AD    28,   45,   51             (Stuiver and Pearson)
                    cal BP  1922, 1905, 1899
   cal AD/BC (cal BP) age ranges obtained from intercepts (Method A):
    one Sigma**    cal BC   54-cal AD 119(2003-1831)
    two Sigma**    cal BC  170-cal AD 230(2119-1720)

    Summary of above ---
    minimum of cal age ranges (cal ages) maximum of cal age ranges:
       one sigma   cal BC   54 ( cal AD   28,   45,   51) cal AD  119
                   cal BP 2003 ( 1922, 1905, 1899) 1831
       two sigma   cal BC  170 ( cal AD   28,   45,   51) cal AD  230
                   cal BP 2119 ( 1922, 1905, 1899) 1720

   cal AD/BC age ranges (cal ages as above) from probability distribution
     (Method B):
    % area enclosed       cal BC (cal BP) age ranges      relative area under
                                                          probability distribution
     68.3 (one sigma)     cal BC   68-cal AD 120(2017-1830)       1.00
     95.4 (two sigma)     cal BC  165- 132(2114-2081)              .03
                                  128-cal AD 225(2077-1725)        .97


Beta-51546
 Radiocarbon Age BP  1730.0  ± 70.0┼                          Reference(s)
  Calibrated age(s) cal AD   261,  288,  327             (Stuiver and Pearson)
                    cal BP  1689, 1662, 1623
   cal AD/BC (cal BP) age ranges obtained from intercepts (Method A):
    one Sigma**    cal AD  227- 399(1723-1551)
    two Sigma**    cal AD  120- 440(1830-1510)

    Summary of above ---
    minimum of cal age ranges (cal ages) maximum of cal age ranges:
       one sigma   cal AD  227 (  261,  288,  327)  399
                   cal BP 1723 ( 1689, 1662, 1623) 1551
       two sigma   cal AD  120 (  261,  288,  327)  440
                   cal BP 1830 ( 1689, 1662, 1623) 1510

   cal AD/BC age ranges (cal ages as above) from probability distribution
     (Method B):
    % area enclosed       cal AD (cal BP) age ranges      relative area under
                                                          probability distribution
     68.3 (one sigma)     cal AD  231- 394(1719-1556)          1.00
     95.4 (two sigma)     cal AD  120- 439(1830-1511)          1.00


References for datasets [and intervals] used:
Stuiver, M and Pearson, GW, 1986, Radiocarbon, 28, 805-838.

Comments:
┼This standard deviation (error) may include a lab error multiplier.
IF SO SPECIFY!
** 1 sigma = square root of (sample std. dev.²+ curve std. dev.²)
   2 sigma = 2 x square root of (sample std. dev.²+ curve std. dev.²)
0* represents a "negative" age BP
1955* denotes influence of bomb C-14
```

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CORAL GABLES, FLA. 33124

REPORT OF RADIOCARBON DATING ANALYSES

FOR: Tim Maxwell
Museum of New Mexico

DATE RECEIVED: February 18, 1992
DATE REPORTED: March 13, 1992
SUBMITTER'S PURCHASE ORDER #

OUR LAB NUMBER	YOUR SAMPLE NUMBER	C-14 AGE YEARS B.P. ±1σ	C13/C12	C13 adjusted age
Beta-51546	LA 58971 FS# 8a-38 (Picacho-RNW) (charcoal-0.6gm carbon)	1690 +/- 70 BP	-22.1 0/00	1730 +/- 70 BP

Note: the small sample was given extended counting time.

These dates are reported as RCYBP (radiocarbon years before 1950 A.D.). By international convention, the half-life of radiocarbon is taken as 5568 years and 95% of the activity of the National Bureau of Standards Oxalic Acid (original batch) used as the modern standard. The quoted errors are from the counting of the modern standard, background, and sample being analyzed. They represent one standard deviation statistics (68% probability), based on the random nature of the radioactive disintegration process. Also by international convention, no corrections are made for DeVries effect, reservoir effect, or isotope fractionation in nature, unless specifically noted above. Stable carbon ratios are measured on request and are calculated relative to the PDB-1 international standard; the adjusted ages are normalized to -25 per mil carbon 13.

UNIVERSITY OF WASHINGTON
QUATERNARY ISOTOPE LAB
RADIOCARBON CALIBRATION PROGRAM 1987
REV. 2.0

```
Calibration file(s): ATM10.14C
Listing file: C14FIL.TXT
Plot file: C14FIL.PLT


51546 beta
 Radiocarbon Age BP  1690.0  ± 70.0┼                        Reference(s)
  Calibrated age(s) cal AD   362                          (Stuiver and Becker)
                    cal BP  1588
                                                        140 year moving average
  cal AD/BC (cal BP) age ranges obtained from intercepts (Method A):
   one Sigma**    cal AD  243- 415(1707-1535)
   two Sigma**    cal AD  150- 530(1800-1420)

