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ARCHAEOLOGY OF THE MOGOLLON HIGHLANDS: SETTLEMENT SYSTEMS AND ADAPTATIONS

edited by
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VOLUME 4. CERAMICS, MISCELLANEOUS ARTIFACTS, BIOARCHAEOLOGY, BONE TOOLS, AND FAUNAL ANALYSIS

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INTRODUCTION TO CERAMIC STUDIES

C. Dean Wilson

Investigations conducted by the Office of Archaeological Studies, Museum of New Mexico, from 1990 to 1995 resulted in the analysis of 177,661 sherds and 67 vessels from 25 sites. This analysis was conducted from 1991 to 1997 and was designed by and conducted under this author. Employees of the Office of Archaeological responsible for analysis of Luna Project ceramics included Patrick Severts, Joyce Snodgrass, Christine Sterling, and Sarah Swedland. In addition, Carol and George Price conducted analyses as volunteers. Ceramic studies presented in this volume would not have been possible without the able contributions of these individuals.

Luna Project pottery analysis was conducted in a manner allowing for a relatively detailed characterization of ceramic assemblages from various sites and components, as well as comparisons of Luna Project site assemblages to those described in other studies. These comparisons form the basis for the examination of various distributions and phenomenon through time and across space. Pottery characterizations resulting from this analysis provide for the dating of various sites and contexts, as well as the examination of patterns of pottery production, exchange, affiliation, and use.

POTTERY TRENDS

Strategies relating to the recording, organization, and interpretation of pottery data from sites in the northern Mogollon Highlands and adjacent regions have been strongly influenced by approaches and perspectives prevalent during the time period that various studies were conducted. Approaches and categories presently employed in the analysis of pottery from sites in the northern Mogollon Highlands are influenced by the fact that most investigations in this area took place from the late 1930s to the early 1960s. These studies took a cultural historic approach, prevalent in this time, emphasizing the continuity of ceramic production by distinct cultural groups thought to have occupied the northern Mogollon Highlands. Most of these were concerned

with the definition of prehistoric culture areas and determination of their distributions through time and space (Gladwin and Gladwin 1934; Hawley 1936; Colton and Hargrave 1937). Thus, the ceramic type categories and analysis conventions developed during this time, and still commonly employed, were concerned with the determination of time of occupation and identification of various cultures or peoples practicing distinct ceramic traditions. Distributions of ceramic types found in sites dating to various periods in the northern Mogollon Highlands and adjacent regions were explained in terms of boundaries associated with a distinct Mogollon cultural tradition or people. For example, the distinct Mogollon pottery found in earlier (pre-A.D. 1000) components scattered throughout the Mogollon Highlands were thought to indicate the widespread distribution of the Mogollon culture. The occurrence of Anasazi white wares along with Mogollon decorated or Mimbres white wares at late (post-A.D. 1000) occupations was described in terms of an Anasazi intrusion and the mingling of different groups (Haury 1936a, 1988; Danson 1957; Martin and Plog 1973; Martin 1979).

Unique aspects of Mogollon occupations were further explained in terms of a long-lived adaptation of a distinct cultural tradition (Martin and Plog 1973; Martin 1979). The Mogollon people were described as having a preference for and overall adaptation to a mountain ecological niche, and the Anasazi were thought to represent a people more suited to the plateau niche (Danson 1957; Martin and Plog 1973). While changes in the Mogollon Highlands were assumed to ultimately reflect influences of the unique ecological resources in this region, factors other than "cultural" differences influencing the ceramic technology of this region were seldom discussed or examined.

More recently, some archaeologists have noted shortcomings in the characterizations of distributions of material culture solely in terms of cultural traditions (Tainter and Gillio 1980; Speth 1988; Wilcox 1988; Tainter and Plog 1994). It has been recently argued that distributions attributed to the Mogollon or Anasazi cultures are better explained in

terms of responses to various conditions associated with various periods and settings. Thus, material similarities between groups in areas of the Mogollon Highlands are seen only partly as a result of cultural transition between generations of potters making up a particular tradition. Similarities of pottery found over wide areas of the Mogollon during various periods may also reflect similarities in qualities of available ceramic materials, food acquisition, storage, and preparation techniques, movement of goods between separated groups, and common symbols encouraging interaction and exchange. Likewise, differences in the pottery noted in adjacent regions may reflect the influences of these same factors.

In this view, pottery distributions are not solely seen as temporal or cultural markers. Instead, the range of pottery and other artifacts made and used by a particular group are seen as means to achieve various social and economic goals critical to groups in a particular setting (Schiffer 1992). Characteristics of pottery must also be evaluated in terms of qualities that allowed for the successful performance of various activities that may have been crucial at a particular time or place. Thus, changes in characteristics of artifacts may reflect gradual modifications in ranges of manufacturing, technological, and decorative choices relating to the performance needs of pottery for a given set of behaviors or activities (Schiffer and Skibo 1987; Schiffer 1992; O'Brien et al. 1994).

Recent "selectionist" approaches have attempted to develop strategies allowing for the examination of the flow of information relating to the production of pottery vessels emphasized in previous cultural historical approaches as well as the ultimate causes of ceramic changes or distributions (Neff 1993). This involves the examination of processes of transmission and selection in pottery-making practices (Neff 1992, 1993). Processes of transmission relate to the flow of information on how to make and decorate vessels through time and across space between interacting groups of potters. Detecting transmission involves identifying spatial and temporal distribution boundaries of ceramic traits. As previously indicated, traits reflecting these boundaries are often reflected in type categories of previous ceramic studies in the Mogollon and other areas of the Southwest. Processes of selection relate to the actual causes of adoption or persistence in some conventions or traits and abandonment or rejection of others. Examination of processes of selection involves the determination of potential causes for the persistence of or changes in ceramic traits noted through time in terms of the resulting advantages or

failures of a particular technological or decorative convention in a given context. Trends are attributed to selective processes only if they can be demonstrated to represent an improvement over available alternatives (Neff 1993). Thus, determination of these processes involves determining how selected traits were superior or preferable to other available alternatives not selected (Neff 1993).

One strategy that may be used to examine selective influences on pottery is a comparison of ceramic trends noted in adjacent areas and examination of local influences that may have resulted in the differences noted. This approach may be particularly useful in the northern Mogollon Highlands, where archaeologists have long struggled to explain similarities and differences between these pottery assemblages and those found in surrounding regions or culture areas. As indicated, differences in pottery observed in sites from adjacent areas of the northern Mogollon Highlands and the Colorado Plateau have usually been explained in terms of historical factors (processes of transmission) relating to the existence of distinct Mogollon and Anasazi peoples who employed pottery manufacturing and decorative practices of their cultural traditions (Hauray 1936b; Martin and Rinaldo 1947; Martin et al. 1952; Martin and Plog 1973).

Alternative interpretations may result from the very careful examination of factors influencing the constructions, firing, and decoration of pottery at a particular time and location. Such interpretations should take into account potential influences of material resources available to potters, the uses of ceramic vessels, and population and environmental pressures represented at a particular time and place. For example, a change in the manipulation of a vessel surface or vessel shape could ultimately reflect changes in the cooking technology resulting from increased boiling of corn and ultimately agricultural intensification. Thus, it is important to employ analytical and reporting strategies that allow for the comparable examination of a wide range of historical and selective processes that may have influenced potters in the Mogollon Highlands.

ANALYTICAL APPROACH

Given the nature of the production, decoration, exchange, and use of pottery vessels in the northern Mogollon Highlands, a wide range of factors may have influenced the combination of traits observed in a particular ceramic assemblage. Thus, it is necessary to develop a consistent and systematic analy-

sis framework, providing for the comparison of various assemblages as well as the examination of a variety of issues and patterns. Monitoring a wide range of ceramic traits from various ceramic assemblages is made possible through the recording of both descriptive attributes and ceramic type categories for all sherds examined. Various descriptive attributes recorded for large samples of Luna Project sherds include temper, interior and exterior pigments, interior and exterior surface manipulations, form, modification, appendages, rim radius, and rim arc. Other attributes were described in more detailed studies conducted on selected subsamples of sherds. All sherds were assigned to typological categories, which were arrived at by a series of decisions. A sherd was first placed into a spatially distinct tradition primarily based on temper, paste, and paint characteristics. Next, ware categories were assigned based on surface manipulation and form. Sherds were then assigned to a specific ceramic type based on temporally sensitive surface manipulations and design styles. Recording of both of these classes of categories provides data allowing for the examination of a wide range of phenomenon, including time of occupation, cultural affiliation, and patterns of production, construction, firing technology, function, and use. For example, examinations of the distributions and frequencies of ceramic attributes related to vessel shape, size, wear, surface finish, and paste, as well as the particular ware class recorded for a ceramic type category, may reflect potential uses and functions of ceramics from a particular context.

Discussions of the classification approach and basis of recognition and description of ceramic descriptive attributes and type categories recognized during Luna Project analysis are presented in the following chapter. In order to facilitate comparisons between ceramic data from the Luna Project and those presented in other studies, discussions of equivalence and similarities in ceramic descriptive attribute and type categories used during Luna Project ceramic analysis and those described elsewhere are noted. These form the basis for a detailed and systematic documentation of ceramic data from the Luna Project and other recent projects in this area and provide for the examination of various trends and patterns discussed in subsequent chapters.

CERAMIC DATING

Because the examination of patterns of change rep-

resented at Luna Project sites requires a precise and reliable chronology, initial interpretations of ceramic distributions focus on the dating of various sites and contexts. Ceramic distributions from Luna Project sites indicate evidence of a very long and continuous occupation of this area by ceramic-producing groups from about A.D. 200 to 1300. Chapter 3 presents information relating to dating of Luna Project sites as indicated by pottery distributions. Assignment of ceramic dates involved a careful review of the somewhat confusing and sometimes contradictory dating discussion for sites in the Mogollon Highlands and adjacent areas. A review of this data resulted in the definition of slightly modified ceramic-based dating periods and phases, which were employed during the present study. Based on the periods and phases defined here, the dating of various Luna Project contexts or sites are then presented in order of the earliest to the latest ceramic phases recognized. Finally, ceramic-based dates are compared to other dating evidence from various sites and contexts. The assignment of dates based on ceramic distributions forms the basis for the examination of trends in population and settlement in this area of the Mogollon Highlands presented in other volumes of the Luna Project as well as discussions and interpretations of ceramic change presented in subsequent chapters of this volume.

CERAMIC TRENDS

The last two chapters of this volume present frameworks allowing for the examination of various changes and trends associated with various ceramic traits. A subsequent chapter presents data relating to the examination of the potential influence of the distinct clay resources occurring in the Luna Project area as well as elsewhere in the northern Mogollon Highlands. This study involved the collection and characterization of the range of clay resources in this area as well as pottery-replication experiments using these clays. Examination and comparisons of clays and locally produced Mogollon pottery indicate that characteristics of Mogollon brown wares were strongly influenced by working qualities and other traits of the self-tempered volcanic clays found in this region. The documentation of potential influences of local clay resources allowed for the distinctions of characteristics and trends in Mogollon pottery resulting from cultural interaction and isolation from those reflecting the selective influences of these clays on the local ceramic technology. In addition, this and other data are used to examine evi-

dence of ceramic production at various sites. These data are also used to determine whether Cibola White Ware pottery could have been produced at sites in the northern Mogollon Highlands or was traded from other areas. Such information may provide further clues concerning the nature of ceramic production and exchange in this region.

Another chapter examines ceramic data relating to trends in ceramic technology, production, exchange, and use through time. These examinations are based on the comparison of distributions of various traits from assemblages assigned to various

temporal periods. This information is combined with observations concerning the influence of environmental and population stresses on Luna Project sites to examine the influences of various pressures on ceramic technology, exchange, and use. Ceramic changes reflecting responses to increasing environmental and population pressures through time include increased exchange with groups in different environments, increased use of specialized ceramics, and minor improvements in ceramic technology and design.

CERAMIC TYPES AND ATTRIBUTES

C. Dean Wilson

This chapter discusses procedures and categories employed during analysis of 170,092 sherds and 67 vessels recovered from Luna Project sites. Ceramic attributes and types recorded during this analysis were selected to examine a wide range of issues, including ceramic dating, determination of cultural affiliation, and patterns of vessel production, exchange, and use.

ANALYSIS PROCEDURES

Ceramic analysis involved first separating sherds into lots from each provenience at a site that exhibited a unique combination of traits. Next, information about each of these sherd lots was recorded as distinct data lines. Each data line from a particular provenience was assigned to consecutive lot numbers. Sherds assigned to each lot grouping were placed into a separate bag along with a slip of paper recording the site number, provenience, and lot number. Information recorded during ceramic analysis include typological assignments, descriptive attribute codings, number of sherds, and total weight. These procedures allow for the matching of sherds with data lines recorded during ceramic analysis.

DESCRIPTIVE ATTRIBUTES

The recording of descriptive attributes provides for a basic description of the distribution of various traits represented in a particular ceramic assemblage. Descriptive attribute classes recorded during the ceramic analysis included temper, interior pigment, exterior pigment, interior manipulation, exterior manipulation, interior slip, exterior slip, vessel form, vessel appendage, modification, rim radius, and rim arc. In addition, stylistic attributes were sometimes recorded for white ware rim sherds assigned to distinct types. A small subsample of sherds was also subjected to refiring analysis, and smaller samples were submitted for petrographic analysis (Hill, this volume).

Temper

Temper refers to aplastic particles added to the clay or particles naturally occurring in the clay that would have served the same purpose as added temper. Temper analysis involved examining freshly broken sherd surfaces through a binocular microscope. Such characterizations are limited, but broad temper categories can be recognized based on combinations of color, shape, fracture, and sheen of tempering particles. Temper categories reflect material sources that were used by prehistoric potters in the Mogollon Highlands and southern Colorado Plateau. Temper categories recognized during the present analysis include the following.

Not recorded refers to samples for which temper type was not recorded. The use of this category was limited to sites from which very large numbers of sherds were recovered and information concerning temper distributions had become redundant. *Indeterminate* refers to cases where temper was examined but the type of material was unknown. *None* refers to cases in which distinct aplastic inclusions were not present in the clay paste.

Mogollon self-tempered refers to the presence of natural inclusions common in Mogollon Highland clay sources. Visual examination and petrographic analysis of clays from local sources and archaeological contexts in the Luna-Reserve area indicate that the only suitable paste clays appear to be colluvial or pedogenic sources ultimately derived from local volcanic outcrops and volcanic-clastic sandstone (Wilson 1994). Such clay sources usually contain numerous natural igneous and sandstone inclusions, and, in most cases, the addition of separate tempering material would have been unnecessary. Local sources of easily crushed material are widely available for use as temper. However, this material is derived from the same parent material as inclusions found in local clay, so that in many cases it is not possible to distinguish added volcanic temper from natural clay inclusions. The inclusions commonly occurring in brown wares produced in the Mogollon Highlands tend to vary in size and are often more

numerous and smaller than crushed temper particles added in pottery produced in other areas of the Southwest. Volcanic inclusions found in the local clay and other deposits consist of angular basalt, rhyolite, and sand particles (Hill, this volume). Three separate categories representing variations of self-tempered igneous clays in the Luna Project area were recognized.

Mogollon self-tempered igneous shiny lithic dominated refers to cases where inclusions are dominated by numerous tiny, light to dark, shiny, angular lithic fragments. These fragments often occur with lower frequencies of sand, sandstone, or tuff particles. *Mogollon self-tempered tuff dominated* refers to similar temper dominated by dull white to buff-colored tuff fragments. It usually contains shiny, angular and sand, and sandstone particles. *Mogollon predominantly sand with sand particles* refers to the presence of particles similar to those previously described but dominated by small, numerous sand and sandstone particles initially derived from local volcanic clastic layers (Gila conglomerate sandstones) that often lie above volcanic deposits but below clay and soil layers. Smaller amounts of dull and lustrous, angular, igneous particles are also usually present.

Sherd temper refers to the use of crushed potsherds as tempering material. Sherd temper is identified as angular to subangular particles that are relatively small and usually white, buff, gray, or orange. Small reflective lithic particles may occur inside or outside the sherd fragments. Crushed sherd temper commonly occurs in late white ware types produced in areas of the Colorado Plateau to the north.

Sand refers to rounded or subrounded, white to translucent, well-sorted medium to coarse quartz sand grains added to the clay. Sand grains were often added to clays derived from shale formations utilized in the Anasazi region. *Sand and sherd* were also sometimes noted together and recorded. *Sandstone* includes temper derived from crushed sandstone and consists of rounded sand grains and matrix. While many of the sand grains occur separately, some are still joined by matrix. *Sandstone and sherd* were also sometimes noted together.

Crushed igneous (andesite diorite) refers to crushed igneous porphyries (such as andesite and diorite) added to the clay paste. The majority of the material is white to gray or pinkish, consisting of feldspar and quartz fragments, along with smaller rod-shaped black hornblende particles. Other variations of this temper include *crushed igneous and sherd*, *crushed igneous and sand*, and *crushed*

igneous, sand, and sherd.

Crushed basalt is identified by the presence of small angular particles similar in composition. These particles are usually small and gray, black, or dark gray. Other variations of this temper that were noted include *basalt and sherd*, *basalt and sand*, *basalt, sand, and sherd*, and *basalt, sandstone, sherds*.

Pigment

Paint pigment categories were recorded for both interior and exterior surfaces. Pigment categories are differentiated by surface relief, sheen, delineation, and color (Shepard 1965). Most of the sherds did not exhibit paint and were recorded as none. Paint pigment categories recognized during the present study include the following.

Indeterminate is assigned to sherds with missing surfaces and the presence or absence of paint pigment that cannot be determined.

Mineral (black) refers to the use of ground minerals as pigments, usually iron oxides. These pigments were applied as powdered compounds, using an organic binder. Mineral-based pigments were almost exclusively employed in the decoration of both Mimbres and southern Cibola White Ware occurring in northern Mogollon sites, although the characteristics of the pigment associated with these traditions differs slightly. Mineral pigments display a distinct and well-defined physical layer, resting on the vessel surface. Mineral pigment is thick and often exhibits visible surface relief. Mineral pigments were usually dull in appearance, cover, and obscure surface polish and irregularities. The firing atmosphere to which mineral pigments were exposed affects color. Iron-based mineral pigments fire to black to brown colors in a reduced or neutral atmosphere, and are placed into a mineral black category. *Mineral (red)* refers to pigments exhibiting characteristics of mineral pigment described above that are orange to red, often indicating exposure to an oxidizing atmosphere.

Organic paint refers to the use of vegetal pigments only. The organic paint is soaked into rather than deposited on the vessel surface. The painted surface is lustrous, depending on the degree of surface polishing. The edges of the painted designs are often fuzzy and indistinct. Pottery decorated with organic pigments is extremely rare in northern Mogollon assemblages.

White clay refers to painted decoration applied with a white clay slip as a paint and sometimes

occurs on White Mountain Redwares and Tularosa White-on-red. *Black mineral and white clay* refer to the use of mineral pigments and white clay paint.

Glaze pigments contain a fluxing agent such as lead. Surfaces of glazed pigments are vitrified and glassy in appearance, and may be orange, gray, black or green. As most sites in the Luna area were abandoned prior to the use of true glaze paints, this pigment is very rare and is represented only at the very latest components in this area.

Manipulation

Manipulation refers to surface treatments resulting from the presence of unobliterated coils and type of coiled construction, as well as evidence of subsequent polishing. Manipulation categories recorded include plain unpolished, plain polished, scored, incised, punctated or punched, applique, filleted (neckbanded), coiled, clapboarded, plain corrugated, overlapping (plain) corrugated, indented corrugated, patterned corrugated, incised corrugated, thin plain corrugated polished, indeterminate, polished on coil surface, alternating corrugated, punched corrugated, pinched, punched incised corrugated, single fillet, and pinched corrugated.

Slip

Slips are defined here as intentional applications of distinctive clay, pigment, or organic deposits over the entire vessel surface. This is usually done to achieve a black, white, or red surface color, not obtainable using paste clays normally employed. Slip categories recognized for northern Mogollon ceramics include none, indeterminate, white slip, red slip, smudged, and fugitive red.

Vessel Form

Vessel form categories were assigned to all sherds and vessels based on observed shape. The resolution of vessel form characterization assigned to sherds is dependent on sherd size and portion of the vessel represented. The consistent placement of all sherds into similarly defined vessel form categories still provides a basic comparison for sherd-based assemblages from various contexts. Vessel form categories recognized during the present study include indeterminate body (polished both sides), bowl rim, bowl body, jar body, wide mouth (cooking storage) jar, jar neck, indeterminate, seed jar rim, handle only, pipe, olla rim, ladle, effigy, canteen rim, beaker, miniature

jar, isolated single coil, and olla neck.

Vessel Appendages

Data relating to the presence of vessel appendages provide information concerning intended vessel use. This category refers to the presence and forms of handles or appliques. Because a variety of appendages can be associated with a wide range of vessel forms, the two categories were recorded independently. Most sherds did not exhibit evidence of appendages and were recorded as none. Vessel appendage categories employed during Luna ceramic analysis include indeterminate, ladle handle (solid), ladle handle (hollow), lug handle (solid), lug handle hollow, strap handle, coil handle, indeterminate handle stub, pinch or nub, and coil only.

Postfiring Modifications

Evidence of the intentional modification of vessels or sherds from repair or for subsequent uses were also noted. Most sherds did not contain evidence of modification and were recorded as none. Modification categories recognized during analysis include indeterminate, drill hole (indeterminate), drill hole (repair), drill hole (suspension), incomplete drill hole, jar modified into bowl, pendant, small regular form (abraded), small regular form (chipped), ceramic scraper, modified edge (truncated), modified edge (outer beveled), modified edge (inner beveled), modified edge (multiple beveled), spindle whorl, drill hole, serrated edge, dipper wear, rim chipping, gaming piece, punched hole indeterminate, serrated edge, small regular abraded form and indented drill hole, spindle whorl with serrated edge, and pigment on interior.

STYLISTIC ATTRIBUTES

Stylistic analysis was conducted on a subset of painted sherds assigned to specific types. During this analysis, attributes relating to rim treatments, surface manipulation, and painted styles were recorded.

Surface Treatment

Surface treatment attributes are similar to those recorded during preliminary analysis but may include more detailed descriptions. For example, polished surfaces are divided into those which are lightly, moderately, and heavily polished. Slipped

surfaces are divided into similar groups.

Rim Thickness

This refers to vessel wall thickness as measured 1 cm below the rim, or at the lowest part of the vessel. Measurements were taken there to be consistent.

Rim Shape

This category refers to the basic profile of the rim. Rim forms recorded during analysis of white ware sherds include *not applicable, tapered, rounded, flat, angled, lipped, and indeterminate*.

Rim Decoration

This category refers to the presence or type of painted decoration found along the top of a rim sherd. Rim decoration categories include *not applicable, undecorated, solidly painted, ticked with dots or squares, and indeterminate*.

Rim Design Orientation

This category refers the presence or absence of framing lines and over-all orientation of the design in regard to the rim. This category provides stylistic information that may be of both temporal and spatial significance. Rim orientation categories include *not applicable, indeterminate, indeterminate no framing lines, indeterminate single thin framing line, indeterminate single thick framing line, indeterminate single thin incorporated line, and single incorporated line not near rim*.

Design Motif Type

This category refers to motif type noted on sherds. Dominant motifs were usually recorded first. After each motif was recorded, motif type, fillings, line thickness, and distance between associated lines was recorded. Prior to the recording of each motif, a sequential number was assigned to identify that motif.

Motif Type

Motif type refers to the basic shape or form of design motifs. Motif classes included various forms of lines, triangles, hatchure, checkerboard, ribbon, scrolls, and dot motifs.

Motif Filling

This category refers to the type of filling in each motif. Categories include *indeterminate, hatched, cross hatched, checkered, dotted, alternating thick/thin parallel lines, and wavy hatchured*.

Line Thickness (in mm)

The thickness of lines occurring independently and in hatchure was recorded.

Line Spacing

This refers to the average distance between lines. It also applies to the distance between hatchure lines.

CERAMIC TYPOLOGY

All sherds and complete vessels were also assigned to ceramic types. Approaches and terminology used to assign pottery from sites in the Mogollon Highlands to various typological categories reflect an almost century-long history of description and classification of the pottery from prehistoric sites in this region.

Previous Ceramic Type Studies

The earliest descriptions of the distinctive pottery from sites in the Mogollon Highlands resulted from surveys and excavations along the upper Gila and Salt drainages by Hough (1907, 1914, 1919). While Hough did not define any specific types, he divided Upper Gila pottery into a "smoothly finished brown" and a "hard white gray" ware group. These divisions appear to correspond with brown ware and white ware types as defined later.

Much of the early attention given to pottery from areas now assigned to regions of the Mogollon, resulted from descriptions and illustrations by Fewkes (1914, 1915) of the remarkable decorated pottery with life-forms from large pueblos in the Mimbres area. Investigations by Bradfield (1931) at Cameron Creek Village and Three Circle Ruin in the Mimbres area resulted in the earliest systematic descriptions of Mogollon pottery. Bradfield (1931) described the pottery using a classification system based on paste characteristics. While this system is no longer used, Bradfield's descriptions still provide useful information concerning characteristics of pottery from the Mimbres branch of the Mogollon. Investigations by the Cosgroves at Swartz Ruin and

by Nesbitt at the Mattox Ruin resulted in further descriptions of pottery from the Mimbres branch of the Mogollon, including the recognition of Mimbres White Ware, for which they defined two varieties: Mimbres Boldface Black-on-white and Mimbres Classic Black-on-white (Nesbitt 1931; Cosgrove and Cosgrove 1932).

Early investigations of sites in the Mogollon Highlands, sponsored by the Gila Pueblo Foundation, were concerned with the recognition and definition of a distinctive Mogollon culture area (Gladwin and Gladwin 1934; Haury 1936b, 1985a). Much of the case for the recognition of a distinct culture area was, in fact, based on the distinct characteristics of pottery from sites in the Mogollon Highlands (Gladwin and Gladwin 1934; Haury 1936a, 1985a; Hawley 1936). Investigations sponsored by the Gila Pueblo Foundation resulted in the first descriptions of pottery types from the Mogollon Highlands. Of particular significance were descriptions of pottery types recovered from Harris and Mogollon villages (Haury 1936a, 1936b). Ceramics from these investigations still provide the basis for the definition and description of almost all Mogollon Brown Ware, Mogollon Red Ware, Mogollon decorated, and Mimbres White Ware dating prior to A.D. 1000 (Haury 1936a). Mogollon types defined by Haury (1936a) included Alma Plain, Alma punched, Three Circle neck corrugated, Alma scored, Alma punched, Alma incised, San Francisco Red, San Lorenzo Red-on-brown, Mogollon Red-on-brown, and Three Circle Red-on-white. He also further described the previously defined Mimbres Boldface Black-on-white. Haury also used the distribution of various types from dated contexts to define a series of temporal phases for the Mogollon area (Haury 1936a, 1936b), which are still used with only slight modifications.

Haury's investigations were followed by a series of studies in the northern Mogollon Highlands. Investigations by Nesbitt (1938) at Starkweather Canyon Ruin near the town of Reserve contributed new information concerning the nature and sequence of ceramic change in the northern Mogollon Highlands. Nesbitt (1938) described both earlier types noted by Haury (1936a) as well as other types associated with the Pueblo period occupations in the Mogollon Highlands. Additional types described by Nesbitt (1938) included Reserve Plain, Reserve Polychrome, Reserve Red, and Upper Gila Polychrome. While some of Nesbitt's type names were subsequently modified (Rinaldo and Bluhm 1956), the descriptions of most of these remain valid.

The large number of archaeological investigations that took place in the Southwest by the 1930s resulted in a number of Southwest ceramic syntheses, which included descriptions of pottery from various areas of the Mogollon Highlands (Gladwin and Gladwin 1934; Hawley 1936; Colton and Hargrave 1937; Colton 1939). The unique characteristics of pottery occurring at sites in the Mogollon Highlands contributed to the definition of a distinct Mogollon culture or branch. Paste and surface colors noted in Mogollon ceramics were interpreted as indicating an oxidation technology distinct from those employed by groups associated with the Anasazi culture to the north (Haury 1936a, 1985a; Colton 1939).

Questions stemming from these initial excavations and syntheses led to a long-term program of investigations in the Pine Lawn Valley during the 1940s and 1950s by Paul Martin of the Chicago Field Museum, and later in east-central Arizona. These investigations resulted in the excavation of a large number of sites spanning the entire occupation of the northern Mogollon area (Martin 1943; Bluhm 1957; Martin and Rinaldo 1947, 1950a, 1950b; Martin et al. 1949, 1952, 1954, 1956, 1957; Rinaldo and Bluhm 1956; Bluhm 1957; Martin and Plog 1973). Analysis of pottery from these investigations allowed for the characterizations of ceramic change in the Pine Lawn Valley for a period spanning over a millennium (from about A.D. 200 to 1350). Martin (1943) described Alma Rough based on excavations of the SU site. Later Mogollon types were defined by Rinaldo and Bluhm (1956) and include Reserve Plain corrugated, Reserve Plain corrugated smudged interior variety, Reserve indented corrugated, Reserve indented corrugated smudged interior variety, Reserve punched corrugated, Reserve incised corrugated, Reserve incised corrugated smudged interior variety, Tularosa patterned corrugated, Tularosa patterned corrugated smudged interior variety, Starkweather smudged decorated, Tularosa White-on-red, and Tularosa Black-on-white.

Additional information concerning characteristics and distribution of ceramics over a wide area in the northern Mogollon Highlands and adjacent areas of the Colorado Plateau resulted from extensive surveys (Danson 1957) and excavations (Smith 1973; McGimsey 1980) conducted as part of the Gila Expedition Surveys by the Peabody Museum. These investigations provided a regional comparison of sites and ceramics from various drainages of the Mogollon Highlands (Danson 1957; Washburn 1977). The classification system employed for ceramics from the many sites excavated during this project did not always use previously defined types,

so that it is sometimes difficult to compare ceramics recovered from these investigations to those described in other studies, although associated illustrations are useful (McGimsey 1980). A study of whole vessels conducted by Washburn (1977) resulted in the only detailed descriptions of design styles in the general region. More recent excavations of Sandstone Hill Pueblo were included in the Gila Expedition Survey (Barnett 1974). The Sandstone Hill Pueblo report includes a brief description of the small number of ceramics from this area, as well as illustrations of a large number of decorated vessels from private collections from this area (Barnett 1974).

Much of the subsequent investigation of Mogollon sites in west-central New Mexico has resulted from "salvage" or CRM projects associated with highway clearance conducted by the Museum of New Mexico (Schroeder and Wendorf 1954; Borhegyi 1956; Peckham et al. 1956; Wendorf 1956; Peckham 1957, 1958, 1963; Hammack et al. 1966; Allen 1969; Kayser 1972a, 1972b, 1972c, 1975, 1976; Berman 1979, 1989; Akins 1998b). These investigations utilized previously defined ceramic types, because no new types were defined during these investigations, and few detailed descriptions of the associated ceramics were presented. Together, descriptions and discussions of pottery from various investigations conducted in the northern Mogollon Highlands and adjacent regions provide the foundation for the ceramic typology still employed.

While the Mogollon ceramic types and sequences were being defined for the northern Mogollon Highlands, other investigations were defining similar pottery and sequences in other regions of the Mogollon Highlands in southwest New Mexico and southeast and eastern Arizona. These investigations resulted in the definition of similarly defined types associated with various branches of the Mogollon.

The basic pottery typology mainly defined during investigations in the northern Mogollon region has long been employed in the Mimbres area to the south, where similar pottery was produced over long spans of time (Haury 1936a, 1936b; Anyon and LeBlanc 1980; LeBlanc 1982a; Woosley and McIntyre 1996; Graybill 1975). Differences in the pottery between areas of the southern and northern Mogollon Highlands appear to be limited to later occupations during which fairly distinct regional types such as Mimbres corrugated and Mimbres Classic were produced in areas of the Mimbres branch (Woosley and McIntyre 1996). Distinctions between pottery types of the Cibola branch and

Mimbres branches of the Mogollon in western New Mexico appear to be limited to later (post-A.D. 1000) occupations, where regionally specific types such as Mimbres Classic were produced in the Mimbres country (LeBlanc and Whalen 1980; LeBlanc 1983; Lekson 1992a; Woosley and McIntyre 1996).

Investigations also resulted in the recognition of areal variants of the Mogollon in regions to the west in Arizona. Excavations by Haury, sponsored by the University of Arizona, resulted in the documentation of a long sequence of ceramic change in the Forestdale Valley (Haury 1941, 1985b, 1985c; Haury and Sayles 1947; Stafford 1980; Reid 1989). Investigations by Sayles (1945) in the southwestern Mogollon country resulted in the definition of similar ceramic sequences for the San Simon branch. Excavations associated with the Point of Pines project in east-central Arizona by the University of Arizona resulted in the definition of types associated with the Black River branch of the Mogollon (Wheat 1954; Breternitz 1959).

Studies in these various regions resulted in a synthesis by Wheat (1955) of the Mogollon area which incorporated information from these regions. While no attempt is made in the present study to define other regional varieties of Mogollon types, many of the types defined here are similar to those noted in various regions or branches of the Mogollon.

DESCRIPTION OF TYPES

The following type descriptions focus on Mogollon brown wares produced in the Northern Mogollon Highlands in west-central New Mexico as well as intrusive types commonly exchanged into this area. Intrusive types described here include some decorated white ware produced in the Mimbres branch of the Mogollon as well as Cibola Gray Ware, Cibola White Ware, and White Mountain Redware produced by Anasazi groups in the southern Colorado Plateau.

While many recent studies have relied on the same basic types defined in earlier type descriptions, a recent modification employed in the classification of utility ware includes the use of descriptive names for basic surface manipulations rather than previously established geographic-based type names (Fowler 1985; Mills 1987; Kayser and Carroll 1988). This was done in part to avoid the difficulties involved in assigning small sherds to vessel-oriented categories. Examples of sherd-based descriptive

categories include plain brown and indented corrugated brown.

During analysis of Luna Project ceramics, a combination of categories defined and utilized during various studies was employed. Typological categories were based on combinations of characteristics previously demonstrated to be temporally, spatially, or functionally sensitive. Pottery was assigned to previously existing categories utilizing a system involving the determination of ceramic tradition, then ware, and finally type. The initial determination of associated ceramic tradition involved the separation of ceramics into broad groups indicating postulated area of origin or "cultural" association. During the analysis, pottery was first assigned to the Mogollon or southern Anasazi ceramic tradition based on pastes and surface characteristics. Next, sherds were divided into ware groups based on surface manipulation and decoration. Finally, they were assigned to types or groupings based on painted decorations or textured treatments known to be temporally sensitive. The basis for the various type categories recognized during the Luna Project are discussed below.

Ceramic Traditions

The distribution of ceramics assigned to various Mogollon and Anasazi types has long played an important role in the definition and differentiation of Southwest culture areas (Gladwin and Gladwin 1934; Colton 1939; Wheat 1955; Danson 1957; Martin and Plog 1973). As the majority of the ceramics from the northern Mogollon Highlands represent Mogollon brown wares, this area is assumed to represent the northern extension of the Mogollon culture area, although certain Anasazi white wares are fairly common in later components in the northern Mogollon Highlands. Mogollon pottery types are similar in construction and decoration to Anasazi but differ in surface appearance (Haury 1936a; Colton 1939) and the presence of brown, dark gray, or red surface and paste colors, as opposed to the gray or white colors prevalent in Anasazi types. These color differences are often attributed to oxidation firing atmospheres for Mogollon brown wares, in contrast to reduction or neutral atmospheres for Anasazi gray and white wares (Haury 1936a; Hall 1950). Other distinct attributes noted for Mogollon brown wares include the presence of very fine temper and the common occurrence of polishing and interior smudging on utility ware forms.

Differences in characteristics of Mogollon and Anasazi pottery are often interpreted as reflecting distinctive culture traditions or affiliation (Hall 1950; Danson 1957; Haury 1985a). For the northern Mogollon Highlands and southern Colorado Plateau, the dominance of Mogollon Brown Ware as opposed to Anasazi types are used to define the distribution and boundaries of the Anasazi and Mogollon culture areas (Mera 1934; Wendorf 1953; Danson 1957). Recent survey, collection, and analysis of clay sources in west-central New Mexico, discussed in a following chapter, indicate that distributions of ceramics belonging to the Mogollon and Anasazi traditions may actually be a reflection of resources and associated technologies available to and employed by prehistoric potters in the Mogollon Highlands versus the Colorado Plateau (Wilson 1994).

Definition of Ceramic Types

Sherds and vessels were assigned to specific types based on temporally sensitive surface manipulations, painted designs, or textured treatments. Categories employed during recent analyses include both formal and descriptive type categories. For cases where both formal and descriptive types have been used to describe a particular set of surface characteristics, both type and descriptive names are presented.

The use of both formal types and descriptive categories during the ceramic analysis resulted in the recognition of a very large number of categories which, in certain cases, could be overwhelming and cumbersome. Thus, for some previously described types, categories were combined to form a small number of groupings which provide very basic descriptive and temporal information. The basic groups defined include indeterminate, plain brown ware, plain smudged brown ware, corrugated brown ware, red slipped brown ware, Mogollon decorated or Mimbres White Ware, Cibola White, and White Mountain Redware. In some cases ceramic type descriptions and trends common to these types are presented by these groupings.

The great majority of the pottery occurring in the northern Mogollon Highlands belong to ceramic traditions associated with one of two Southwestern cultures, the Mogollon and southern Anasazi. Almost all the utility ware represents Mogollon brown wares, and similar pastes persist in the great majority of the brown utility ware produced through the entire Mogollon occupation of this region.

Mogollon decorated or Mimbres white wares represent the dominant decorated pottery until about A.D. 1000, after which Cibola Anasazi types such as Reserve Black-on-white and Tularosa Black-on-white are the dominant decorated types. The appearance of Anasazi White Ware in the northern Mogollon Highlands has been generally explained in terms of increased Anasazi intrusion or influence after A.D. 1000, resulting in the joint production of Mogollon Brown Ware and Anasazi White Ware by local potters, although evidence discussed elsewhere in this volume questions such interpretations.

The following section describes pottery assigned to various ceramic traditions, wares, and types identified during the analysis. Detailed descriptions are presented for ceramic groups commonly occurring in sites in the northern Mogollon country and include Mogollon Brown Ware, early Mogollon (Mimbres) decorated and White Ware, and Late Anasazi White Ware types. Brief descriptions are presented for ceramic groups that were occasionally encountered but rare, including Anasazi Gray Ware, early Anasazi White Ware, Late Mimbres White Ware, and White Mountain Redware.

Indeterminate Tradition Types

Indeterminate tradition types refer to pottery that could not be assigned to a specific tradition. This category was seldom used and was limited to rare situations where sherds were tempered with material or inclusions or exhibited manipulations not attributed to known traditions. Types assigned to indeterminate traditions represent only .1 percent of the pottery from Luna Project sites. Indeterminate white ware refers to white ware sherds for which tradition and basic time of occupation could not be determined. Indeterminate late white ware refers to white ware exhibiting late characteristics for which the tradition cannot be determined. Indeterminate red ware refers to red slipped sherds belonging to an unknown tradition.

Mogollon Brown Ware Types

The great majority (94.5 percent) of sherds from Luna Project sites were assigned to Mogollon Brown Ware types (Fig. 4.1). Mogollon Brown Ware, as defined here, refer to unslipped pottery constructed of self-tempered, volcanic-derived clays with high iron content, common throughout the Mogollon Highlands.

The great majority of unslipped brown ware sherds display no painted decoration, although a single type (Mogollon Red-on-brown) contains red pigment painted over an unslipped brown surface.

Brown ware pastes are somewhat soft, and sherds often break along an even plane. Pastes of all brown ware types consistently fired to yellow-red or red when exposed to a controlled oxidization atmosphere. In addition, the majority of brown ware contained temper dominated by small angular particles of volcanic rock and sand particles. Lower frequencies of brown ware contained similar inclusions but were dominated by tuff or sand particles. Alluvial clays occurring throughout this area fired to similar colors, indicating the use of local self-tempered clays.

Similar utility wares were produced by Salado groups who reoccupied portions of the Mogollon Highlands after the abandonment of this area by the Mogollon groups (Nelson and LeBlanc 1986; Lekson 1992c). Similarities in the utility ware pottery associated with these temporally separated traditions result from the use of similar clay resources as well as manufacturing and firing conventions. While the distribution of types from Mogollon and Salado pottery assemblages differ, similarities in brown utility ware result in the common occurrence of self-tempered pottery with brown surfaces, often exhibiting plain polished exteriors. In addition, brown ware associated with both traditions may exhibit red slipped surfaces and smudged interiors. Such similarities may create problems in assigning individual sherds to these traditions, particularly for sites in the Mogollon Highlands reoccupied by Salado groups. No evidence of a Salado occupation, however, has been identified on the Luna Project, so it is safe to assume that almost all the brown utility ware sherds and vessels identified during the present study represent Mogollon period types.

Mogollon Brown Ware was assigned to specific types primarily based on differences in textured surface decorations. The following presentation of type categories presents a compromise between studies using various typing conventions in that both formal types defined during earlier studies (Hauray 1936a; Rinaldo and Bluhm 1956) and more recent descriptive names (Fowler 1985; Kayser and Carroll 1988; Mills 1987) are discussed.

Plain Brown Ware Types

Plain brown ware represent the most common category at Luna sites and represent 43.5 percent of the

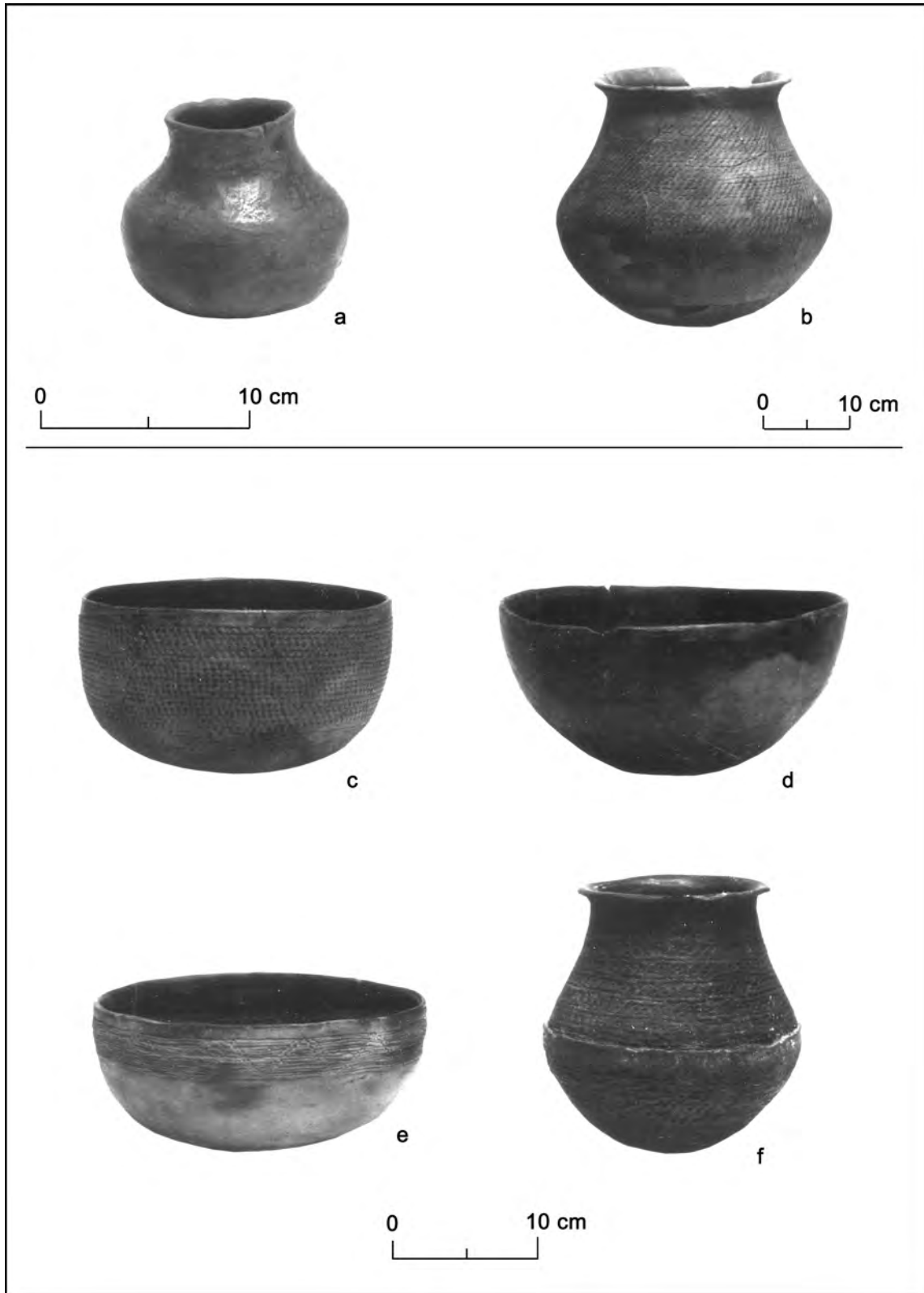


Figure 4.1. Mogollon Brown Ware types: (a) Alma Plain jar, (b) Reserve indented corrugated jar, (c) Reserve indented corrugated bowl, (d) Reserve smudged bowl, (e) Tularosa fillet rim bowl, (f) alternating corrugated jar. (Examples not from the Luna project sites.)

Table 4.1. Temper of Plain Brown Ware Types

Temper	Alma Plain Rim		Alma Plain Body		Alma Rough Rim		Alma Rough Body		Total	
	N	%	N	%	N	%	N	%	N	%
Not examined	36	2.0	616	1.8	2	.3	28	.3	682	1.5
Not recorded	0	.0	10	.0	0	.0	0	.0	10	.0
None	0	.0	3	.0	0	.0	0	.0	3	.0
Mogollon lithic and sand	1332	74.2	26681	79.0	444	67.9	7751	72.0	36208	77.1
Mogollon tuff	174	9.7	2057	6.1	34	5.2	456	4.2	2721	5.8
Mogollon sand	253	14.1	4393	13.0	174	26.6	2522	23.4	7342	15.6
Sand	0	.0	0	.0	0	.0	1	.0	1	.0
Sand and sherd	1	.1	0	.0	0	.0	0	.0	1	.0
Crushed igneous	0	.0	2	.0	0	.0	4	.0	6	.0
Sandstone	0	.0	2	.0	0	.0	0	.0	2	.0
Total	1796	100.0	33746	100.0	654	100.0	10762	100.0	46976	100.0

pottery identified. Types include Alma Plain rim and body, and Alma Rough rim and body. Color is variable in all plain brown wares. Although the majority of sherds exhibit brown surfaces, a significant number of sherds also exhibit yellow-red, light gray, and dark gray colors. As is the case with other Mogollon Brown Ware groups, the majority of plain brown wares exhibit fine volcanic lithic and sand temper (Table 4.1). While tempers for plain brown wares are similar to those noted for other types, the frequency of sherds dominated by large tuff inclusions are significantly higher at sites occupied during the Early Pithouse period, while that for sherds dominated by sand inclusions is lower. The relative size of temper particles found in plain brown ware is larger at contexts dating to the Early Pithouse period. Surfaces are sometimes bumpy, and walls are often uneven in thickness. The majority of the sherds assigned to types of this category appear to be derived from wide mouth cooking or storage jars, although a smaller but significant frequency are from bowls (Table 4.2). Other forms are represented in extremely low frequencies, although sherds derived from seed jars are fairly common and may even dominate some components dating to the Early Pithouse period.

Alma Plain Rim (Plain Polished Rim)

Alma Plain or Plain polished rim refers to completely smoothed plain rim sherds with at least one polished surface (Figs. 4.2-4.3). Alma Plain rim sherds are assumed to have derived from vessels whose entire surface was smoothed and polished. This category is only assigned to rim sherds, because similar body sherds could have also derived from vessel forms exhibiting coiled or corrugation treatments along the rim or neck.

This type occurs during all occupations, although it is particularly common in the Early Pithouse period. There is a significant change in vessel form in Alma Plain through time. The majority of rim sherds from sites dating to Early Pithouse phases are derived from seed jars, followed by bowls and then cooking jars. The great majority of Alma Plain rim sherds from later occupations are derived from cooking/storage jars and bowls. Wall thickness range from 4.0 to 7.0 mm and average 6.2 mm.

Alma Plain Body (Plain Polished Body)

Alma Plain body or plain polished body refers to smoothed polished brown ware body sherds or ves-

Table 4.2. Vessel Forms of Plain Brown Ware Types

Vessel Form	Alma Plain Rim		Alma Plain Body		Alma Rough Rim		Alma Rough Body		Total	
	N	%	N	%	N	%	N	%	N	%
Indeterminate body, polished	3	.1	3939	7.0	0	.0	39	.2	3981	5.1
Bowl rim	848	23.7	14	.0	399	38.1	4	.0	1265	1.6
Bowl body	0	.0	13256	23.5	1	.1	36	.2	13293	17.2
Jar body	35	1.0	34091	60.4	3	.3	13104	80.8	47233	61.1
Cooking jar rim	2588	72.4	63	.1	565	53.9	11	.1	3227	4.2
Cooking jar neck	12	.3	3750	6.6	2	.2	975	6.0	4739	6.1
Jar body corrugated and polish	0	.0	14	.0	0	.0	2	.0	16	.0
Indeterminate	22	.6	1312	2.3	18	1.7	1917	11.8	3269	4.2
Seed jar rim	46	1.3	0	.0	36	3.4	0	.0	82	.1
Handle only	2	.1	4	.0	0	.0	32	.2	38	.0
Pipe	0	.0	4	.0	0	.0	1	.0	5	.0
Olla rim	14	.4	1	.0	10	1.0	2	.0	27	.0
Ladle	0	.0	4	.0	0	.0	4	.0	8	.0
Effigy/fetish	0	.0	1	.0	0	.0	24	.1	25	.0
Canteen rim	0	.0	0	.0	2	.2	0	.0	2	.0
Jar miniature	3	.1	5	.0	11	1.0	51	.3	70	.1
Isolated single coil	0	.0	1	.0	0	.0	14	.1	15	.0
Olla neck	0	.0	14	.0	0	.0	2	.0	16	.0
Plate rim	0	.0	0	.0	1	.1	0	.0	1	.0
Whole jar	1	.0	0	.0	0	.0	0	.0	1	.0
Total	3574	100.0	56473	100.0	1048	100.0	16218	100.0	77313	100.0

sels. Plain body sherds are placed into a category separate from plain rim sherds known to have derived from completely smoothed vessels, since they could have been derived from Alma Plain rim vessels as well as the lower portions of neckbanded or corrugated vessels. Because both jar and bowl sherds were sometimes polished on the interior and exterior surfaces, it is often difficult to determine the type of vessel from which a particular body sherd may have derived. Sherds from the nonrim portion of a neck can often be identified based on the distinct curve associated with this form. Body sherds

exhibiting equal polish on both surfaces were assigned to indeterminate body-polished. Those exhibiting greater polish on the interior surface were often classified as bowls, while those with a higher degree of polishing on the exterior surface were usually classified as jars. While jar body sherds represent the most common vessel category to which Alma Plain body sherds were assigned, other vessel categories are also present in significant frequencies. An examination of vessels from which Alma Plain body sherds were recovered, however, indicates it is often very difficult to determine the vessel

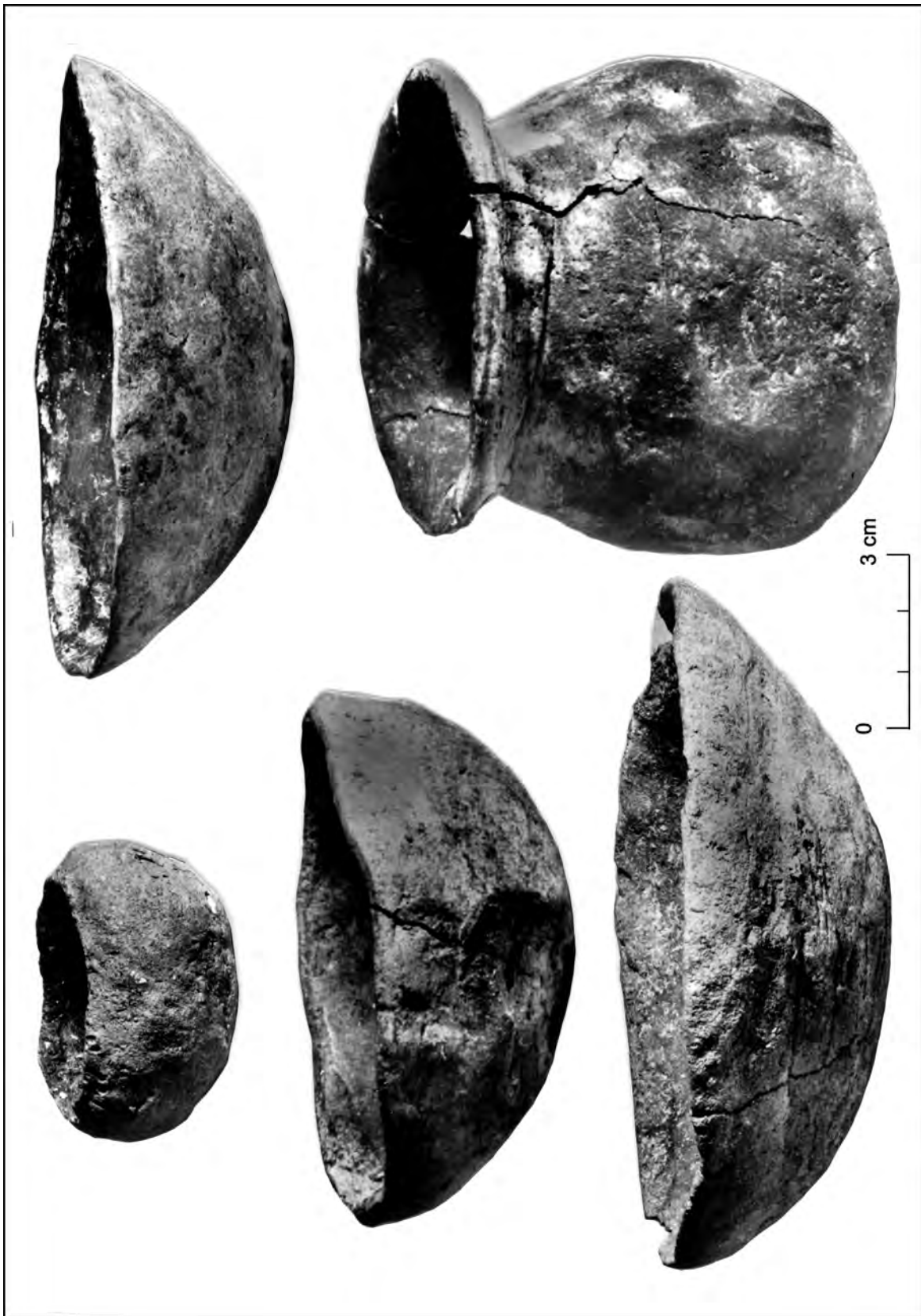


Figure 4.2. Alma Plain and Alma Rough ceramics from LA 39969.

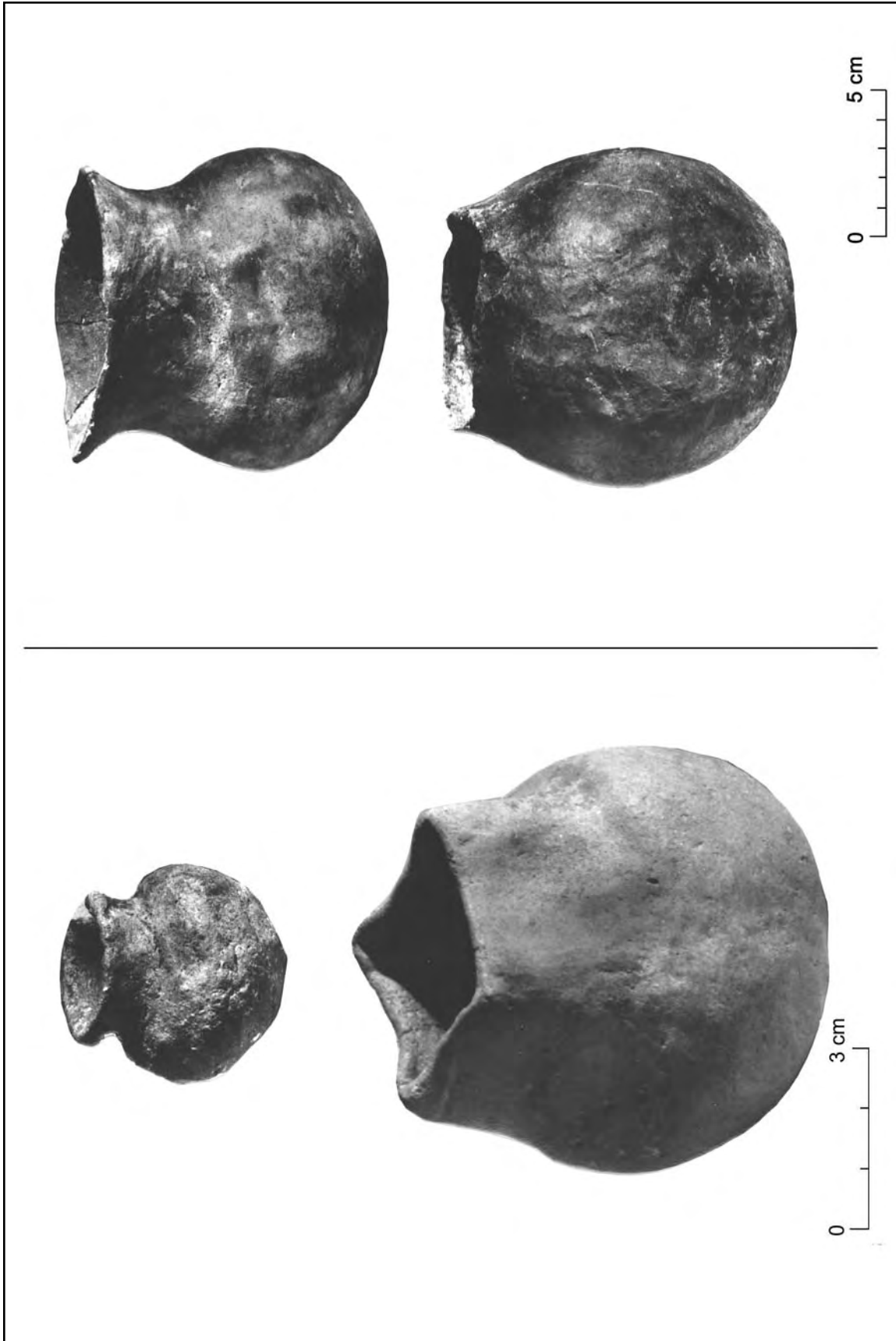


Figure 4.2. Continued. Alma Plain and Alma Rough ceramics from LA 39988.

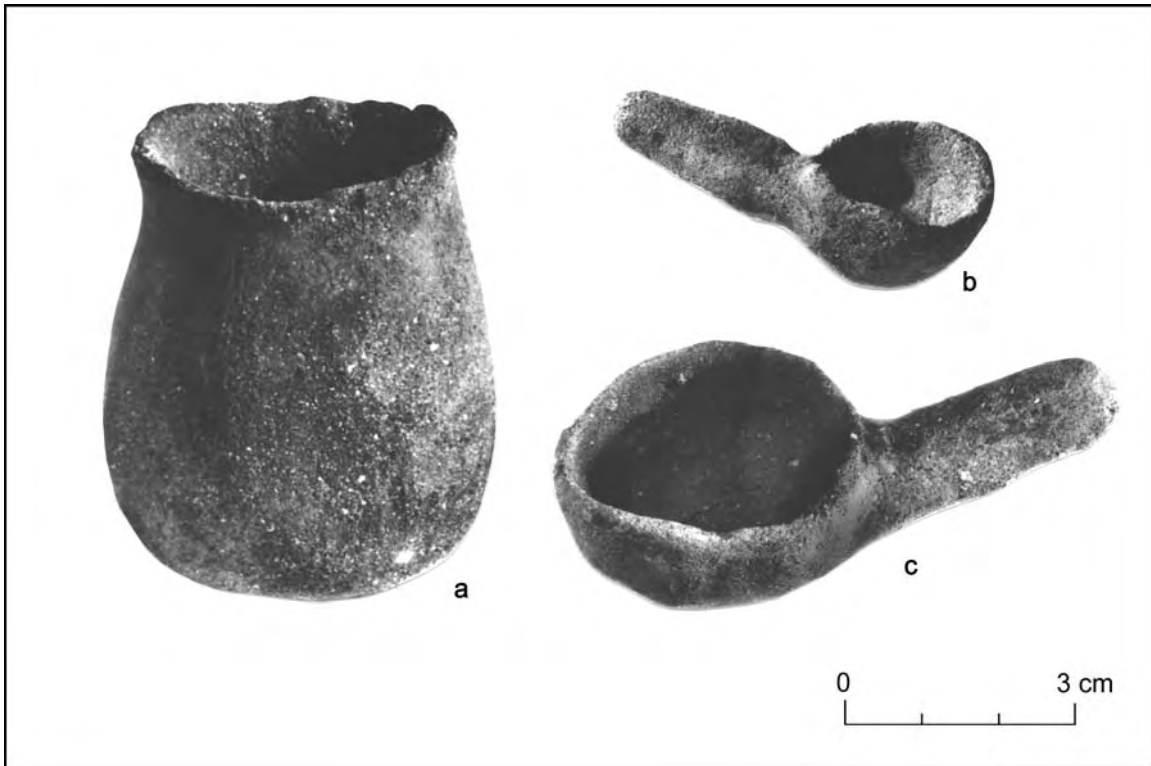


Figure 4.3. Alma Plain and Alma Rough ceramics; (a-b) LA 70185, (c) LA 39975).

form from which a body sherd derived. Therefore, discussions of distributions of vessel forms for plain brown ware sherds are primarily limited to rim sherds. A high frequency of the Alma Plain body sherds were polished on the exterior surface, while the frequency of sherds exhibiting polishing on the interior surface was much lower.

Alma Plain body sherds are common at sites dating to all phases of the Mogollon. While it is often assumed there was a decline in the frequency of this type from early to late phases (Haury 1936a), examinations from Luna Project assemblages indicate they are commonly associated with all phases, although the range of types with which Alma Plain sherds are associated does increase significantly during the late Tularosa phase.

Alma Rough Rim (Plain Unpolished Rim)

Alma Rough rim or Alma Plain unpolished rim refers to unpolished plain rim sherds (Figs. 4.2-4.3). Sherds assigned to Alma Rough rim vessels are assumed to have derived from vessels with smoothed and unpolished surfaces. A careful examination of sherds indicates that some classified as Alma Rough actually derived from Alma Plain vessels from which the polish had worn off, partly from the soft surfaces of Alma Plain. This may be a par-

ticularly common occurrence in surface assemblages where sherds have been subjected to various weathering processes.

Most of the Alma Rough rim sherds from Luna Project sites are from cooking/storage jars. Other forms include bowls, seed jars, and ollas. Seed jars represent the dominant vessel form for this type at sites dating to the Early Pithouse period, and cooking/storage jars are the dominant form during later occupations. By definition, sherds assigned to this type were not polished on the interior or exterior surface. Wall thickness in a small sample of Alma Rough sherds ranged from 4.6 to 7.5 mm and averaged 5.67 mm.

While Alma Rough body sherds occur at sites dating to all phases of the Mogollon, the frequency of this type decreased during the Late Pithouse period and increased during the Pueblo period. This may reflect basic changes in vessel use and construction through time. Plain brown wares produced during this time are softer, more crumbly, and not as well smudged or polished.

Alma Rough Body (Plain Unpolished Body)

Alma Rough body or plain unpolished body refers to unpolished brown ware body sherds. Body sherds are placed into a distinct category because they

Table 4.3. Temper of Early Textured Brown Ware Types

Temper	Alma Scored		Alma Incised		Alma Punched		Fillet Alma Neckbanded		Three Circle Neckbanded		Pinched		Punched Incised		Alma Applique		Single Fillet Rim		Total			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Not examined	0	.0	0	.0	0	.0	1	.6	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1
Mogollon lithic and sand	209	81.0	60	83.3	13	81.3	123	77.4	595	80.5	18	90.0	4	100.0	2	100.0	1	100.0	1025	80.6		
Mogollon tuff	8	3.1	1	1.4	0	.0	15	9.4	12	1.6	1	5.0	0	.0	0	.0	0	.0	0	.0	37	2.9
Mogollon sand	41	15.9	11	15.3	3	18.8	20	12.6	131	17.7	1	5.0	0	.0	0	.0	0	.0	0	.0	207	16.3
Sand and sherd	0	.0	0	.0	0	.0	0	.0	1	.1	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1
Total	258	100.0	72	100.0	16	100.0	159	100.0	739	100.0	20	100.0	4	100.0	2	100.0	1	100.0	1271	100.0		

Table 4.4. Vessel Forms of Early Textured Brown Ware Types

Vessel Form	Alma Scored		Alma Incised		Alma Punched		Fillet Alma Neckbanded		Three Circle Neckbanded		Pinched		Punched Incised		Alma Applique		Single Fillet Rim		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Bowl rim	4	1.4	4	3.5	7	16.7	2	1.2	2	.3	11	33.3	1	12.5	1	6.7	2	25.0	33	2.4
Bowl body	11	3.9	14	12.3	3	7.1	3	1.8	11	1.5	5	15.2	0	.0	1	6.7	1	12.5	49	3.5
Jar body	45	16.1	25	21.9	7	16.7	3	1.8	16	2.2	8	24.2	1	12.5	10	66.7	0	.0	115	8.1
Cooking jar rim	61	21.9	22	19.3	1	2.4	35	20.9	198	26.6	0	.0	0	.0	2	13.3	4	50.0	323	22.9
Cooking jar neck	148	53.0	44	38.6	19	45.2	126	73.7	513	69.0	4	12.1	5	62.5	1	6.7	1	12.5	861	60.9
Corrugated exterior bowl	0	.0	0	.0	0	.0	0	.0	2	.3	0	.0	0	.0	0	.0	0	.0	2	.1
Indeterminate	3	1.1	5	4.4	2	4.8	0	.0	0	.0	1	3.0	0	.0	0	.0	0	.0	11	.8
Seed jar rim	7	2.5	0	.0	0	.0	0	.0	0	.0	2	6.1	1	12.5	0	.0	0	.0	10	.7
Olla rim	0	.0	0	.0	2	4.8	2	1.2	0	.0	0	.0	0	.0	0	.0	0	.0	4	.3
Canteen rim	0	.0	0	.0	0	.0	0	.0	1	.1	0	.0	0	.0	0	.0	0	.0	1	.1
Jar miniature	0	.0	0	.0	1	2.4	0	.0	0	.0	2	6.1	0	.0	0	.0	0	.0	3	.2
Total	279	100.0	114	100.0	42	100.0	171	100.0	743	100.0	33	100.0	8	100.0	15	100.0	8	100.0	1413	100.0

could have been derived from Alma Plain rim vessels as well as the lower portions of neckbanded or corrugated vessels. Almost all Alma Rough body sherds were assigned to jar body, although it is likely that some of these were derived from bowls. By definition, sherds assigned to this type were not polished on the interior or exterior surface. While Alma Rough body sherds occurs at sites dating to all phases of the Mogollon, the frequency of this type decreases during the Late Pithouse period and increased during the Pueblo period.

EARLY TEXTURED BROWN WARE TYPES

Early textured brown wares exhibit surface manipulations produced before the production of corrugated types, although such forms were produced in low frequencies after the introduction of corrugated brown wares. Surface textures associated with these types are usually present only on the upper portion of a vessel, so that sherds derived from the lower portions of the same vessel are usually assigned to plain brown ware types. Only .8 percent of all sherds represent textured types, although this includes a wide and varied range of types. Early textured types identified during the present study include Alma scored, Alma incised, Alma punched, Three Circle punched, Alma pinched, Alma punched incised, Alma applique, and Alma single fillet rim. Surface colors and paste characteristics are similar to those described for plain brown wares. Distribution of temper types is also similar to those noted in plain brown wares (Table 4.3). The majority of the sherds assigned to this category appear to be derived from wide mouth cooking or storage jars, although a smaller but significant frequency are from bowls (Table 4.4). Other forms are represented in extremely low frequencies.

Alma Scored (Plain Scored)

Alma scored or Alma Plain scored sherds are differentiated from Alma Plain by the presence of shallow grooves or striations (Figs. 4.4-4.5). Scored treatments consist of a series of distinctive straight or slightly curving striations which are almost always oriented vertically on the vessel (Haury 1936a). Striated treatments are usually very close to each others and may be .1 to 2.0 mm across. These striations are parallel in orientation, although they occasionally intersect at angles. The orientation of these striations probably resulted from the wiping of the wet vessel with a corn cob, plant brush, or other tool.

While all sherds exhibiting scored treatments were assigned to this type, the great majority of Alma scored sherds represent rim or neck sherds, indicating that scored treatments were usually executed near the rim or neck of a vessel. Scored treatments usually occur in bands beginning at the rim and measure between 20 and 60 cm in thickness. While striated portions of a vessel are unpolished, the smoothed area below is often polished. Interior portions of vessels, not exhibiting surface striations, are almost always polished. While utility ware with scored treatments occur throughout the Southwest, the surface treatments noted for Alma scored appear to be different from those noted in any other Southwest types. Thus, Alma scored represents one of the very few examples of a decorative convention that appeared to have been almost exclusively limited to the Mogollon region.

Most of the Alma scored sherds in the present study appear to be derived from cooking/storage jars, although examples of bowl rim, bowl body, jar body, seed jar, and indeterminate forms were noted. Scored treatments were present on the exterior surface only. The majority of sherds were polished on the interior surface. Wall thickness in a small sample of Alma scored sherds ranged from 4.8 to 7.6 mm and averaged 5.67 mm.

Alma scored first appeared during the later part of the Early Pithouse period. This type is found in similar frequencies at sites of the Early Pithouse and Late Pithouse periods. Alma scored almost always disappears by the beginning of the Reserve phase.

Alma Incised (Plain Incised)

Alma incised or Alma Plain incised is similar to Alma Plain but has incised patterns (Fig. 4.6). Incised lines are deeper and wider than noted in Alma scored and reflect patterns made with a fine or sharp tool or fingernails. The most common pattern includes straight, rectilinear, curving, and zigzag lines. These include single lines as well as a series of parallel, intersecting, and crossing lines. These lines are usually sparsely executed and limited to specific areas of a vessels such as the rim. Another style of incised designs consists of rows of fingernail-shaped incisions along the rim.

The majority of Alma incised sherds appear to be derived from cooking/storage jar vessels, although bowl and indeterminate forms were also noted. For all sherds, the incised treatment occurred on the exterior surface, which was often polished. A slight majority of these sherds were also polished on

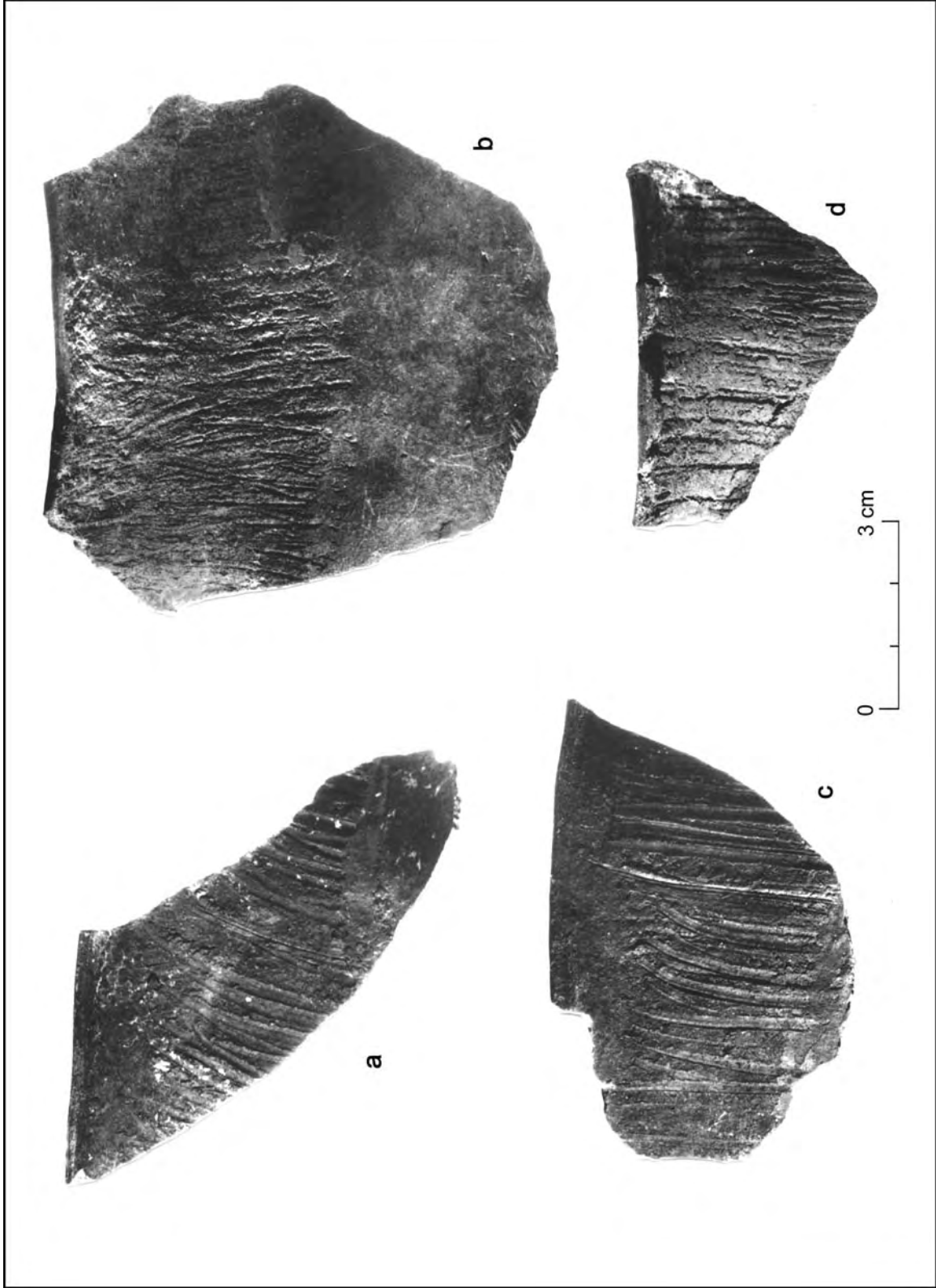


Figure 4.4. Alma scored: (a) LA 70196, (b) LA 45507, (c-d) LA 70196.

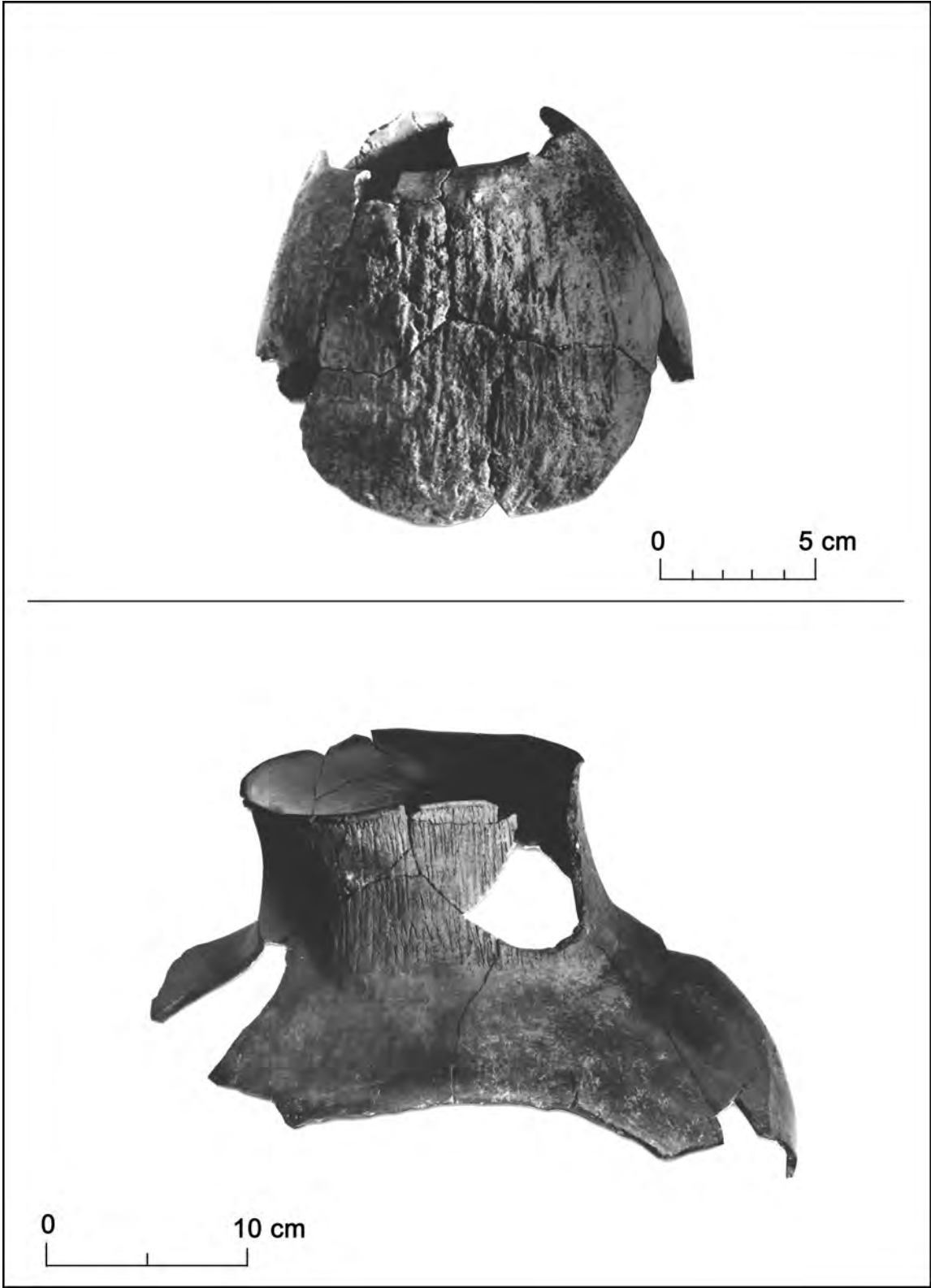


Figure 4.5. Alma scored; (upper) LA 39975, (lower) LA 70196.

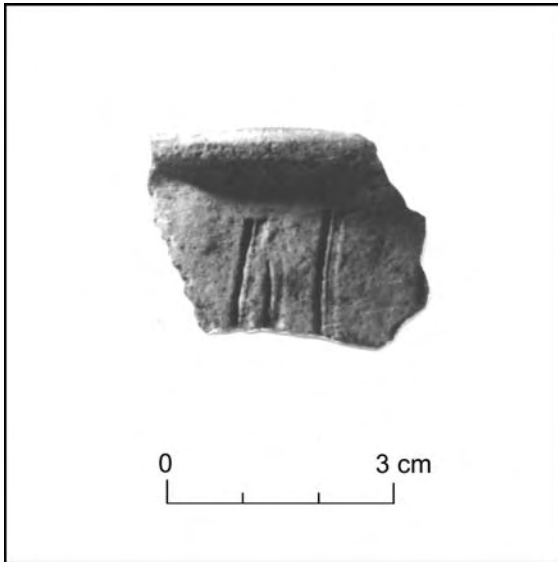


Figure 4.6. *Alma incised* from LA 70185.

the interior surface.

Alma incised is always extremely rare but may be present in components dating to all phases. It is probably most common in the San Francisco phase.

Alma Punched (Plain Punched)

Sherds assigned to *Alma punched* or *Alma Plain punched* are identical to polished plain, except the surface is covered with punched indentations, often circular. These indentations appear to have been created using an implement or stick as a punch. This category is equivalent to previous definitions of *Alma punched* (Haury 1936a; Nesbitt 1938). A few sherds exhibiting both incised and punched decorations were classified as *Alma punched incised*.

Only seven *Alma punched* sherds were recovered during the Luna Project. Punched decorations were limited to exterior surfaces, although a small number of the interior surfaces were polished. *Alma punched* is most common at sites dating to the Late Pithouse and Pueblo periods, where it is present in trace frequencies.

Other plain brown ware types exhibited simple decorations applied in relief. These were classified as *Alma pinched* or *Alma applique*, given the nature of the application of these designs.

Alma Neckbanded (Wide Neckbanded)

Alma neckbanded sherds are recognized by the presence of two to six rows of unobliterated coils or fillets on the neck (Fig. 4.7). Coils are relatively

wide compared to other coiled or corrugated types, range from 4 to 200 mm, and average about 10 mm (Haury 1936a; Kayser and Carroll 1988). Rows of coils lie directly above each other, and there is little overlap or relief between coils. Junctures between coils are sometimes distinct, although in some cases they may be only partially obliterated and difficult to define. Execution of coils is often sloppy, and thickness of a given coil may vary considerably. Portions of vessels exhibiting coiled and smoothed treatments are often polished.

Manipulations indicative of *Alma neckbanded* are limited to the upper portions of vessels. Almost all sherds assigned to this type appear to have derived from cooking/storage jar vessels. Wall thickness measurements for a small sample of sherds ranged from 4.6 to 7.5 mm and averaged 5.7 mm.

Alma neckbanded represents the first attempt by potters in the Mogollon Highlands to leave unobliterated coils on the surface. Coiled decorations on this type are similar to the first textured types in other areas of the upland Southwest such as the Colorado Plateau. For example, characteristics of the coil treatments on *Alma Plain* are similar to those noted on early Anasazi textured types such as *Kana'a Gray*, *Moccasin Gray*, or *Rosa Gray* (Winds 1977; Blinman and Wilson 1993). *Alma neckbanded* appeared toward the end of the Early Pithouse period, or *Georgetown* phase, and is most common at sites dating to the San Francisco phase. It is present in lower frequencies during the *Three Circle* phase. Sherds of this type also occur in trace frequencies in the Pueblo period, although these may sometimes be mistaken for varieties of wide-coiled corrugated types, particularly forms of *Mimbres* corrugated produced in the *Mimbres* region to the south. A very few sherds exhibited a single application of similar wide coils and were classified as single fillet rim.

Three Circle Neck Coiled (Neck Corrugated)

Three Circle neck corrugated or *neck coiled* is similar to, but distinguished from, *Alma punched* by the thickness and shape of unobliterated neck coils (Haury 1936a; Fig. 4.8). The term *neck coiled* is more appropriate because it is best considered a later neckbanded or neck coiled rather than a corrugated type. Pottery with corrugated treatments limited to the neck area were still assigned to corrugated types. *Three Circle neck coiled* vessels exhibit from 5 to 15 rows of unobliterated coils along the neck, which



Figure 4.7. Alma neckbanded from LA 45507.



Figure 4.7. Continued. Alma neckbanded from LA 45507.

may cover the upper third of some vessels. Junctures between all rows of coils are distinct. Coils are usually unpolished, although occasional polished examples were noted. Coils from a sample of Three Circle neck coiled sherds range from about 4 to 12 mm in thickness and average 7.7 mm. Coils tend to be thin and flat, sometimes overlapping each other, or rounded. Texture treatments of this type include rounded coils (30.3 percent), clapboard coils (69.1 percent), and thin overlapping coils (.3 percent). The majority of the interior surfaces were polished, while a minority of sherds assigned to this type were polished over the coils on the exterior surface.

Three Circle neck coiled displays characteristics that are intermediate between those noted in Alma neckbanded and plain corrugated types and represents part of a progression of development of textured wares occurring throughout the upland Southwest. Coil treatments are similar to those described for later Anasazi neckbanded types such as Mancos Gray. Three Circle neck coiled is usually distinguished from corrugated types in that coils tend to be limited to the neck area, are usually thicker. There is less likely to be a difference in thickness between the top and lower coils.

Coil manipulations used to define Three Circle neck coiled are limited to the upper portions of vessels. The great majority of sherds appear to be

derived from cooking/storage jars. Wall thickness measurements recorded for a small sample of sherds ranged from 4.6 to 7.5 mm and averaged 5.7 mm.

Three Circle neck corrugated appeared during the San Francisco phase and is most common at sites dating to the subsequent Three Circle phase. Trace frequencies of sherds occur at sites dating to this type and probably represent variation found in plain corrugated types.

PLAIN SMUDGED BROWN WARE TYPES

Plain smudged brown wares exhibit pastes and temper similar to those of plain brown wares, but with interior smudging (Table 4.5). The common occurrence of smudged interiors represents one of the major traits distinguishing much of the pottery produced by prehistoric groups in the Mogollon Highlands and other regions of the upland Southwest. Plain smudged brown wares include sherds exhibiting a plain surface on the exterior surface and a distinct deposit of soot on the interior surface. Exterior surfaces on most smudged Mogollon brown wares are usually red, brown, or gray brown and indicate that most of the vessel was exposed to low oxidation or neutral firing conditions. Smudged surfaces reflect the intentional deposition of soot or

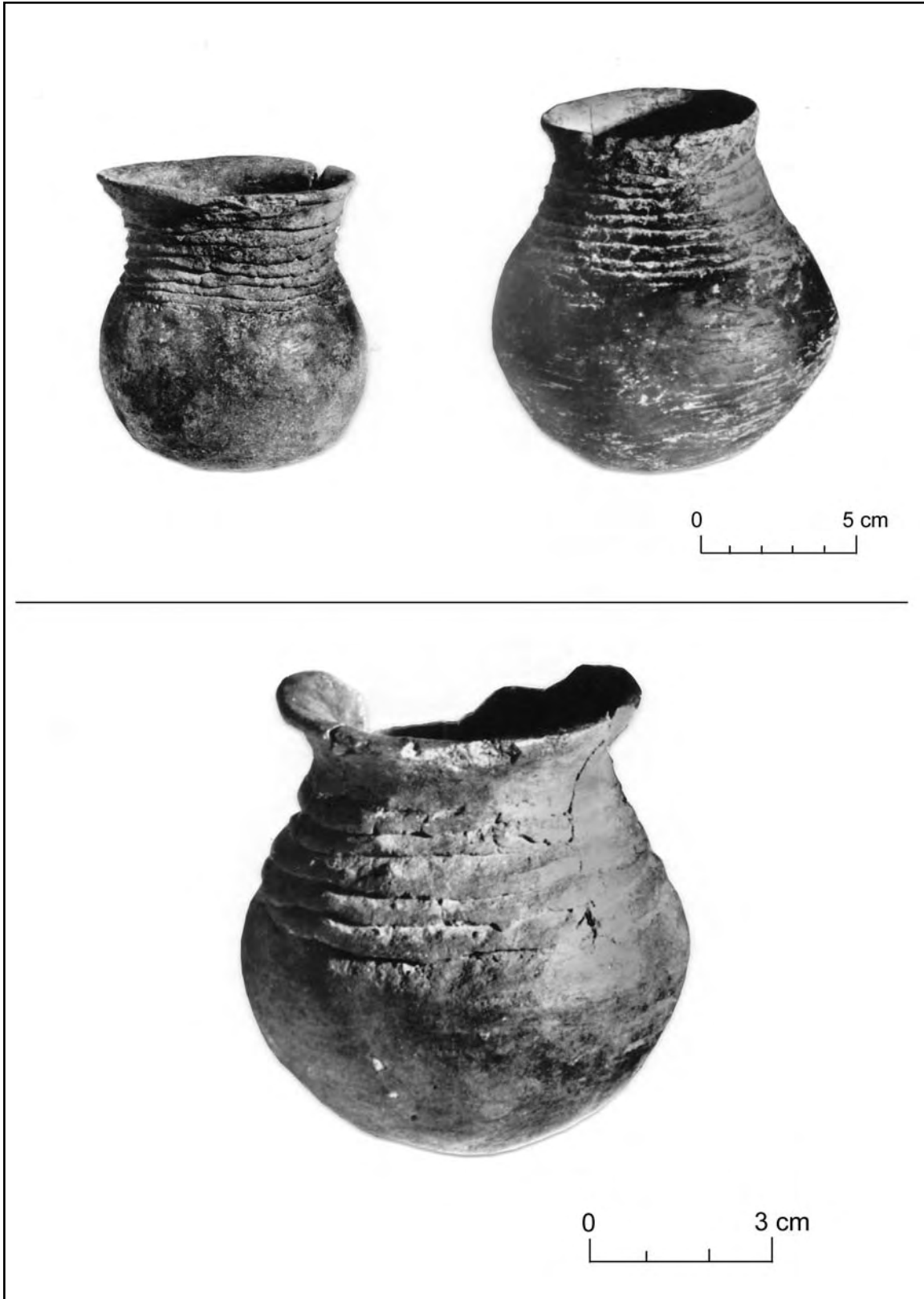


Figure 4.8. Three Circle neck coiled; (upper) LA 39968 and LA 39969, (lower) LA 39968.