   Summary of above ---
   minimum of cal age ranges (cal ages) maximum of cal age ranges:
      one sigma   cal AD  243 (  362)  415
                  cal BP 1707 ( 1588) 1535
      two sigma   cal AD  150 (  362)  530
                  cal BP 1800 ( 1588) 1420

  cal AD/BC age ranges (cal ages as above) from probability distribution
    (Method B):
   % area enclosed      cal AD (cal BP) age ranges      relative area under
                                                        probability distribution
    68.3 (one sigma)    cal AD  246- 413(1704-1537)           1.00
    95.4 (two sigma)    cal AD  162- 523(1788-1427)           1.00
```

References for datasets [and intervals] used:
Stuiver,M and Becker,B, 1986, Radiocarbon, 28, 863-910.

Comments:
┼This standard deviation (error) may include a lab error multiplier.
IF SO SPECIFY!
** 1 sigma = square root of (sample std. dev.^{2}+ curve std. dev.^{2})
   2 sigma = 2 x square root of (sample std. dev.^{2}+ curve std. dev.^{2})
0* represents a "negative" age BP
1955* denotes influence of bomb C-14

APPENDIX 7: THE IDEAL MODEL OF CORE REDUCTION TECHNOLOGY AND HOW IT RELATES TO THE PICACHO PROJECT

The Ideal Model

The ideal model of core reduction and its by-products provides perspective on the Picacho project assemblages. In general, the ideal lithic debitage assemblage will have several characteristics. If we can assume that most knappers desired to obtain flakes for making formal artifacts and other uses (e.g., flakes with edges suitable for casual cutting and scraping activities), then cortex is an impediment which must be removed. Under most circumstances, the most efficient course is to remove cortex in a manner that wastes as little material as possible.

The debitage from successful knapping, then, would have most of the cortex on relatively few flakes. These flakes would be among the larger ones derived from the reduction process since they would be removed fairly early in the process. Given these considerations, the ideal lithic debitage assemblage would have a small percentage of large cortical flakes, and progressively smaller flakes with less and less cortex. The smallest flakes, derived from core interiors, would lack cortex altogether. We would expect that most or all of the larger flakes bearing little or no cortex (i.e., those most useful for artifact production) would be mostly absent from the assemblage.

This scenario, of course, presupposes that large chunks of material are available for the purpose. This was rarely, if ever, the case in the Picacho project region, but the model does provide a general set of expectations by which to view the project assemblages.

The Picacho Project Materials

Locally available lithic materials are described in the previous appendix. Several characteristics of those materials should be emphasized here because of the effects they had relative to the core reduction model just outlined.

The local gray cherts derived from the San Andres formation are in the form of concretions or nodules eroding primarily from limestone. The cherts were deposited in small vesicles, pockets, and fissures within the limestone. Shapes are of two general types: irregular, elongate, and rounded; and thin and tabular (less common). The ratio of exterior surface area (cortex) to interior material is high. Nodules as large as 10 by 8 by 6 cm are uncommon. Material grain is variable and ranges from cryptocrystalline to grainy (silt or very fine sand size particles). The cherts are primarily silica, but minor carbonate may also be present in some specimens. Internal fractures, impurities, and textural inconsistencies are sometimes present. Although rare units are undoubtedly excellent for knapping, overall suitability of this material with regard to size and shape of the natural units is not particularly good.

The by-products from core reduction of San Andres Chert, as they deviate from the ideal situation, include relatively high cortex ratio with a larger percentage of flakes possessing cortex; larger percentage of flakes with irregular shapes as a reflection of the irregular raw material unit shapes; relatively few flakes (other than the very smallest flakes) totally lacking cortex; relatively small flakes overall (the longest flakes are uncommon).

APPENDIX 8: POTTERY COUNTS BY PROVENIENCE, TINTOP CAVE, LA 71167

Provenience	Chupadero Black-on-white		El Paso Polychrome	Victoria/ Anchondo Red-on-brown	Babicora Polychrome	Three Rivers Red-on-terracotta	San Andres Red-on-terracotta	Broadline Red-on-terracotta	Red-slipped Brown	Three Rivers Ware	Jornada Brown	Thin Jornada Brown	South Pecos Brown	South Pecos-like Brown	El Paso Brown	Totals
	Jar	Bowl														
Level 2 (35-55 cm below datum)																
4N/ 2W																
5N/2W																
6N/2W																
4N/1W																
5N/1W																
6N/1W																
4N/0W																
5N/0W																
6N/0W																
4N/1E																
5N/1E																
6N/1E													1			1
3N/2E																
4N/2E																