Table 4.5. Temper of Plain Smudged Brown Ware Types

Temper	Reserve Smudged Body		Smudged Fillet Rim		Plain Smudged Rim		Early Smudged		Smudged Painted		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Not examined	29	.3	6	2.1	6	.4	0	.0	0	.0	41	.3
Mogollon lithic and sand	7287	65.6	31	10.6	994	67.7	8	100.0	9	69.2	8329	64.6
Mogollon tuff	1909	17.2	214	73.3	188	12.8	0	.0	2	15.4	2313	17.9
Mogollon sand	1882	16.9	41	14.0	281	19.1	0	.0	1	7.7	2205	17.1
Sand and sherd	0	.0	0	.0	0	.0	0	.0	1	7.7	1	.0
Sandstone	1	.0	0	.0	0	.0	0	.0	0	.0	1	.0
Total	11108	100.0	292	100.0	1469	100.0	8	100.0	13	100.0	12890	100.0

Table 4.6. Vessel Forms of Plain Smudged Brown Ware Types

Vessel Form	Reserve Smudged Body		Smudged Fillet Rim		Plain Smudged Rim		Early Smudged		Smudged Painted		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Indeterminate body polished	65	.2	0	.0	0	.0	0	.0	0	.0	65	.2
Bowl rim	52	.2	27	3.1	3045	97.9	1	11.1	25	30.5	3150	8.4
Bowl body	32002	96.1	844	95.9	3	.1	8	88.9	55	67.1	32912	88.0
Jar body	647	1.9	0	.0	0	.0	0	.0	0	.0	647	1.7
Cooking jar rim	4	.0	1	.1	45	1.4	0	.0	0	.0	50	.1
Cooking jar neck	104	.3	4	.5	7	.2	0	.0	1	1.2	116	.3
Corrugated exterior bowl	0	.0	0	.0	0	.0	0	.0	1	1.2	1	.0
Indeterminate	428	1.3	4	.5	2	.1	0	.0	0	.0	434	1.2
Seed jar rim	0	.0	0	.0	7	.2	0	.0	0	.0	7	.0
Olla rim	0	.0	0	.0	2	.1	0	.0	0	.0	2	.0
Effigy/fetish	2	.0	0	.0	0	.0	0	.0	0	.0	2	.0
Jar miniature	1	.0	0	.0	0	.0	0	.0	0	.0	1	.0
Total	33305	100.0	880	100.0	3111	100.0	9	100.0	82	100.0	37387	100.0

carbon material over a well-polished surface during the last stages of firing. Experimental firings indicate that this effect was probably achieved by placing large amounts of organic material, such as bark, inside an upside-down vessel. While this does not affect the exterior surface, it results in localized smudging of the interior during the last stages of fir-

ing. This technique usually resulted in the smudging of the entire vessel's interior surface only. On rare occasions, vessels fired using this technique may exhibit unsmudged areas along the interior near the rim or smudged bands near the rim on the exterior surface. Interestingly, smudged Mogollon brown wares from the Luna Project exhibit a similar varia-

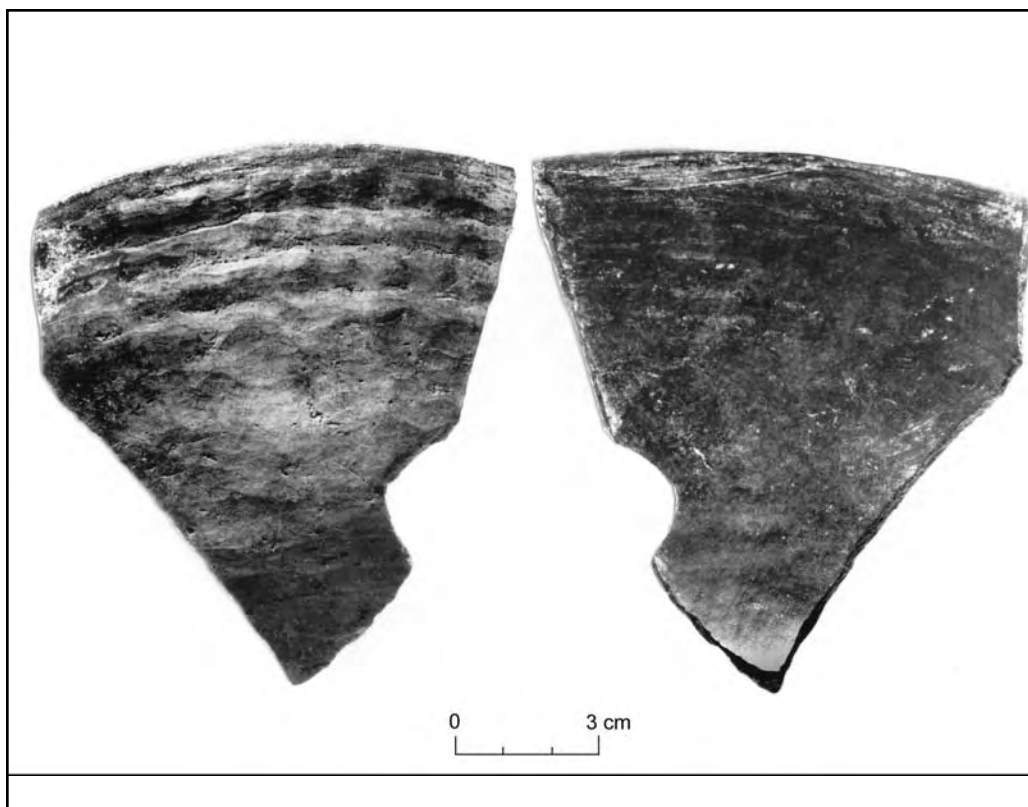


Figure 4.9. Reserve smudged from LA 70196, interior and exterior.

tion in the location of smudged surfaces as noted in these experimental firings, further indicating the use of this technique to achieve smudged interiors.

During the analysis, pottery exhibiting both smudged interior and corrugated exterior surfaces were assigned to smudged varieties of corrugated types. Plain smudged browns comprise 21.0 percent of all sherds. Plain smudged browns include Reserve smudged body, Reserve plain smudged rim, Tularosa filleted rim smudged, early smudged, and painted smudged. The exterior surfaces of smudged vessels exhibit the same range of colors noted for other brown wares. The majority of plain smudged sherds contain similar frequencies of types of inclusions described for other nonsmudged plain wares, although the size of particles in smudged types tend to be smaller. This may be a reflection of the suitability of finer nonplastics in highly polished surfaces. The great majority of the sherds belonging to this category appear to be derived from bowls, although jar forms are represented in extremely low frequencies (Table 4.6).

Reserve Smudged Body (Plain Smudged Body)

Reserve smudged or plain smudged body is similar to Alma Plain except for the presence of heavily

smudged interiors (Nesbitt 1938). Interior surfaces are highly polished with a thick smudged layer. Occasionally, sherds may be smudged on both the interior and exterior surface, but when exterior smudging is present, it is almost always limited to areas near the rim. The reduction and sooting of the interior surface is often very deep, and black color often penetrates halfway into the vessel wall. This often results in a streaky profile in which the exterior half of the vessel wall exhibits a brownish to reddish color, while the interior part exhibits a black to dark gray color.

The majority of the exterior surfaces also exhibit polished treatments. Polishing ranges from light sporadic polishing to very highly polished surfaces. These exterior surfaces include those that are evenly smoothed and heavily polished surfaces as well as less smoothed dimpled surfaces. The great majority of the Reserve smudged sherds represent bowl body sherds.

While it is sometimes implied that smudged brown wares did not appear until the Late Pithouse period, a low frequency of the sherds from Early Pithouse period assemblages exhibit interior polishing and smudging that may have been intentional. These sherds are slightly different in appearance from Reserve smudged, and were sometimes classi-

fied as early smudged. Sherds and vessels consistently exhibiting characteristics described for Reserve smudged sherds appear in significant frequencies during the Late Pithouse and Pueblo periods. Reserve smudged appears to represent a common type in assemblages dating to these periods.

Reserve Smudged Rim (Plain Smudged Rim)

Reserve smudged rim or Reserve Plain smudged rim refers to plain rims with polished interiors (Figs. 4.9-4.10). Wall thickness measurements for a small sample ranged from 4.8 to 7.5 mm, averaging 6.2 mm.

The majority of sherds assigned to this category represent bowl rim sherds, although cooking/storage jars are also represented. Bowl rim sherds exhibit a wide range of profiles and shapes. While depth and shape of bowls vary considerably, bowls are often unusually deep and steep compared to shapes noted for other Mogollon types. Rim profiles were also extremely variable and included tapered and rounded rims similar to those noted in other Mogollon brown wares, as well as rims exhibiting various degrees of flaring. These include slight flares and distinct eversion in the rim profile. Examples exhibiting flared rims are most common during later (Tularosa phase) occupations.

Tularosa Filleted Rim Smudged

Tularosa filleted rim smudged is similar to plain smudged rim but exhibits thin bands of textured manipulations near the exterior rims of bowls (Fig. 4.11). Rim sherds are distinguished from Reserve smudged by the presence of a fillet, and bands of textured decoration are often located below these fillets. These decorations may include one to five rows of textured decorations in rows of corrugated, fingernail incised, and punctate decorations. Three rows of textured decorations are most common. Width of rows range from 1.5 to 9.0 mm. For the sample of sherds examined, the width of these bands ranges from 6.4 to 14.3 mm and averages 10.2 mm. The rows of coils or other treatments are often not polished, whereas the smoothed exterior of both the rim fillet and lower body are always well polished. The combination of this exterior effect and the very polished black sooted interiors creates a particularly effective aesthetic effect. This type appears to be limited to later (Tularosa phase) occupations.

Vessel forms appear to be limited to bowls. Rim profiles are similar to those described for Reserve

Plain smudged and include tapered and rounded rims similar to those in other Mogollon brown wares, as well as rims exhibiting various degrees of flared treatments. Wall thickness measurements for a small sample of filleted rim smudged sherds range from 4.8 to 7.5 mm and average about 6.2 mm.

Starkweather Smudged (Smudged Decorated)

Starkweather smudged or smudged decorated refers to pottery with painted decorations under an unslipped brown ware surface covered by a smudged surface (Fig. 4.12). Sherds assigned to this category are identical to those previously classified as Starkweather smudged (Nesbitt 1938; Rinaldo and Bluhm 1956). Other than the presence of painted decorations, characteristics described are the same as for sherds classified as Reserve Plain smudged. The few sherds recovered during the Luna Project are derived from bowls. Vessel walls range from 4.5 to 8.0 mm and average 6.3 mm. The painted surface was polished, painted, and finally intentionally covered with a soot deposit during firing. Decorations are identified as duller black lines covered by the polished black smudged surface. Painted designs are often difficult to recognize, and it is likely that some of the sherds assigned to plain smudged types may contain decorations not readily visible through the smudged treatments. Painted areas are usually black or dark gray, although in rare cases they may be dark red or white.

Designs usually consist of fine to parallel, straight, zigzag, chevron, or spiraled lines. Lines range from about 1 to 5 mm in thickness. Other elements noted on Starkweather smudged sherds include triangles, squares or diamonds, dots, scrolls, and anthropomorphs. Orientations of designs are very simple and crudely executed. Starkweather Black-on-white occurs in Reserve and Tularosa phase contexts and represents one of the few painted types produced in the northern Mogollon during the Pueblo period. Design elements are very distinct from Reserve Black-on-white and Tularosa Black-on-white, the dominant painted types found at Pueblo period sites in this area, as well from Mimbres Black-on-white produced in the Mimbres region. Types and orientation of these designs indicate that Starkweather smudged was not a copy of contemporaneous painted types from either the Mimbres Mogollon or southern Cibola Anasazi regions, but probably derived out of Three Circle Red-on-white or Mangus Black-on-white, occurring in Late Pithouse period assemblages in this area.

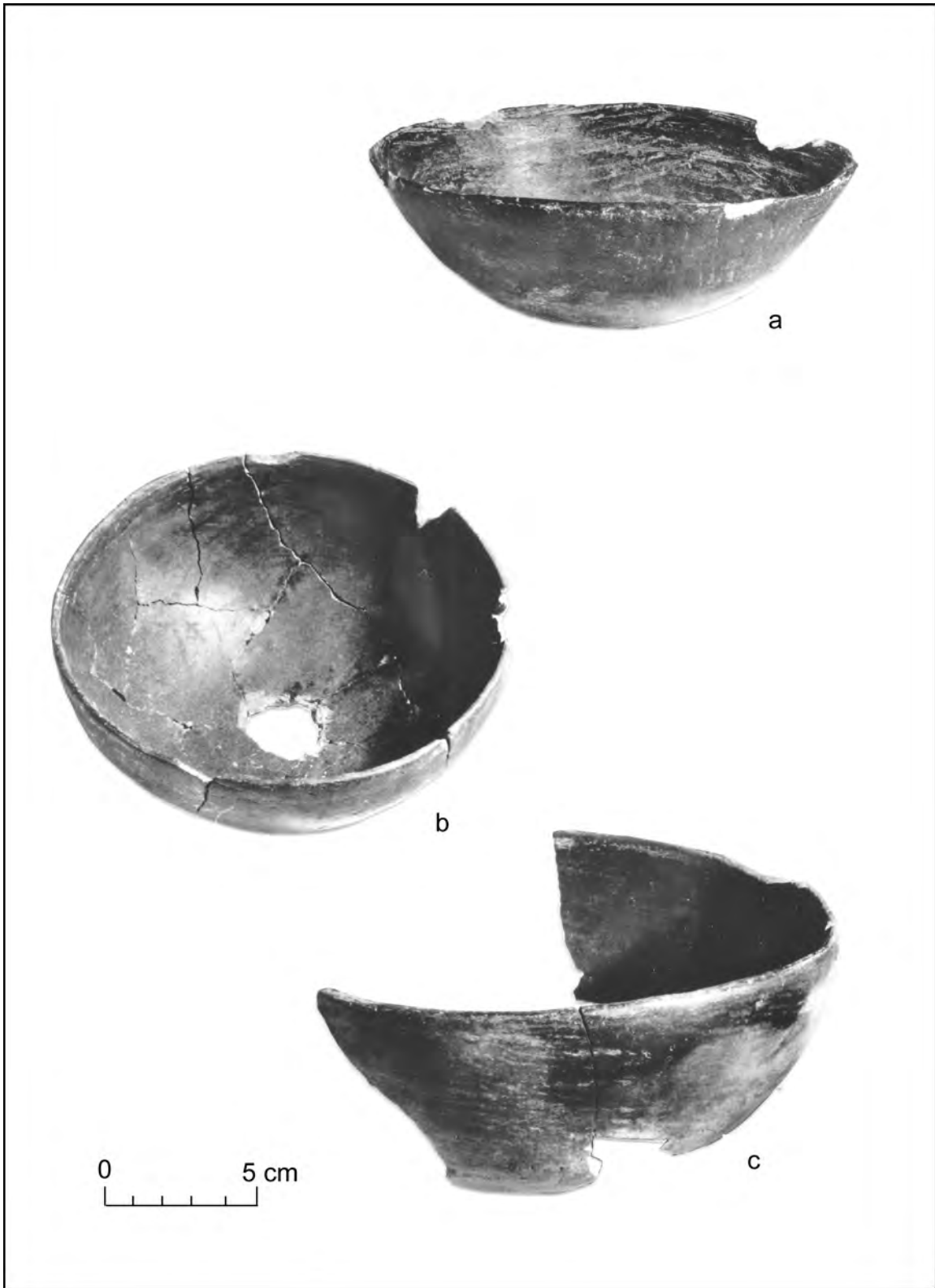


Figure 4.10. Reserve smudged; (a, c) LA 39969, (b) LA 39968.

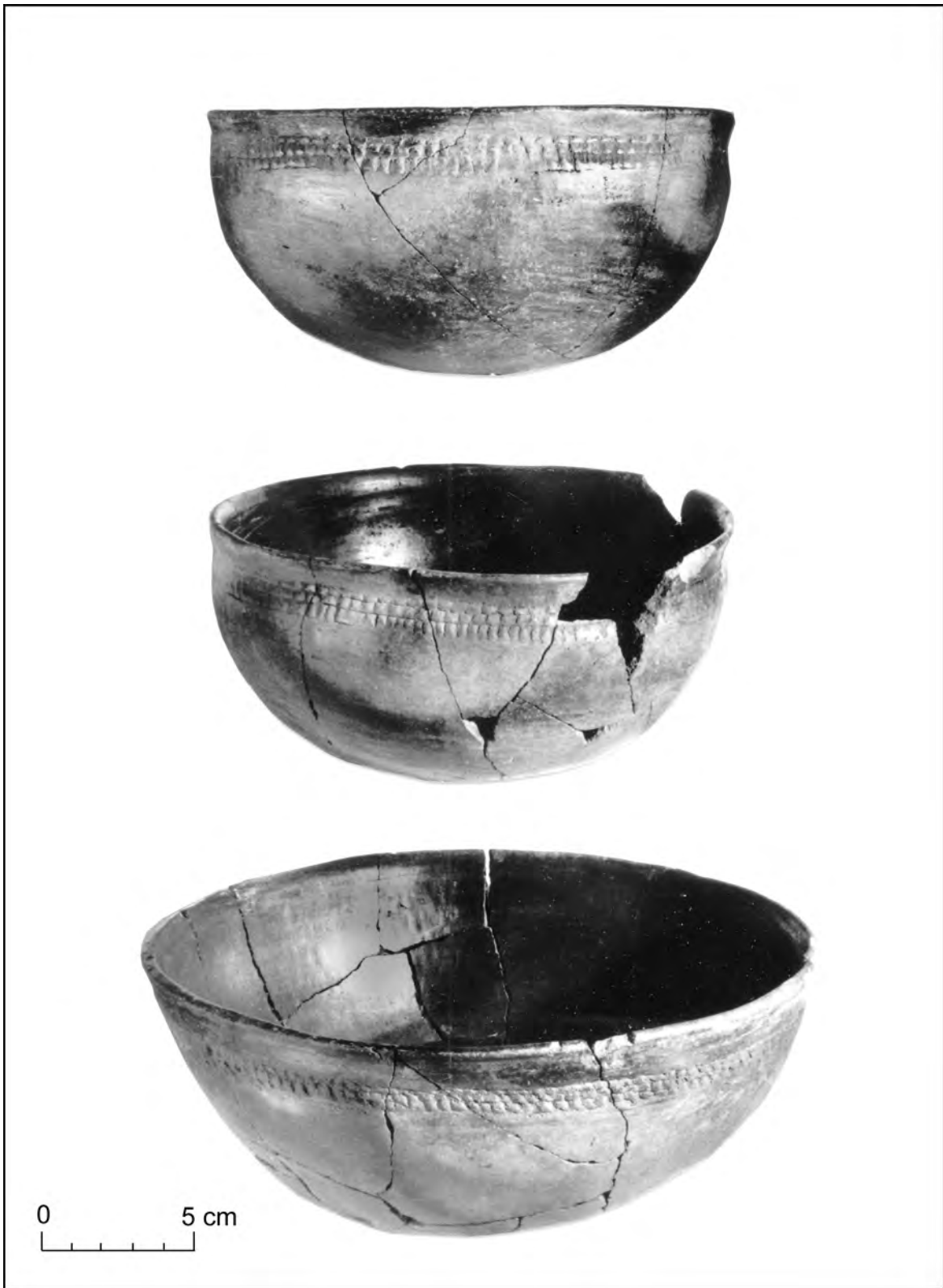


Figure 4.11. Tularosa fillet rim smudged from LA 3279.

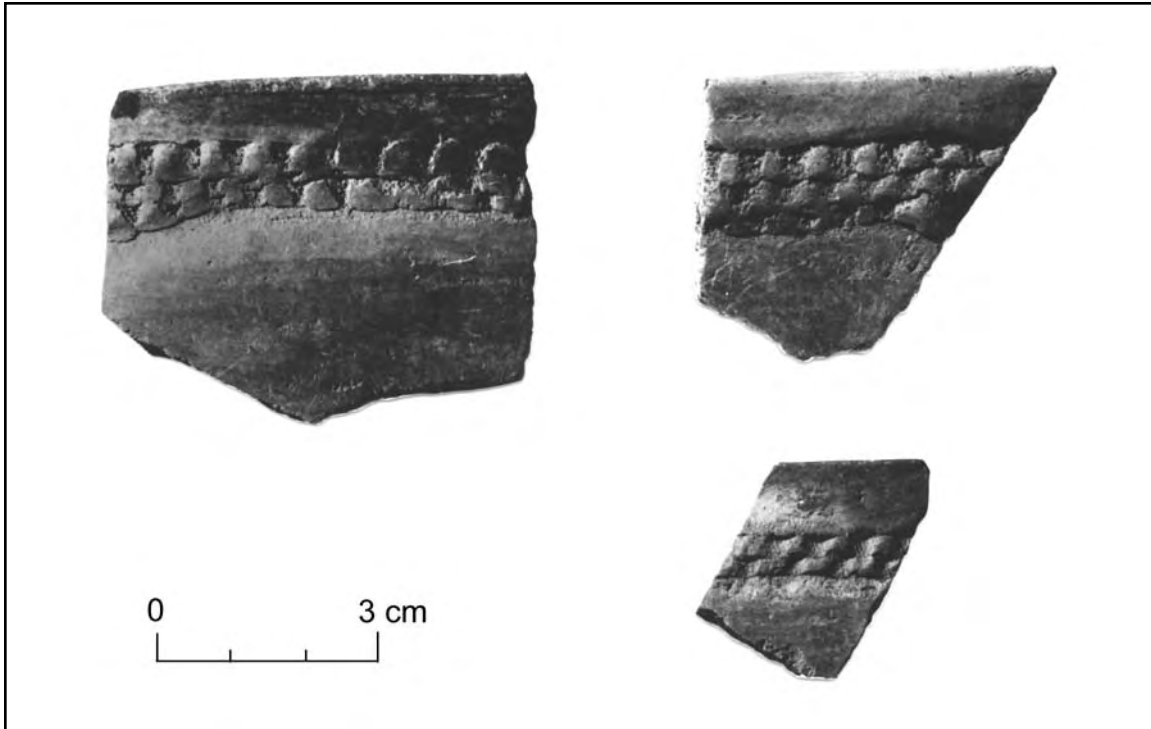


Figure 4.11. Continued. Tularosa fillet rim smudged, LA 3279.



Figure 4.12. Starkweather smudged.

Table 4.7. Temper of Corrugated Brown Ware Types

Temper	Reserve Plain Corrugated		Reserve Plain Corrugated Smudged		Reserve Corrugated Indented		Reserve Corrugated Indented Smudged		Tularosa Corrugated Patterened		Tularosa Corrugated Patterened Smudged		Indented Corrugated		Indented Corrugated Smudged	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Not examined	5	.1	1	.2	24	.9	5	1.1	14	8.6	0	.0	2	.1	1	.9
Indeterminate	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
None	10	.3	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Mogollon lithic and sand	2129	62.1	186	46.2	945	34.4	131	30.0	48	29.6	5	35.7	1327	79.8	90	82.6
Mogollon tuff	585	17.1	102	25.3	1310	47.7	210	48.2	84	51.9	2	14.3	90	5.4	2	1.8
Mogollon sand	699	20.4	114	28.3	465	16.9	90	20.6	16	9.9	7	50.0	243	14.6	16	14.7
Sandstone	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Total	3428	100.0	403	100.0	2744	100.0	436	100.0	162	100.0	14	100.0	1662	100.0	109	100.0

Temper	Alternating Corrugated		Overlap Corrugated		Overlap Corrugated Smudged		Indeterminate Corrugated		Punctated Corrugated		Punctated Incised and Corrugated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Not examined	0	.0	0	.0	0	.0	1	.1	1	1.6	0	.0	54	.4
Indeterminate	0	.0	0	.0	1	.5	0	.0	0	.0	0	.0	1	.0
None	0	.0	0	.0	0	.0	1	.1	0	.0	0	.0	11	.1
Mogollon lithic and sand	141	60.8	1683	85.0	173	80.8	713	74.0	48	76.2	0	.0	7619	61.4
Mogollon tuff	22	9.5	63	3.2	4	1.9	68	7.1	5	7.9	1	100.0	2548	20.5
Mogollon sand	69	29.7	235	11.9	36	16.8	180	18.7	9	14.3	0	.0	2179	17.6
Sandstone	0	.0	0	.0	0	.0	1	.1	0	.0	0	.0	1	.0
Total	232	100.0	1981	100.0	214	100.0	964	100.0	63	100.0	1	100.0	12413	100.0

Table 4.8. Vessel Forms of Corrugated Brown Ware Types

Vessel Form	Reserve Plain Corrugated		Reserve Corrugated Indented		Reserve Corrugated Indented Smudged		Tularosa Corrugated Patterned		Tularosa Corrugated Patterned Smudged		Incised Corrugated		Incised Corrugated Smudged		Alternating Corrugated			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Indeterminate body polished	1	.0	0	.0	3	.1	1	.2	0	.0	0	.0	1	.1	0	.0	0	.0
Bowl rim	26	.8	48	10.8	37	1.6	144	21.8	1	.4	14	30.4	1	.1	3	3.0	19	4.5
Bowl body	188	5.7	246	55.3	154	6.7	263	50.4	8	3.1	19	41.3	25	1.8	22	22.0	46	11.0
Jar body	838	25.4	17	3.8	778	33.7	19	3.6	101	39.8	4	8.7	113	8.3	4	4.0	108	25.8
Cooking jar rim	250	7.6	10	2.2	322	14.0	5	1.0	29	11.4	0	.0	66	4.8	3	3.0	14	3.3
Cooking jar neck	1817	55.1	73	16.4	855	37.0	42	8.0	108	42.5	3	6.5	1131	83.0	62	62.0	207	49.5
Jar body, corrugated and polish	57	1.7	18	4.0	49	2.1	15	2.9	4	1.6	1	2.2	9	.7	2	2.0	10	2.4
Corrugated exterior bowl	12	.4	19	4.3	15	.6	35	6.7	1	.4	3	6.5	1	.1	0	.0	3	.7
Indeterminate	105	3.2	13	2.9	82	3.6	19	3.6	2	.8	0	.0	13	1.0	4	4.0	10	2.4
Olla rim	0	.0	0	.0	2	.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Effigy/fetish	0	.0	0	.0	1	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Jar miniature	1	.0	1	2	3	.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Indeterminate bowl/jar corrugated exterior	2	.1	0	.0	6	.3	8	1.5	0	.0	2	4.3	2	.1	0	.0	0	.0
Plate rim	0	.0	0	.0	0	.0	1	.2	0	.0	0	.0	0	.0	0	.0	0	.0
Whole jar	0	.0	0	.0	1	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Total	3297	100.0	445	100.0	2308	100.0	522	100.0	254	100.0	46	100.0	1362	100.0	100	100.0	418	100.0

Table 4.8. (continued)

Vessel Form	Overlap Corrugated		Overlap Corrugated Smudged		Indeterminate Corrugated		Punctuated Corrugated		Punctuated Incised Corrugated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Indeterminate body polished	0	.0	0	.0	9	.9	0	.0	0	.0	15	.1
Bowl rim	8	.6	11	7.0	23	2.2	0	.0	1	16.7	306	2.7
Bowl body	66	5.2	88	55.7	81	7.9	7	5.8	1	16.7	1214	10.7
Jar body	154	12.2	2	1.3	225	21.9	20	16.5	1	16.7	2384	21.1
Cooking jar rim	49	3.9	2	1.3	124	12.1	3	2.5	1	16.7	878	7.8
Cooking jar neck	958	76.2	50	31.6	458	44.6	79	65.3	2	33.3	5845	51.6
Jar body corrugated and polished	15	1.2	2	1.3	7	.7	3	2.5	0	.0	192	1.7
Corrugated exterior bowl	1	.1	3	1.9	2	.2	2	1.7	0	.0	97	.9
Indeterminate	7	.6	0	.0	96	9.3	5	4.1	0	.0	356	3.1
Olla rim	0	.0	0	.0	1	.1	0	.0	0	.0	3	.0
Effigy/fetish	0	.0	0	.0	0	.0	0	.0	0	.0	1	.0
Jar miniature	0	.0	0	.0	0	.0	0	.0	0	.0	5	.0
Indeterminate bowl/jar corrugated exterior	0	.0	0	.0	2	.2	2	1.7	0	.0	24	.2
Plate rim	0	.0	0	.0	0	.0	0	.0	0	.0	1	.0
Whole jar	0	.0	0	.0	0	.0	0	.0	0	.0	2	.0
Total	1258	100.0	158	100.0	1028	100.0	121	100.0	6	100.0	11323	100.0

While such examples were not noted during the present study, such a technology could account for the occurrence of Mogollon Red-on-brown sherds at later contexts in other areas to the south (Lekson 1990). As Starkweather decorations occur on smudged interiors, this type appears to be limited to bowl forms.

CORRUGATED BROWN WARE TYPES

Corrugated brown wares are usually distinguished from earlier neckbanded types in that the unobliterated coils or corrugations tend to be thinner and are often present over the entire vessel. Observations of corrugated pottery from the Luna Project support those from studies that emphasize the complexity and wide variety noted in surface texture treatment in Mogollon Brown Ware corrugated types (Stone 1986). In order to document the variability in corrugated vessels, a number of corrugated types were differentiated based on coil shape, thickness, degree of overlap, presence and type of indentation or tooled treatment, and the presence of interior smudging. The wide range of corrugated treatments noted in Mogollon Brown Ware resulted in the recognition of a number of distinct corrugated brown wares. Many of the types presented here were first described by Rinaldo and Bluhm (1956), whose descriptions were based on examinations of ceramics from a number of different sites near Reserve dating to the Reserve and Tularosa phases, based on excavations by Paul Martin. Some of the variation noted in corrugated treatments were used to define additional types not defined by Rinaldo and Bluhm (1956). A total of 7.0 percent of the sherds from Luna Project sites were assigned to corrugated brown wares. Corrugated brown wares in Luna ceramic analysis include indeterminate corrugated, Reserve Plain corrugated, Reserve Plain corrugated smudged, plain overlapping corrugated, plain corrugated, Reserve indented corrugated, Reserve indented corrugated smudged, Reserve incised corrugated, Reserve punched corrugated, Reserve punctated corrugated smudged, Tularosa patterned corrugated, Tularosa patterned corrugated smudged, alternating corrugated, alternating corrugated smudged, and incised punched corrugated.

Paste, paste characteristics, and surface color are similar to those noted for other brown wares (Table 4.7). Most of the paste cross sections from unsmudged corrugated sherds were brown throughout the wall, although sherds with gray and reddish profiles or gray cores were also fairly common.

Corrugated sherds exhibiting smudged interiors revealed darker profiles toward the interior side. Tempering inclusions are similar in other brown ware types except particles tend to be smaller for corrugated types exhibiting smudged or highly polished interiors.

The majority of corrugated sherds appear to be derived from cooking/storage jars, although significant frequencies are from bowls (Table 4.8). Other forms are represented in extremely low frequencies. Bowl forms are usually represented by corrugated sherds with smudged interiors. Corrugated jars are often very everted near the rim. Some sherds were polished on the exterior surface. About half of these sherds were also polished on the interior surface. The thickness of vessel walls near the rim ranges from 5.0 to 7.5 mm and averages 6.4 mm.

Indeterminate Corrugated

Indeterminate corrugated refers to corrugated sherds for which the type of coiled treatment could not be determined, usually as a result of small sherd size. Therefore, attributes of this type cannot be described.

Reserve Plain Corrugated (Very Fine Plain Corrugated)

Reserve Plain corrugated or very fine plain corrugated is characterized by very thin coils not exhibiting spaced indentations on vessel exteriors (Figs. 4.13-4.16). Juncures between coils are usually very distinct and display considerable relief relative to thickness. Coils usually, but not always, overlap each other, producing a clapboard effect. Coils are usually unpolished, although rare polished examples were noted. Polishing is usually limited to nonoverlapping coils. Sherds assigned to this category are very similar to those classified as Three Circle neck corrugated and overlapping corrugated, and there is definite overlap between sherds assigned to these three types. Sherds classified as Reserve Plain corrugated are often distinguished from these two categories by thinner coils. Reserve Plain corrugated is also distinguished from Three Circle neck corrugated by the common occurrence of unobliterated coils along the lower portions of vessels and the presence of a wider and distinct top fillet. The width of coils of Reserve Plain corrugated ranges from 1.5 to 6.0 mm and averages 3.4 mm.

Reserve Plain corrugated is present in assemblages dating to both the Reserve and Tularosa phases.

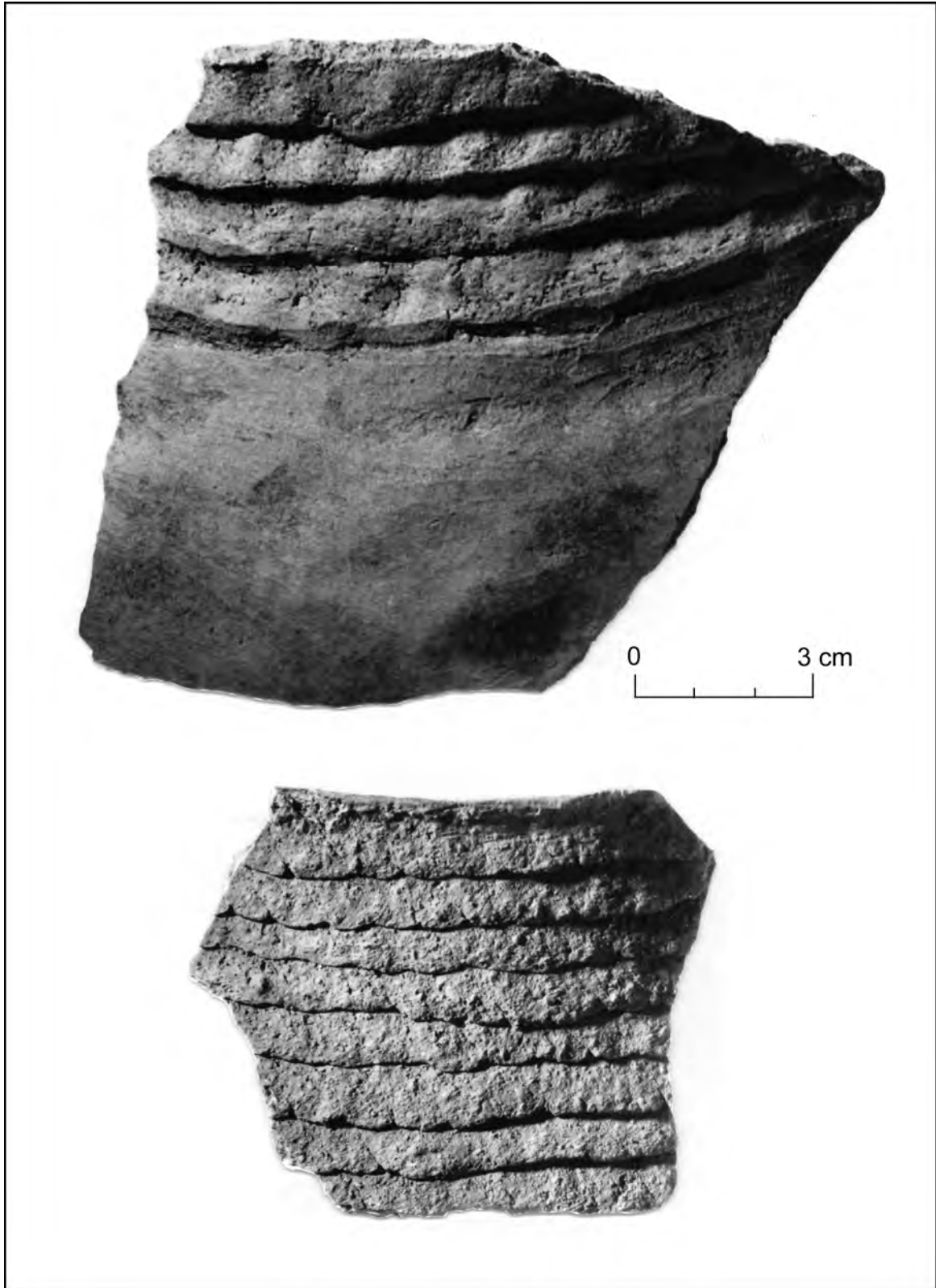


Figure 4.13. Reserve Plain corrugated, LA 45507.

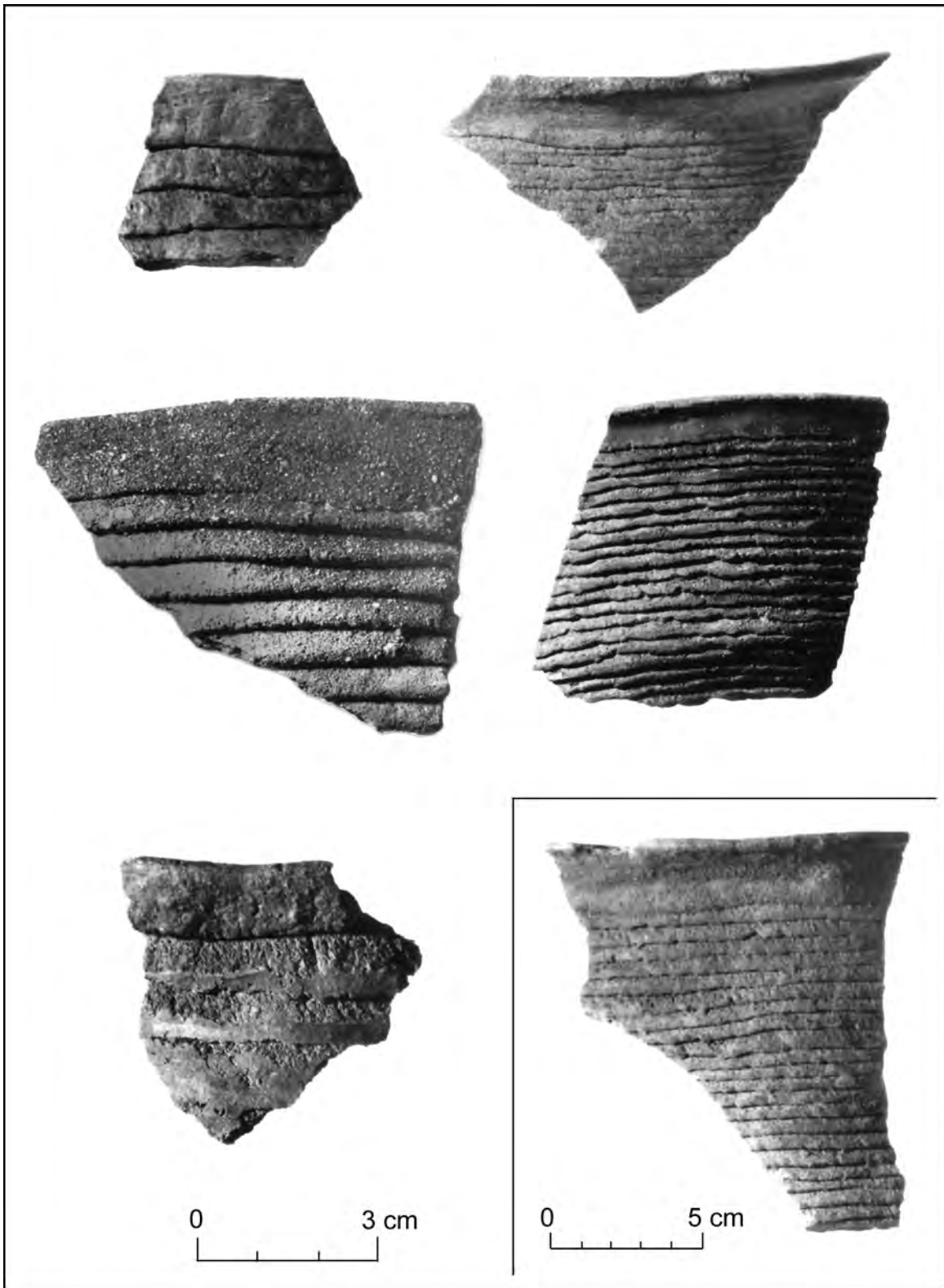


Figure 4.14. Reserve Plain corrugated, LA 70185.

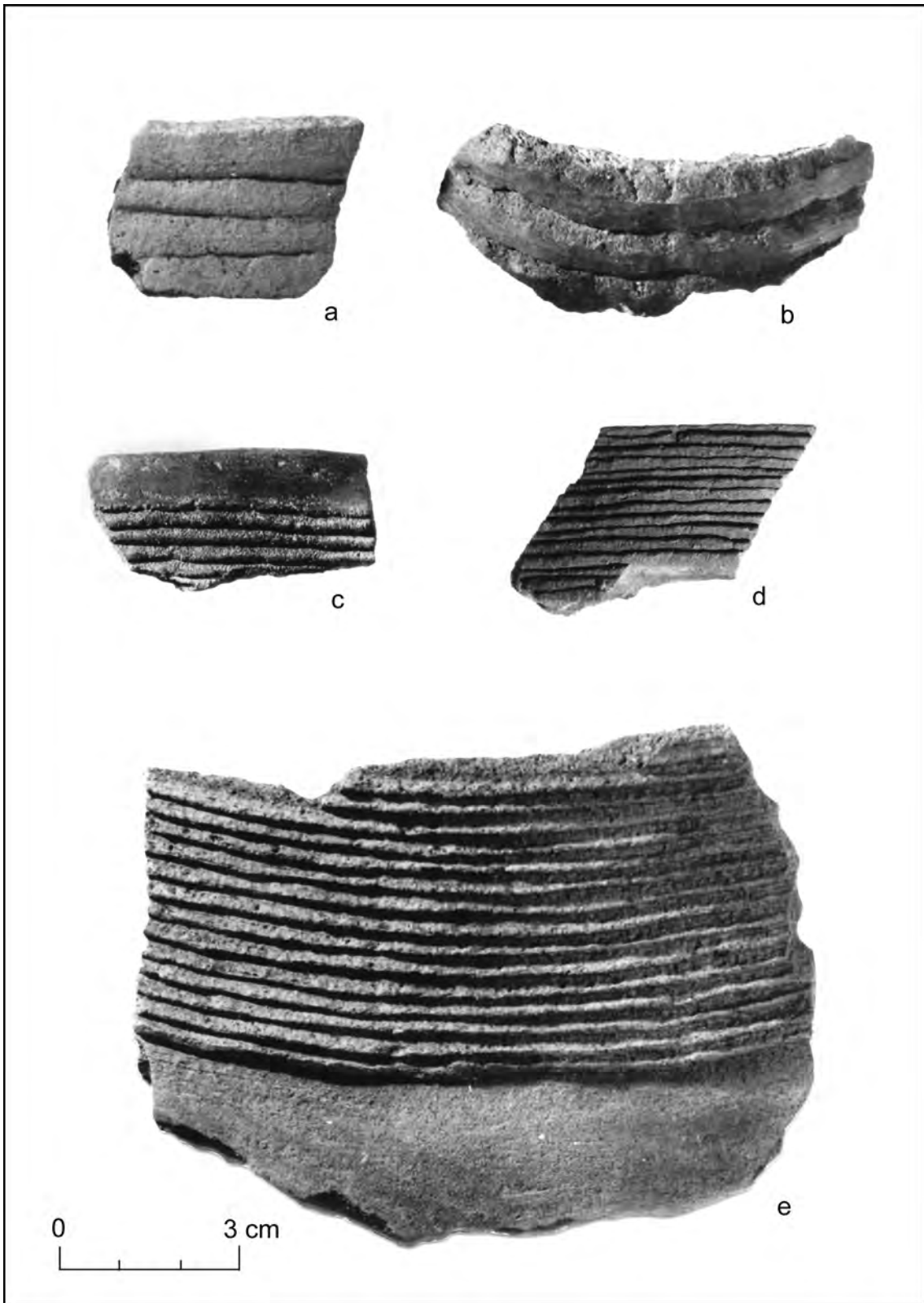


Figure 4.15. Reserve Plain corrugated; (a-b) LA 45510, (c) LA 39969, (d) LA 70139, (e) LA 3563.

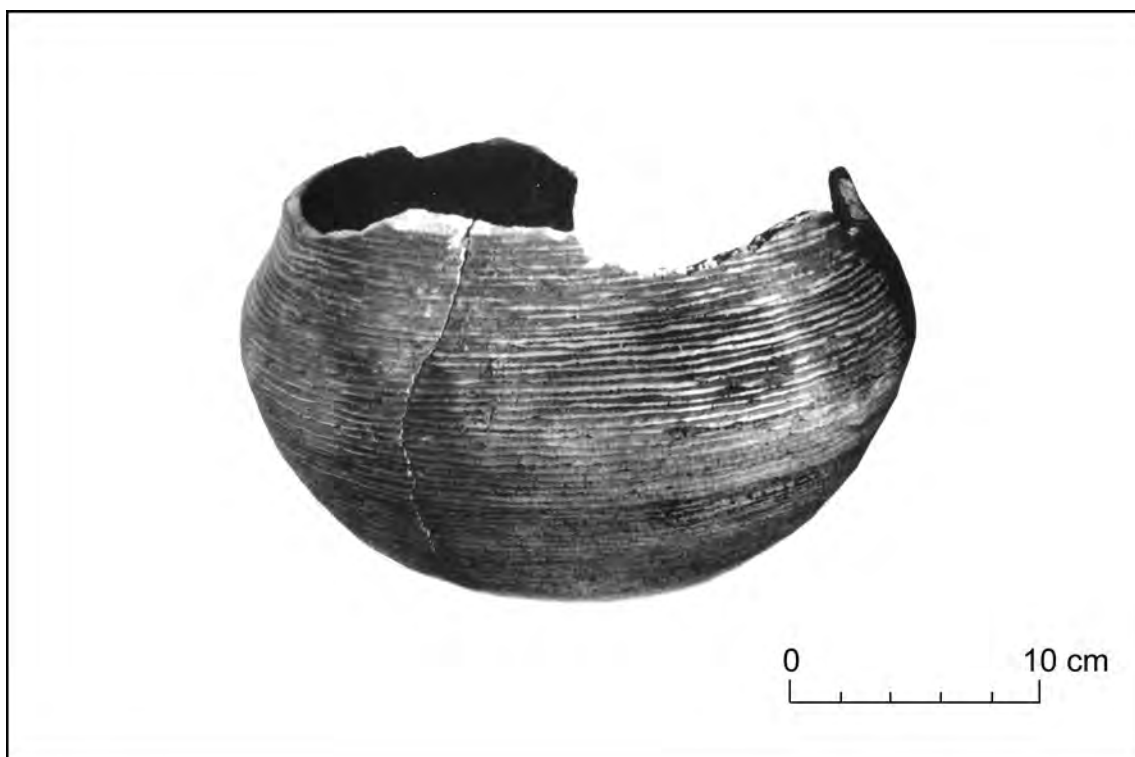


Figure 4.16. Reserve plain corrugated, LA 3279.

es and appears to represent the dominant corrugated type at contexts dating throughout the Reserve phase as well as during the early part of the Tularosa phase.

Reserve Plain Corrugated Smudged (Very Fine Plain Corrugated Smudged)

Reserve Plain corrugated smudged or very fine plain corrugated smudged refers to vessels with polished smudged interiors and treatments on vessel exteriors identical to those described for plain (very fine) corrugated. Smudged forms represent 7.8 percent of all very fine plain corrugated sherds.

Plain Overlapping Corrugated

The utilization of the plain overlapping category represented an attempt to divide sherds previously assigned to Reserve Plain corrugated into distinct, potentially temporal, sensitive groupings. Plain overlapping corrugated was defined in an attempt to distinguish sherds exhibiting coil treatments intermediate in characteristics between those described for plain (very fine) corrugated and neck coiled. Sherds appear to be similar to those previously assigned to Reserve Plain corrugated (Rinaldo and

Bluhm 1956). Ideally, this category was developed to discern the wider (more than 5 mm) clapboard effect observed in plain corrugated sherds. A reexamination of sherds indicates that this effort was largely unsuccessful, because there is considerable overlap in characteristics assigned to the very fine plain corrugated and plain overlapping corrugated. While differences in distributions of sherds assigned to Reserve Plain corrugated versus plain overlapping corrugated may provide some potentially useful information, it is recommended that in future studies these categories be lumped together.

Plain Overlapping Corrugated Smudged

This category refers to sherds exhibiting manipulation identical to those described for plain (overlapping) corrugated with the addition of an intentionally smudged interior. Smudged forms represent 10.4 percent of all sherds exhibiting exterior treatments described for plain overlapping corrugated.

Reserve Indented Corrugated (Indented Corrugated)

Reserve indented corrugated or indented corrugated is similar to Reserve Plain corrugated except all the

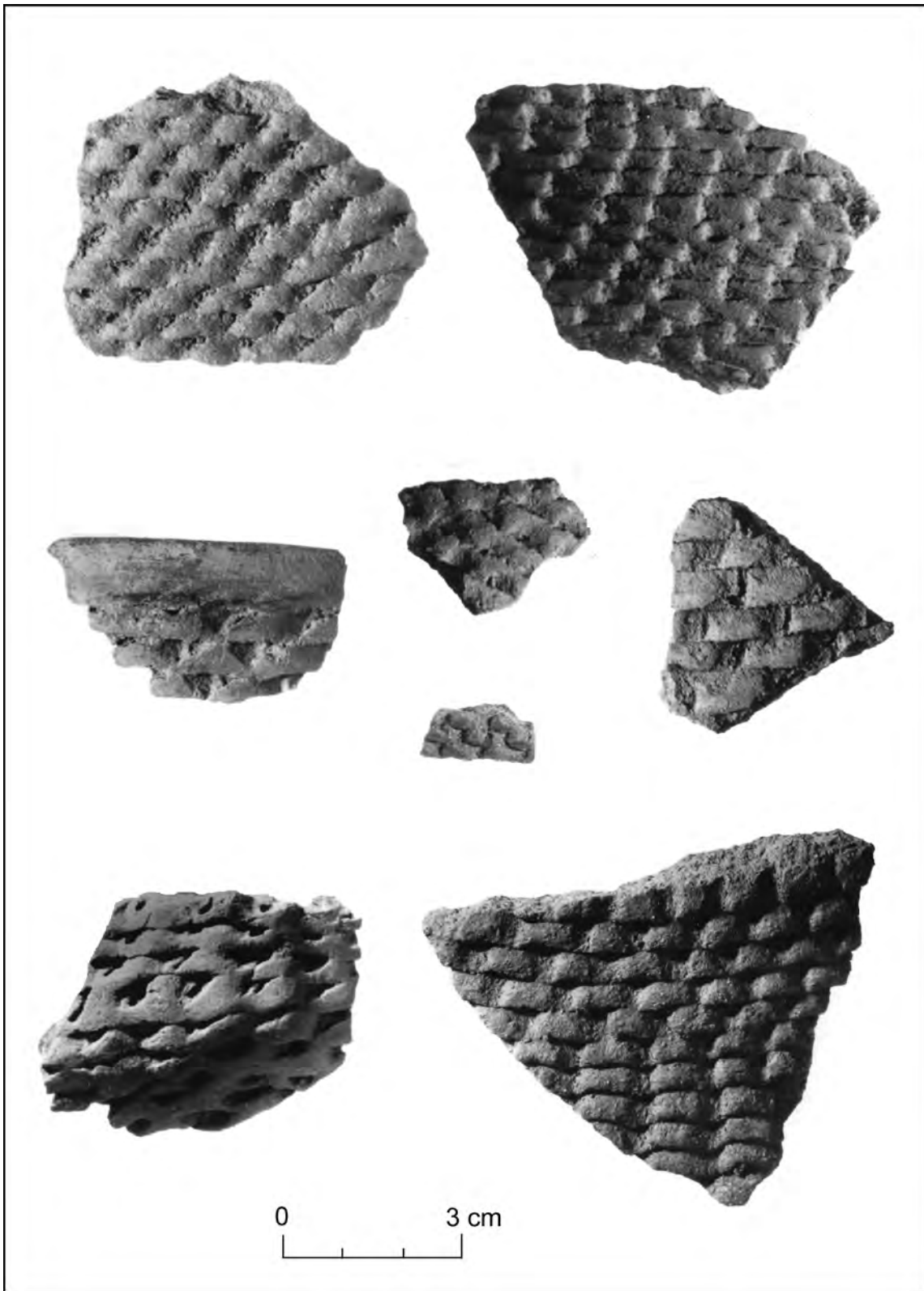


Figure 4.17. Reserve indented corrugated, LA 39968.

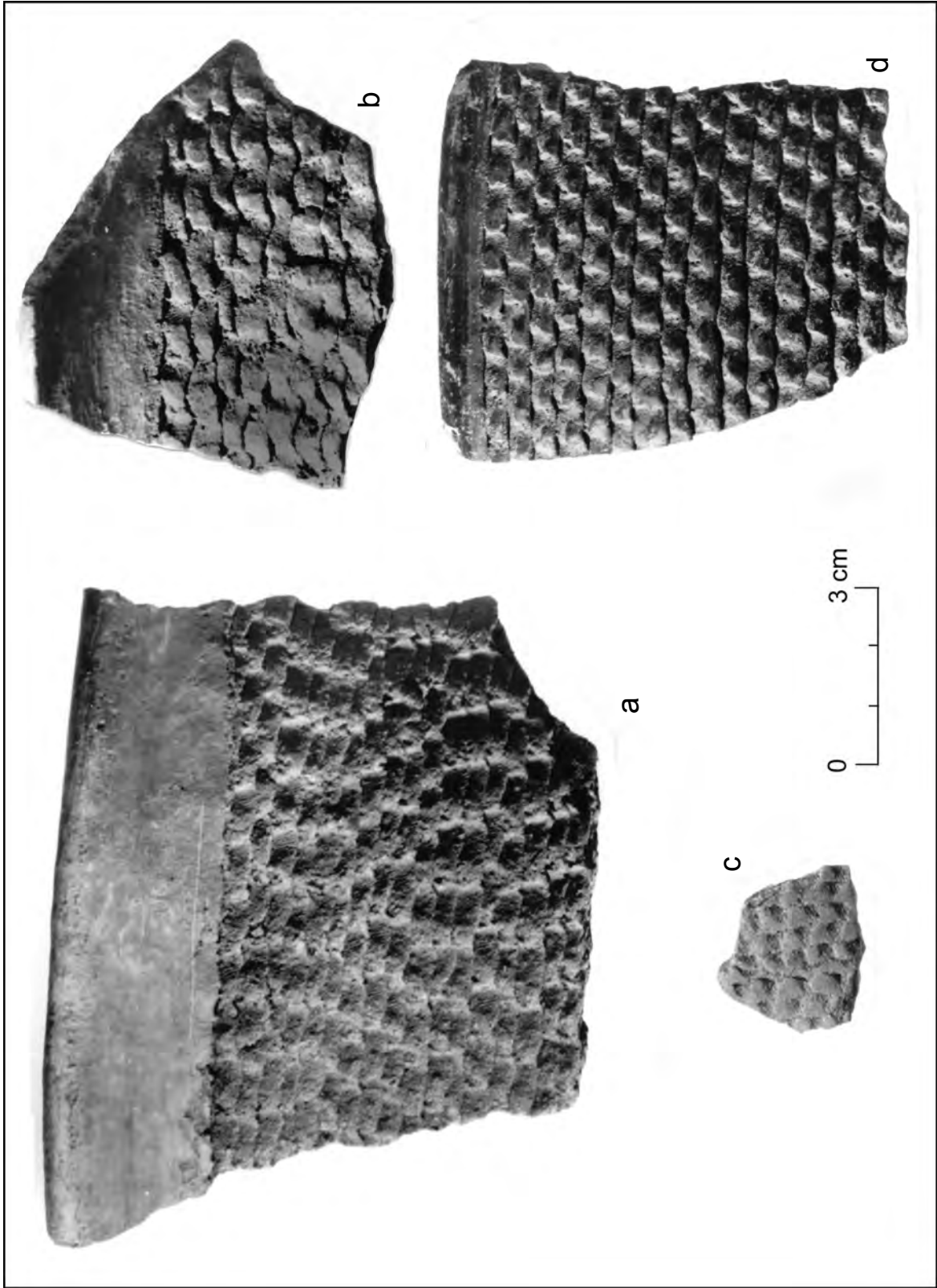


Figure 4.18. Reserve indented corrugated; (a-c) LA 3279, (d) LA 39969.

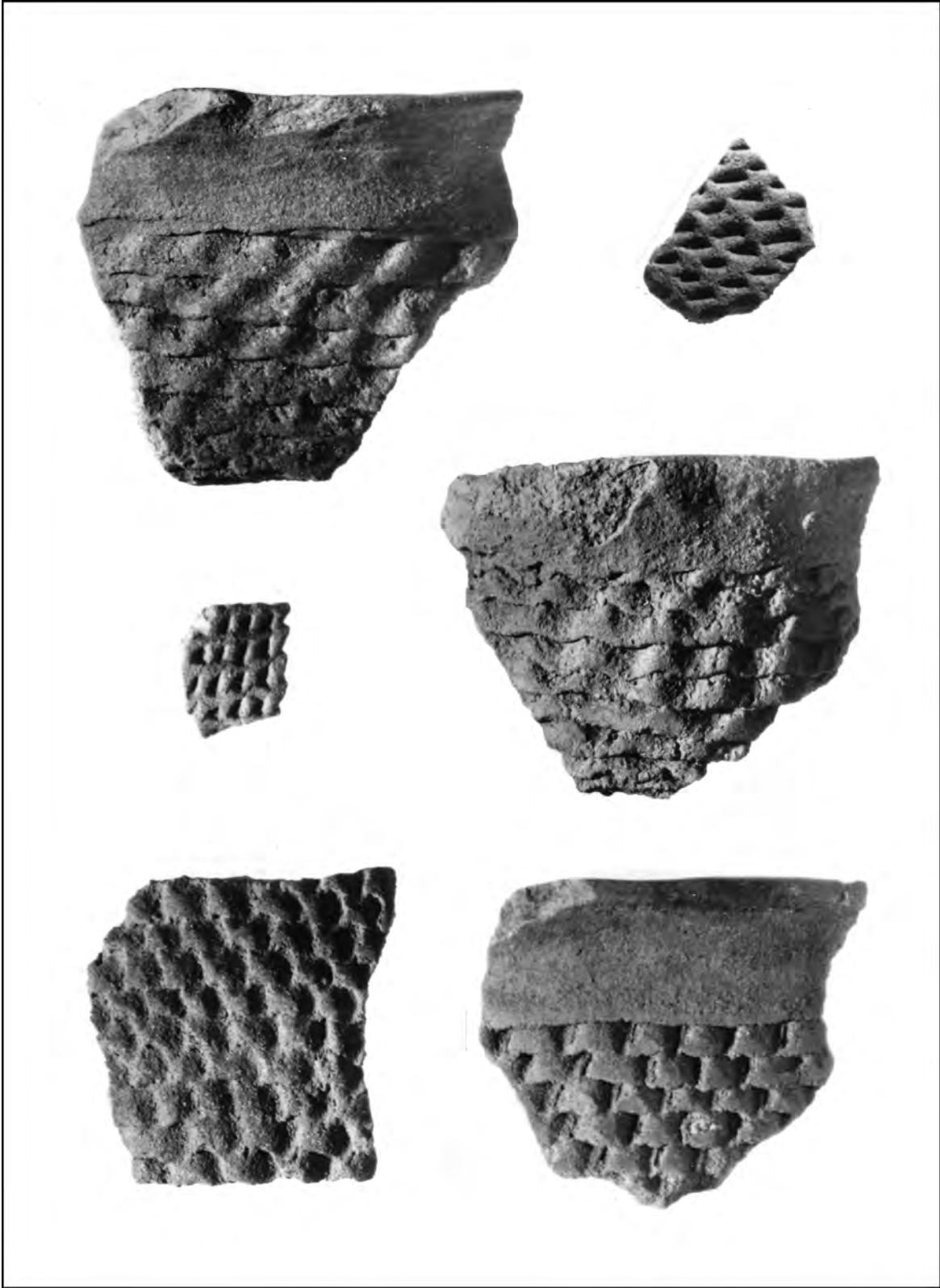


Figure 4.19. Reserve indented corrugated, LA 70135.

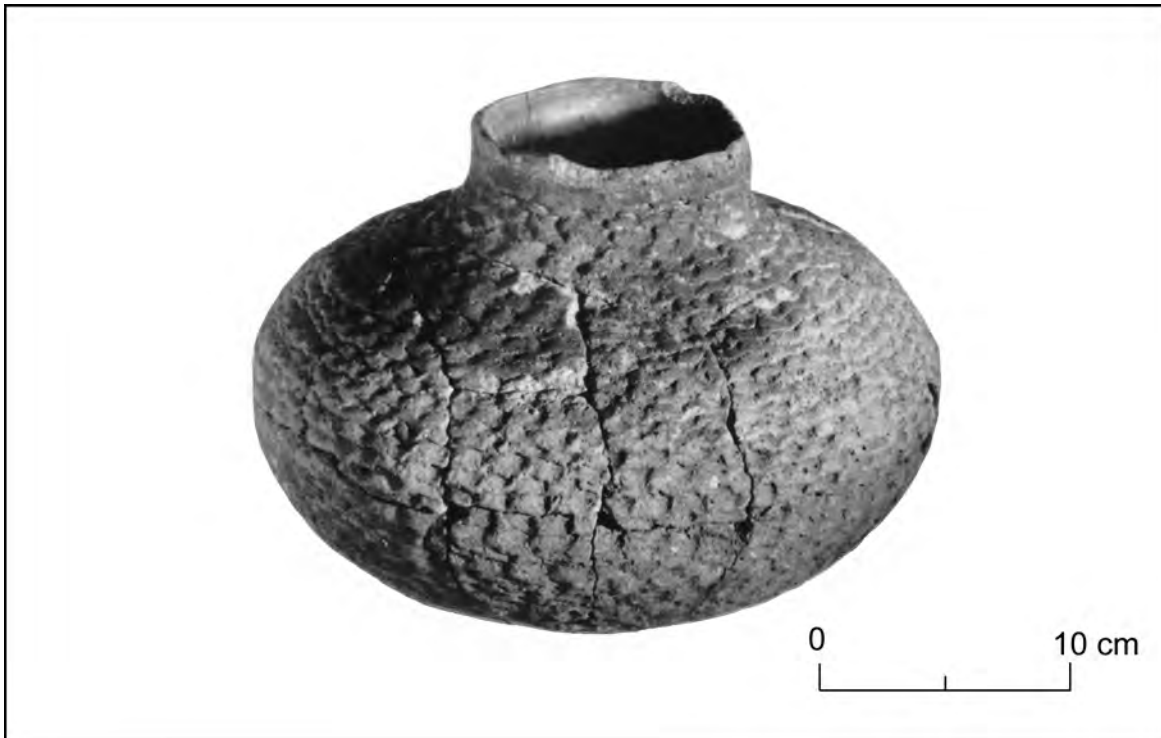


Figure 4.20. Reserve indented corrugated, LA 3279.

coils exhibit a series of evenly spaced indentations (Figs. 4.17-4.20). Of all the corrugated types defined for Mogollon brown wares, those for Reserve indented corrugated most closely resemble textures noted in the corrugated gray ware at Anasazi sites dating to the Pueblo II and Pueblo III periods. Despite these similarities, individual corrugated treatments on Reserve corrugated tend to be smaller in size and shape and more precise in execution as compared to contemporaneous Anasazi indented corrugated types. Individual corrugated treatments may be square, rectangular, or triangular in shape. Coils are usually unpolished, although rare polished examples were noted. Polishing is usually limited to surfaces exhibiting more or less pronounced corrugations. Indentations on sherds assigned to this type tend to be distinct, and corrugated treatments are fairly pronounced. Indented areas are sometimes spaced in a manner to create vertical or angular patterns down the vessel. The length of individual corrugated treatments ranges from 2.5 to 15 mm across and averages 8.0 mm. The width of coils ranges from 1.9 to 12 mm and averages 4.7 mm. Almost all indented corrugated sherds contain an unobliterated top fillet, and these mostly range from 6 to 30 mm in thickness and average 17.7 mm. The indented corrugated treatments usually cover the entire vessel, although in some cases only the neck or the neck and upper portions of the body are corrugated. The

thickness of vessel walls near the rim ranges from 4.5 to 10 mm and averages 7.1 percent mm.

Reserve corrugated appears to have been produced during the Reserve and Tularosa phases. The date given for this type is A.D. 1050 to 1250, although I suspect it spans from about A.D. 1000 to 1300. The relative abundance of Reserve corrugated sherds appears to be the highest at later Pueblo period occupations, particularly those dating to the late Tularosa phase.

*Reserve Indented Corrugated Smudged
(Indented Corrugated Smudged)*

Reserve indented corrugated smudged or indented corrugated smudged are characterized by exterior treatments described for indented corrugated, with the addition of smudging on a highly polished interior, and is contemporaneous with this type. Smudged forms represent 9.6 percent of all sherds exhibiting exterior treatments described for Reserve indented corrugated.

*Reserve Incised Corrugated (Tooled
Corrugated)*

The great majority of ceramics classified as incised corrugated or tooled corrugated exhibit exterior



Figure 4.21. Reserve incised indented, LA 70185.

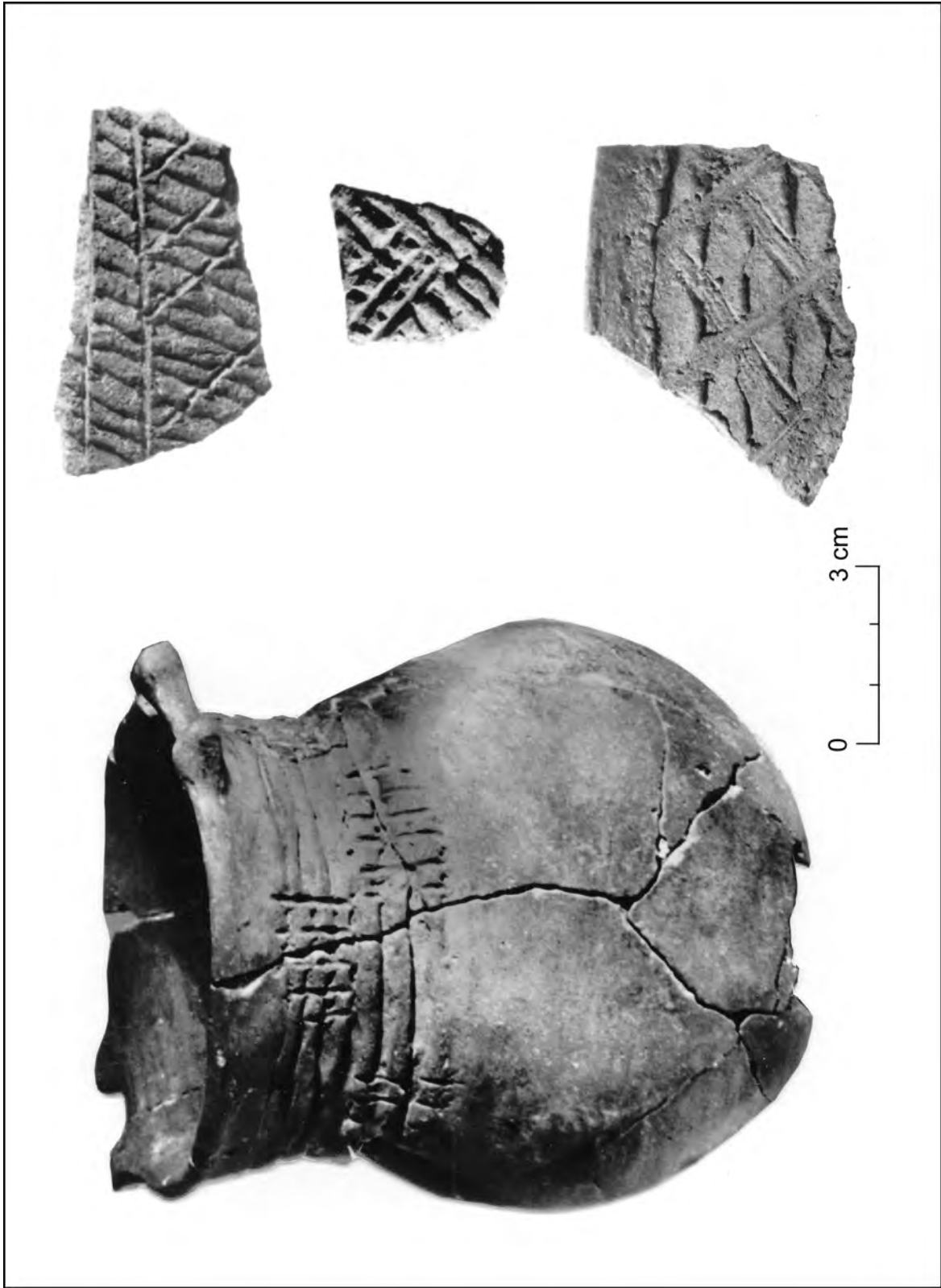


Figure 4.22. Reserve incised corrugated, LA 39968.

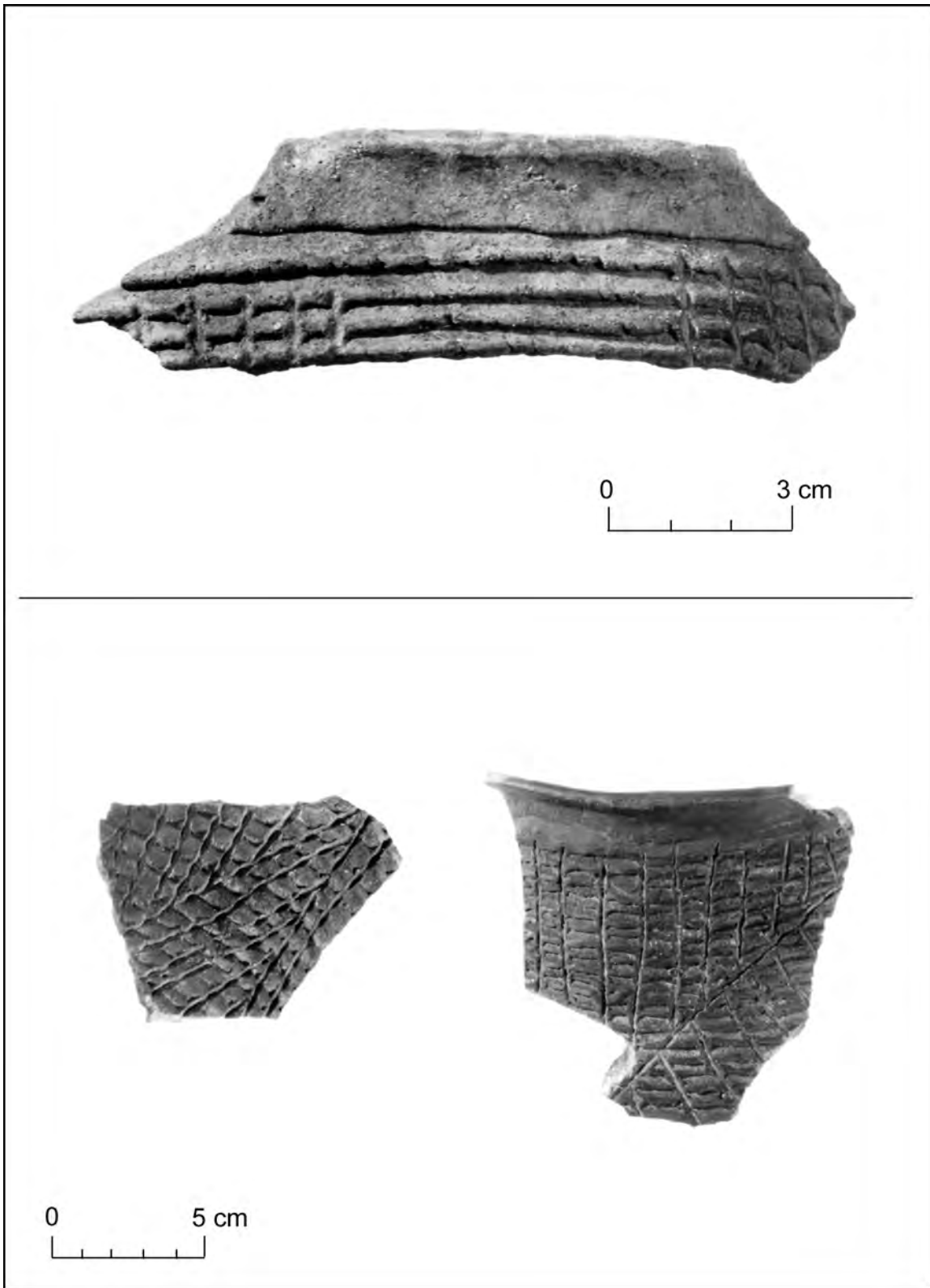


Figure 4.23. Reserve incised indented; (upper) LA 45510, (lower) LA 39968.

treatments similar to those described for Reserve Plain indented corrugated, but with the addition of incised decorations (Figs. 4.21-4.23). A few sherds exhibiting manipulations similar to those for Reserve indented corrugated with incised decorations were also classified as Reserve incised corrugated. Incised lines are usually thin and somewhat shallow but easily identified. Incised lines range from 2 to 4 mm in width. Wear patterns associated with these lines indicate that most of these were made with a solid thin tool such as a stick, although the presence of thin parallel striations indicate a few were created using a softer fibrous brushlike tool. The effect created by incising corrugated surfaces somewhat resembles the effect noted in indented corrugated, although actual indentations created by incised lines are thinner and more linear, and spacing between compressed or incised areas is wider. Patterns created by indented lines are fairly consistent and include a series of parallel lines going vertically or angling down from the rim. Spacing between parallel lines measures from 4 to 30 mm apart and averages 9.6 mm. The orientation of these lines is often parallel or angular to the unobliterated coils, creating a series of hatched patterns framed by these lines. In rare cases, incised lines were embellished with a series of evenly spaced short lines or ticks. Within the overall vessel, parallel lines may intersect, creating larger patterns of nested triangles, cross-hatching, stepped elements, zigzags, and rectilinear patterns. There is remarkable consistency in designs represented in incised corrugated pottery found in the Mogollon Highlands because Reserve incised corrugated appears to represent a fairly unique and uniform type. In some cases, indented and punched decorations occur together to create a single effect. Incised decorations commonly dominate, and in such cases ceramic items are classified as Reserve incised corrugated. Other characteristics, including width of coils and fillet width, are identical to those noted in plain corrugated not exhibiting incised treatment.

While incised corrugated forms also occur in Anasazi types, they are much rarer, and the common occurrence of this decoration in the upland Southwest may be unique to northern Mogollon brown utility ware. The use of incised decorations in Mogollon brown utility wares began during the Early Pithouse period with the production of Alma incised and continued with incised corrugated forms, as indicated by similarities in the incised decorations associated with these different types. The earliest form of Reserve incised may have included incised forms of Three Circle neck corrugated or

neckbanded. This results in a beginning date as early as the Three Circle phase for the type. Reserve incised corrugated became more common during the Reserve phase as true corrugated forms of this type were produced during both the Reserve and Tularosa phases.

Reserve Incised Corrugated Smudged (Incised Corrugated Smudged)

This category is similar to incised corrugated except the interior is highly polished and smudged. Smudged forms represent 4.2 percent of all sherds exhibiting exterior treatments described for Reserve incised corrugated sherds.

Reserve Punched Corrugated (Punctate Corrugated)

Reserve punched corrugated or punctate corrugated refers to sherds exhibiting a combination of corrugated and punctate treatments. Most of such decorations were probably created by using a stick with a small circular or elongated point, rounded and pressed into an unobliterated coil. Punctations are usually small (less than 4 mm across). Numerous punched decorations were placed to create a series of parallel lines, nested lines triangles, diamonds, and rectilinear patterns. Shapes and effects created by these numerous punctations are similar to those noted in Reserve incised corrugated. This type is thought to have been produced during the Reserve and Tularosa phases, sometime between A.D. 1050 and 1300.

Tularosa Patterned Corrugated

Tularosa patterned corrugated refers to the presence of indented coils on plain corrugated vessels spaced to produce geometric patterns within the vessel (Figs. 4.24-4.26). Pottery assigned to this type differs from those classified as alternating corrugated in that variation between indented and plain treatments is within rather than between coils. A series of regular spaced indentations appear along intervals of thin plain coils to form distinct geometric patterns. These include diamonds, triangles, connecting triangles, stepped triangles, and square, rectilinear, or chevron-shaped patterns (Kayser and Carroll 1988). Coils are often very thin, and patterns are usually precisely executed. This is among the finest made utility ware produced anywhere in the prehistoric Southwest, and was probably made between A.D.

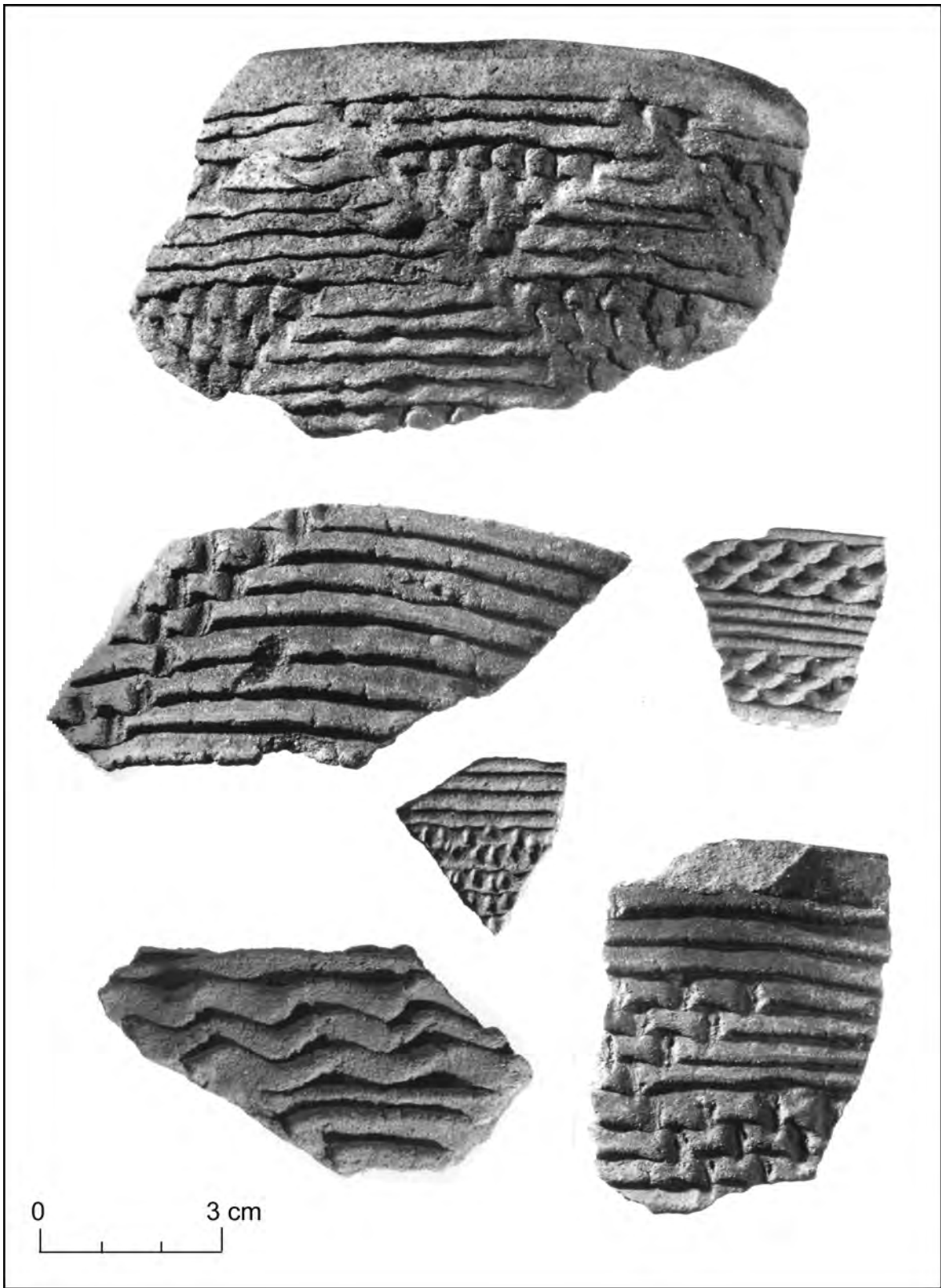


Figure 4.24. Tularosa patterned corrugated and alternating corrugated, LA 70185.

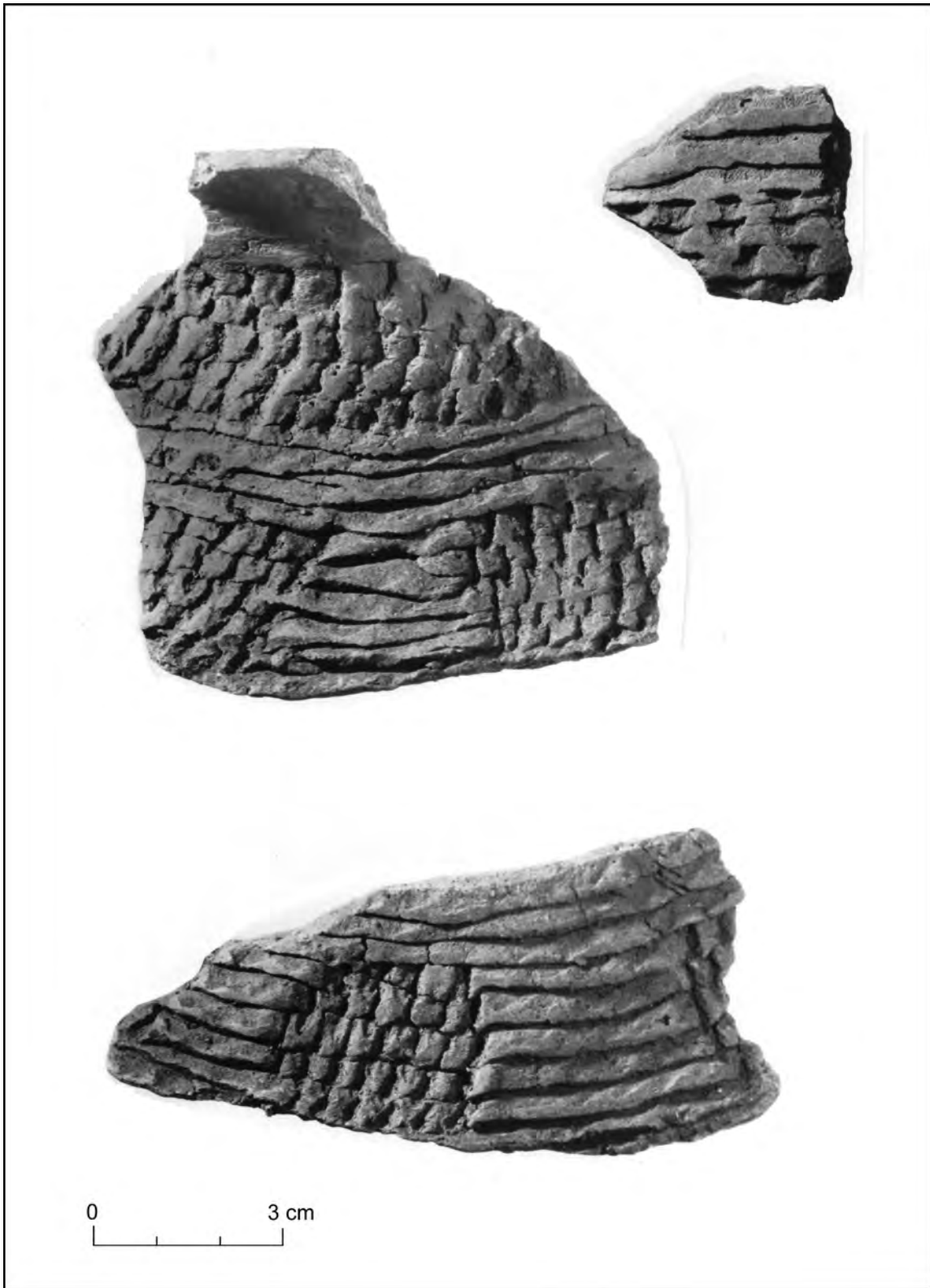


Figure 4.25. Tularosa patterned corrugated and alternating corrugated, LA 3279.

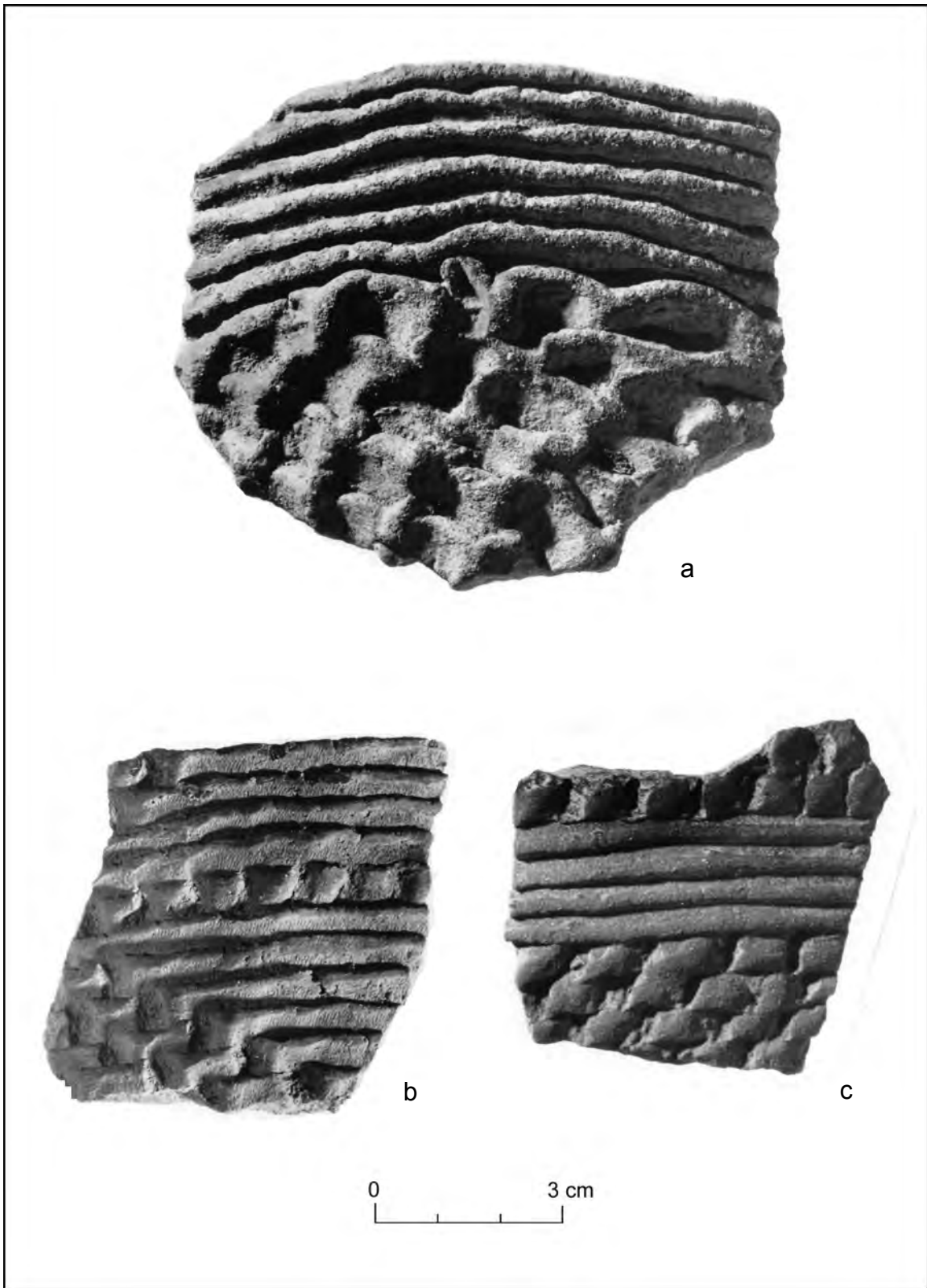


Figure 4.26. Tularosa patterned corrugated and alternating corrugated; (a) LA 45510, (b) LA 39965, (c) LA 39968.

1050 and 1350.

Tularosa Patterned Corrugated Smudged
(*Smudged Patterned Corrugated*)

Sherds placed into this category are distinguished from patterned corrugated by highly polished and smudged interior surfaces. Smudged forms represent 7.5 percent of all sherds exhibiting exterior treatments described for Tularosa patterned corrugated smudged.

Alternating Corrugated

Sherds assigned to an alternating corrugated category are, in part, included in previous definitions of Tularosa patterned corrugated (Rinaldo and Bluhm 1956). Alternating corrugated refers to the presence of rows of alternating bands exhibiting decorations described for plain and patterned corrugated. Within a vessel, coils of both plain and indented coils create the effect of several alternating bands usually ranging between 8 to more than 50 mm wide. Coils associated with this treatment exhibit ranges of thicknesses, although these coils tend to be fine and well executed.

MOGOLLON SLIPPED RED TYPES

Mogollon red wares exhibit pastes and tempers similar to those described for brown ware types (Table 4.9) with the addition of a red slip. Basic forms associated with slipped red types are similar to those in unslipped brown wares, and there appears to be little functional basis for the division of these two ware groups (Fig. 4.27). A total of 2.3 percent of the pottery from the Luna sites was assigned to Mogollon red wares. Types include San Francisco Red, other red slipped, corrugated red slipped, smudged interior red, and Tularosa White-on-red. Mogollon red wares recovered during the Luna Project exhibit similar refired paste color and temper distributions, indicating that they were probably locally produced. High proportions of sherds representing types of this category are derived from both necked jar and bowl forms (Table 4.10). Other forms are represented in very low frequencies.

San Francisco Red (Red Slipped Brown)

San Francisco Red is similar to Alma Plain but exhibits a deep-red slip applied over a brown ware paste clay. Surfaces are well polished and sometimes

exhibit a lustrous sheen (Haury 1936a). The red slip tends to be thin, and temper fragments are sometimes visible through the slip. Slips adhere very well to the surface, although the weathering of the soft surfaces may result in obliteration of evidence of the slipped surface. Such examples may be misclassified as Alma Rough. In earlier examples, polishing streaks on slipped surfaces run parallel to the rim and may extend from the rim to the center, forming a radiating pattern. The great majority of the San Francisco Red sherds were polished on the interior surface and exterior surfaces.

A small portion of brown ware sherds from all temporal components displayed red slips, so that San Francisco Red has a very long temporal span, similar to that of Alma Plain. It is the only other type occurring along with plain brown ware during the Early Pithouse period, when it is most common. San Francisco Red sherds from Early Pithouse period occupations appear to be similar to those noted for contemporaneous Alma Plain and Alma Rough sherds, although bowl forms are more common. Very low frequencies of San Francisco Red occur during all other Mogollon phases as well, although total frequencies decline during the San Francisco phase. Forms associated with San Francisco Red sherds from later occupations parallel those associated with contemporaneous Alma Plain.

Red Slipped with Corrugated Exterior

This category refers to later red ware forms with interiors exhibiting a distinctive red slip over a corrugated exterior. Such forms are always very rare but appear to be most common during the Tularosa phase.

Smudged Red Ware

This category refers to sherds with red slipped exteriors and smudged interiors. While included here with red ware types, this essentially represents a red slipped version of Reserve smudged. Such forms appear to be most common during the Tularosa phase.