5N/2E	1															1
6N/2E																
3N/3E																
4N/3E																
5N/3E											1					1
6N/3E													1			1
Level 3 (55-75 cm below datum)																

4N/ 2W																
5N/2W																
6N/2W																
4N/1W																
5N/1W																
6N/1W																
4N/0W																
5N/0W																
6N/0W									1			1			2
4N/1E																
5N/1E																
6N/1E																
3N/2E																
4N/2E																
5N/2E									2			2			4
6N/2E	4	2						1			1		6		1?	15
3N/3E																
4N/3E									1						1
5N/3E												1			1
6N/3E	1									2	1				5
Level 4 (75-95 cm below datum)																
4N/ 2W																
5N/2W																
6N/2W															2	2
4N/1W																
5N/1W																
6N/1W																

4N/0W																
5N/0W																
6N/0W	2												1			3
4N/1E																
5N/1E	1						1			1	1				2	6
6N/1E			2								2	3	2		2	11
3N/2E																
4N/2E																
5N/2E															1	1
6N/2E	3					2				1	10	5	3	7	3	34
3N/3E																
4N/3E																
5N/3E			1								1	2	4	1		9
6N/3E		1				1					2	2	5	1		12
Level 5 (95-115 cm below datum)																
4N/ 2W																
5N/2W																
6N/2W																
4N/1W									2	2			2			6
5N/1W						1			1			4	1		3	10
6N/1W	2		3		2							3	1			11
4N/0W						5				5	1	3	1			15
5N/0W	2					2				3	1	3		2		13
6N/0W	4	2	2						1	2		4				15
4N/1E																
5N/1E	2								1	4	2		2		2	13
6N/1E	2	3	1								2	3	7	2		20

3N/2E						2				1		2	3			8
4N/2E											1					1
5N/2E	4					1			1	1	3	1	2	5	1	19
6N/2E											7	1	12	4	1	25
3N/3E											1					1
4N/3E												1	1			2
5N/3E	1		1							3	2	3	5		1	16
6N/3E									1							1
Level 6 (115-135 cm below datum)																
4N/ 2W	1					1					3	3	4	1	4	17
5N/2W							1									1
6N/2W								1							1	2
4N/1W	2	3				5		2	6	1	2	10	8		4	43
5N/1W	4	2	6		2	6	3		3	4	7	7	4	7	8	63
6N/1W		1	2					1	1	1	2		3		1	12
4N/0W	13	5	1	1		15	3?		4	4	14	24	15	15		114
5N/0W	6	2	5			4	2	2?	3		10	27	7	7	2	77
6N/0W											1	1	1	1		4
4N/1E					1	3	1		2		8	2	2		1	20
5N/1E	3					1		1		1		10	2	13	2	33
6N/1E									1		5	6	5	8	1	26
3N/2E								1	1	2	3	2	4			13
4N/2E								1?	1	3	1	5	5	4		20
5N/2E																
6N/2E																
3N/3E	1				3	1			1	1	1	1	6	2	3	20
4N/3E						1	1		1		3	1	2	3	1	13

5N/3E																
6N/3E																
Level 7 (135-155 cm below dat;um)																
4N/ 2W							1					2				3
5N/2W											1					1
6N/2W							1				2		2			5
4N/1W													2	2	2	6
5N/1W						1		1	1		1	2		5		11
6N/1W						1			1					1		3
4N/0W	1			1					1		1	3	1	4		12
5N/0W									1							1
6N/0W													1		1	2
4N/1E	1					1		1			2				2	7
5N/1E																
6N/1E						1		1								2
3N/2E														1		1
4N/2E																
5N/2E																
6N/2E																
3N/3E									1		1		1			3
4N/3E							1?		1		3	3	1	2		11
5N/3E																
6N/3E																
Level 8 (155-175 cm below datum)																
4N/ 2W																
5N/2W																
6N/2W																

4N/1W										1	1					2
5N/1W														1		1
6N/1W													1			1
4N/0W															1	1
5N/0W															1	1
6N/0W																
4N/1E																
5N/1E																
6N/1E																
3N/2E																
4N/2E	1					1										2
5N/2E																
6N/2E																
3N/3E											1		1			2
4N/3E												1	1			2
5N/3E																
6N/3E																
Level 9 (175-195 cm below datum)																
4N/ 2W																
5N/2W																
6N/2W																
4N/1W														1	1?	2
5N/1W																
6N/1W																
4N/0W																
5N/0W																
6N/0W																

4N/1E																
5N/1E																
6N/1E																
3N/2E													1			1
4N/2E																
5N/2E																
6N/2E																
3N/3E																
4N/3E												1				1
5N/3E																
6N/3E																
Level 10 (195-215 cm below datum)																
4N/ 2W																
5N/2W																
6N/2W																
4N/1W																
5N/1W																
6N/1W																
4N/0W																
5N/0W																
6N/0W																
4N/1E																
5N/1E																
6N/1E																
3N/2E																
4N/2E														1		1
5N/2E																

6N/2E																
3N/3E																
4N/3E																
5N/3E																
6N/3E																
Totals	62	21	24	1	8	57	15	13	37	45	113	152	144	101	55	849

Pottery counts by provenience, minor utility types, Tintop Cave (LA 71167)

Provenience	Playas Incised (local)	Jornada Corrugated	McKenzie Brown	Unidentified Brown	Total
55-75 cm below datum					
6N/3E				1	1
75-95 cm below datum					
6N/1E				2	2
95-115 cm below datum					
6N/2W		1			1
5N/0W			1		1
5N/1E				1	1
6N/1E				1	1
6N/3E				1	1
115-135 cm below datum					
5N/2W		1			1
4N/1W				1	1
4N/0W			1	2	3
5N/1E	1			1	2
6N/1E				1	1
135-155 cm below datum					
4N/1E			1	1	2
3N/2E		1			1
4N/3E				1	1
Totals	1	3	3	13	20