Tularosa White-on-red (Red Slipped White Clay Paint)

Along with Starkweather smudged decorated, Tularosa White-on-red may represent the only painted type produced in the northern Mogollon Highlands. It is similar to Tularosa smudged fillet

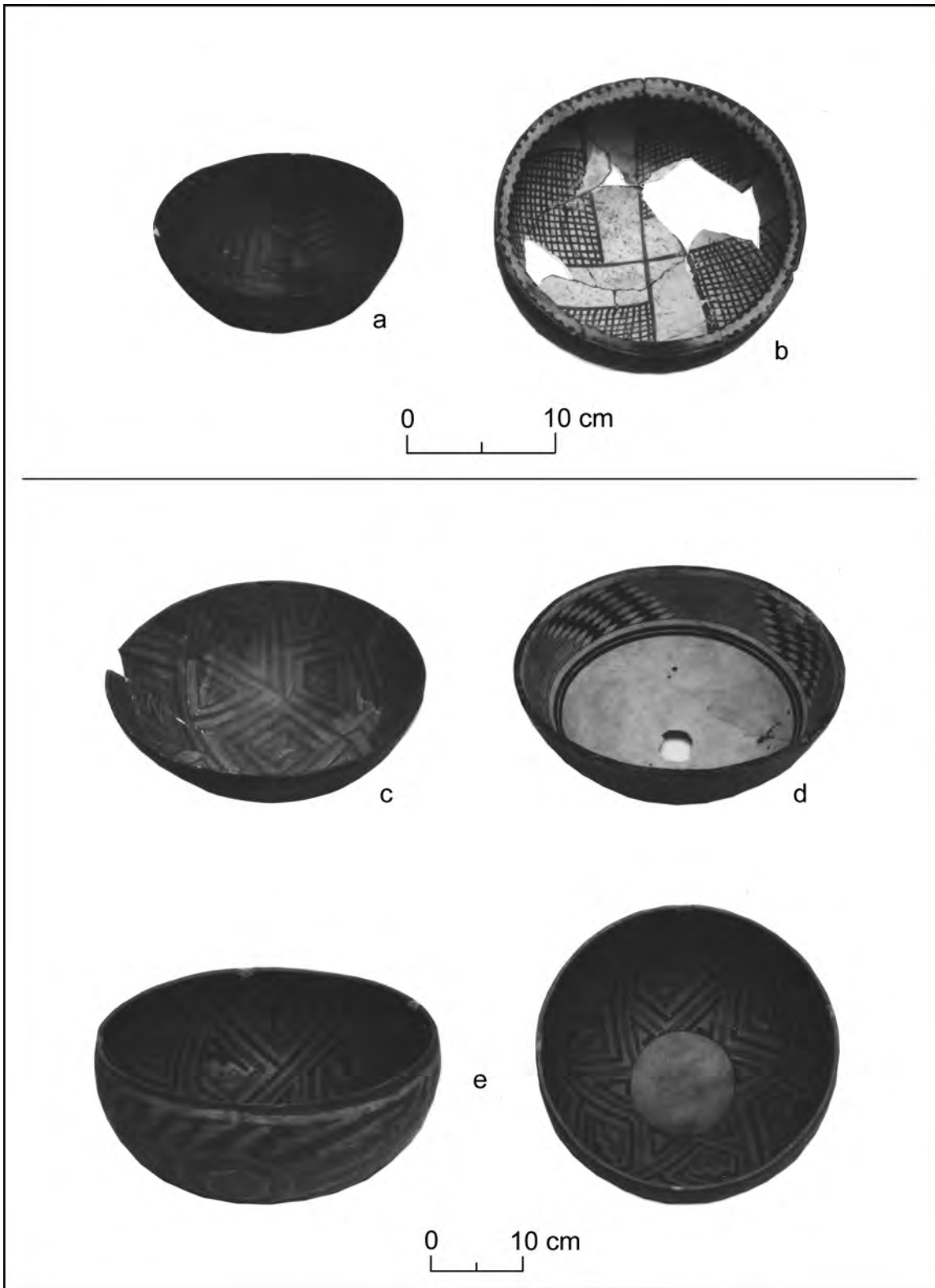


Figure 4.27. Various painted bowls; (a, c) Three Circle Red-on-white, (b) Mimbres Boldface Black-on-white, (d) Mimbres Black-on-white, (e) side and top view of St. Johns Polychrome bowl.

Table 4.9. Temper of Mogollon Slipped Red Ware Types

Temper	Tularosa White-on-red		San Francisco Red		Other Corrugated Red Slipped		Corrugated Red Slipped		Red Ware Smudged		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Not examined	0	.0	4	.5	0	.0	0	.0	1	2.9	5	.4
Mogollon lithic and sand	2	2.1	396	57.3	366	80.4	3	23.1	12	34.3	779	58.3
Mogollon tuff	92	94.8	86	11.7	31	6.8	1	7.7	13	37.1	223	16.7
Mogollon sand	3	3.1	250	33.9	58	12.7	9	69.2	8	22.9	328	24.5
Sand	0	.0	1	.1	0	.0	0	.0	1	2.9	2	.1
Total	97	100.0	734	100.0	455	100.0	13	100.0	34	100.0	1333	100.0

Table 4.10. Vessel Forms of Mogollon Red Slipped Types

Vessel Form	Tularosa White-on-red		San Francisco Red		Other Red Slipped		Corrugated Red Slipped		Red Ware Smudged		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Indeterminate body, polished	0	.0	9	.3	34	7.0	0	.0	0	.0	43	1.0
Bowl rim	32	9.0	99	3.7	27	5.5	3	1.7	5	1.2	166	4.0
Bowl body	319	88.8	619	23.3	128	26.2	18	10.4	420	98.1	1501	36.6
Jar body	3	.8	1726	65.0	217	44.4	69	39.9	1	.2	2016	49.1
Cooking jar rim	0	.0	20	.8	5	1.0	27	15.6	0	.0	52	1.3
Cooking jar neck	1	.3	158	5.9	71	14.5	55	31.8	0	.0	285	6.9
Indeterminate	4	1.1	18	.7	4	.8	0	.0	2	.5	28	.7
Seed jar rim	0	.0	5	.2	3	.6	0	.0	0	.0	8	.2
Olla rim	0	.0	2	.1	0	.0	1	.6	0	.0	3	.1
Total	356	100.0	2656	100.0	489	100.0	173	100.0	428	100.0	4102	100.0

except for the presence of designs executed in clay paint over a slipped exterior (Fig. 4.28). Exterior surfaces are covered by a slip which ranges from orange to red. Rows of textured decoration are often located on the exterior just below the rim. These decorations may include one to five rows of textured decorations in rows of corrugated, fingernail incised, or punctated decorations. Painted designs include chevrons, rectilinear, zigzagged, and spiraled lines. Forms are limited to bowls.

MOGOLLON DECORATED AND MIMBRES WHITE WARE TYPES

Mogollon decorated types identified during the Luna Project include one unslipped painted type (Mogollon Red-on-brown) and slipped Mimbres white wares. Mimbres White Ware refers to the white slipped and painted pottery apparently produced in the Mogollon region. Mogollon painted and Mimbres White Ware exhibit similar pastes and temper as unslipped brown wares (Table 4.11).

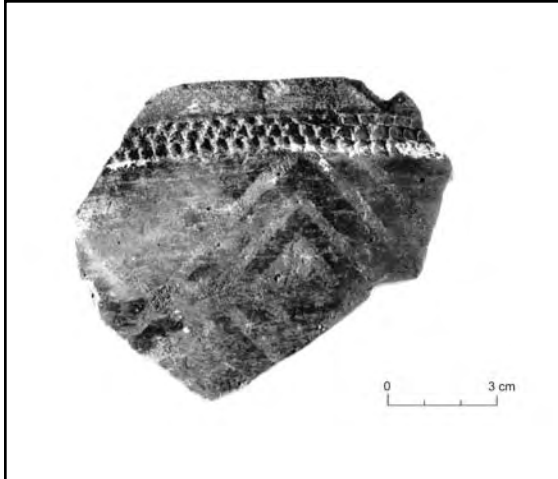


Figure 4.28. Tularosa White-on-red.

Painted decorations are executed in iron-based mineral pigments applied over a white, slipped surface and usually polished over. Surfaces are usually moderately to lightly polished but not as lustrous as contemporaneous white wares from other regions. The slip tends to be soft and easily weathered, resulting in the common obliteration of painted or slipped surfaces. Painted decorations are executed in a mineral pigment and are usually polished, resulting in a lustrous appearance, as opposed to the duller appearance noted in Cibola white wares. Painted decorations are often distinct from contemporary painted types produced in other regions of the Southwest. A long-lived tradition reflecting the gradual development of Mimbres White Ware from Three Circle Red-on-white to Mimbres Black-on-white is indicated. A total of .4 percent of the sherds were assigned to Mogollon decorated or Mimbres White Ware. Mogollon painted or Mimbres White Ware were distinguished by the presence of a slip, paint color, and stylistic attributes. Types distinguished during the analysis include Mogollon Red-on-brown, Mimbres slipped unpainted, Mimbres slipped red paint, Three Circle Red-on-white, Mangus Black-on-white, Mimbres transitional black-on-white, Mimbres indeterminate, and Mimbres Black-on-white. Tables 4.12-4.20 show the distribution of attributes related to vessel surface, rim thickness, rim shape, rim decoration, and painted designs for various Mogollon painted and Mimbres white wares examined during the stylistic analysis. The majority of sherds from this category represent bowls, although jars are present in low frequencies (Table 4.12).

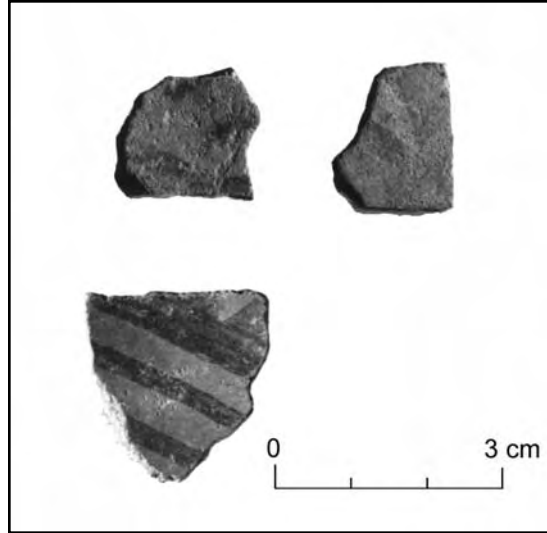


Figure 4.29. Mogollon Red-on-brown, LA 70201.

Mogollon Red-on-brown

Mogollon Red-on-brown represents one of the earliest painted type found in the Mogollon region (Haury 1936a; Colton and Hargrave 1937). During the present study, no pottery clearly representing the earliest painted sherds, such as San Lorenzo Red-on-brown or Dos Cabezas Red-on-brown (Haury 1936a; Sayles 1945), were found, so the very few red-on-brown sherds identified from Luna sites were classified as Mogollon Red-on-brown (Fig. 4.29). Vessel surfaces are well smoothed and highly polished. Mogollon Red-on-brown is distinguished from earlier and contemporaneous Mogollon brown wares by the additional presence of a red design executed in either high-iron slip or hematite pigments. It is likely that this type evolved out of San Francisco Red, in which similar red slips or pigments were applied over the entire vessel surface. In addition to the red designs, vessels surfaces may be unslipped or slipped with a soft, light brown to light red clay.

The red pigment applied as a decoration is often polished, creating a blurred effect. Rims are often solidly painted. Painted motifs usually consisted of relatively broad straight lines and single or connected triangles arranged together in simple patterns, producing a sawtooth design. Designs were often organized into four wedge-shaped sections. Each quarter was often organized around a single or group of solid triangles suspended by a single line and surrounded by a series of parallel curvilinear or chevron lines. These designs are simple and repetitive compared to later painted decorations. Such

Table 4.11. Temper of Mogollon Decorated Types

Temper	Mogollon Red-on-brown		Slip Unpainted		Slip Painted Red		Slip Pigment Black		Three Circles Red-on-white		Mangus Black-on-white		Mimbres Indeterminate		Transitional Black-on-white		Classic Black-on-white		Mimbres Polychrome		Slip Paint Brown Clay		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Mogollon lithic and sand	6	66.7	69	62.2	20	52.6	17	47.2	67	75.3	180	59.0	43	58.9	3	7.50	28	68.3	0	.0	1	50.0	434	61.2
Mogollon tuff	2	22.2	33	29.7	14	36.8	18	50.0	11	12.4	94	30.8	19	26.0	0	.0	8	19.5	1	100.0	0	.0	200	28.2
Mogollon sand	1	11.1	8	7.2	3	7.9	1	2.8	9	10.1	30	9.8	8	11.0	1	2.50	1	2.4	0	.0	1	50.0	63	8.9
Sand	0	.0	0	.0	0	.0	0	.0	1	1.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1
Sand and sherd	0	.0	1	.9	1	2.6	0	.0	0	.0	1	.3	1	1.4	0	.0	3	7.3	0	.0	0	.0	7	1.0
Crushed igneous	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	1.4	0	.0	0	.0	0	.0	0	.0	1	.1
Sandstone	0	.0	0	.0	0	.0	0	.0	1	1.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1
Basalt, sand, and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	2.4	0	.0	0	.0	1	.1
Leucocratic igneous	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	1.4	0	.0	0	.0	0	.0	0	.0	1	.1
Total	9	100	111	100	38	100	36	100	89	100	305	100	73	100	4	100	41	100	1	100	2	100	709	100

Table 4.12. Vessel Form of Mogollon Decorated Types

Vessel Form	Mogollon Red-on-brown		Slip Unpainted		Slip Painted Red		Slip Pigment Black		Three Circle Red-on-white		Marcus Black-on-white		Indeterminate Mimbres		Transitional Black-on-white		Classic Black-on-white		Mimbres Polychrome		Slipped with Brown Clay		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Indeterminate body polished	1	100	4	3.4	1	2.6	0	.0	1	1.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	7	.9
Bowl rim	1	100	6	5.1	5	12.8	3	8.1	20	22.5	75	24.0	31	25.4	8	61.5	16	32.7	1	100.0	1	50.0	167	21.1
Bowl body	6	60.0	92	78.0	32	82.1	33	89.2	61	68.5	218	69.9	81	66.4	4	30.8	30	61.2	0	.0	1	50.0	558	70.5
Jar body	2	20.0	8	6.8	1	2.6	0	.0	6	6.7	17	5.4	9	7.4	1	7.7	2	4.1	0	.0	0	.0	46	5.8
Cooking jar rim	0	.0	0	.0	0	.0	1	2.7	1	1.1	1	.3	1	.8	0	.0	0	.0	0	.0	0	.0	4	.5
Cooking jar neck	0	.0	4	3.4	0	.0	0	.0	0	.0	1	.3	0	.0	0	.0	1	2.0	0	.0	0	.0	6	.8
Indeterminate	0	.0	3	.4	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	3	.4
Seed jar rim	0	.0	1	.8	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1
Total	10	100	118	100	39	100	37	100	89	100	312	100	122	100	13	100	49	100	1	100	2	100	792	100

designs often covered the entire interior of the vessel.

Mogollon Red-on-brown is primarily represented by bowls, although jars are present in very low frequencies. Forms for sherds include bowls, bodies, and jars. Mogollon Red-on-brown was probably first produced just after A.D. 650 and may have been produced until A.D. 900.

Descriptive Mimbres White Ware Types

These include sherds exhibiting brown pastes and white slips but lacking distinct designs used in the definition of previously defined formal types based on the presence or type of painted decorations. Unpainted sherds with brown ware pastes and white slips were classified as Mimbres slipped unpainted. The majority of sherds assigned to this category are derived from bowls, while those from jars are present but very rare. Mimbres slipped painted (red pigment) refers to sherds with brown ware paste and white slip and red pigment that cannot be assigned to a specific type because of the lack of diagnostic designs. Such sherds often appear to belong to Three Circle Red-on-white. Mimbres slipped painted (black pigment) refers to sherds with brown ware paste and a white slip, but containing indistinct design styles that cannot be assigned to a specific type.

Slipped Painted, Brown Clay Pigment

This represents an unusual type consisting of a few vessels with painted decoration that is applied in a brownish clay paint over a white slip.

Three Circle Red-on-white

Three Circle Red-on-white is the earliest white ware found in the Mogollon region and probably developed from Mogollon Red-on-brown (Fig. 4.30). This type is distinguished from earlier painted types by the presence of a white slip and bridges the gap between the earliest Mogollon red painted pottery and Mimbres White Ware (Haury 1936a). Paste cross sections are often slightly redder than in other Mogollon slipped-painted types, indicating these sherds may have been exposed to a slightly more oxidizing atmosphere than the other types. Exterior surfaces of bowls and interior surface of jars are usually unslipped and brown to red. The white slipped surface contrasts significantly with the brown ware paste and tends to be buff to white and chalky. Slips also tend to be soft and often flake off.

The slip is often crackled, and most examples of Three Circle Red-on-white from Luna sites exhibit small glittery (mica) fragments. Similar fragments commonly occur in local weathered tuff deposits, and these are assumed to represent the source of the white slip.

Design styles noted on Three Circle Red-on-white pottery are intermediate between those described for Mogollon Red-on-brown and Mangus Black-on-white. Designs were similar to but more precisely executed than earlier types. Motifs include straight and squiggle lines, scrolls, and isolated and connected triangles. Designs are often arranged in quartered layouts similar to that noted in Mogollon Red-on-brown. Lines are often organized in chevron or rectilinear patterns and are often oriented around solid designs. While design motifs and layouts are similar to those found on Mogollon Red-on-brown, the proportion of solid to line fillers is greater. Unfortunately, it is sometimes difficult to distinguish misfired red-on-white examples of Mangus Black-on-white from Three Circle Red-on-white, although they may be distinguished by differences in the color and inclusions of slips and overall design styles.

The majority of sherds assigned to this category represent bowl sherds, although jar forms are also present. Thickness of vessel walls near the rim ranges from 3 to 6 mm and averages 4.6 mm. The great majority of these sherds are polished on the interior, and all are polished on the exterior surfaces. Three Circle Red-on-white appears to have been mainly produced during the San Francisco period and was short-lived and may not have been made in as large an area as other early Mogollon painted types.

Mangus (Mimbres Boldface) Black-on-white

The earliest black-on-white type common on the Luna Project is Mangus (or Mimbres Boldface) Black-on-white (Fig. 4.31). Early excavations in the Mimbres area noted the presence of black-on-white pottery that appeared to predate Classic Mimbres Black-on-white. Given the nature of the design styles, this pottery was referred to as Boldface Black-on-white (Bradfield 1931; Cosgrove and Cosgrove 1932). Gladwin and Gladwin (1934), in keeping with the rules that were then being developed for Southwest pottery classification, assigned similar pottery to Mangus Black-on-white. This term never fully gained acceptance by Southwest archaeologists, and more recently different investigators use various terms to describe this pottery

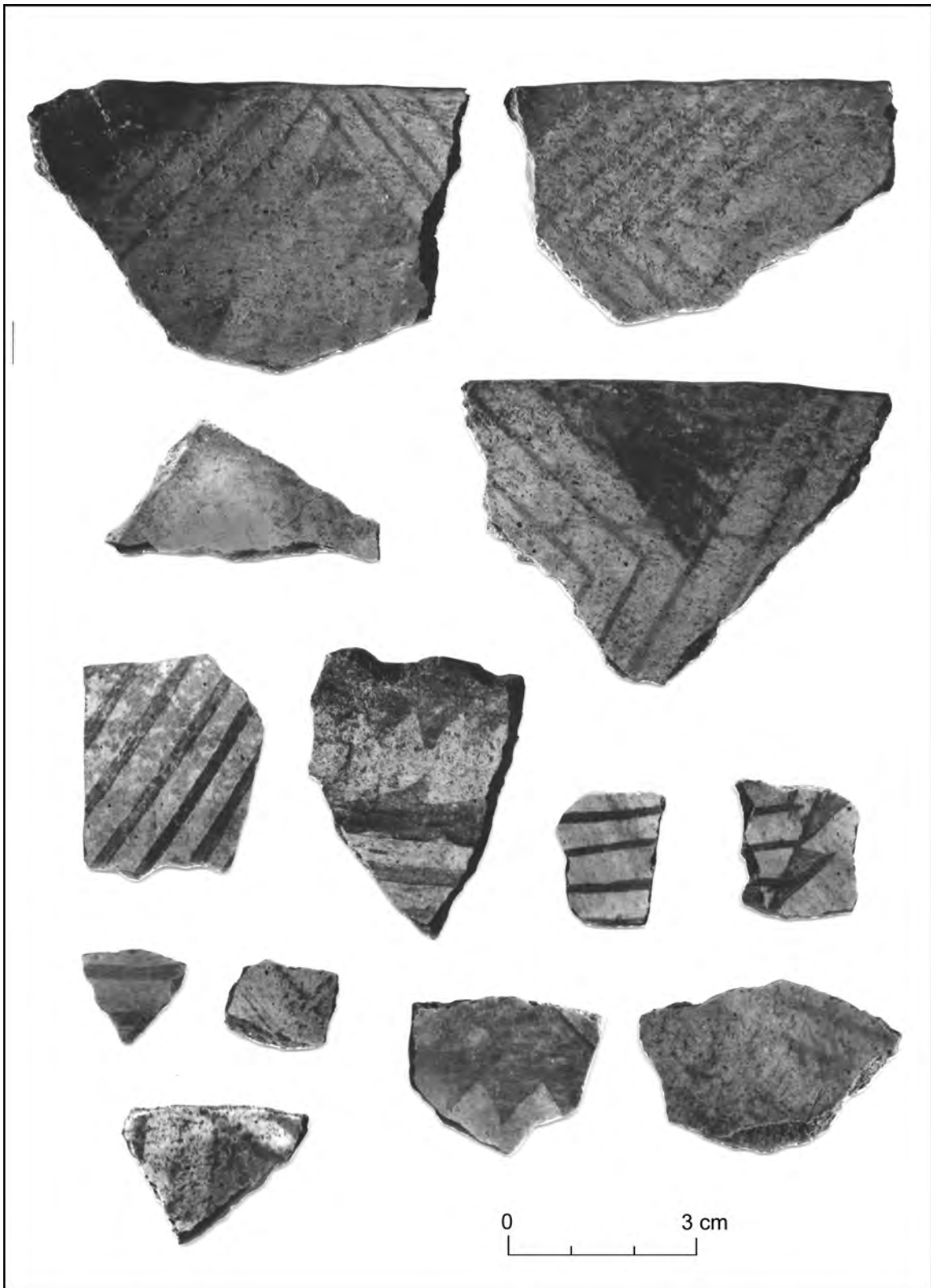


Figure 4.30. Three Circle Red-on-white, LA 70196.

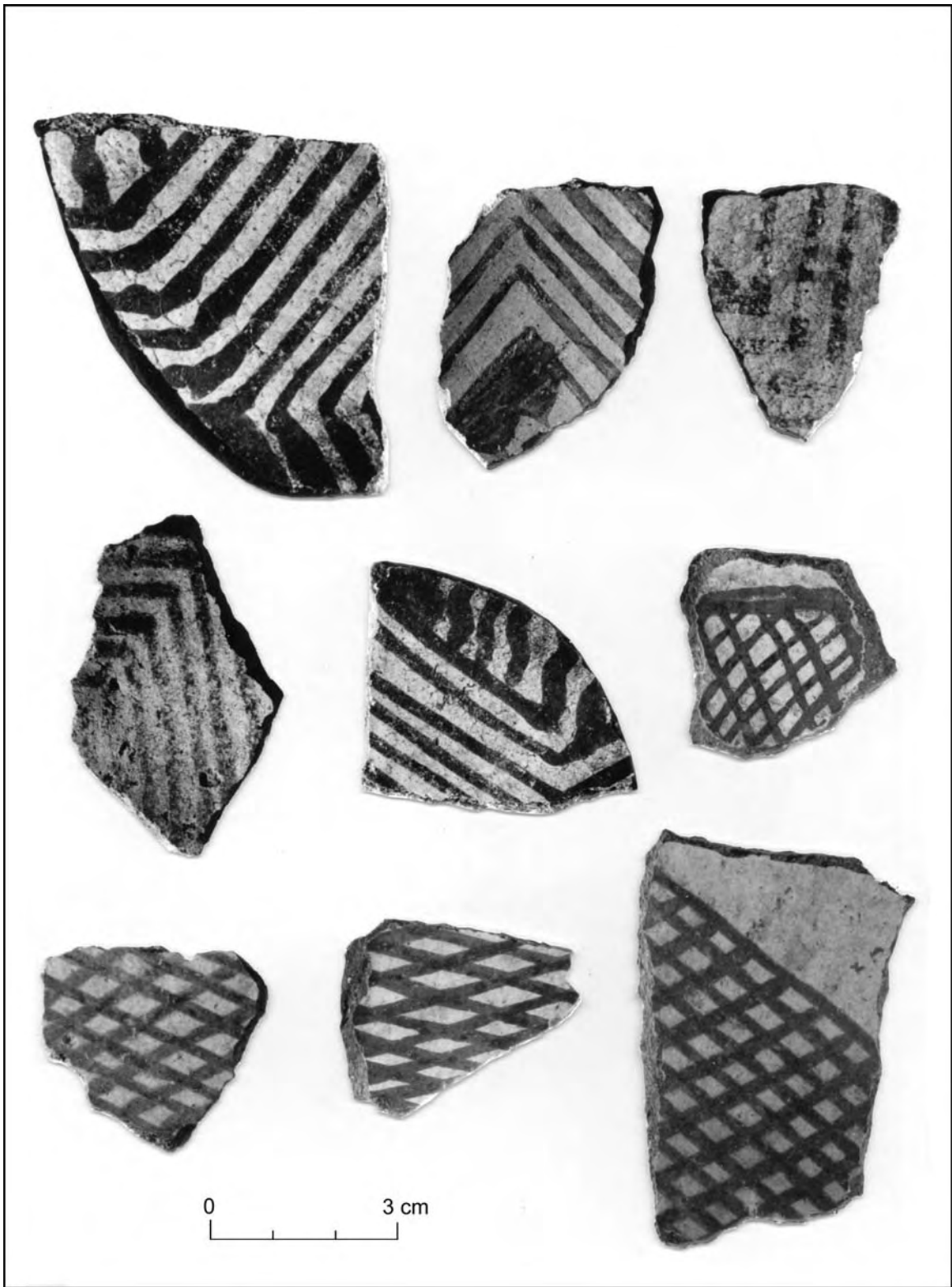


Figure 4.31. Mangus (Mimbres Boldface) Black-on-white, LA 45507.

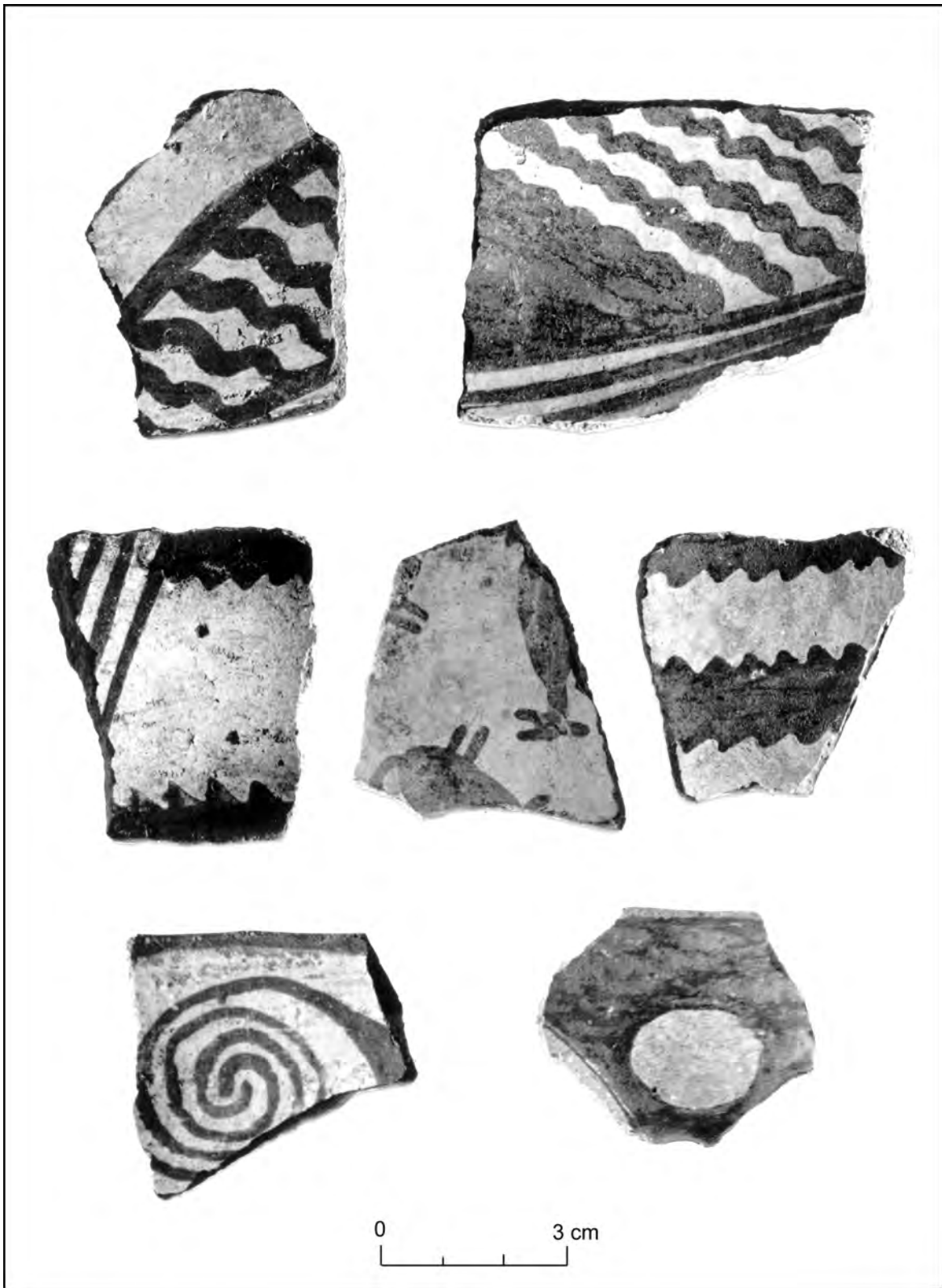


Figure 4.31. Continued. Mangus (Mimbres Boldface) Black-on-white, LA 45507.



Figure 4.31. Continued. Mangus (Mimbres Boldface) Black-on-white, LA 45507.

(Brody 1977; LeBlanc 1983; Lekson 1990; Woosley and McIntyre 1996). Because the term Mangus Black-on-white is more consistent with the rules of Southwest taxonomy, that term is used here. Some recent studies have also placed ceramics, which would here be sorted into Mangus or Boldface Black-on-white, into a Mimbres Style I or Early Style II (Shafer and Brewington 1995) or Phase I (LeBlanc 1983) category.

While paint color is obviously an important attribute in separating this type from earlier Three Circle Red-on-white, other attributes are also important indicators of this type, because a small but significant frequency of examples may exhibit decorations in brown to red paint. Pastes tend to be brown to gray. Slips tend to be white to pink and are often soft and chalky. Slipped surfaces are usually very smoothed and exhibit a relatively high polish. The exterior of bowls and interior of jars are usually unslipped but exhibit a slight polish. Unslipped surfaces are usually gray to brown. The majority of sherds assigned to this type are derived from bowls, although jars are also present. The thickness of vessel walls near the rim ranges from 4 to 7 mm and averages 5.2 mm. The great majority of the bowl sherds are polished on the interior and exterior surfaces. Rims are usually rounded to tapered and solidly painted.

Designs are executed in bold designs covering much of the decorative surface. Motifs include straight and wavy lines, triangles, curvilinear scrolls, occasional life forms, and ribbons with wavy hatchures. While design styles are similar to those noted on earlier Mogollon painted types, there were definite changes in the organization of these designs (Brody 1977). Designs are often arranged into quartered or banded patterns where different elements were combined together to form larger motifs. These often included a mixture of hatchured and solid designs. These sections were often separated from similar pattern combinations by a series of thin precisely executed lines. Three distinctive layouts commonly occur on this type: designs which are divided into quadrants, circular layouts, and the extension of unbroken fields across the surface (Brody 1977). Lines tend to be finer and better executed than early forms but not as much so as in Mimbres Classic Black-on-white.

Mangus Black-on-white represents the earliest Mogollon type consistently decorated with black paint and appears to have been produced sometime between A.D. 750 and A.D. 1000. Similar elements and layouts appear to have been executed in pottery associated with contemporaneous pottery produced

in other Southwestern regions. For example, painted styles described for Mangus Black-on-white are similar to those noted in Santa Cruz Red-on-buff and Gila Butte Red-on-buff in the Hohokam region (Gladwin et al. 1937; Haury 1976; Wallace 1995) and Red Mesa Black-on-white in the Anasazi region (Gladwin 1945; Toll and McKenna 1987; Windes 1977; Fowler 1994).

Mimbres (Transitional) Black-on-white (Style II)

Later Mimbres white wares exhibit paste, slip, and paint categories very similar to those described for Mangus Black-on-white but exhibit different painted styles. These late types are rare in the northern Mogollon Highlands, so they are only briefly described here. Mimbres transitional refers to pottery exhibiting styles that are intermediate between those noted in Mangas Black-on-white and Mimbres Classic Black-on-white. This type is distinguished from Mangus Black-on-white by the use of thin straight hatchures framed by thick lines, which often replace the wavy lines found on earlier forms (Brody 1977). There is also a general refinement in the execution of designs from earlier types. Pottery assigned to this category is similar to that recently placed into Mimbres Late Style II (Shafer and Brewington 1995).

Mimbres (Classic) Black-on-white (Style III)

Mimbres Classic represents the last decorated type of this series and appeared at about A.D. 1000 (Fig. 4.32). While sherds exhibiting late styles are usually classified as Mimbres Classic (Haury 1936a), they are sometimes referred to as Mimbres Black-on-white Style III. Mimbres Classic Black-on-white is mainly represented by bowl forms. The thickness of vessel walls near the rim ranges from 5 to 6 mm and averages 6.3 mm.

Characteristics of Mimbres Classic Black-on-white include the use of fine, regularly spaced hatchure bordered by thin lines. A diagnostic feature of this type is the presence of framing lines near the rim. These framing lines vary considerably and may include one to four broad lines, multiple fine lines, multiple fine lines bordered by one or two fine lines, or a single fine line. During the early part of the production of this type, often only one line was used to separate the bowl rim and the main field of painted design. Naturalistic motifs also became common and vary from simple to complex forms, and the

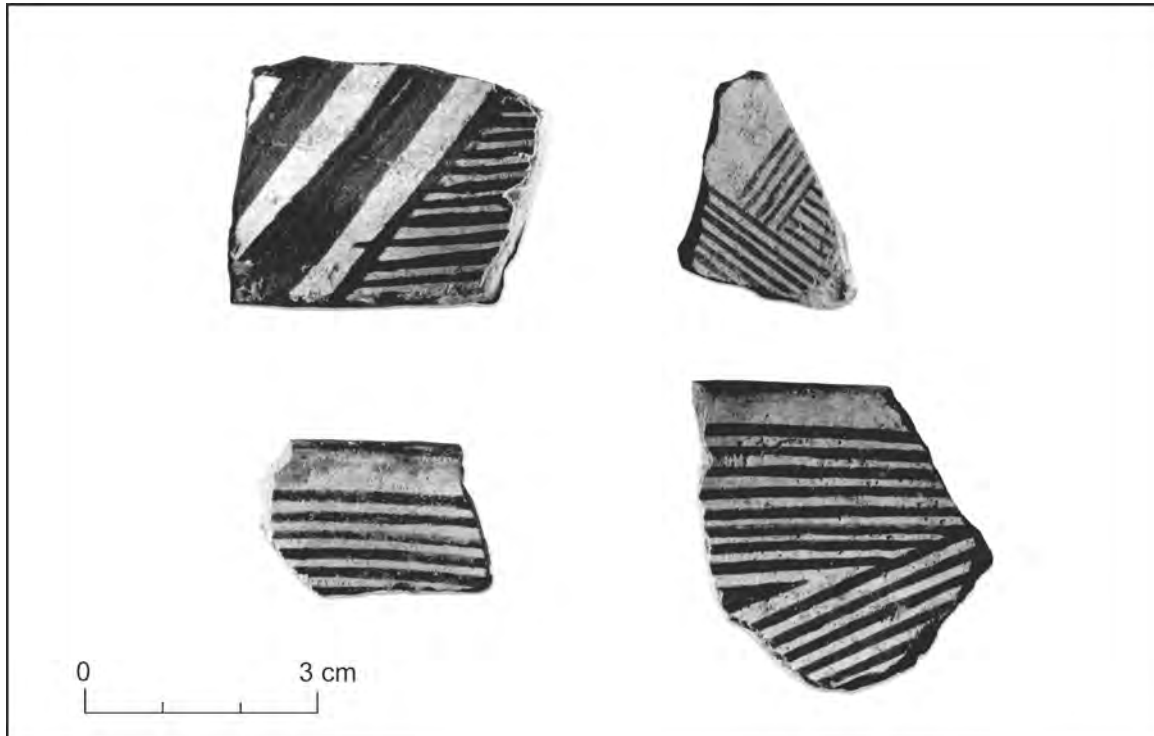


Figure 4.32. Mimbres Classic Black-on-white, LA 39968.

more elaborate represent painted motifs divided by geometric motifs. Execution is variable, and ranges from precise execution with dense black paint to watery brown motifs with less exact line work.

ANASAZI (SOUTHERN CIBOLA) CERAMIC TYPES

Pottery assigned to southern Cibola tradition types were extremely rare in ceramic assemblages from project sites. Southern Cibola types are easily distinguished from Mogollon brown wares by the presence of light, low-iron clay pastes and sand and/or sherd temper. The absence of low-iron sedimentary clays in the Mogollon Highlands indicates that these types were not locally produced within the Luna Project area, but originated in areas of the Colorado Plateau in the Anasazi country.

Cibola Gray Ware Types

Cibola gray wares refer to Anasazi utility ware not exhibiting slipped or painted surfaces with paste characteristics of the Cibola region. In contrast to Mogollon Brown Ware, gray ware is almost always unpolished. Gray wares exhibit pastes and surface characteristics distinct from contemporaneous

Cibola white wares. Paste and surfaces are white, gray, or dark gray. Gray ware sherds from Luna sites fired to buff color in an oxidation atmosphere indicating the use of low-iron sedimentary clays common in formations occurring in the southern part of the Colorado Plateau. Cibola Gray Ware is consistently tempered with medium to coarse sand grains (Table 4.13). Gray ware pastes tend to be much coarser than in brown ware, and temper often protrudes through the surface. As is the case for Mogollon brown wares, Anasazi gray wares are distinguished on the basis of temporally sensitive surface treatments and textures. Gray wares were distinguished by texture treatments used to differentiate Mogollon brown wares. Only gray wares from the Luna Project are described. The gray pottery identified is from a very small number of types. Almost all the gray ware sherds identified during the present study appear to be derived from jars (Table 4.14).

Plain Polished Body (Obelisk Utility)

Polished utility wares appear to be limited to the earliest Anasazi occupation, during which local utility wares were very similar to early brown ware forms, but contain paste and temper, indicating they probably originated in the Anasazi country. In the Cibola and Kayenta regions, similar utility ware forms have

Table 4.13. Temper of Cibola Gray Ware Types

Temper	Cibola Gray Body		Cibola Obelisk Gray Body		Cibola Gray Body Plain		Cibola Lino Gray Rim		Cibola Neckcoiled		Cibola Indented Corrugated		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N
Mogollon lithic and sand	2	1.6	0	.0	0	.0	0	.0	0	.0	0	.0	2
Sand	116	94.3	1	33.3	43	70.3	6	70.3	100.0	.0	1	100.0	167
Sand and sherd	5	4.1	2	66.7	10	16.4	0	16.4	.0	100.0	0	.0	18
Sandstone	0	.0	0	.0	4	6.6	0	6.6	.0	.0	0	.0	4
Igneous and sand	0	.0	0	.0	4	6.6	0	6.6	.0	.0	0	.0	4
Total	123	100.0	3	100.0	61	100.0	6	100.0	100.0	100.0	1	100.0	195

Table 4.14. Vessel Form of Cibola Gray Ware Types

Vessel Form	Cibola Gray body		Cibola Obelisk Gray body		Cibola Gray body plain		Cibola Lino Gray rim		Cibola Neckcoiled		Cibola Indented corrugated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Bowl rim	0	.0	1	12.5	0	.0	0	.0	0	.0	0	.0	1	.5
Bowl body	0	.0	0	.0	1	1.6	0	.0	0	.0	0	.0	1	.5
Jar body	102	82.3	4	50.0	56	88.9	0	.0	0	.0	4	100	166	100.0
Cooking jar rim	2	1.6	0	.0	2	3.2	7	100	1	100	0	.0	12	5.8
Cooking jar neck	20	16.1	0	.0	4	6.3	0	.0	0	.0	0	.0	24	11.6
Indeterminate	0	.0	3	37.5	0	.0	0	.0	0	.0	0	.0	3	1.4
Total	124	100	8	100	63	100	7	100	1	100	4	100	207	100.0

been classified as Obelisk Utility (Reed et al. 1997).

Plain Gray Body

Plain gray body refers to sherds derived from unpolished, completely smoothed vessels. This category is only assigned to rim sherds, because similar body sherds could also have been derived from forms exhibiting coiled or corrugated treatments along the rim or neck.

Unpolished Rim (Lino Gray)

This category refers to unpolished gray body sherds that could have originated from Lino Gray vessels as

well as the lower portions of neckbanded, neck coiled, or corrugated forms.

Textured or Corrugated Types

Neck coiled gray refers to sherds or vessels exhibiting thin unobliterated coils or clapboarded near the neck or rim. Indented corrugated refers to the presence of coils with spaced indentations along the coil.

CIBOLA WHITE WARE TYPES

Cibola white wares represent the second most common ceramic group at Luna Project sites dating after A.D. 1000 (Fig. 4.33). Cibola White Ware exhibit-



Figure 4.33. Cibola White Ware jars from west-central New Mexico; (a-b) Reserve Black-on-white, (c-e) Tularosa Black-on-white, (f) Klageto Black-on-white. (Vessels not from Luna Project sites.)

Table 4.15. Temper of Cibola White Ware Types

Temper	Cibola Early Unpainted		Cibola Early Painted		Cibola Late Unpainted		Cibola La Plata Black-on-white		Cibola's White Mound/Black-on-white		Cibola Red Mesa/Black-on-white		Cibola Puerto Black-on-white		Cibola Reserve Black-on-white		Cibola Tularosa Black-on-white		Cibola Reserve/Tularosa Black-on-white		Cibola Hachure		Cibola Indeterminate Black-on-white		Cibola Gallup Black-on-white			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Indeterminate	0	.0	0	.0	0	.0	1	.2	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Mud/clay sand	0	.0	4	12.5	2	.3	0	.0	0	.0	0	.0	2	4.9	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Sand	39	67.2	21	65.6	24	3.3	11	1.7	0	.0	10	55.6	26	63.4	0	.0	20	2.5	4	.7	1	.9	0	.0	0	.0	0	.0
Sand and sherd	1	1.7	6	18.8	618	84.0	483	76.4	1	100.0	0	.0	9	22.0	6	85.7	704	87.6	383	69.9	83	74.1	24	85.7	20	59.8		
Sherd	12	20.7	0	.0	65	88	99	15.7	0	.0	0	.0	2	4.9	0	.0	53	6.6	87	15.9	12	10.7	4	14.3	12	35.3		
Crushed igneous	0	.0	0	.0	2	.3	0	.0	0	.0	2	11.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Sandstone	2	3.4	1	3.1	2	.3	1	.2	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	3	.5	0	.0	0	.0	1	2.9
Igneous, sand, and sherd	0	.0	0	.0	0	.0	2	.3	0	.0	2	11.1	0	.0	0	.0	1	.3	0	.0	0	.0	0	.0	0	.0	0	.0
Basalt, sand, and sherd	0	.0	0	.0	2	.3	5	.8	0	.0	0	.0	0	.0	0	.0	6	.7	0	.0	10	8.9	0	.0	0	.0	0	.0
Basalt	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1	0	.0	0	.0	0	.0	0	.0	0	.0
Basalt and sherd	0	.0	0	.0	2	.3	15	2.4	0	.0	0	.0	0	.0	0	.0	7	.9	10	1.8	0	.0	0	.0	0	.0	0	.0
Igneous and sand	4	6.9	0	.0	0	.0	3	.5	0	.0	4	22.2	2	4.9	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Sand/sandstone and sherd	0	.0	0	.0	7	1.0	3	.5	0	.0	0	.0	0	.0	0	.0	9	1.1	5	.5	2	1.8	0	.0	0	.0	0	.0
Basalt and sand	0	.0	0	.0	0	.0	6	.9	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Igneous and sherd	0	.0	0	.0	1	.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.2	0	.0	0	.0	0	.0	0	.0
Sandstone and sherd	0	.0	0	.0	10	1.4	3	.5	0	.0	0	.0	0	.0	1	14.3	3	.4	4	.7	4	3.6	0	.0	0	.0	0	.0
Basalt, sand and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.2	0	.0	0	.0	0	.0	0	.0
Leucocratic igneous	0	.0	0	.0	1	.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	2.9
Total	88	100	32	100	2491	100	2042	100	7	100	18	100	44	100	16	100	919	100	1875	100	284	100	226	100	58	100		

Table 4.15 (continued)

Temper	Cibola Shovflake Black-on-white		Cibola Straggled Interior		Pinedale Black-on-white		Pinedale Polychrome		Pueblo Early Unpainted		Pueblo Late Unpainted		Pueblo Late Painted		Pueblo Reserve Black-on-white		Pueblo Tularosa Black-on-white		Late Unpainted Basalt		Late Painted Basalt		Tularosa with Basalt		Hechura with Basalt		Total			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Indeterminate	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.0
Mogilon sand	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	8	.3
Sand	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	158	4.9
Sand and sherd	5	830	0	.0	0	.0	0	.0	1	100	13	33.3	6	750	2	66.7	0	.0	0	.0	4	14.8	0	.0	0	.0	2374	750		
Sherd	1	16.7	0	.0	0	.0	1	100	0	.0	26	66.7	2	250	1	3.3	1	100	0	.0	0	.0	0	.0	0	.0	378	11.9		
Crushed igneous	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	4	.1		
Sandstone	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	10	.3		
Igneous, sand, and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	3	.1		
Basalt, sand, and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	9	64.3	9	33.3	0	.0	0	.0	91	2.9		
Basalt	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	3.7	1	50	0	.0	3	.1		
Basalt and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	4	28.6	13	48.1	0	.0	8	100	59	1.9		
Igneous and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	13	.4		
Sand/ sandstone and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	26	.8		
Basalt and sand	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	50	0	.0	7	.2		
Igneous and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	2	.1		
Sandstone and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	25	.8		
Basalt, sand, and sherd	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	7.1	0	.0	0	.0	0	.0	2	.1		
Leucocratic igneous	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	2	.1		
Total	47	100	1	100	48	100	7	100	1	100	43	100	14	100	4	100	119	100	14	100	27	100	2	100	8	100	8420	100		

ing similar pastes, treatments, and designs dominates decorated assemblages occurring over a very wide area of the southern Colorado Plateau and northern Mogollon Highlands. Southern Cibola white wares are recognized based on temporally sensitive surface and decorative treatments (Dowel 1980; Sullivan and Hantman 1984; Fowler 1994; Christenson 1995). Cibola White Ware dating prior to A.D. 1000 is almost always tempered with sand, while those dating after A.D. 1000 often contain crushed sherd temper as well. Table 4.15 illustrates temper identified for Cibola White Ware from Luna sites. Later Cibola white wares sometimes, but not always, contain a thin white slip. Cibola types exhibit a mineral paint which is usually dull and is less polished than that noted on Mimbres white wares. The majority of sherds represent bowls, although jar forms are represented in low but significant frequencies (Table 4.16). A wide range of other forms are represented in very low frequencies.

A total of 4.7 percent of the sherds analyzed during the Luna Project represent Cibola white wares. Cibola White Ware types in the present study include early unpainted, early painted, late unpainted, late painted, White Mound Black-on-white, Red Mesa Black-on-white, Puerco/Escavada Black-on-white, Gallup Black-on-white, Reserve Black-on-white, Tularosa Black-on-white, Tularosa/Reserve Black-on-white, Snowflake Black-on-white, Klagetoh Black-on-white, Pinedale Black-on-white, and smudged interior white. Tables 4.17 through 4.23 illustrate distributions of various attributes, including interior surface treatment, exterior surface treatments, rim thickness, rim shape, rim decoration, and painted designs recorded for selected Cibola White Ware during the stylistic analysis.

Similar white ware pottery exhibiting yellow-red pastes and sherd temper are assigned to this tradition. This may indicate an origin along the Puerco Valley. Ceramics belonging this tradition may or may not be present in Luna Project assemblages.

Descriptive Cibola White Ware Types

White wares not exhibiting styles indicative of previously defined formal types were assigned to descriptive types based on the presence of paint, temper type, and surface characteristics. Early unpainted refers to unpolished or slightly polished white ware sherds assumed to be early but exhibiting painted decoration and large sand temper. Early painted refers to sand-tempered, unpainted, unpolished, or slightly polished forms probably produced

during earlier (pre-A.D. 900) periods. Late unpainted refers to unpainted ceramics exhibiting later characteristics such as a high polish, slip, or sherd temper. Late painted refers to painted ceramics exhibiting characteristics of later types.

La Plata Black-on-white

La Plata Black-on-white represents the earliest painted type defined for the southern Anasazi and dates from about A.D. 550 to 800 (Fig. 4.40). La Plata Black-on-white is usually tempered with quartz sand grains. This type is unpolished or slightly polished. It is distinguished from Lino Black-on-white by the presence of decorations in mineral rather than organic paint. This paint reflects the use of iron rich minerals and is red, brown, or black.

Painted decorations cover less of the vessel surface than later Cibola tradition types. Rims are often solidly painted. Designs are usually arranged in isolated groups of two or three arrangements or pendants from the rim. Painted designs are often executed in narrow lines that are commonly elaborated. Design motifs include thin lines, solid or open triangles, ticks, flags, and dot or basket stitched (Z and I) motif-filled spaces.

White Mound Black-on-white

White Mound Black-on-white refers to white ware produced in the Cibola area during the Pueblo I period (Gladwin 1945). Surfaces and pastes are similar to those described for La Plata Black-on-white, and White Mound Black-on-white is distinguished by slightly later design elements (Fig. 4.34). Design elements often include several thin to medium parallel lines or chevrons which may be embellished with ticked lines or triangles. Designs are more likely to cover the entire vessel than to occur in groups.

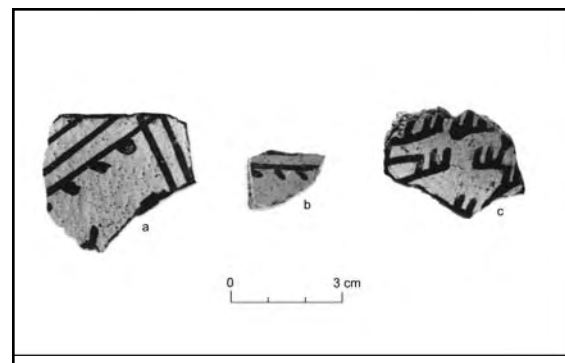


Figure 4.34. *White Mound Black-on-white*; (a-b) LA 45507, (c) LA 70196.

Table 4.16. Vessel Forms of Cibola White Ware Types

Vessel Form	Cibola Early Unpainted		Cibola Early Painted		Cibola Late Unpainted		Cibola Late Painted		Cibola La Plata Black-on-white		Cibola White Mound Black-on-white		Cibola Red Mesa Black-on-white		Cibola Puerco Black-on-white		Cibola Reserve Black-on-white		Cibola Tularosa Black-on-white		Cibola Reserve/Tularosa Black-on-white		Cibola Hachure		Cibola Indeterminate Black-on-white			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Indeterminate body polished	1	1.7	0	.0	10	.4	2	.1	0	.0	0	.0	0	.0	0	.0	1	.1	0	.0	0	.0	1	.3	0	.0	0	.0
Bowl rim	1	1.7	5	15.6	33	1.3	150	7.3	0	.0	5	27.8	2	4.5	2	12.5	81	8.8	79	4.2	9	3.1	17	7.5	9	15.5		
Bowl body	26	44.8	21	65.6	313	12.6	590	28.9	6	85.7	11	61.6	25	56.8	6	37.5	214	23.3	219	11.7	61	20.7	99	43.8	12	20.7		
Jar body	23	39.7	5	15.6	1792	71.9	1042	51.0	1	14.3	0	.0	14	31.8	6	37.5	553	60.2	1445	77.1	194	66.0	53	23.5	26	44.8		
Cooking jar rim	0	.0	1	3.1	14	.6	45	2.2	0	.0	2	11.1	0	.0	0	.0	6	.7	43	2.3	3	1.0	0	.0	0	.0		
Cooking jar neck	7	12.1	0	.0	126	5.1	146	7.1	0	.0	0	.0	3	6.8	2	12.5	36	3.9	74	3.9	19	6.5	56	24.8	4	6.9		
Indeterminate	0	.0	0	.0	184	7.4	49	2.4	0	.0	0	.0	0	.0	0	.0	3	.3	5	.3	0	.0	1	.4	6	10.3		
Seed jar rim	0	.0	0	.0	1	.0	4	.2	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0		
Handle	0	.0	0	.0	2	.1	8	.4	0	.0	0	.0	0	.0	0	.0	2	.2	0	.0	0	.0	0	.0	0	.0		
Ollarim	0	.0	0	.0	16	.6	6	.3	0	.0	0	.0	0	.0	0	.0	20	2.2	9	.5	3	1.0	0	.0	0	.0		
Effigy/teatish	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1	1	.1	0	.0	0	.0	0	.0		
Carteen rim	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1	0	.0	0	.0	0	.0	0	.0		
Ollaneck	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.1	0	.0	4	1.4	0	.0	0	.0		
TOTAL	58	100	32	100	2491	100	2042	100	7	100	18	100	44	100	16	100	919	100	1875	100	294	100	226	100	58	100		

Table 4.16 (continued)

Temper	Cibola Gallup Black-on-white		Cibola Snowflake Black-on-white		Cibola Smudged Interior		Cibola Finedate Black-on-white		Pinedale Poly-chrome		Puerco Early Unpainted		Puerco Late Unpainted		Puerco Late Painted		Puerco Reserve Black-on-white		Puerco Tularosa Black-on-white		Late Unpainted Basalt		Late Painted Basalt		Tularosa with Basalt			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Indeterminate body polished	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Bowl rim	5	100	3	6.4	0	.0	3	6.3	1	14.3	0	.0	0	.0	1	7.1	0	.0	0	.0	0	.0	2	7.4	2	100	0	.0
Bowl body	0	.0	13	27.7	1	100	0	.0	4	57.1	1	100	4	9.3	5	36.7	3	75	18	15.1	3	.0	15	55.6	0	.0	0	.0
Jar body	0	.0	39	61.7	0	.0	35	72.9	2	28.6	0	.0	36	83.7	5	36.7	0	.0	87	73.1	13	92.9	7	25.9	0	.0	0	.0
Cooking jar rim	0	.0	0	.0	0	.0	1	2.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Cooking jar neck	0	.0	2	4.3	0	.0	9	18.8	0	.0	0	.0	2	4.7	3	21.4	1	25.0	14	11.8	0	.0	3	11.1	0	.0	0	.0
Indeterminate	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	2.3	0	.0	0	.0	0	.0	1	7.1	0	.0	0	.0	0	.0
Seed jar rim	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Handle	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Olla rim	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Effigy/finish	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Canteen rim	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Olla neck	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Total	5	100	47	100	1	100	48	100	7	100	1	100	43	100	14	100	4	100	119	100	14	100	27	100	2	100	0	.0

Table 4.16. Continued.

Vessel Form	Hachure with Basalt		Total	
	N	%	N	%
Indeterminate body polished	0	.0	15	.2
Bowl rim	1	12.5	411	4.9
Bowl body	7	87.5	1674	19.9
Jar body	0	.0	5368	63.8
Cooking jar rim	0	.0	116	1.4
Cooking jar neck	0	.0	507	6.0
Indeterminate	0	.0	250	3.0
Seed jar rim	0	.0	5	.1
Handle	0	.0	12	.1
Olla rim	0	.0	54	.6
Effigy/Fetish	0	.0	2	.0
Canteen rim	0	.0	1	.0
Olla neck	0	.0	5	.1
Total	8	100.0	8420	100.0

Table 4.17. Interior Manipulation of Mogollon Painted and Mimbres White Ware Types

Type	Plain Unpolished		Plain Polished		Indeterminate		Total	
	N	%	N	%	N	%	N	%
Mogollon Red-on-brown	1	10.0	9	90.0			10	100.0
Slip unpainted	24	20.7	90	77.6	2	1.7	116	100.0
Slip painted, red	3	7.9	35	92.1			38	100.0
Slip pigment, black	2	5.4	35	94.6			37	100.0
Three Circles Red-on-white	1	1.1	88	98.9			89	100.0
Mangus Black-on-white	13	4.2	298	95.8			311	100.0
Mimbres indeterminate	15	12.6	104	87.4			119	100.0
Transitional black-on-white	1	9.1	10	90.9			11	100.0
Classic black-on-white	2	4.4	43	95.6			45	100.0
Mimbres Polychrome			1	100.0			1	100.0
Slip paint, brown clay			2	100.0			2	100.0
Puerco Gray body	1	100.0					1	100.0
Puerco Obelisk Gray body	1	100.0					1	100.0
Puerco Gray body plain	4	100.0					4	100.0
Total	68	8.7	715	91.1	2	.3	785	100.0

Table 4.18. Exterior Manipulation of Mogollon Painted and Mimbres White Ware Types

Type	Plain Unpolished		Plain Polished		Indeterminate		Total	
	N	%	N	%	N	%	N	%
Mogollon Red-on-brown			16	1.1			16	1.1
Slip unpainted	23	23.7	139	9.9	2	25.0	164	10.9
Slip painted, red	1	1.0	45	3.2	4	50.0	50	3.3
Slip pigment, black	12	12.4	38	2.7			50	3.3
Three Circles Red-on-white			138	9.9			138	9.2
Mangus Black-on-white	15	15.5	754	54.0	2	25.0	771	51.3
Mimbres indeterminate	36	37.1	193	13.8			229	15.2
Transitional black-on-white			21	1.5			21	1.4
Classic black-on-white	3	3.1	48	3.4			51	3.4
Mimbres Polychrome			1	.1			1	.1
Slip paint, brown clay			3	.2			3	.2
Puerco Gray body	2	2.1					2	.1
Puerco Obelisk Gray body			1	.1			1	.1
Puerco Gray body plain	5	5.2					5	.3
Total	97	100.0	1397	100.0	8	100.0	1502	100.0

Table 4.19. Mimbres Types by Rim Thickness

Thickness (mm)	Three Circle		Mangus Black-on-white		Late Indeterminate		Transitional		Classic Black-on-white		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
0	73	76.8	231	79.1	36	81.8			25	75.8	365	78.5
3	1	1.1									1	.2
4	10	10.5	8	2.7							18	3.9
5	8	8.4	32	11.0	5	11.4					45	9.7
6	3	3.2	20	6.8	3	6.8			6	18.2	32	6.9
7			1	.3			1	100.0	2	6.1	4	.9
Total	95	100.0	292	100.0	44	100.0	1	100.0	33	100.0	465	100.0

Table 4.20. Mimbres Types by Rim Shape

Shape	Three Circle		Mangus Black-on-white		Late Indeterminate		Transitional		Classic Black-on-white		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Not applicable	73	76.8	231	79.1	36	81.8			25	75.8	365	78.5
Tapered	5	5.3	20	6.8	3	6.8					28	6.0
Rounded	12	12.6	37	12.7	5	11.4	1	100	7	21.2	62	13.3
Flat	3	3.2	4	1.4					1	3.0	8	1.7
Angled	2	2.1									2	.4
Total	95	100	292	100	44	100	1	100	33	100	465	100

Table 4.21. Mimbres Types by Rim Decoration

Decoration	Three Circle		Mangus Black-on-white		Late Indeterminate		Transitional		Classic Black-on-white		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Not applicable	73	76.8	231	79.1	36	81.8			25	75.8	365	78.5
Undecorated	8	8.4	7	2.4					1	3.0	16	3.4
Solidly painted	11	11.6	46	15.8	5	11.4	1	100.0	6	18.2	69	14.8
Indeterminate	2	2.1	8	2.7	3	6.8					13	2.8
Dashed, incomplete, solid	1	1.1							1	3.0	2	.4
Total	95	100.0	292	100.0	44	100.0	1	100.0	33	100.0	465	100.0

Table 4.22. Mimbres Types by Rim Design Orientation

Orientation	Three Circle		Mangus Black-on-white		Late Indeterminate		Transitional		Classic Black-on-white		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Not applicable	73	76.8	231	79.1	36	81.8			25	75.8	365	78.5
Indeterminate	4	4.2	7	2.4	3	6.8					14	3.0
Indeterminate no framing lines	15	15.8	43	14.7	1	2.3			3	9.1	62	13.3
Indeterminate single thin framing line			1	.3	1	2.3			1	3.0	3	.6
Indeterminate single thick framing line	1	1.1	7	2.4	3	6.8			1	3.0	12	2.6
Indeterminate single thick incorporated line			1	.3					1	3.0	2	.4
Indeterminate single thin incorporated line	2	2.1	2	.7							4	.9
Indeterminate multi thin framing lines							1	100.0	1	3.0	2	.4
Indeterminate multi thick framing lines									1	3.0	1	.2
Total	95	100.0	292	100.0	44	100.0	1	100.0	33	100.0	465	100.0

Table 4.23. Mimbres Types by Motif Number and Motif Type

Motif Type	Three Circle		Mangus Black-on-white		Late Indeterminate		Transitional		Classic Black-on-white		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
THIN PARALLEL LINE												
Motif number 1	39	26.5	44	11.7	3	6.5	1	100.0	23	42.6	110	17.6
Motif number 2	5	3.4	7	1.9					1	1.9	13	2.1
Motif number 3	2	1.4	1	.3							3	.5
THICK PARALLEL LINE												
Motif number 1	1	.7	3	.8					1	1.9	5	.8
Motif number 2			1	.3					1	1.9	2	.3
Motif number 3	1	.7									1	.2
TRIANGLE												
Motif number 1	5	3.4	1	.3					1	1.9	7	1.1
Motif number 2	7	4.8	1	.3					4	7.4	12	1.9
Motif number 3			1	.3							1	.2
CROSSED LINES												
Motif number 1			5	1.3							5	.8
THICK CURVILINEAR LINES												
Motif number 1			3	.8							3	.5
Motif number 2			1	.3							1	.2
RIBBON												
Motif number 1			19	5.1					1	1.9	20	3.2
Motif number 2			5	1.3					3	5.6	8	1.3
Motif number 3			2	.5							2	.3
CHECKERBOARD												
Motif number 1			1	.3							1	.2
SINGLE THICK LINE												
Motif number 1			9	2.4	3	6.5			4	7.4	16	2.6
Motif number 2	1	.7	6	1.6							7	1.1
MOTIF CONNECTED BY SINGLE LINE												
Motif number 2	3	2.0							2	3.7	5	.8
Motif number 3	1	.7							1	1.9	2	.3
CURVILINEAR RIBBON												
Motif number 1			5	1.3	2	4.3					7	1.1
Motif number 2			2	.5							2	.3
Motif number 3			1	.3							1	.2
RECTILINEAR RIBBON												
Motif number 1			4	1.1							4	.6
Motif number 2									1	1.9	1	.2

Table 4.23. Continued

Motif Type	Three Circle		Mangus Black-on-white		Late Indeterminate		Transitional		Classic Black-on-white		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Motif number 3			1	.3							1	.2
CURVILINEAR SCROLL												
Motif number 1			40	10.6	1	2.2					41	6.6
Motif number 2			3	.8							3	.5
Motif number 3			1	.3							1	.2
SINGLE THIN LINE												
Motif number 1	6	4.1	6	1.6	2	4.3			1	1.9	15	2.4
Motif number 2	6	4.1	3	.8							9	1.4
SQUIGGLE LINES, SINGLE OR PARALLEL												
Motif number 1			36	9.6							36	5.8
Motif number 2			3	.8							3	.5
INTERSECTING LINES, SINGLE												
Motif number 1	17	11.6	7	1.9	1	2.2			1	1.9	26	4.2
Motif number 2	4	2.7	1	.3							5	.8
Motif number 3	1	.7									1	.2
CONNECTED TRIANGLES												
Motif number 1	9	6.1	4	1.1							13	2.1
Motif number 2	4	2.7									4	.6
Motif number 4	1	.7									1	.2
CIRCLE												
Motif number 1			1	.3							1	.2
INDETERMINATE												
Motif number 1	15	10.2	59	15.7	30	65.2			1	1.9	105	16.8
Motif number 2	8	5.4	26	6.9	1	2.2			5	9.3	40	6.4
Motif number 3	5	3.4	2	.5					2	3.7	9	1.4
RECTILINEAR SCROLL												
Motif number 1			4	1.1							4	.6
Motif number 2			3	.8							3	.5
Motif number 4			1	.3							1	.2
SCALLOPED LINE												
Motif number 1	2	1.4	29	7.7	2	4.3					33	5.3
Motif number 2	2	1.4	6	1.6					1	1.9	9	1.4
Motif number 3	1	.7	2	.5							3	.5
CORRECTED TRIANGLE												
Motif number 1	1	.7									1	.2

Table 4.23. Continued.

Motif Type	Three Circle		Mangus Black-on-white		Late Indeterminate		Transitional		Classic Black-on-white		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
PARTIAL SCROLL (BOLDFACE)												
Motif number 1			10	2.7							10	1.6
Motif number 2			3	.8	1	2.2					4	.6
INDETERMINATE PENDANTS												
Motif number 2			1	.3							1	.2
ZOOMORPHIC												
Motif number 1			2	.5							2	.3
Total	147	100.0	376	100.0	46	100.0	1	100.0	54	100.0	624	100.0

Red Mesa Black-on-white

Red Mesa Black-on-white refers to Cibola White Ware exhibiting treatments and decorative styles indicative of pottery produced over wide areas of the Cibola region during the early Pueblo II period (Fig. 4.35). Painted surfaces are often polished and slipped. Temper may be sand, sherd, or sherd and sand. Red Mesa Black-on-white was very rare at Luna Project sites but sometimes present in low frequencies at contexts dominated by Mangus Black-on-white and Reserve Black-on-white.

Rims are usually solidly painted. Painted designs are commonly organized into banded or quartered patterns. Design motifs include multiple parallel lines sometimes embellished with triangles or ticked lines, ribbons with squiggle hatchure, and different types of motifs often occur together in bold and complex patterns.

Puerco/Escavada Black-on-white

Definitions of and distinctions between Puerco Black-on-white and Escavada Black-on-white are somewhat confusing and vague. As used here, previous definitions were lumped into a single category which refers to the presence of a surface slip noted on other Pueblo II types and use of a range of solid design styles employed during the later part of the Pueblo II and early Pueblo III periods. Design styles often include triangles, parallel lines, and chevrons. It may, however, be easy to confuse solidly painted portions of Reserve Black-on-white and these types. Given the nature of white ware assemblages in the northern Mogollon Highlands, during the present study there was definitely a bias toward placing such ceramics into Reserve Black-on-white.

Hatchure Only

This category refers to Pueblo II sherds exhibiting hatchure but too small to determine if solid designs may have also been present. Such sherds may have been derived from Gallup Black-on-white or Reserve Black-on-white, but not Tularosa Black-on-white, given polish and spacing of hatchured lines.

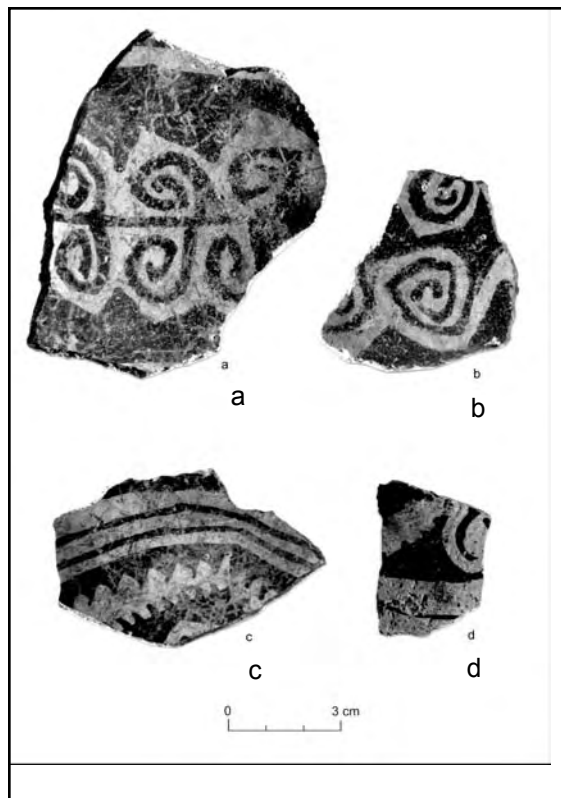


Figure 4.35. Red Mesa Black-on-white; (a-c) LA 45507, (d) LA 39968.

Gallup Black-on-white

This refers to Pueblo II hatched sherds that are large enough to determine whether the vessel was solely decorated with hatchure designs.

Reserve Black-on-white

Reserve Black-on-white is the most common distinctive type represented at Luna sites (Figs. 4.36-4.37). Reserve Black-on-white refers to Cibola White Ware exhibiting very widespread styles associated with late Pueblo II white wares found through much of the northern Mogollon and southern Anasazi country (Martin and Rinaldo 1950a; Doyel 1980; Crown 1981; Fowler 1988, 1994; Varien 1990). In the Luna and Reserve areas, Reserve Black-on-white replaces Mimbres White Ware and Mangus Black-on-white as the most common white ware at about A.D. 1000, while in various areas of the southern Colorado Plateau, this type follows Red Mesa Black-on-white (Doyel 1980; McGimsey 1980; Crown 1981; Fowler 1994). Vessel surfaces tend to be white, and paste also tends to be light, sometimes with a light gray core. Surfaces are sometimes slipped with a white chalky clay. Vessels are moderately polished but generally not as much as Tularosa Black-on-white. Reserve Black-on-white vessels also tend to be relatively thin compared to Tularosa Black-on-white. The majority of sherds assigned to Reserve Black-on-white are from jars. The thickness of vessel walls near the rim ranges from 3 to 6 mm and averages 4.2 mm.

Reserve Black-on-white is fairly similar in appearance and form to Tularosa Black-on-white, and sherds and vessels are often distinguished by slight differences in design styles and layouts or surface finishing. Reserve Black-on-white vessels are commonly decorated with opposed solid and hatched elements. Hatched elements are often wider than solid elements. Hatched elements include triangular, rectilinear, and curvilinear shapes. Solid design elements include scrolls, narrow broad lines, triangles, and sawteeth. Design elements are relatively large, particularly when compared to Tularosa Black-on-white. In addition, spacing between hatched lines is relatively wide. All-over layouts are most abundant, although banded layouts are also fairly common. Given the common occurrence of Reserve Black-on-white at early Pueblo assemblages, there was a tendency to place some sherds exhibiting only solid or hatched designs into this

type.

Tularosa Black-on-white

Tularosa Black-on-white is similar to Reserve Black-on-white but exhibits later painted styles and manipulations (Figs. 4.38-4.39). Surfaces tend to be well polished and are often slipped. Slipped surfaces are often pearly white and tend to exhibit a crackled finish. Vessel walls are relatively thick. The thickness of vessel walls near the rim ranges from 3 to 6 mm and averages 4.7 mm.

As compared to earlier types, Tularosa Black-on-white designs tend to be small and well executed. Designs include interlocking hatchure and solids, and rectilinear patterns are more common than curvilinear. Hatched lines tend to be thin and more closely spaced, and line work appears to be finer than that in earlier Cibola white wares. Unlike other Cibola White Ware types, hatched lines commonly exhibit a longitudinal orientation. Hatched portions tend to be smaller than other Cibola White Ware and are more equally balanced in proportion to the solid elements. Painted designs tend to cover much more of the total vessel surfaces than later types, often creating striking effects.

Tularosa/Reserve Black-on-white

This category reflects difficulties in distinguishing Reserve Black-on-white from Tularosa Black-on-white sherds or vessels. It refers to painted sherds exhibiting treatments and designs that could belong to either Reserve Black-on-white or Tularosa Black-on-white. Pottery assigned to this category dates sometime during the Reserve or Tularosa phases.

Snowflake Black-on-white

Snowflake Black-on-white covers a wide range of decorations (Fig. 4.40). The most useful definition of this type refers to the use of bold, solid, and stepped elements (Crown 1981; Mills 1987; Fowler 1994). These elements are usually attached to the end of broad rectilinear bands. The little pottery assigned to this category seemed to be associated with Tularosa Black-on-white.

Klagetto Black-on-white

Klagetto Black-on-white exhibits many of the common characteristics found on late forms of Tularosa



Figure 4.36. Reserve Black-on-white; LA 39969.

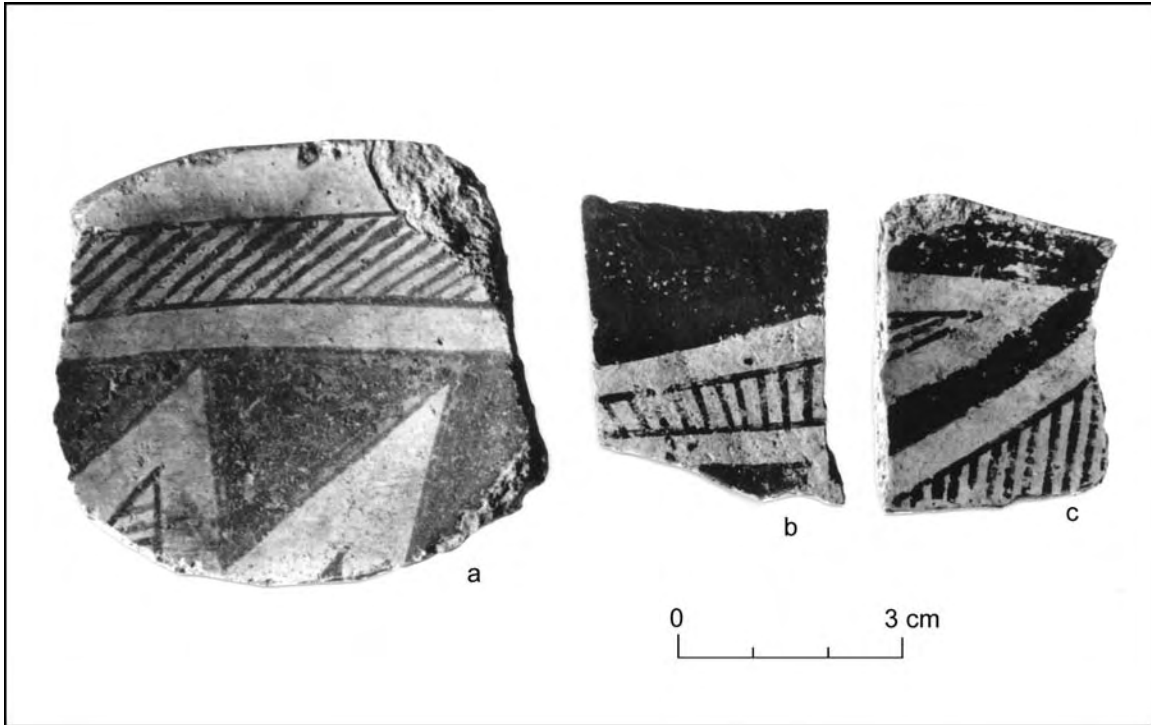


Figure 4.37. Reserve Black-on-white; (a) LA 3563, (b-c) LA 70185.

Black-on-white such as thick vessel walls and cracked slips (Fig. 4.40). Design elements are similar to those described for Tularosa Black-on-white but tend to be larger, with thicker lines and wider spaces between lines and elements (Mount et al. 1993).

Pinedale Black-on-white

Pinedale Black-on-white represents one of the last of the Cibola White Wares produced (Wood 1987). This type is similar to other late Cibola White Wares but was distinguished by the presence of a very glassy paint. Surfaces are polished and usually slipped and cracked, and similar to those in Tularosa Black-on-white. Tempering material is usually crushed sherd.

The black mineral paint is usually very thick and glassy, creating a glazed effect. Painted designs are characterized by balanced and interlocking solid and hatched elements of equal width. Designs are busy and are characterized by parallel hatching or perpendicular cross hatching with opposed elaborated designs, similar to those seen on Tularosa Black-on-white. Other motifs include Tularosa Black-on-white as well as interlocking pennant triangles and stepped triangles.

Smudged Interior

This category refers to smudged pottery with white ware pastes.

OTHER WHITE WARE TRADITIONS

White ware pottery that could be assigned to types from traditions other than Cibola White Ware are limited to a single Mesa Verde Black-on-white sherd belonging to the northern San Juan tradition. Mesa Verde Black-on-white often contains crushed igneous, often with crushed sherd, temper. It is usually well polished, and often slipped with a pearly white surface. Vessel walls, especially bowls, are usually very thick. Rims are usually flat, with ticked painted decorations. Vessels exhibit decorations in organic paint. Designs are usually complex and well executed. Painted designs cover much of the vessel surface, and a negative effect is often created by the unpainted portion. Design elements are similar to those observed in earlier types and include hatchure, triangles, stepped triangles, dots, diamonds, and ticked lines. Two classes of designs occur on Mesa Verde Black-on-white: banded and all-over styles. Banded designs are usually bracketed by framing lines. Single framing lines are usually thick, and if

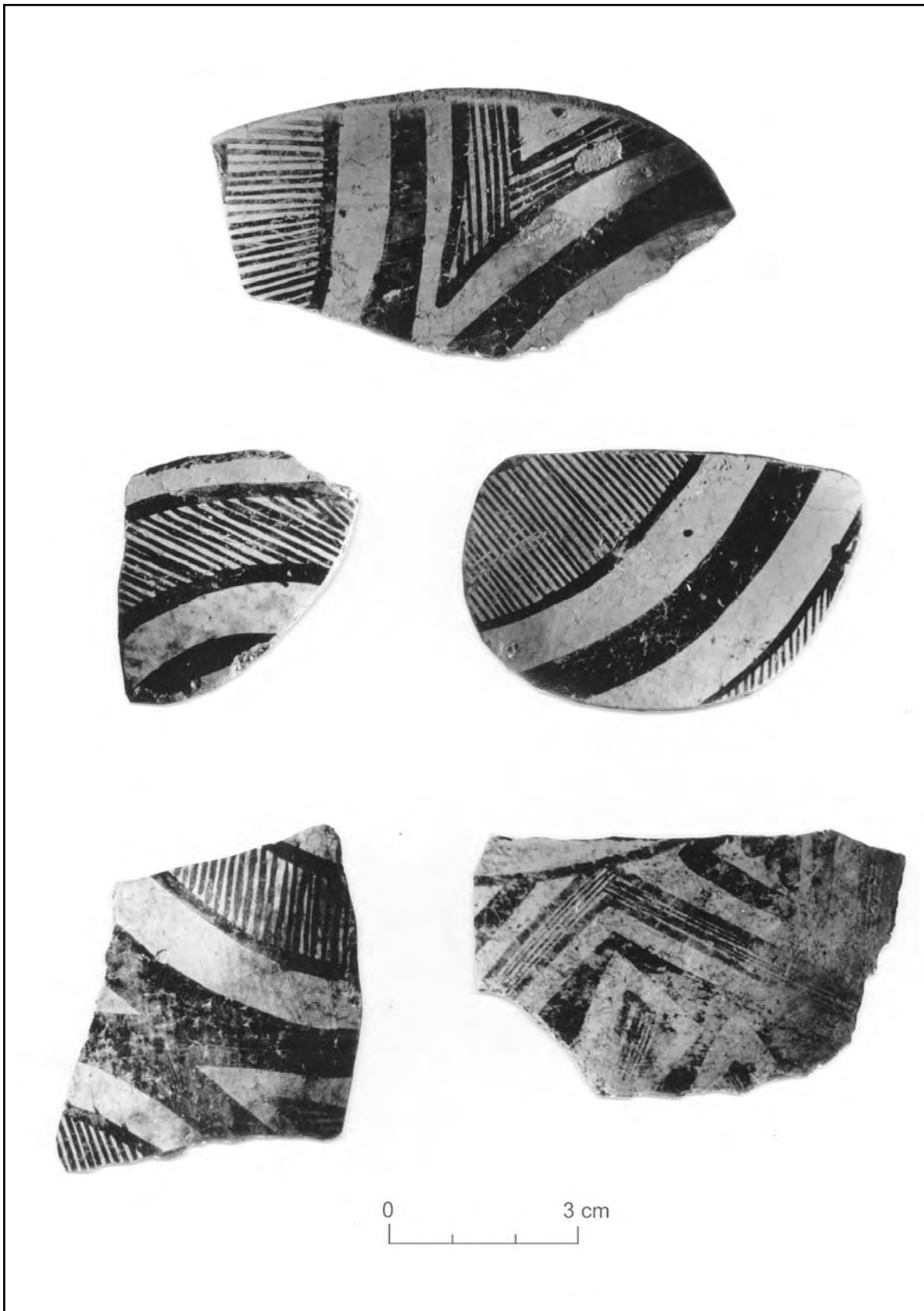


Figure 4.38. Tularosa Black-on-white, LA 70185.

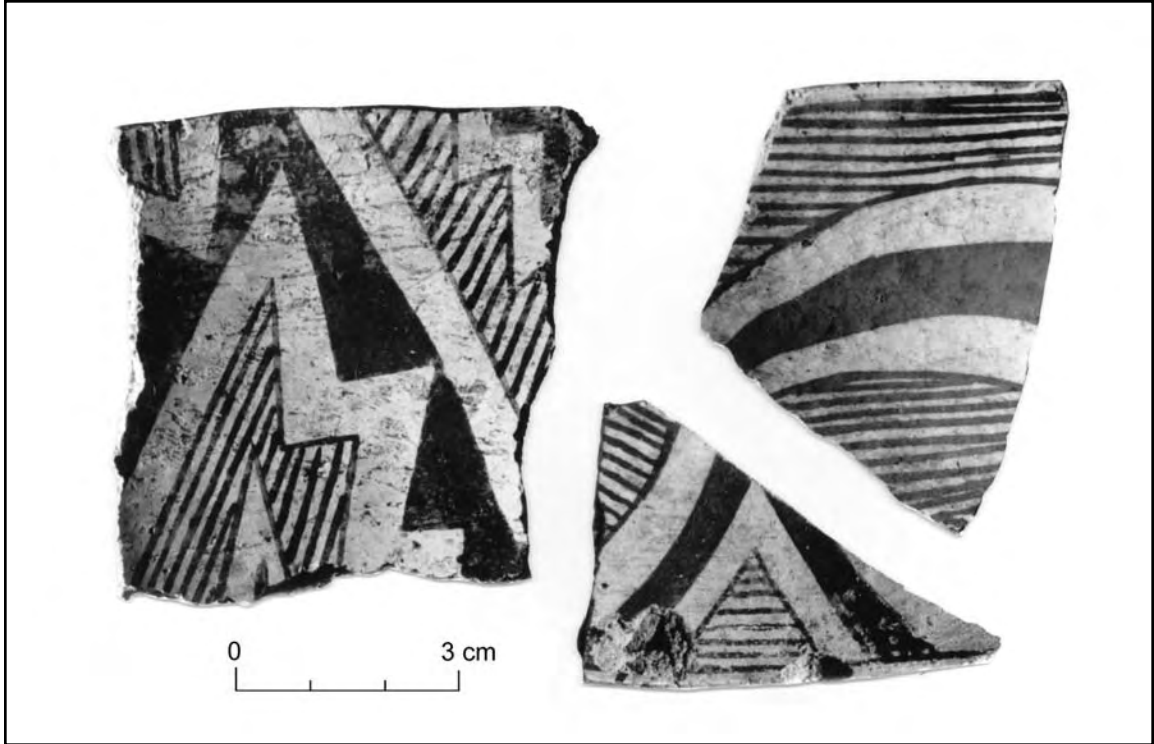


Figure 4.38. Continued. Tularosa Black-on-white, LA 70185.



Figure 4.39. Tularosa Black-on-white, LA 3279.

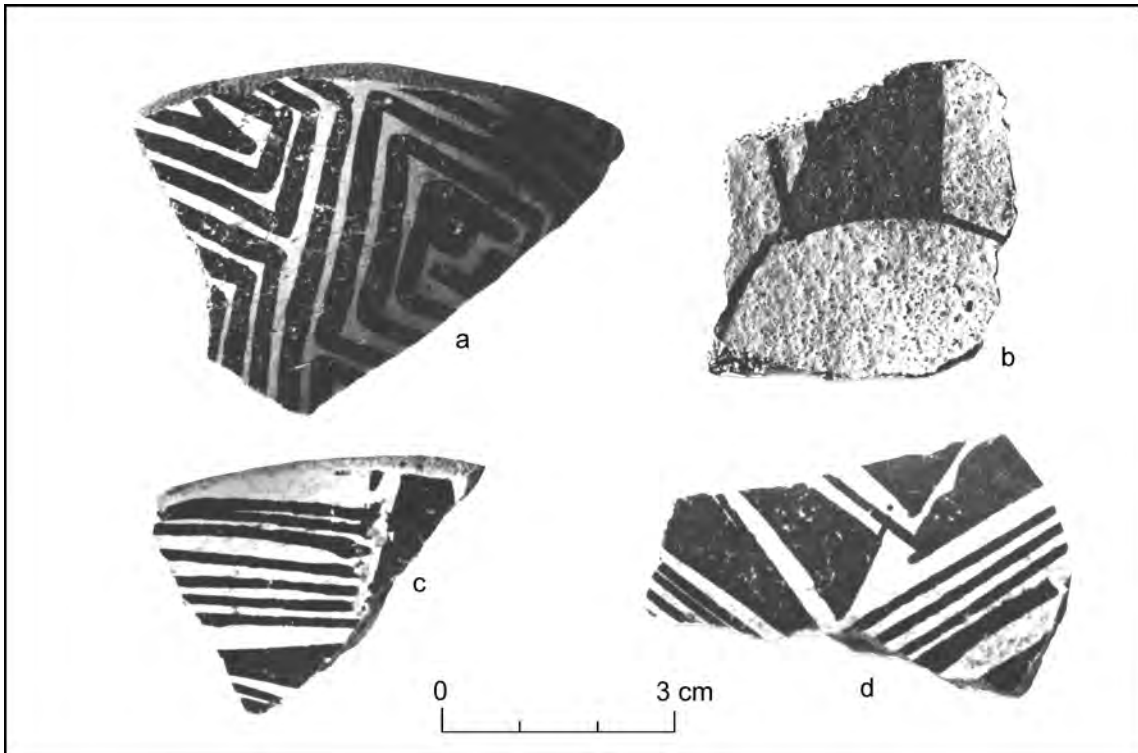


Figure 4.40. (a) Snowflake Black-on-white, LA 3279; (b) La Plata Black-on-white, LA 45507; (c-d) Klagetoe Black-on-white, LA 3279.

more than one framing line is present, they are usually of different thicknesses.

WHITE MOUNTAIN REDWARE

White Mountain red wares appear to represent a fairly specialized tradition that appeared during the late Pueblo II period in the White Mountains and upper Little Colorado drainages. White Mountain red wares, one of the widest distributed pottery traditions, are found at sites throughout much of the Southwest (Carlson 1970). Table 4.24 illustrates temper groups for White Mountain Redware from Luna sites. They are characterized by a light paste, sherd temper, and dark red slip. Surfaces are well polished. Painted decorations are executed in a sharp black mineral or organic paint and later with glaze paint, sometimes in combinations with decorations in white clay. The great majority of the White Mountain Redware sherds are from bowl forms, and jar forms are represented in very low frequencies (Table 4.25).

White Mountain Redware sherds not displaying distinctive painted designs indicative of previously defined formal types were classified as indeterminate.

Wingate Black-on-red

Wingate Black-on-red exhibits dark red to bright red slips. Designs consist primarily of hatchure elements, often with opposed solid elements, similar to designs described for Reserve Black-on-white. Ceramics with similar styles and decorations in white clay paint on the exterior were assigned to Wingate Polychrome.

Puerco Black-on-red

Puerco Black-on-red contains dark red to bright red slips. Designs consist almost exclusively of solid elements, including triangles, broad lines, checkerboards, and parallel hatching.

St. Johns Black-on-red

St. Johns Black-on-red contains bright red to red-orange slips. Designs are similar to those described for Tularosa Black-on-white and include interlocking opposed solids and fine hatchure. Bowls with similar decorations with the addition of wide designs in white clay paint on the exterior surface were assigned to St. Johns Polychrome.

Table 4.24. Temper of White Mountain Redware Types

Temper	Cibola Indeterminate White Mountain Red		Cibola Wingate Black-on-red		Cibola Wingate Polychrome		Cibola Puerco Black-on-red		Cibola St. Johns Black-on-red		Cibola St. Johns Polychrome		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Sand	2	3.1	0	.0	0	.0	0	.0	0	.0	0	.0	2	2.0
Sand and sherd	56	87.5	17	94.4	2	100.0	4	100.0	8	88.9	2	100.0	89	89.9
Sherd	6	9.4	1	5.6	0	.0	0	.0	1	11.1	0	.0	8	8.1
Total	64	100.0	18	100.0	2	100.0	4	100.0	9	100.0	2	100.0	99	100.0

Table 4.25. Vessel Forms of White Mountain Redware Types

Vessel Form	Cibola Indeterminate White Mountain Red		Cibola Wingate Black-on-Red		Cibola Wingate Polychrome		Cibola Puerco Black-on-Red		Cibola St. Johns Black-on-Red		Cibola St. Johns Polychrome		Cibola Springer Polychrome		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Bowl rim	12	9.0	4	14.8	2	66.7	4	50.0	9	9.6	1	3.6	0	.0	32	10.7
Bowl body	94	70.7	23	85.2	1	33.3	4	50.0	83	88.3	26	92.9	6	100.0	237	79.3
Jar body	12	9.0	0	.0	0	.0	0	.0	1	1.1	0	.0	0	.0	13	4.3
Cooking jar neck	2	1.5	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	2	.7
Indeterminate	13	9.8	0	.0	0	.0	0	.0	1	1.1	1	3.6	0	.0	15	5.0
Total	133	100.0	27	100.0	3	100.0	8	100.0	94	100.0	28	100.0	6	100.0	299	100.0

Springerville Polychrome

Springerville Polychrome refers to pottery exhibiting manipulations and designs as noted in St. Johns but with both white and black paint on bowl interiors and jar exteriors.

slip, it may represent a type produced by Piro Pueblo groups to the east (Marshall and Walt 1984), and may reflect pottery acquired by Apache groups inhabiting this area during the protohistoric and historic periods.

PROTOHISTORIC POTTERY

A single sherd exhibits a distinct paste with basalt temper and red slip. It is likely that this is protohistoric. Given the characteristics of the temper and

CERAMIC DATING

C. Dean Wilson

Initial examination of ceramic distributions at Luna Project sites indicated a very long and continuous occupation by Mogollon groups from A.D. 200 to at least 1300. Data from this project provide one of the first opportunities to systematically examine the long sequence of ceramic change in the northern Mogollon Highlands in New Mexico since Paul Martin's pioneering investigations in this region (Martin 1943, 1979; Martin and Rinaldo 1947, 1950a, 1951; Martin et al. 1949, 1952, 1954, 1956; Barter 1957a; Bluhm 1957; Martin and Plog 1973). This chapter presents information relating to the methods and strategies used to assign dates to Luna Project sites based on ceramic distributions as well as discussions of the proposed dating of various sites and components. Data presented in this chapter form the basis for the examination of various ceramic changes and trends discussed in subsequent chapters.

DATING APPROACHES

Two basic approaches have been used to assign dating periods based on ceramic distributions (Goetze and Mills 1993). One is the judgmental approach, where the distribution of types in a particular ceramic assemblage is used judgmentally to identify a phase or period with known temporal spans. The other approach consists of seriation techniques used to quantitatively order assemblages based on differences in the frequency of ceramic types or traits.

Most ceramic dating schemes previously used to date northern Mogollon sites are based on judgmental phase assignments employed during investigations conducted from the 1930s through the 1950s (Haury 1936a; Nesbitt 1938; Martin 1943; Martin and Rinaldo 1947, 1950a; Martin et al. 1949, 1952, 1954, 1956; Wendorf 1956; Barter 1957a, 1957b; Bluhm 1957, 1960; Danson 1957; Peckham 1957, 1963). Studies in this area have documented change by examining ceramic distributions from stratigraphic profiles, architectural associations, and contexts yielding independent radiocarbon, archaeomagnetic, and tree-ring dates (Haury 1936a; Bannister et al. 1970; Martin 1979). In addition, these studies employed cross-dating, using independently dated types from other regions such as the

Cibola Anasazi and Mimbres Mogollon.

One technique commonly employed in northern Mogollon ceramic studies involved the organization of information concerning the frequency of types from relatively dated assemblages into wedge bar graphs (Haury 1936a; Nesbitt 1938; Martin et al. 1949, 1952, 1957; Nesbitt 1938). These graphs were used to illustrate gradual changes in the frequency of various ceramic types during a given occupational sequence and provided the basis for the recognition of various ceramic-based phases.

Two basic judgmental schemes are commonly used to assign dates to northern Mogollon ceramic assemblages. The most frequently employed scheme involves the recognition of several temporally sensitive phases. Assemblages associated with different phases have long been recognized by combinations of decorated white and textured utility ware (Haury 1936a; Nesbitt 1938; Martin and Plog 1973; Berman 1979, 1989; Martin 1979). Phases defined during early investigations of the northern Mogollon Highlands include the Pine Lawn (A.D. 200 to 500), Georgetown (A.D. 500 to 700), San Francisco (A.D. 700 to 900), Three Circle (A.D. 900 to 1000), Reserve (A.D. 1000 to 1075), and Tularosa (A.D. 1075 to 1300) phases.

A similar but broader scheme was first employed by researchers at the Mimbres Foundation (Anyon et al. 1981; LeBlanc 1982b; Lekson 1986). This system involved grouping earlier defined phases of the Mimbres region into a series of longer and more generally defined periods (Anyon et al. 1981; Lekson 1986). Basic periods recognized during investigations by the Mimbres Foundation have been modified for the northern Mogollon region (Berman 1979). This results in the recognition of three broadly defined periods including the Early Pithouse, Late Pithouse, and Pueblo periods.

Parallel use of the two dating schemes provides temporal classifications of varying resolutions appropriate for different situations. The phase system is most appropriate for larger assemblages, containing specific types used to recognize different phases. It is often not possible, however, to distinguish phases for smaller assemblages, where fairly rare types used to recognize different phases are often not present. In contrast, each of the three peri-

Table 4.26. Mogollon Dating Periods and Phases

Period	Phase	Span
Early Pithouse	Pine Lawn	A.D. 200 to 500
	Georgetown	A.D. 500 to 700
Late Pithouse	San Francisco	A.D. 700 to 900
	Three Circle	A.D. 900 to 1000
	Reserve	A.D. 1000 to 1100
Pueblo	Reserve/Tularosa Transition (Apache Creek)	A.D. 1100 to 1150
	Tularosa	A.D. 1150 to 1300

ods defined for the northern Mogollon are characterized by dramatic and easily recognized differences in ceramic distributions, even for very small ceramic assemblages. For example, Early Pithouse period components are defined by the lack of painted or textured types. Late Pithouse occupations are characterized by the additional occurrence of low frequencies of early Mogollon painted or Mimbres White Ware and necked textured types. Pueblo period sites are distinguished by the additional presence of later Anasazi style white ware and corrugated brown wares. Table 4.26 illustrates the relationship between the various phases and periods for sites in the northern Mogollon Highlands.

Unfortunately, most of the phases and periods defined for the northern Mogollon region are quite long. Thus, it is sometimes necessary to also employ techniques allowing for finer temporal resolution. One simple quantitative technique used to order and date ceramic assemblages based on type distributions is ceramic mean dating. This technique was first developed to date historical ceramic assemblages (South 1977) and has the potential to produce more precise and replicable dating results than judgmental samples. The first step in assigning ceramic mean dates to an assemblage is to determine the median date of the production of each ceramic type present. Next, mean dates for all types are added and divided by the number of sherds (South 1977). This yields a dating point estimate for a particular collection. A potential advantage of the mean dating formula is that, rather than relying solely on information concerning the presence and absence of ceramic types, information concerning the relative frequency of various types is incorporated into dating estimates.

Modified versions of this technique have recently been used to date assemblages from Anasazi and Mogollon sites (Mills 1987; Goetze and

Mills 1993; Reed 1994; Christenson 1995). While problems have been noted in the use of this technique in various Southwest regions, Goetze and Mills (1993) feel that with an increased refinement of production spans of southwestern ceramic types, this technique provides a relatively efficient way of dating ceramic assemblages.

My initial attempts to use this technique to date assemblages from the Luna Project sites, however, resulted in dating assignments that did not match well with previous calibrations. Calendar dates arrived at through this technique from early Mogollon sites (Pithouse periods) were significantly later than those indicated by other evidence. In contrast, in later (Pueblo period) assemblages, this technique yielded dates that were too early. These problems result from the long persistence of certain ceramic types such as Alma Plain, which dominated Mogollon assemblages for over a millennium. This reflects the very conservative and accumulative nature of ceramic change in the northern Mogollon. For example, while in most of the Anasazi region relatively short and dramatic sequences of replacement are represented by the shift from plain to corrugated dominated utility ware assemblages, Northern Mogollon assemblages dating to almost all phases are dominated by Alma Plain. Later components are characterized by the additional presence of later textured and painted types but usually occur along with a much higher frequency of pottery exhibiting textured and painted styles also common in earlier occupations. Thus, ceramic change in the Mogollon Highlands is best considered as cumulative rather than sequential, as in the Anasazi region, and strongly affects the nature of median dates of types commonly occurring in the northern Mogollon Highlands.

Some studies have attempted to control for the influence of long-lived types by weighting mean

Table 4.27. Basis for Assignment of Ceramic Types to Scores

Dating Score Assigned to Sherd	Types Included in Score
1: Types appearing during the Pine Lawn Phase	All unpolished and polished plain brown ware types; all early slipped red ware types
2: Types appearing during the late Georgetown or early San Francisco phases	Alma neckbanded Early plain textured types Alma Plain Plain smudged brown ware Anasazi plain gray types Early Anasazi black-on-white Early plain gray wares Early Anasazi black-on-white White Mound Black-on-white Mogollon Red-on-brown Three Circle Red-on-white Mimbres slipped
3: Types appearing sometime during the late San Francisco phase or Three Circle phase	Three Circle neckbanded Incised corrugated Mangus Black-on-white Red Mesa Black-on-white
4: Types appearing during the Reserve phase	Reserve Black-on-white and most other Late Anasazi white ware Most plain and indented corrugated Indeterminate White Mountain Red Puerco Black-on-red; Wingate Black-on-red
5: Types usually appearing during the Tularosa phase	Tularosa Black-on-white Patterned and alternating corrugated St. Johns Black-on-red and Polychrome Three Circle Red-on-white

dating scores or only using shorter-lived decorated types (Reed 1994). This, however, results in the exclusion of information concerning the presence of long-lived pottery. Such exclusions may eliminate information relating to the most common pottery at these sites, and, in my opinion, does not really contribute any more dating insights than that provided by judgmental inferences.

In response to these problems, in the present study, assemblages from various sites were quantitatively ordered through the use of a simple scoring technique based on logic, similar to that used in ceramic mean dating. This technique allows for the documentation of the kind of gradual ceramic change represented at sites in the northern Mogollon Highlands. Given the nature of northern Mogollon ceramic change, relative scores should not only reflect the influence of the numerous long-lived types, but should also give more weight to later types. Rather than assigning a particular type to a specific date, types were assigned to gradational scores that reflected the cumulative nature of ceramic changes in the northern Mogollon. Each type was assigned a particular score based on the sequential order of the phase during which it appeared, rather than a median date. Early plain brown wares appearing during the earliest (Pine Lawn) ceramic phase were assigned to 1, the lowest score. Early textured

types appearing during the next phase received a score of 2, and so on, ending with the assignment of sherds appearing in the late Tularosa phase to a score of 5. Table 4.27 illustrates the scores for the various types identified during the Luna Project. These scores were assigned to each sherd from an assemblage, added, and then divided by the number of total sherds. While the scores derived from these assignments do not provide a chronological date, they do provide a score helpful in the determination of the relative time associated with a particular assemblage. One advantage of this technique over other seriation techniques is that it is simple and can easily be applied to other assemblages presented in various reports.

These scores also may allow for the identification of mixing or contamination from different components that may not be evident through judgmental inferences alone. For example, significant differences in scores of assemblages containing similar diagnostic types used in judgment inferences may indicate the presence of mixed assemblages. In addition, an examination of the relative influence of scores associated with a particular phase provides a way to evaluate mixing from different components. These scores may also provide a tool for examining the relative continuity of occupation represented by a group of assemblages. For example, a sudden

jump in the total score could indicate temporal gaps or hiatuses that may otherwise be very difficult to identify.

A combination of the previously discussed approaches was used to assign dates to Luna sites and components. Distributions of types were first used to assign ceramic assemblages from a particular context to one of three basic periods. Next, when possible, assemblages were assigned to a particular phase, based on the occurrence of specific and relatively rare types. In addition, contexts were further dated by assigning previously described ceramic scores to these assemblages. Data relating to the distribution of ceramic types at Luna Project sites are presented in Table 4.28. Information relating to the dating of each site is presented in Table 4.29. Information concerning the dating of Luna sites is discussed in order of the earliest to latest components.

ASSIGNMENT AND DATING OF EARLY PITHOUSE PERIOD COMPONENTS

By definition, the Early Pithouse phase of the Mogollon is differentiated from the earlier San Pedro phase of the Cochise Archaic by the addition of undecorated brown ware (Martin 1979; Stuart and Gauthier 1981). In some schemes, the Early Pithouse period is divided into the Pine Lawn and Georgetown phases (Wheat 1955; Berman 1979; Martin 1979; Anyon et al. 1981; Stuart and Gauthier 1981). Both of these phases are characterized by the absence of painted types and most textured utility wares. Thus, almost all the sherds from assemblages dating to both phases are Alma Plain, Alma Rough, or similar pottery exhibiting red slips and classified as San Francisco Red (Martin 1943; Martin et al. 1949; Fitting 1973).

Unfortunately, criteria previously used to ceramically differentiate Pine Lawn and Georgetown phase components are vague and inconsistent (Berman 1989; Bullard 1962). Martin appears to have in part distinguished Georgetown and Pine Lawn phase components based on an assumed decline of Alma Rough and the occurrence of very low frequencies of textured brown ware and Mogollon Red-on-brown (Martin 1943; Martin et al. 1949). Other possible criteria that could be used to subdivide the Late Pithouse period ceramically may include changes in the overall dominance of ceramics and possible increases in red slipped pottery. Based on pottery and architectural similarities at sites previously assigned to these two phases, how-

ever, Berman (1989) questions the existence of the Georgetown phase in the northern Mogollon. She places occupations previously assigned to the Georgetown phase into the Pine Lawn Phase (Berman 1989). The ceramic reality and time span of these phases will ultimately depend on further examination of changes noted in distributions of Alma Plain, Alma Rough, early textured ware, and Mogollon Red-on-brown.

Ceramic distributions indicate that at least four sites on the Luna Project contain components dating during the Early Pithouse period. These include LA 70188 (Raven's Roost), LA 39975 (Lazy Meadows), LA 45508 (Humming Wire), and Component B of LA 39972 (SU Tanks).

LA 70188 (Raven's Roost)

A total of 57 sherds were recovered from LA 70188 (Table 4.30). Most of these sherds were recovered from the general fill, and only two were from Pit Structure 1. The majority (61.4 percent) of the sherds from this site are plain brown wares. Alma Plain polished sherds slightly outnumber Alma Rough sherds. Red slipped brown wares are relatively common, but this may be a reflection of the small overall sample size. Despite the small sample size, the presence of plain brown ware and red ware sherds belonging to many vessels, and the lack of later textured types and Mimbres white wares, indicate that the majority of these ceramics are associated with a Late Pithouse Period occupation. Late Anasazi white wares include late unpainted, Tularosa Black-on-white, and hatchure black-on-white. Proportions of Alma Plain, Alma Rough, and San Francisco Red are very similar to distributions noted at other Early Pithouse period sites. The occurrence of five late Anasazi white wares at various proveniences also indicates some contamination from a Pueblo period component.

While several dates were recovered from this site, most of them indicate Archaic or Apache occupations and are too early or late to be associated with the ceramics. Six dates from B.C. 70 to A.D. 330 may indicate an occupation from the Late Archaic to the early part of the Early Pithouse period. Most of the sherds from this site may be associated with the later part of this span and could possibly indicate a temporal transition between the Late Archaic and Early Pithouse period. In many areas of the Southwest, sites dating to the very earliest ceramic occupations tend to yield very small ceramic assemblages (Blinman and Wilson 1993; Wilson et al.

Table 4.28. Ceramic Groups by Site

Site	Indeterminate		Plain Brown Ware		Early Textured Brown		Plain Smudged Brown		Corrugated Brown		Mogollon Slipped Red		Mogollon Painted and Mimbres White		Cibola White		White Mountain Red and Nonlocal Red		Other		Gray Wares		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
LA 3279	123	.1	23789	26.1	136	.1	26114	28.7	31938	35.1	2785	3.1	130	.1	5460	6.0	187	.2	313	.3	8	.0	90983	100
LA 3563	2	.1	1566	61.6	13	.5	286	11.2	428	16.8	42	1.7	83	3.3	117	4.6	7	.3					2544	100
LA 9721			1	100.0																			1	100
LA 37917			1	100.0																			1	100
LA 37919			9	100.0																			9	100
LA 39968	23	.1	10459	53.8	65	.3	3397	17.5	3902	20.1	157	.8	63	.3	1316	6.8	43	.2			1	.0	19426	100
LA 39969	4	.1	3056	52.3	21	.4	1277	21.9	1001	17.1	40	.7	30	.5	410	7.0	3	.1			1	.0	5843	100
LA 39972	1	.0	1360	66.8	4	.2	310	15.2	248	12.2	70	3.4	2	.1	42	2.1							2037	100
LA 39975			1969	84.8	31	1.3	8	.3			314	13.5											2322	100
LA 43766			127	84.7	1	.7	4	2.7	7	4.7	1	.7	2	1.3	8	5.3							150	100
LA 43786			58	77.3	4	5.3	3	4.0	2	2.7	4	5.3	4	5.3									75	100
LA 45507	6	.0	12294	70.9	1000	5.8	2480	14.3	284	1.6	42	.2	952	5.5	114	.7					176	1	17348	100
LA 45508			239	94.5					1	.4	11	4.3			2	.8							253	100
LA 45510	3	.0	5751	71.7	14	.2	568	7.1	1209	15.1	160	2.0	29	.4	280	3.5	5	.1			1	.0	8020	100

Table 4.28. Continued.

Site	Indeterminate		Plain Brown Ware		Early Textured Brown		Plain Smudged Brown		Corrugated Brown		Mogollon Slipped Red		Mogollon Painted and Mimbres White		Cibola White		White Mountain Red and Nonlocal Red		Other		Gray Wares		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
LA 70185	27	.2	8376	58.2	26	.2	2546	17.7	2867	19.9	78	.5	3	.0	427	3.0	20	.1	1	.0	18	.1	14389	100
LA 70188			35	61.4							17	298			5	8.8							57	100
LA 70189	1	.2	317	69.2	8	1.7	39	8.5	62	13.5	2	.4			24	5.2	5	1.1					458	100
LA 70191			3	42.9			1	14.3	2	28.6							1	14.3					7	100
LA 70196			884	70.6	50	4.1	104	8.5	1	.1	21	1.7	142	11.6	41	3.3					1	.1	1224	100
LA 70201	2	.2	884	75.8	17	1.5	1	.1	24	2.1	172	14.8	58	5.0	8	.7							1166	100
LA 75792	6	.2	1874	73.6	11	.4	44	1.7	454	17.8	38	1.5			115	4.5	5	.2					2547	100
LA 78439			5	83.3					1	16.7													6	100
LA 89846	4	.6	397	62.3			52	8.2	151	23.7					33	5.2							637	100
LA 89847	2	.5	255	57.4			103	23.2	57	12.8	14	3.2	1	.2	12	2.7							444	100
Total	204	.1	73798	43.4	1401	.8	37341	22.0	42656	25.1	3972	2.3	1502	.9	8420	5.0	276	.2	315	.2	206	.1	170091	100

Table 4.29. Dating Phases and Scores Assigned to Luna Project Sites

Phase or Period	Site	Temper Score	Standard Deviation	Total Number
Early Pithouse period, some Pueblo period mixing	LA 70188	1.28	.92	57
Early Pithouse period	LA 39975	1.01	.13	2322
Early Pithouse period	LA 45508	1.04	.33	253
Early Pithouse period	LA 39972 north area	1.04	.235	834
San Francisco phase	LA 70196	1.33	.62	1224
Three Circle phase	LA 45507	1.45	.80	17346
Probably Three Circle phase	LA 43786	1.33	.81	75
San Francisco and Three Circle phase and possible Early Pithouse	LA 70201	1.17	.58	1166
Late Pithouse early Reserve transitional	LA 45510	1.64	1.17	8020
Reserve phase	LA 75792	1.68	1.23	2547
Reserve phase	LA 39969	1.99	1.24	5843
Reserve phase	LA 39972 south area	1.86	1.2	1203
Reserve, some Three Circle phase mixture	LA 3563	1.82	1.22	2544
Reserve phase	LA 70189	1.71	1.18	458
Late Reserve (AC) phase	LA 70185	1.90	1.24	14389
Tularosa phase	LA 89846	1.99	1.39	637
Early Tularosa phase	LA 39968	2.01	1.29	19426
Late Tularosa phase	LA 3279	2.73	1.41	90986
Indeterminate Pueblo period, some Pithouse period mixture	LA 89847	1.76	1.13	144
Reserve phase and early mixed	LA 43766	1.35	.01	150
Late Pithouse / Pueblo periods mixed	LA 75791	1.58	1.18	144
Indeterminate Mogollon	LA 78439	1.50	1.22	6
Indeterminate Mogollon	LA 37917	1.0	0	1
Indeterminate Mogollon	LA 37919	1.0	0	9
Indeterminate Mogollon	LA 70191	2.43	1.51	7
Indeterminate Mogollon	LA 9721	1.0		1

Table 4.30. Ceramic Types by Provenience, LA 70188

Type	General Fill		Pit Structure		Total	
	N	%	N	%	N	%
Alma Plain body	19	34.5			19	33.3
Alma Rough rim	2	3.6			2	3.5
Alma Rough body	14	25.5			14	24.6
San Francisco Red	10	18.2	1	50.0	11	19.3
Other red slipped	6	10.9			6	10.5
Cibola late unpainted	2	3.6			2	3.5
Cibola late painted			1	50.0	1	1.8
Cibola Tularosa Black-on-White	1	1.8			1	1.8
Cibola hatchure	1	1.8			1	1.8
Total	55	100.0	2	100.0	57	100.0

1996), so the small sample size at this site may reflect the transitional nature of this component rather than an intrusion. It is quite possible, then, that the ceramic component of LA 70188 represents the earliest ceramic occupation excavated during the Luna Project, as well as one of the earliest thus far identified for the northern Mogollon. Given the shallow context of recovery of some of these sherds, it is also possible that they were deposited long after LA 70188 was abandoned, although still during the Early Pithouse period.

LA 39975 (Lazy Meadows)

A total of 2,322 sherds were recovered from LA 39975 (Table 4.31). This site is a half mile south of the SU Site, the largest and best known Early Pithouse phase site in this region (Martin 1943; Martin and Rinaldo 1947; Martin et al. 1949). This site was originally referred to as Luna Junction, and a single pithouse was excavated in 1956 as part of a highway project (Peckham 1963). During the analysis of 1,131 sherds from the original excavation of LA 39975, all sherds were assigned to one of three types—Alma Plain, Alma Rough, and San Francisco Red—resulting in the placement of this site into the Pine Lawn phase.

Additional features excavated during the Luna Project and yielding ceramics include Pit Structures 1 through 3, Pit 1, and Roasting Pit 1. Similar ceramic distributions were noted for all contexts at this site, indicating that all contexts investigated at this site date to the Early Pithouse period.

The great majority (84.8 percent) of the sherds recovered from LA 39975 during the Luna Project were assigned to plain brown wares. Polished Alma plain rim sherds slightly outnumber unpolished Alma Rough sherds. Several cases were noted where sherds from different proveniences, assigned to plain and unpolished forms, could be matched to the same vessel. Thus, differences in the frequency of Alma Plain versus Alma Rough may, to a large part, reflect factors relating to the erosion of the soft surfaces of early polished plain ware forms. Given this observation, the differentiation of phases of the Early Pithouse period based on surface frequency of polished to unpolished sherds must be viewed with at least some skepticism.

A very low proportion (.3 percent) of the early brown wares exhibit a layer of soot over a heavily polished surface and were classified as early smudged. Early textured brown wares were limited to Alma scored. Types exhibiting a red slip over the surface, including sherds classified as San Francisco

Table 4.31. Ceramic Types by Provenience, LA 39975

Ceramic Type	General Fill		Pit Structure 1		Pit Structure 2		Pit Structure 3		Total	
	N	%	N	%	N	%	N	%	N	%
Alma Plain rim	15	1.6	13	1.4			3	1.0	31	1.3
Alma Plain body	318	34.6	461	48.0	78	58.6	112	38.2	975	42.0
Alma Rough rim	17	1.9	21	2.2	3	2.3	6	2.0	48	2.1
Alma Rough body	430	46.8	330	34.3	23	17.3	124	42.3	915	39.4
Alma scored	27	2.9	3	.3			1	.3	31	1.3
Early smudged	3	.3					5	1.7	8	.3
San Francisco Red	1	.1	8	.8					9	.4
Other red slipped	107	11.7	124	12.9	29	21.8	42	14.3	304	13.1
Corrugated red slipped			1	.1					1	.0
Total	918	100.0	961	100.0	133	100.0	293	100.0	2322	100.0

Red or red slipped brown ware, represent similar if not identical groups and occur in low but significant frequencies. A single sherd exhibiting a corrugated surface with a red slip probably represents a contaminant from a nearby site.

With the exception of a single corrugated sherd, ceramic distributions indicate an occupation limited to the Early Pithouse period. Ceramic distributions from different proveniences and earlier highway-related investigations (Peckham 1963) are very similar and indicate that various features at this site could have been occupied contemporaneously. The consistent dominance of polished over unpolished brown ware forms, the presence of low frequencies of sherds exhibiting treatments, and lack of later textured and painted types may indicate an occupation sometime during the Late Pine Lawn or Early Georgetown periods.

Radiocarbon analyses from LA 39975 resulted in a wide range of dates (Zamora, this report) but support inferences from the ceramics that all the structures at this site were occupied sometime during the Early Pithouse period. A roasting pit yielded dates from A.D. 370 and 550; Pit Structure 1 yielded dates of A.D. 610 and 700, and Pit Structures 2 and 3 appear to date between A.D. 330 and 370. While these could indicate a long occupation lasting from A.D. 220 to A.D. 700, covering the entire Early Pithouse period, it is possible that the earlier dates reflect the use of old wood (Zamora, this

report). It is likely that the later dates reflect the time of occupation of this site, dating to the Late Pinelawn and Early Georgetown phases.

LA 45508 (Humming Wire)

A total of 253 sherds were recovered from LA 45508 (Table 4.32). Features from which sherds were recovered include Pit Structure 1 and Pit Structure 2. The great majority (94.5 percent) of sherds from this site represent plain brown wares. Alma Plain rim polished outnumbers Alma Rough almost two to one. Red slipped brown ware sherds are present but relatively rare. The remaining three sherds represent indeterminate corrugated (.4 percent) and Reserve/Tularosa Black-on-white. The majority of these sherds probably derived from a component dating to the Early Pithouse period, although the presence of a single corrugated sherd and two late Anasazi style white ware sherds indicate some very slight contamination from a Pueblo period site upslope from LA 45508.

Most of the radiocarbon dates recovered from this site are very late, including a date of A.D. 1670 at Pit Structure 1, which probably reflects contamination (Oakes, this report). The other radiocarbon dates from this site include a date of A.D. 600 at Pit Structure 2 and appear to support an occupation sometime during the later part of the Early Pithouse period.

Table 4.32. Ceramic Types by Provenience, LA 45508

Type	General Fill		Pit Structure 1		Pit Structure 2		Total	
	N	%	N	%	N	%	N	%
Alma Plain rim			2	1.1	1	9.1	3	1.2
Alma Plain body	43	63.2	99	56.9	8	72.7	150	59.3
Alma Rough rim	1	1.5	5	2.9			6	2.4
Alma Rough body	19	27.9	60	34.5	1	9.1	80	31.6
Indeterminate corrugated					1	9.1	1	.4
San Francisco Red	2	2.9	8	4.6			10	4.0
Other red slipped	1	1.5					1	.4
Cibola Reserve/Tularosa Black-on-white	2	2.9					2	.8
Total	68	100.0	174	100.0	11	100.0	253	100.0

Table 4.33. Ceramic Type by Provenience, LA 39972

	Early Pithouse		Early Pueblo		Total	
	N	%	N	%	N	%
Alma Plain rim	10	1.4	65	4.9	75	3.7
Alma Plain body	387	54.5	586	44.2	973	47.8
Alma Rough rim	4	.6	9	.7	13	.6
Alma Rough body	217	30.6	82	6.2	299	14.7
Alma scored			2	.2	2	.1
Alma incised			1	.1	1	.0
Three Circle neckbanded			1	.1	1	.0
Reserve smudged body	22	3.1	255	19.2	277	13.6
Reserve Plain corrugated			19	1.4	19	.9
Reserve Plain corrugated smudged			1	.1	1	.0
Reserve corrugated indented			29	2.2	29	1.4
Tularosa corrugated pattern			2	.2	2	.1
Tularosa corrugated smudged pattern			1	.1	1	.0
Incised corrugated			47	3.5	47	2.3
Incised corrugated smudged			6	.5	6	.3
Alternating corrugated			1	.1	1	.0
Overlap corrugated	2	.3	108	8.1	110	5.4
Overlap corrugated smudged			9	.7	9	.4

Table 4.33. Continued.

	Early Pithouse		Early Pueblo		Total	
	N	%	N	%	N	%
Plain smudged rim			33	2.5	33	1.6
Indeterminate corrugated			14	1.1	14	.7
Indeterminate			1	.1	1	.0
Punctuated corrugated			9	.7	9	.4
Slip unpainted			1	.1	1	.0
Mangus Black-on-white			1	.1	1	.0
San Francisco Red	67	9.4	2	.2	69	3.4
Other red slipped	1	.1			1	.0
Cibola late unpainted			5	.4	5	.2
Cibola late painted			1	.1	1	.0
Cibola Reserve Black-on-white			32	2.4	32	1.6
Cibola Tularosa Black-on-white			2	.2	2	.1
Cibola Reserve/Tularosa Black-on-white			1	.1	1	.0
Puerco Reserve Black-on-white			1	.1	1	.0
Total	710	100.0	1327	100.0	2037	100.0

Component B of LA 39972 (SU Tanks)

Ceramic evidence of an Early Pithouse occupation at LA 39972 was limited to 710 sherds from Area B (Table 4.33). Assemblages from this area are dominated by plain brown wares (87.0 percent). Most of these represent Alma Plain, although Alma Rough sherds are also fairly common. The next most common group at this component are represented by Mogollon slipped red wares (9.6 percent). Smudged brown ware sherds classified as Reserve smudged are also represented ((3.1 percent) and could represent a smudged variation of early plain brown wares. Two overlapping corrugated sherds represent the only pottery that is clearly not associated with the Pithouse occupation. Thus, the ceramic assemblage from this area of the site clearly indicates a Pithouse period component, with surprisingly little contamination, given the presence of fairly large numbers of Pueblo period sherds in other areas of this site.

Relationship between Early Pithouse Components

Ceramic distributions at the four sites or components assigned to the Early Pithouse period are quite

similar. The most common type at all three sites is Alma polished, followed by Alma Rough. Differences in the relative frequency of these types may reflect factors influencing erosion of surfaces and sampling error resulting from the small number of sherds in two of the assemblages assigned to the Early Pithouse period. All four sites contain smaller but significant frequencies of red slipped brown wares. While slipped brown ware was assigned to two different types, in retrospect, it appears that a single brown ware type similar to previous definitions of San Francisco Red is represented. Textured and decorated types, potentially indicative of an occupation during the later part of the Georgetown phase, are relatively rare and may indicate that none of these sites date after A.D. 650. While LA 39975 did contain low frequencies of two types (early smudged and Alma scored), and LA 39972 may have contained smudged pottery associated with the early component, the additional presence of these types may simply have resulted from the much larger number of ceramics from this site. These differences did not affect the assignment of ceramic scores previously described, based on the date of introduction of ceramic types. Another pattern that could reflect differences in the dating of Early

Pithouse phase sites is the relative abundance of ceramics, because there is some evidence to suggest an overall increase in ceramics during the early part of the Pithouse period. Given the similar numbers of structures at these three sites, differences in the relative dating of the three sites could explain the drastic differences in the amount of pottery at LA 39975 and LA 70188.

Dating scores for three of the four sites assigned to the Early Pithouse period were extremely low (ranging from 1.01 to 1.04) and reflect the dating of the site. The higher score (1.28) at LA 70188 simply reflects the influence of five intrusive Cibola White Ware sherds on a small sample. If these five sherds are removed from the assemblage, the dating score at this site is extremely similar to that noted at other Early Pithouse sites.

ASSIGNMENT AND DATING OF LATE PITHOUSE PERIOD COMPONENTS

The beginning of the Late Pithouse period is defined ceramically by the addition of early Mogollon or Mimbres painted types, early textured or neckbanded types, and relatively high frequencies of smudged types. In the northern Mogollon country, the end of this phase is defined ceramically by the appearance of corrugated brown ware and white ware assemblages dominated by Cibola Anasazi types such as Reserve Black-on-white.

Two distinct phases have been defined within the Late Pithouse period: the San Francisco (A.D. 700 to 900) and Three Circle (A.D. 900 to 1000) phases. In some schemes, Mogollon Red-on-brown is thought to represent the earliest Mogollon painted type, followed by increasing amounts of Three Circle Red-on-white, and finally by white ware types dominated by Mangus (Mimbres Boldface) Black-on-white. Scored and incised are thought to represent the earliest form of textured utility ware types, followed by Alma punched, and Three Circle neck coiled.

In contrast to later phases, the great majority of decorated ceramics from Late Pithouse period components in the northern Mogollon country represent decorated Mogollon painted or Mimbres white wares. Pastes, surface manipulations, and designs of decorated pottery dominating northern Mogollon assemblages are extremely similar to those dominating assemblages at contemporaneous sites in the Mimbres region to the south. Early decorated Mogollon or Mimbres white wares exhibit similar pastes and temper combinations noted for Mogollon

brown wares, but are distinguished from these by the addition of painted decorations and/or slipped treatments. Early Mogollon decorated types are normally distinguished from each other by differences in paint color, slipped treatments, and decorative styles (Haury 1936a). The similarity and gradation between the early decorated types has been long noted, and it is often assumed that these types reflect a slow and gradual adoption and replacement of color schemes and design elements. The traditional scheme of development begins with the introduction of Mogollon Red-on-brown as the first painted type appearing sometime during the early or middle eighth century (Lekson 1990; Powell 1990), following its replacement by Three Circle Red-on-white sometime during the early ninth century. Three Circle Red-on-white is often assumed to have developed into Mangus Black-on-white during the ninth to tenth century (Haury 1936a). Syntheses of pottery from this region often assumed a slow progression of short-lived decorated Mogollon types that only slightly overlap each other's periods of production (Haury 1936a).

Other studies have questioned assumptions of a simple and orderly progression of decorated Mogollon types (Withers 1985). Based on a review of stratigraphic data from Mogollon sites, Withers (1985), notes that Mogollon Red-on-brown and Three Circle Red-on-white often occur together in the same contexts, and states there is very little evidence that Mogollon Red-on-brown preceded Three Circle red-on-white. He also stresses the general absence of sites in which Three Circle Red-on-white outnumbered other decorated pottery types, and considers Three Circle a variant of Mogollon Red-on-brown. In this scheme, both types are assumed to have been produced at about the same time and by the same people. Withers (1985) also feels that Three Circle Red-on-white was shorter-lived than Mogollon Red-on-brown. Examinations of ceramic distribution data presented from some Late Pithouse sites also result in questions concerning assumptions that Mangus Black-on-white necessarily has a later beginning date than Mogollon Red-on-brown and Three Circle Red-on-white, as Black-on-white types often appear in early contexts along with these types (Withers 1985).

Some of the problems concerning the documentation of sequences of changes in white wares result from inconsistencies and difficulties in determining criteria utilized in the definition and recognition of early painted types. For example, some studies appear to have distinguished Early Mogollon painted types solely based on paint and surface color. It is

often, however, not possible to determine if other criteria were utilized to distinguish these types. For example, it is possible that some of the differences in paint and paste color utilized by some archaeologists to differentiate Mogollon types may simply reflect variation of firing technologies utilized during a particular time, while regional changes in decorative styles may be more temporally sensitive and more indicative of a type. Thus, during the examination of early Mogollon painted types from Luna sites, attempts were made to monitor a variety of technological and stylistic attributes in order to adequately document temporally sensitive changes within Mogollon painted or Mimbres white wares.

Examination of distributions and associations of painted and textured types associated with Late Pithouse occupations provide an opportunity to evaluate the nature of continuity of occupation during the Late Pithouse period. Ceramic distributions from four sites including LA 70196 (Fence Corner Site), LA 45507 (Luna Village), LA 43786 (Downslope Site), and LA 70201 (Turkey Toes) indicate occupations during the Late Pithouse Period. In addition, three sites exhibited evidence of occupations dating both to the Late Pithouse and Pueblo periods, and include LA 3563 (South Leggett Pueblo), LA 89847 (Red Ear Site), and LA 75791 (Lady Bug Junction).

LA 70196 (Fence Corner Site)

A total of 1,224 sherds were recovered from LA 70196 (Table 4.34). The great majority of sherds recovered from this site were from Pit Structure 1 and general fill.

The majority (70.6 percent) of the sherds from this site represent plain brown wares. Alma Plain polished sherds greatly outnumber Alma Rough sherds. Early red slipped brown wares are present in very low frequencies. Ceramic assemblages from this site are distinguished from Early Pithouse assemblages by the presence of low frequencies of early textured and painted types. A total of 4.1 percent of all sherds were assigned to early textured types including Alma scored, Alma incised, Alma punched, and Three Circle punched. This represents the earliest Luna Project occupation where plain smudged brown wares are common. A single sherd was classified as plain overlapping corrugated. Early Mogollon decorated types include 8.9 percent of all sherds from this site and include Three Circle Red-on-white, the overwhelmingly dominant type represented, as well as much lower frequencies of

Mangus Black-on-white. Other painted Mogollon types not exhibiting distinct painted styles were classified as indeterminate Mimbres white wares, slipped unpainted, slipped painted red, and slipped painted black. Very low frequencies of Anasazi types were identified at this site and include Obelisk Gray body, early unpainted, early painted, White Mound, and early unpainted. Late Anasazi white wares include late unpainted and late painted.

Similarities of distribution of ceramic types from various proveniences indicate that the various contexts at LA 70196 were probably contemporaneous. The general lack of corrugated ware, the presence of low frequencies of early textured ware, and the occurrence of Three Circle Red-on-white as the dominant white ware indicate an occupation dating to the San Francisco phase, sometime during the eighth or ninth century. The presence of gray ware types and White Mound Black-on-white sherds from the Anasazi region may also support an occupation dating sometime during this span.

Data from LA 70196 may also provide insights concerning the dating of Three Circle Red-on-white and its use as an indicator for late San Francisco phase occupations. Observations concerning the associated characteristics and dating of this type are important because very few assemblages dominated by Three Circle Red-on-white have been previously reported (Withers 1985). Technological and stylistic attributes of the pottery from this site seem to be very similar and may provide a basis for the definition and verification of Three Circle Red-on-white as a temporally distinct type. Examination of the white slipped painted brown ware from LA 70196 indicates a very narrow range of attributes, probably indicative of a fairly short occupation. While most of the Mimbres White Ware sherds from this site exhibit decorations in red paint, a few exhibit black designs and would have been classified as Mangus (Mimbres Boldface) Black-on-white. Most of the sherds from LA 70196 exhibiting decorations in black paint, however, exhibit the same designs and manipulations as in those with red paint and are different from the ranges of design noted on Mangus Black-on-white sherds from later sites, such as Luna Village. Thus, most of the sherds from this site exhibiting black painted decoration may represent a variation of a basic firing technology in which pottery was fired in a lower oxidizing atmosphere, a variation that may have been sporadically achieved during this time. Pastes tend to be more reddish than later Mimbres white wares and are covered by a white to buff slip. The slip of Three Circle Red-on-white sherds from this site consistently contain

Table 4.34. Ceramic Types by Provenience, LA 70196

Type	General Fill		Pit Structure		Total	
	N	%	N	%	N	%
Alma Plain rim	2	1.2	13	1.2	15	1.2
Alma Plain body	104	60.8	658	62.6	763	62.3
Alma Rough rim			4	.4	4	.3
Alma Rough body	23	13.5	59	5.6	82	6.7
Alma scored	1	.6	40	3.8	41	3.3
Alma incised			5	.5	5	.4
Fillet Alma neckbanded			1	.1	1	.1
Three Circle neckbanded			3	.3	3	.2
Reserve smudged body	3	1.8	83	7.9	86	7.0
Overlap corrugated			1	.1	1	.1
Plain smudged rim	1	.6	17	1.6	18	1.5
Slip unpainted	5	2.9	11	1.0	16	1.3
Slip painted, red	2	1.2	4	.4	6	.5
Slip pigment, black			4	.4	4	.3
Three Circle Red-on-white	11	6.4	103	9.8	114	9.3
Mangus Black-on-white			1	.1	1	.1
San Francisco Red	1	.6	11	1.0	12	1.0
Other red slipped	3	1.8	6	.6	9	.7
Cibola Obelisk Gray body			1	.1	1	.1
Cibola early unpainted	12	7.0	7	.7	20	1.6
Cibola early painted			3	.3	3	.2
Cibola late unpainted	2	1.2	7	.7	9	.7
Cibola late painted	1	.6	1	.1	2	.2
Cibola White Mound Black-on-white			6	.6	6	.5
Puerco Obelisk Gray body			1	.1	1	.1
Puerco early unpainted			1	.1	1	.1
Total	171	100.0	1051	100.0	1224	100.0

small but visible mica particles that protrude through the slip. Similar particles are found in most of the local weathered tuff sources of suitable quality to have been used as a slip source (Wilson 1994). These mica inclusions are absent in the slip of later Mimbres White wares associated with later contexts in this area. Thus, the presence of such mica inclusions may be a diagnostic characterization of Three-Circle Red-on-white that, along with design styles, is more temporally sensitive than paint color. Almost all the sherds from LA 70196 displayed similar designs consisting of boldly executed parallel lines and triangles covering much of the vessel surface. If Three Circle Red-on-white is defined by the presence of slip with mica inclusions and similar design styles, then almost all ceramics from LA 70196 can be assigned to Three Circle Red-white, including most of the sherds exhibiting decorations in black paint. When this criteria is utilized, Three Red-on-white appears to represent a very distinctive and short-lived type.

While ceramics from LA 70196 indicate a San Francisco phase occupation usually dated to the eighth or ninth century, the radiocarbon dates from this site cluster in the late seventh century (Oakes, this report). The dates are too early for the ceramics and probably indicate a problem with old wood. Archaeomagnetic samples from the same proveniences from which the radiocarbon dates were recovered are more reasonable and date A.D. 810-910 for the lower hearth and A.D. 735 to 800 for the wall plaster from Pit Structure 1.

LA 45507 (Luna Village)

A total of 17,346 sherds were recovered at LA 45507 for the Luna Project (Table 4.35). Luna Village may contain as many as 50 to 100 pit structures and may be among the largest pithouse villages in the northern Mogollon. Early investigations by Hough (1919) resulted in the excavation of a number of pit structures including a very large structure that was originally referred to as a dance plaza. Brief descriptions and illustrations of sherds and vessels recovered during the original excavation of Luna Village indicate the presence of plain polished, neckbanded, incised, smudged, and incised utility ware forms and painted styles in black paint later attributed to Mimbres Bold Face or Mangus Black-on-white.

A number of additional structures and features were excavated on the Luna Project. Proveniences from which ceramics were recovered include Pit

Structures 1, 3, 9, 12, 13, and general fill. The majority of (70.9 percent) of the sherds from this site represent plain brown wares. Alma Plain polished outnumbers Alma Rough sherds about five to one. Red slipped brown wares occur in very low frequencies. Early textured brown wares make up 5.8 percent of the total sherds and include Alma scored, Alma incised, Alma punched, and Three Circle punched. Plain smudged brown wares make up 14.3 percent of all sherds. Corrugated brown types (1.6 percent of all sherds) include a variety of manipulations. Early Mogollon decorated types consist of 3.8 percent of all sherds and include extremely low frequencies of Mogollon Red-on-Brown and Three Circle Red-on-white. By far the dominant Mogollon painted type is Mangus Black-on-white. Anasazi types include gray body rim, early Anasazi painted, early Anasazi unpainted, White Mound Black-on-white, Red Mesa Black-on-white, and late Anasazi painted.

Similar combinations of ceramics were associated with various contexts and indicate that the various structures and features were occupied at least during the same phase. This combination of types indicates an occupation during the Three Circle phase, probably sometime during the late ninth or tenth century. This assignment is primarily based on the presence of Three Circle punched as the dominant textured type along with Alma punched, significant frequencies of plain smudged sherds, and Mangus Black-on-white as the painted type. The presence of Red Mesa Black-on-white as the dominant intrusive Anasazi white ware and lower frequencies of White Mound Black-on-white also support an occupation sometime during the tenth century.

Mogollon white wares recovered from LA 45507 exhibit a narrow range of characteristics, probably indicative of ceramics produced during a fairly short time. While the majority of the decorated sherds from this site exhibited decorations in black paint, a fairly significant frequency exhibited decoration in brown or red paint. Manipulation and design styles of the sherds exhibiting red paint, however, were much more similar to the black painted Mangus Black-on-white sherds from this site rather than Three Circle Red-on-white sherds from LA 70196. Distributions of paint color reflect a range of firing atmospheres utilized in the firing of white ware vessels during this span of time, so that some sherds exhibiting red paint were classified as Mangus Black-on-white based on surface and stylistic characteristics. Pastes tend to be gray to brown and less red than noted in earlier Three Circle Red-

Table 4.35. Ceramic Types by Provenience, LA 45507

Type	General Fill		Pit Structure 1		Pit Structure 3		Pit Structure 9		Pit Structure 12		Pit Structure 13		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Alma Plain rim	80	1.3	26	2.6	44	1.1	6	1.9	106	2.1	12	1.6	276	1.6
Alma Plain body	3154	51.4	598	60.5	2450	62.5	248	76.5	3050	60.6	446	61.1	10022	57.8
Alma Rough rim	54	.9	2	.2	16	.4	4	1.2	12	.2			94	.5
Alma Rough body	1552	25.3	92	9.3	106	2.7	20	6.2	76	1.5	12	1.6	1900	11.0
Alma scored	74	1.2	18	1.8	14	.4			40	.8	4	.5	150	.9
Alma indsed	16	.3							8	.2	14	1.9	38	.2
Filet Alma neckbanded	28	.5	4	.4	60	1.5			36	.7	4	.5	134	.8
Three Circle neckbanded	186	3.0	66	6.7	92	2.3	22	6.8	270	5.4	40	5.5	678	3.9
Reserve smudged body	354	5.8	102	10.3	700	17.9	8	2.5	812	16.1	118	16.2	2142	12.3
Reserve Plain corrugated	18	.3	4	.4	2	.1			2	.0			30	.2
Reserve corrugated indented					2	.1					2	.3	6	.0
Reserve corrugated smudged indented					2	.1							2	.0
Incised corrugated	2	.0			2	.1							6	.0
Overlap corrugated	32	.5			24	.6			12	.2	4	.5	74	.4
Plain smudged rim	52	.8	14	1.4	82	2.1	2	.6	174	3.5	10	1.4	338	1.9
Indeterminate corrugated	40	.7	4	.4	26	.7	2	.6	78	1.5	8	1.1	166	1.0
Mogollon Red-on-brown	4	.1			6	.2							10	.1
Indeterminate					2	.1			4	.1			6	.0
Slip unpainted	46	.7			14	.4			12	.2	2	.3	76	.4
Slip painted, red	8	.1	2	.2									10	.1
Slip pigment, black	16	.3	2	.2									18	.1

Table 4.35. Continued.

Type	General Fill		Pit Structure 1		Pit Structure 3		Pit Structure 9		Pit Structure 12		Pit Structure 13		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Three Circle Red-on-white	2	.0			2	.1							4	.0
Mangus Black-on-white	250	4.1	38	3.8	206	5.3	194	3.9	38	5.2	728	4.2		
Mimbres indeterminate	54	.9	2	.2	26	.7	14	.3	2	.3	100	.6		
Slip paint, brown clay	2	.0									2	.0		
San Francisco Red	26	.4			4	.1	10	.2			40	.2		
Other red slipped					2	.1					2	.0		
Cibola Gray body	34	.6			6	.2	10	3.1	68	1.4	118	.7		
Cibola Gray body plain	12	.2			10	.3	22	.4	4	.5	52	.3		
Cibola Lino Gray rim							2	.6	4	.1	6	.0		
Cibola early unpainted	20	.3	8	.8	8	.2					36	.2		
Cibola early painted	8	.1	4	.4			10	.2			22	.1		
Cibola late unpainted											2	.0		
Cibola late painted					2	.1	4	.1	2	.3	8	.0		
Cibola White Mound Black-on-white	6	.1			6	.2					12	.1		
Cibola Red Mesa Black-on-white	4	.1	2	.2			16	.3	8	1.1	30	.2		
Cibola indeterminate black-on-white	4	.1									4	.0		
Puerco Gray body					2	.1					2	.0		
Puerco Gray body plain	2	.0									2	.0		
Total	6140	100.0	988	100.0	3918	100.0	324	100.0	5034	100.0	730	100.0	100.0	

on-white sherds. Slips are usually chalky and very white and do not contain mica. Design styles of these white wares were boldly executed, cover much of the vessel surface, and exhibit ranges of design styles similar to examples of this type from tenth century sites in the Mimbres region.

Dates obtained from LA 45507 include 25 radiocarbon dates, 4 tree-ring dates, and 4 archaeomagnetic samples (Oakes and Zamora, this report). The archaeomagnetic samples clustered between A.D. 795 and A.D. 805. Five radiocarbon samples and one tree-ring sample also align with these dates. Pit Structures 9 and 12 each yielded a single radiocarbon date that is a hundred years later (ca. A.D. 900). Pit Structure 1 was dated between A.D. 960 to 970. Dating evidence may indicate an initial occupation at LA 45507 during the late ninth century with a continued occupation until the late tenth century. While the Three Circle phase usually has been dated between A.D. 900 to 1000 (Haury 1936a; Wheat 1955), these radiocarbon dates could indicate a somewhat earlier beginning date (LeBlanc and Whalen 1980). More information is needed before these earlier dates for the Three Circle phase can be fully evaluated.

LA 43786 (Downslope Site)

A total of 75 sherds were examined from LA 43786 (Table 4.36). All sherds were from the general fill. The majority (77.3 percent) of the sherds represent plain brown wares. Alma Rough sherds were slightly more common than Alma Plain polished. A total of 5.3 percent of all sherds represented red slipped brown ware. Early textured brown wares included

Table 4.36. Ceramic Types by Provenience, LA 43786

	General Fill	
	N	%
Alma Plain body	27	36.0
Alma Rough body	31	41.3
Fillet Alma neckbanded	4	5.3
Reserve smudged body	1	1.3
Reserve Plain corrugated	2	2.7
Plain smudged rim	2	2.7
Slip pigment, black	4	5.3
San Francisco Red	1	1.3
Other red slipped	3	4.0
Total	75	100.0

Alma punched. Plain smudged brown represented 4.0 percent of all sherds. Corrugated brown types (2.7 percent) were exclusively represented by Tularosa Plain very fine corrugated. Indeterminate Mimbres white wares were exclusively represented by Mimbres slipped black pigment.

No independent dates were recovered from LA 43786, so the dating of this site is entirely based on ceramic distributions. This combination of types, particularly the association of Alma punched with black painted Mimbres ceramics, indicate an occupation sometime during the Late Pithouse period, possible during the Three Circle phase. While very fine corrugated is usually associated with Pueblo period occupations, a low frequency of this type representing a variety of vessels normally classified as neckcoiled may occur at pithouse sites. Sherds from LA 43786 also indicate an occupation sometime during the Late Pithouse period, although the small sample size makes it difficult to determine the particular phase represented. The presence of Mimbres White Ware sherds exhibiting black paint (but not from red ware forms) and the presence of Alma punched indicates this site most likely dates to the Three Circle phase.

LA 70201 (Turkey Toes)

A total of 1,166 sherds were recovered from LA 70201 (Table 4.37). Ceramics were limited to surface and shallow fill. Pottery from LA 70201 appears to represent material washed downslope from Turkey Foot Ridge, originally excavated by Martin and Rinaldo (1950b). Investigations at Turkey Foot Ridge in 1948 resulted in the excavation of 16 pit structures interpreted as evidence of a small occupation in the Georgetown phase, a major occupation during the San Francisco phase, and a small but significant occupation in the Three Circle phase (Martin and Rinaldo 1950b). Data recovered during Martin's excavations of Turkey Foot Ridge form much of the basis for the characterization of phases of the Late Pithouse period in the Pine Lawn Valley. Turkey Foot Ridge, then, appears to reflect a long and continuous occupation of groups which began sometime during the Early Pithouse period and continued into the end of the Late Pithouse period. This occupation may be analogous to the occupational span recently documented for Mogollon Village near Alma to the south of the Luna Project (Mauldin et al. 1996). Mogollon Village appears to reflect a long continuous pithouse occupation spanning most of the Early Pithouse and Late Pithouse

Table 4.37. Ceramic Types by Provenience, LA 70201

	General Fill	
	N	%
Alma Plain rim	26	2.2
Alma Plain body	627	53.8
Alma Rough rim	4	.3
Alma Rough body	227	19.5
Alma scored	4	.3
Alma incised	1	.1
Alma punched	1	.1
Fillet Alma neckbanded	4	.3
Three Circle neckbanded	7	.6
Reserve smudged body	1	.1
Reserve Plain corrugated	5	.4
Incised corrugation	1	.1
Overlap corrugation	8	.7
Indeterminate corrugated	10	.9
Mogollon Red-on-brown	5	.4
Indeterminate	2	.2
Slip unpainted	17	1.5
Slip painted, red	5	.4
Slip pigment, black	2	.2
Three Circle Red-on-white	9	.8
Mangus Black-on-white	19	1.6
Slip paint-brown clay	1	.1
San Francisco Red	171	14.7
Other red slipped	1	.1
Cibola early painted	2	.2
Cibola late painted	6	.5
Total	1166	100.0

period that lasted almost a thousand years. An examination of potential factors that may have resulted in the long and continuous occupation during this span, and the absence of similar spans of occupations at other sites in the Luna project area, may be particularly informative.

No features were found during excavations of LA 70201 (Zamora, this report). All sherds were associated with surface or shallow general fill. The majority (75.9 percent) of the sherds from this site

are plain brown wares. Alma Plain polished outnumbers Alma Rough almost two to one. Red slipped brown wares were also relatively common. Early textured types consist of 1.5 percent of the sherds from this site and include Alma scored, Alma incised, Alma punched, Alma neckbanded, and Three Circle neckbanded. Corrugated brown ware types include Tularosa Plain very fine corrugated, incised corrugated, plain overlapping corrugated, indeterminate corrugated, and indeterminate. While Mangus Black-on-white was the dominant Mogollon painted type, Mogollon Red-on-brown and Three Circle Red-on-white sherds were also present. Anasazi types include early painted and late painted.

These ceramic distributions indicate an occupation from the end of the Early Pithouse period to the Late Pithouse period. The wide variety of Mogollon painted types, including significant frequencies of Mogollon Red-on-brown, Three Circle Red-on-white, and Mangus Black-on-white, supports a mixed occupation during the Georgetown, San Francisco, and Three Circle phases. The presence of Mogollon Red-on-brown sherds, a type absent at other pithouse phase sites, indicates the presence of pottery from an Early San Francisco phase component. Thus, ceramic distributions support previous interpretations that artifacts from LA 70201 are ultimately derived from Turkey Foot Ridge. If this is the case, then Turkey Foot Ridge does span a longer period within the Late Pithouse period (particularly the period transitional between the Georgetown and San Francisco phases) than the other Late Pithouse phase sites investigated.

Pithouse at LA 3563 (South Leggett Pueblo)

The ceramic dating of LA 3563 presents a dilemma. This site represents a pueblo dating to the Reserve phase and a pithouse dating to the Three Circle phase, excavated in 1949 by Martin and Rinaldo (1950a). Recent investigations by OAS resulted in the reexcavation of the pithouse from this site (Zamora, this report). Martin and Rinaldo (1950a) assigned this pithouse to the Three Circle phase based on ceramics found on the floor of the pit structure, but they note that it was also used during the Reserve phase as a refuse dump by occupants of the pueblo at this site. Unfortunately, the Three Circle phase ceramics from the floor and other proveniences at this site had been removed by Martin, so that the great majority of the pottery is from surrounding areas of the site dating to the Reserve

phase. Ceramic distributions at this site are most similar to those noted at Reserve phase sites and are described later in this chapter along with other Reserve phase assemblages. Evidence of a Three Circle phase occupation includes the presence of some early textured types and the relatively high frequency (4.6 percent of all sherds) of Mimbres white wares. These include fairly equal frequencies of Three Circle Red-on-white and Mangus Black-on-white.

The Relationship between Late Pithouse Components

Distributions of ceramic types at Late Pithouse period sites indicate occupations dating to both the San Francisco and Three Circle phases. One of the few gaps in the Mogollon sequence that may be represented by the Luna Project data is the absence of sites containing components dominated by Mogollon Red-on-brown that can be attributed to the early part of the San Francisco phase. This type is represented in the mixed deposits at LA 70201, which may include material from components dating to this span. Ceramic scores assigned to Late Pithouse sites were clearly intermediate between those noted at sites assigned to the Early Pithouse and Pueblo periods. A jump in scores between single component Early Pithouse and Late Pithouse period sites may, however, reflect the absence of well-dated sites occupied during the first half of the San Francisco phase.

Ceramic data from two Luna Project sites yielded large amounts of pottery indicative of occupation entirely within two distinct phases of the Early Pithouse period. These include LA 70196 (Fence Corner), which was occupied during the San Francisco phase, and LA 45507 (Luna Village), occupied during the Three Circle phase. A comparison of these sites indicates that while ceramic assemblages are similar, the frequency and treatment of early textures and painted types differs significantly, and it is unlikely that there was any overlap in the occupation of these two sites. Earlier dates for LA 70196 are also supported by a ceramic score of 1.33, compared to a score of 1.45 for LA 45507.

Comparisons of painted sherds found at these sites indicate the production of distinct Mimbres white wares in different phases of the Late Pithouse period. These are reflected by differences in paint color, as well as in the ranges of paint color. Differences in slip characteristics and design styles are better indicators of associations with a particular

phase of the Late Pithouse period than paint colors alone. Therefore, types such as Three Circle Red-on-white and Mangus Black-on-white are diagnostic indicators of relatively short temporal periods if defined by a variety of attributes. A general reliance on paint color alone to distinguish these two types has sometimes resulted in incorrect characterizations of extremely long spans for these types.

Ceramic distributions from the two other sites dating to the Late Pithouse period reflect mixtures of ceramics dating to different phases or small sample size. The wide range of types and score (1.33) from LA 70201 indicates a mixture of ceramics associated with the entire span of the Late Pithouse period, although no component associated with a particular phase could be identified. This reflects the downslope movement of pottery from the various components of Turkey Foot Ridge, which contains components spanning the entire Late Pithouse period occupation.

Characterizations of ceramics and the relatively low score (1.17) from LA 43786 may reflect an occupation sometime during the Late Pithouse period, but the absence of diagnostic white ware makes it impossible to determine the specific phase represented. Assemblages from other sites, dominated by pottery dating to the Pueblo period but with low frequencies of pottery derived from Late Pithouse period components, are discussed later in this chapter.

ASSIGNMENT AND DATING OF PUEBLO PERIOD COMPONENTS

The majority of sites on the Luna Project contain components dating to the Pueblo period. Major changes in both architecture and ceramics occurred in the northern Mogollon region at about A.D. 1000 and mark the beginning of the Pueblo period. For the Reserve area, such changes include a shift from pit structure to surface structure (pueblo) architecture. Ceramic changes include a shift from Mogollon or Mimbres painted types such as Mangus Black-on-white to Cibola white wares such as Reserve Black-on-white and the introduction of corrugated pottery. These changes have sometimes been interpreted as reflecting a northern expansion or intrusion of the Anasazi culture that replaced the Mogollon culture (Haury 1936a; Martin and Rinaldo 1947; Martin et al. 1952; Martin and Plog 1973). The Pueblo period of the northern Mogollon, as identified by these traits, spans from A.D. 1000 to 1300. This span was originally divided into two distinct phases, including the Reserve and Tularosa phases of the Mogollon

(Martin and Rinaldo 1950a; Danson 1957; Bluhm 1960).

The Reserve phase is recognized by changes in architecture and pottery that occurred around A.D. 1000. Surface architecture was introduced during this phase and often consisted of crude and unworked river cobbles set in mud mortar. Most white ware sherds are derived from Reserve Black-on-white and sometimes occur along with lower frequencies of Red Mesa Black-on-white, Tularosa Black-on-white, Mangus Black-on-white, and Mimbres Classic Black-on-white. Brown utility wares in Reserve phase contexts include a wide range of corrugated brown wares, including plain corrugated, indented corrugated, and incised corrugated forms (Martin and Rinaldo 1950a). Plain brown utility wares, however, still dominate assemblages dating to the Reserve phase. Corrugated and plain brown wares are often smudged. White Mountain red wares appear during this time and may include low frequencies of Wingate Black-on-red and Puerco Black-on-red.

Some recent studies have proposed that Reserve Black-on-white does not appear until after A.D. 1000 (Tuggle and Reid 1982; Mills 1987; Reid et al. 1995). If this interpretation is correct, it would exclude the existence of a Reserve phase dating to the A.D. 1000s. Present evidence, however, does appear to support the existence of a Reserve phase dating to the eleventh century (Wilson 1996). During this time period, white ware is dominated by Reserve Black-on-white and Tularosa Black-on-white is not yet present. It should be noted, however, that evidence concerning the time of introduction of Reserve Black-on-white needs to be continually evaluated.

An Apache Creek phase intermediate between the Reserve and Tularosa phases, dating between A.D. 1075 and 1150, was also later proposed (Peckham et al. 1956; Kayser 1975; Berman 1989). The initial recognition of this phase was based on the presence of late pithouses dating to the eleventh and twelfth centuries. Features associated with these structures include deep, gable-roofed, masonry-lined pueblos that contained ventilators. A problem with definitions based purely on the presence of distinct pit structures is that pithouses fitting the Apache Creek phase definition temporally overlap pueblos similar to those described for Reserve and Tularosa phase occupations (Berman 1989). While the recognition of this phase was almost totally based on architecture, ceramics associated with Apache Creek phase contexts are similar to those associated with the Tularosa phase, although some

of the later types are absent (Peckham et al. 1956). During the present study, however, sites falling within the temporal span attributed by some to the Apache Creek phase are assigned to the Late Reserve or Early Tularosa phase.

The Tularosa phase is often viewed as a time of elaboration of traits introduced during the Reserve phase (Berman 1989). The architecture of the Tularosa phase consists of surface masonry structures similar to those built during the Reserve phase but tends to be better constructed than earlier structures. Ceramic types present at Tularosa phase occupations include Tularosa Black-on-white, Tularosa White-on-red, St. Johns Polychrome, Tularosa fillet rim, and Tularosa patterned corrugated (Rinaldo and Bluhm 1956; Martin et al. 1957). While textured types found at Tularosa phase sites are similar to those found in the earlier Reserve phase, there may be a slight increase in the frequency of Reserve indented corrugated and Tularosa patterned corrugated during this phase (Martin et al. 1957). The frequency of Alma Plain decreases during the Tularosa phase, and by the late part of this phase, corrugated types dominate (Martin et al. 1956; Martin et al. 1957). There may also be an increase in the total frequency of smudged sherds during this phase (Martin et al. 1957).

Luna Project sites that date to the Pueblo period include LA 45510 (SAK); LA 75792 (Thunder Ridge); LA 39969 (Haury's site); LA 39972, Area A (SU Tanks); LA 3563 (South Legget Pueblo); LA 70189 (Lightning Strike); LA 70185 (DZ); LA 89846 (Haca Negra); LA 39968 (Spurgeon Draw); and LA 3279 (Hough). Ceramic distributions indicate that most of these Pueblo period sites can be assigned to previously defined phases.

LA 45510 (SAK Site)

A total of 8,020 sherds were recovered from LA 45510 (Table 4.38). Sherds were from the surface and general fill of this site. A majority (71.7 percent) of the sherds represent plain brown wares. Alma Rough body sherds slightly outnumber Alma Plain polished sherds. Red slipped brown wares are present but very rare, making up 2 percent of all pottery. A variety of textured brown wares were identified, but they represent only .2 percent of all pottery. Plain smudged brown wares represent 7.1 percent of the pottery. A total of 15.1 percent of the sherds from this site represent corrugated brown types. The majority of these represent plain fine corrugated, although a wide variety of corrugated types were

Table 4.38. Ceramic Types by Provenience,
LA 45510

Type	General Fill	
	N	%
Alma Plain rim	143	1.8
Alma Plain body	2635	32.9
Alma Rough rim	88	1.1
Alma Rough body	2885	36.0
Alma scored	1	.0
Alma incised	4	.0
Alma punched	1	.0
Fillet Alma neckbanded	5	.1
Three Circle neckbanded	2	.0
Reserve smudged body	502	6.3
Reserve Plain corrugated	804	10.0
Reserve Plain corrugated smudged	8	.1
Reserve corrugated indented	38	.5
Tularosa corrugated patterned	7	.1
Incised corrugated	78	1.0
Alternating corrugated	9	.1
Overlap corrugated	118	1.5
Overlap corrugated smudged	3	.0
Plain smudged rim	66	.8
Indeterminate corrugated	142	1.8
Indeterminate	3	.0
Punctuated corrugated	2	.0
Pinched	1	.0
Slip unpainted	5	.1
Slip painted, red	1	.0
Slip pigment, black	8	.1
Three Circle Red-on-white	1	.0
Mangus Black-on-white	4	.0
Mimbres indeterminate	7	.1
Classic Black-on-White	3	.0
San Francisco Red	148	1.8
Other red slipped	11	.1
Red ware, smudged	1	.0

Table 4.38. Continued.

Type	General Fill	
	N	%
Cibola Gray body	1	.0
Cibola early painted	1	.0
Cibola late unpainted	190	2.4
Cibola late painted	56	.7
Cibola Reserve Black-on-white	17	.2
Cibola Reserve/Tularosa Black-on-white	1	.0
Cibola Hachure	3	.0
Cibola indeterminate Black-on-white	1	.0
Cibola smudged interior	1	.0
Cibola indeterminate White Mountain Red	5	.1
Puerco late unpainted	5	.1
Puerco late painted	4	.0
Puerco Reserve Black-on-white	1	.0
Total	8020	100.0

identified, including plain fine corrugated smudged, Reserve indented corrugated, Tularosa patterned corrugated, incised corrugated, alternating corrugated, plain overlapping corrugated, plain overlapping corrugated smudged, indeterminate corrugated, indeterminate, and punctuated corrugated. Early Mogollon decorated types make up .4 percent of all pottery and include Three Circle Red-on-white and Mangus Black-on-white, while indeterminate Mimbres white wares were also present. Cibola gray wares are represented in trace amounts by gray body sherds. Anasazi white wares (3.5 percent) include early painted, late unpainted, late painted, Reserve Black-on-white, Reserve/Tularosa Black-on-white, hatchure black-on-white, and indeterminate black-on-white. Indeterminate White Mountain red wares were present in trace frequencies.

While Reserve Black-on-white represents the sole formal white ware type, it is relatively rare compared to pottery that could not be assigned to types. This is a result of the ceramics having been recovered from surface and mixed deposits resulting in a smaller than average sherd mass at 2.8 g, compared to 5.5 g for all sites combined. These smaller sherds are less likely to exhibit sufficiently decorat-

ed surface area allowing their assignment to a distinct type.

Assemblages from LA 45510 exhibit a combination of ceramic types associated with the Late Pithouse and Pueblo periods. A mixture of ceramic types associated with the Late Pithouse period and Reserve phase have been noted at the Switchback site (Peckham 1957) and the Sawmill site (Bluhm 1957), although a much higher frequency of white wares associated with the Late Pithouse period were recovered from the Switchback site. This mixture of pottery can be interpreted in terms of an occupation during the transition between the Three Circle and Reserve phases or the presence of sherds derived from two temporally distinct components. Architectural evidence favors the earlier interpretation, because this site is associated with a pithouse depression upslope without evidence of a Pueblo component. It is possible that the apparent contradictory presence of a pithouse depression and later Cibola White Ware and corrugated brown wares with earlier types may indicate an occupation between the end of the Three Circle phase of the Late Pithouse period and the beginning of the Reserve Phase of the Pueblo period. While decorated wares are dominated by Cibola white wares with Reserve Black-on-white, the frequency of Cibola white wares is much lower than at other Reserve phase sites. Corrugated types primarily consist of plain and incised corrugated types, with very few indented corrugated. These ceramic distributions may indicate a date overlapping both the Three Circle and Reserve phases (or sometime between A.D. 950 to 1050).

LA 75792 (Thunder Ridge)

A total of 2,547 sherds were recovered from LA 75792 (Table 4.39). Proveniences include surface and general fill of artifact scatters. The majority (73.9 percent) of the sherds are plain brown wares. Frequencies of Alma Plain polished and Alma Rough are about the same. Red slipped brown wares include 1.5 percent of all sherds. Early textured brown wares consist of .4 percent of all sherds and include Alma scored, Alma incised, and Three Circles punched. Plain smudged brown wares consist of 1.7 percent of the total ceramics. Corrugated brown types make up 17.8 percent of all sherds and include Tularosa very fine corrugated, Reserve indented corrugated, Reserve indented corrugated smudged, Tularosa corrugated patterned, incised corrugated, alternating corrugated, overlapping cor-

rugated, and indeterminate corrugated. Cibola white wares make up 4.5 percent of all sherds and include early unpainted, early painted, late unpainted, late painted, Reserve Black-on-white, and hatchured black-on-white. The relative frequency of white ware sherds that can be assigned to distinct types such as Reserve Black-on-white is low and reflects a small sherd mass (3.6 grams), resulting from effects of the surface and redeposited contexts. The presence of Reserve Black-on-white and the absence of Tularosa Black-on-white indicates a Reserve phase component. This is further supported by the presence of corrugated wares dominated by plain corrugated types. Incised corrugated types are represented in low but significant frequencies, and indented corrugated types are relatively low. The distribution of types at this site appear to reflect an occupation during the early part of the Reserve phase or in the eleventh century. White Mountain red wares are present in very low frequencies and include indeterminate White Mountain Redware and Wingate Black-on-red.

LA 39969 (Haury's Site)

A total of 5,843 sherds were recovered from LA 39969 (Table 4.40). Contexts from which pottery was recovered include general fill and Rooms 1, 2, and 3. The majority (52.3 percent) of the sherds are plain brown wares. Alma Plain significantly outnumbers Alma Rough sherds. Very low frequencies of red slipped brown ware (.6 percent), early textured brown (.4 percent), and Mimbres White Ware (.5 percent) are present. A relatively high frequency (17.1 percent) were represented, including Reserve Plain corrugated, Reserve Plain corrugated smudged, Reserve corrugated indented, Reserve corrugated smudged indented, Tularosa corrugated patterned, incised corrugated, incised corrugated smudged, alternating corrugated, overlapping corrugated, overlapping corrugated smudged, indeterminate corrugated, and punctated corrugated (.2 percent). Plain smudged types represented 21.0 percent of all pottery and included Reserve smudged body, filleted smudged rim, filleted smudged rim, and smudged painted (trace). Cibola white wares consist of 7 percent of the pottery and include early painted white, late unpainted white, late painted white, La Plata Black-on-white (trace), Red Mesa Black-on-white (trace), Puerco Black-on-white, Reserve Black-on-white, Tularosa Black-on-white, Reserve/Tularosa Black on white, hatchured black-on-white (trace), indeterminate black-on-white, Gallup Black-

Table 4.39. Ceramic Types by Provenience, LA 75792

Type	General Fill		Pit Structure		Total	
	N	%	N	%	N	%
Indeterminate red ware	5	.2			5	.2
Alma Plain rim	64	2.8	7	3.1	71	2.8
Alma Plain body	764	33.1	89	39.9	853	33.7
Alma Rough rim	38	1.6	4	1.8	42	1.7
Alma Rough body	847	36.7	55	24.7	902	35.6
Alma scored	1	.0	1	.4	2	.1
Alma incised	7	.3			7	.3
Three Circle neckbanded	2	.1			2	.1
Reserve smudged body	28	1.2	10	4.5	38	1.5
Reserve Plain corrugated	156	6.8	7	3.1	163	6.4
Reserve corrugated indented	26	1.1	4	1.8	30	1.2
Reserve corrugated smudged indented	1	.0			1	.0
Tularosa corrugated pattern	3	.1	3	1.3	6	.2
Incised corrugated	49	2.1	8	3.6	57	2.2
Alternating corrugated			1	.4	1	.0
Overlap corrugated	137	5.9	6	2.7	143	5.6
Plain smudged rim	4	.2	2	.9	6	.2
Indeterminate corrugated	42	1.8	5	2.2	47	1.9
Indeterminate	1	.0			1	.0
San Francisco Red	6	.3	4	1.8	10	.4
Other red slipped	22	1.0	6	2.7	28	1.1
Cibola early unpainted	1	.0			1	.0
Cibola early painted	1	.0			1	.0
Cibola late unpainted	22	1.0	5	2.2	27	1.1
Cibola late painted	62	2.7			62	2.4
Cibola Reserve Black-on-White	5	.2	5	2.2	10	.4
Cibola Reserve/Tularosa Black-on-White	1	.0	1	.4	2	.1
Cibola hatchure	6	.3			6	.2
Cibola indeterminate White Mountain Red	2	.1			2	.1
Cibola Wingate Black-on-red	3	.1			3	.1
Puerco late unpainted	2	.1			2	.1
Puerco late painted	1	.0			1	.0
Late painted basalt	2	.1			2	.1
Total	2311	100.0	223	100.0	2534	100.0

Table 4.40. Ceramic Types by Provenience, LA 39969

Type	General Fill		Room 1		Room 2		Room 3		Total	
	N	%	N	%	N	%	N	%	N	%
Alma Plain rim	129	3.2	7	2.8	22	4.3	26	2.5	185	3.2
Alma Plain body	1683	41.9	101	40.7	228	44.1	459	44.8	2486	42.5
Alma Rough rim	31	.8	1	.4	8	1.5	8	.8	48	.8
Alma Rough body	259	6.5	9	3.6	29	5.6	35	3.4	337	5.8
Alma scored	7	.2					4	.4	11	.2
Alma incised	4	.1	1	.4					5	.1
Alma punched	2	.0			1	.2	1	.1	4	.1
Three Circle neckbanded							1	.1	1	.0
Reserve smudged body	747	18.6	49	19.8	99	19.1	195	19.0	1094	18.7
Filletted rim smudged	4	.1			1	.2			5	.1
Reserve Plain corrugated	68	1.7	6	2.4	11	2.1	13	1.3	98	1.7
Reserve Plain corrugated smudged	13	.3	1	.4	1	.2	6	.6	21	.4
Reserve corrugated indented	152	3.8	9	3.6	13	2.5	24	2.3	198	3.4
Reserve corrugated smudged indented	16	.4			1	.2	1	.1	18	.3
Tularosa corrugated pattern	4	.1							4	.1
Incised corrugated	118	2.9	3	1.2	6	1.2	28	2.7	159	2.7
Incised corrugated smudged	6	.1	1	.4	3	.6	3	.3	13	.2
Alternating corrugated	22	.5	9	3.6	2	.4	3	.3	36	.6
Overlap corrugated	229	5.7	16	6.5	26	5.0	63	6.1	335	5.7
Overlap corrugated smudged	34	.8	1	.4	6	1.2	6	.6	47	.8
Plain smudged rim	121	3.0	9	3.6	15	2.9	29	2.8	176	3.0
Indeterminate corrugated	41	1.0	5	2.0	3	.6	10	1.0	59	1.0
Indeterminate	4	.1							4	.1
Punctated corrugated	5	.1			3	.6	5	.5	13	.2
Smudged painted	2	.0							2	.0
Slip unpainted	7	.2	1	.4					8	.1
Mangus Black-on-white							1	.1	1	.0
Mimbres indeterminate	8	.2					4	.4	12	.2
Transitional Black-on-white	1	.0					1	.1	2	.0
Classic Black-on-White	5	.1					2	.2	7	.1
San Francisco Red	15	.4			1	.2	13	1.3	29	.5
Other red slipped	2	.0			1	.2			3	.1
Red ware, smudged							8	.8	8	.1
Cibola Gray body plain							1	.1	1	.0
Cibola early painted	1	.0					1	.1	2	.0
Cibola late unpainted	47	1.2	4	1.6	6	1.2	16	1.6	74	1.3
Cibola late painted	36	.9	2	.8	8	1.5	10	1.0	58	1.0
Cibola La Plata Black-on-White	1	.0							1	.0
Cibola Red Mesa Black-on-White	2	.0							2	.0
Cibola Puerco Black-on-White	3	.1							3	.1
Cibola Reserve Black-on-White	170	4.2	12	4.8	20	3.9	45	4.4	250	4.3
Cibola Tularosa Black-on-White	2	.0			1	.2	3	.3	6	.1
Cibola Reserve/Tularosa Black-on-white	4	.1			1	.2			5	.1

Table 4.40. Continued.

Type	General Fill		Room 1		Room 2		Room 3		Total	
	N	%	N	%	N	%	N	%	N	%
Cibola Reserve/Tularosa Black-on-white	4	.1			1	.2			5	.1
Cibola hatchure	1	.0							1	.0
Cibola indeterminate black-on-white	1	.0							1	.0
Cibola Gallup Black-on-White	5	.1							5	.1
Cibola Snowflake Black-on-White	1	.0							1	.0
Cibola Wingate Black-on-Red	2	.0			1	.2			3	.1
Puerco Reserve Black-on-White			1	.4					1	.0
Total	4015	100.0	248	100.0	517	100.0	1025	100.0	5843	100.0

on-white, and Snowflake Black-on-white.

While Tularosa Black-on-white is present, it occurs in extremely low frequencies and is overwhelmingly dominated by Reserve Black-on-white. This indicates an occupation sometime during the Reserve phase. Corrugated pottery includes relatively high frequencies of plain and indented corrugated types. The occurrence of low frequencies of intrusive types such as Mimbres Classic Black-on-white and Wingate Polychrome also supports an occupation during the eleventh century.

A Reserve phase assignment is supported by radiocarbon dates which indicate use during the early eleventh century. A few outside areas produced a pooled date at about A.D. 1195, and may indicate a very brief reuse of this site that is associated with very few ceramics.

LA 39972 (SU Tanks), Area A

A total of 1,327 sherds were associated with the later component in the south area of LA 39972 (see Table 4.33). The majority (55.9 percent) of the sherds are plain brown wares. Alma Rough body sherds greatly outnumber Alma Plain polished sherds. Plain red slipped brown wares (.2 percent), Mogollon slipped red (.2 percent), and Mimbres white wares (.2 percent) are present but very rare. Corrugated brown wares represent 12.2 percent of all pottery and include Reserve Plain corrugated, Reserve Plain corrugated smudged, Reserve corrugated indented, Tularosa patterned corrugated, Tularosa patterned corrugated smudged, incised corrugated, incised corrugated smudged, alternating corrugated, overlapping corrugated, overlapping corrugated smudged, and indeterminate corrugated. The major-

ity of the corrugated sherds represent plain corrugated types. Plain smudged brown types represent 21.7 percent of the ceramics from this site. Cibola white wares represent 2.1 percent of all sherds and include late unpainted, late painted, Reserve Black-on-white, Tularosa Black-on-white, and Reserve/Tularosa Black-on-white. The presence of Reserve Black-on-white as the dominant white ware and very low frequencies of Tularosa Black-on-white indicate that this component may date to the late Reserve phase.

LA 3563 (South Leggett Pueblo, Late Component)

As previous investigations by Martin and Rinaldo (1950a) indicate, the pit structure excavated by OAS at LA 3563 was occupied during the Three Circle phase. Distribution of ceramics indicate that the majority of these sherds were derived from the Reserve phase component at this site (Table 4.41). While distributions of the small frequency of pottery indicative of the Three Circle occupation associated with this pithouse were previously discussed, most of the remaining discussion of the 2,544 sherds at LA 3563 focuses on distributions, primarily indicating a Reserve phase occupation associated with the five rooms excavated by Martin and Rinaldo (1950a).

While low frequencies of early textured brown and Mimbres white wares reflect the Three Circle phase occupation of this site, the frequencies of smudged brown (11.2 percent), corrugated brown (16.8 percent), and Cibola white wares (4.6 percent) are very similar to those at other Reserve phase sites. In addition, the dominance of Reserve Black-on-

Table 4.41. Ceramic Types by Provenience, LA 3563

Type	General Fill		Pit Structure		Total	
	N	%	N	%	N	%
Indeterminate white ware			1	.0	1	.0
Alma Plain rim	7	3.5	75	3.2	82	3.2
Alma Plain body	106	53.3	1265	53.9	1371	53.9
Alma Rough rim			10	.4	10	.4
Alma Rough body	18	9.0	85	3.6	103	4.0
Alma scored			4	.2	4	.2
Alma incised	1	.5	3	.1	4	.2
Fillet Alma neckbanded			1	.0	1	.0
Three Circle neckbanded			4	.2	4	.2
Reserve smudged body	17	8.5	231	9.9	248	9.7
Reserve Plain corrugated	10	5.0	99	4.2	109	4.3
Reserve Plain corrugated smudged			18	.8	18	.7
Reserve corrugated indented	3	1.5	45	1.9	48	1.9
Reserve corrugated smudged indented			7	.3	7	.3
Tularosa corrugated pattern			9	.4	9	.4
Tularosa corrugated smudged pattern			3	.1	3	.1
Incised corrugated	3	1.5	57	2.4	60	2.4
Incised corrugated smudged			3	.1	3	.1
Alternating corrugated			2	.1	2	.1
Overlap corrugated	5	2.5	108	4.6	113	4.4
Overlap corrugated smudged	1	.5	11	.5	12	.5
Plain smudged rim	2	1.0	36	1.5	38	1.5
Indeterminate corrugated	1	.5	43	1.8	44	1.7
Indeterminate			1	.0	1	.0
Slip unpainted	3	1.5	14	.6	17	.7
Slip painted, red	11	5.5	16	.7	27	1.1
Slip pigment, black	1	.5	13	.6	14	.6
Three Circles Red-on-white			10	.4	10	.4
Mangus Black-on-white			11	.5	11	.4
Classic Black-on-White			4	.2	4	.2
San Francisco Red	1	.5	13	.6	14	.6
Other red slipped	3	1.5	25	1.1	28	1.1
Cibola early unpainted			1	.0	1	.0
Cibola late unpainted	1	.5	7	.3	8	.3

Table 4.41. Continued.

Type	General Fill		Pit Structure		Total	
	N	%	N	%	N	%
Cibola late painted	3	1.5	25	1.1	28	1.1
Cibola Red Mesa Black-on-White			1	.0	1	.0
Cibola Reserve Black-on-White	2	1.0	68	2.9	70	2.8
Cibola Reserve/Tularosa Black-on-White			1	.0	1	.0
Cibola hatchure			2	.1	2	.1
Cibola indeterminate White Mountain Red			5	.2	5	.2
Cibola Wingate Black-on-red			2	.1	2	.1
Puerco late unpainted			4	.2	4	.2
Puerco late painted			2	.1	2	.1
Total	199	100.0	2345	100.0	2544	100.0

white and absence of Tularosa Black-on-white indicate a Reserve phase occupation. This is further supported by very low frequencies of Wingate Black-on-red sherds of the White Mountain Redware tradition and Mimbres Classic Black-on-white. Corrugated types are dominated by plain corrugated forms. Thus, ceramic distributions indicate that the great majority of sherds recovered from this pithouse date to the Reserve phase during the eleventh century and are probably derived from proveniences associated with the surface rooms at this site.

LA 70189 (Lightning Strike Pueblo)

A total of 458 sherds were recovered from LA 70189. Ceramics were recovered from the surface and general fill of the shallow pit structure (Table 4.42). The majority (69.2 percent) of the sherds represent plain brown wares. Alma Plain polished outnumbers Alma Rough about three to one. Types present in low frequency include early textured brown (1.7 percent) and Mogollon slipped red (.4 percent). Plain smudged brown wares are relatively common, consisting of 8.5 percent of all sherds. Corrugated brown types make up 13.6 percent and include fine plain corrugated, Reserve indented corrugated, incised corrugated, plain overlapping corrugated, indented corrugated, and indeterminate corrugated. In contrast to many of the other Pueblo period sites examined, no form of corrugated textured wares appears to dominate this assemblage. Late Anasazi white wares include (5.3 percent) late

unpainted, late painted, Reserve Black-on-white, Tularosa Black-on-white, hatchure black-on-white, and indeterminate black-on-white. White Mountain Red wares (1.1 percent of all sherds) include indeterminate White Mountain Redware and Wingate Black-on-red.

This site mainly dates to the Pueblo period, although the high frequency of plain brown wares and the presence of a few early textured types and Red Mesa Black-on-white could indicate the presence of an earlier component dating to the Late Pithouse period. The dominance of Reserve Black-on-white over Tularosa Black-on-white probably indicates an occupation during the Reserve phase. This date may be supported by the presence of Wingate Black-on red. The presence of two Tularosa Black-on-white sherds could indicate some mixture from a later component or an occupation late in the Reserve phase.

Two radiocarbon dates from material washed into a later, shallow pit structure from the nearby pueblo indicate a mean date of A.D. 1010-1020. This date supports ceramic data indicating a Reserve phase occupation.

LA 70185 (DZ Site)

A total of 14,389 sherds were analyzed from LA 70185 (DZ), a surface structure dating to the Pueblo period (Table 4.43). Proveniences include Rooms 1-4 and Features 1, 2, and 4, artifact scatters, and the midden. The majority (57.3 percent) of sherds from LA 70185 are plain brown wares. Alma Plain pol-

Table 4.42. Ceramic Types by Provenience, LA 70189

Type	General Fill		Pit Structure		Total	
	N	%	N	%	N	%
Alma Plain rim	13	3.5	5	5.7	18	3.9
Alma Plain body	179	48.2	38	43.7	217	47.4
Alma Rough rim	6	1.6	2	2.3	8	1.7
Alma Rough body	64	17.3	10	11.5	74	16.2
Alma punched	1	.3			1	.2
Fillet Alma neckbanded	2	.5			2	.4
Three Circle neckbanded	5	1.3			5	1.1
Reserve smudged body	19	5.1	11	12.6	30	6.6
Reserve Plain corrugated	8	2.2	1	1.1	9	2.0
Reserve corrugated indented	11	3.0	1	1.1	12	2.6
Incised corrugated	15	4.0	2	2.3	17	3.7
Overlap corrugated	14	3.8	3	3.4	17	3.7
Plain smudged rim	4	1.1	5	5.7	9	2.0
Indeterminate corrugated	7	1.9			7	1.5
Indeterminate			1	1.1	1	.2
San Francisco Red	1	.3			1	.2
Other red slipped			1	1.1	1	.2
Cibola late unpainted	4	1.1	1	1.1	5	1.1
Cibola late painted	4	1.1	2	2.3	6	1.3
Cibola Red Mesa Black-on-white	1	.3			1	.2
Cibola Reserve Black-on-white	6	1.6	1	1.1	7	1.5
Cibola Tularosa Black-on-white	1	.3			1	.2
Cibola indeterminate Black-on-white			1	1.1	1	.2
Cibola indeterminate White Mountain Red	1	.3			1	.2
Cibola Wingate Black-on-red	4	1.1			4	.9
Puerco late unpainted			2	2.3	2	.4
Puerco Tularosa Black-on-white	1	.3			1	.2
Total	371	100.0	87	100.0	458	100.0

Table 4.43. Ceramic Types by Provenience, LA 70185

Type	General Fill		Room 1		Room 2		Room 3		Room 4		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Alma Plain rim	299	2.7	16	1.7	41	2.4			13	2.4	369	2.6
Alma Plain body	3853	34.6	224	23.9	423	24.5	5	12.8	209	37.9	4714	32.8
Alma Rough rim	163	1.5	13	1.4	23	1.3			5	.9	204	1.4
Alma Rough body	2516	22.6	116	12.4	337	19.5	3	7.7	117	21.2	3089	21.5
Alma scored	8	.1			1	.1					9	.1
Alma incised	6	.1			2	.1					8	.1
Alma punched	3	.0			1	.1					4	.0
Three Circle neckbanded	1	.0									1	.0
Reserve smudged body	1385	12.4	321	34.3	325	18.8	13	33.3	89	16.1	2133	14.8
Fillet rim smudged	3	.0			1	.1					4	.0
Reserve Plain corrugated	1082	9.7	56	6.0	185	10.7	3	7.7	46	8.3	1372	9.5
Reserve Plain corrugated smudged	129	1.2	5	.5	19	1.1	1	2.6			154	1.1
Reserve corrugated indented	169	1.5	17	1.8	37	2.1	3	7.7	2	.4	228	1.6
Reserve corrugated smudged indented	40	.4	2	.2	9	.5	3	7.7	1	.2	55	.4
Tularosa corrugated patterned	8	.1	1	.1	1	.1					10	.1
Tularosa corrugated smudged pattern	5	.0			1	.1					6	.0
Incised corrugated	381	3.4	29	3.1	65	3.8	2	5.1	21	3.8	498	3.5
Incised corrugated smudged	2	.0	1	.1	5	.3			1	.2	9	.1
Alternating corrugated	86	.8	11	1.2	17	1.0	1	2.6	11	2.0	126	.9
Overlap corrugated	149	1.3	7	.7	18	1.0			3	.5	177	1.2
Overlap corrugated smudged	37	.3	3	.3	3	.2					43	.3
Plain smudged rim	228	2.0	59	6.3	99	5.7	1	2.6	14	2.5	401	2.8
Indeterminate corrugated	140	1.3	10	1.1	17	1.0	2	5.1	5	.9	174	1.2
Indeterminate	22	.2			5	.3					27	.2
Punctuated corrugated	9	.1	4	.4	2	.1					15	.1
Smudged painted	5	.0	3	.3							8	.1
Pinched	4	.0									4	.0
San Francisco Red	31	.3	3	.3	1	.1			5	.9	40	.3

Table 4.43. Continued.

Type	General Fill		Room 1		Room 2		Room 3		Room 4		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Other red slipped	23	.2	4	.4							27	.2
Corrugated red slipped	7	.1	1	.1	1	.1			1	.2	10	.1
Red ware, smudged	1	.0									1	.0
Cibola Gray body	3	.0			2	.1					5	.0
Cibola Obelisk Gray body	3	.0									3	.0
Cibola Gray body plain	7	.1	3	.3							10	.1
Cibola late unpainted	108	1.0	10	1.1	18	1.0	1	2.6	2	.4	139	1.0
Cibola late painted	79	.7	9	1.0	17	1.0	1	2.6	4	.7	110	.8
Cibola Reserve Black-on-White	91	.8	3	.3	33	1.9			1	.2	128	.9
Cibola Tularosa Black-on-white	17	.2	4	.4	7	.4					28	.2
Cibola Reserve/Tularosa Black-on-white	5	.0	1	.1							6	.0
Cibola hatchure	2	.0									2	.0
Cibola indeterminate Black-on-white					1	.1			1	.2	2	.0
Cibola Snowflake Black-on-white	2	.0									2	.0
Cibola indeterminate White Mountain Red	9	.1			9	.5			1	.2	19	.1
Cibola Wingate Black-on-red	1	.0									1	.0
Puerco Gray body plain	2	.0			1	.1					3	.0
Puerco late unpainted	1	.0									1	.0
Puerco late painted	5	.0									5	.0
Puerco Reserve Black-on-White	1	.0									1	.0
Puerco Showlow Black-on-Red	1	.0									1	.0
Late painted basalt	1	.0									1	.0
Tularosa with basalt					2	.1					2	.0
Total	11133	100	936	100	1729	100	39	100	552	100	14389	100

ished sherds slightly outnumber Alma Rough sherds. Ceramic groups represented in low frequencies include early textured brown (.2 percent), slipped red (.5 percent), Mimbres White Ware (trace), Cibola Gray Ware (.1 percent), and White Mountain Redware (.1 percent). A total of 17.7 percent of sherds from this site are plain smudged brown types. Corrugated brown wares consist of 19.97 percent sherds from this site. Corrugated sherds include Reserve Plain corrugated, Reserve Plain corrugated smudged, Reserve indented corrugated, Reserve indented corrugated smudged, Tularosa patterned corrugated, Tularosa patterned corrugated smudged, incised corrugated, incised corrugated smudged, alternating corrugated, plain overlapping corrugated, plain overlapping corrugated smudged, indeterminate corrugated, indeterminate, and punctated corrugated.

Similar distributions of types were noted at all contexts from LA 70185. While both Reserve Black-on-white and Tularosa Black-on-white occur at this site, Reserve Black-on-white outnumbers Tularosa Black-on-white almost four to one. Plain fine corrugated is the dominant corrugated type, and incised corrugated outnumbers indented corrugation forms. Ceramic distributions appear to indicate an occupation during the later part of the Reserve phase in the late eleventh or early twelfth century.

Two radiocarbon dates from Room 2 resulted in dates between A.D. 1020 and 1060 (Zamora, this report). Two dates from the ventilator shaft, A.D. 1160 and 1170, were dismissed as too late during the interpretation of this site. While ceramic distributions appear to most closely correspond to the earlier date, the presence of some Tularosa Black-on-white could indicate an occupation extending into the twelfth century.

LA 89846 (Haca Negra)

While a total of 637 sherds were recovered from LA 8946 (Table 4.44), most of the excavated contexts at this site dated to the Archaic or protohistoric Apache period, and pottery appears to have been deposited from a pueblo just upslope from this site. Most (62.3 percent) of the sherds represented plain brown wares, and a slight majority are Alma Rough. Types belonging to the plain smudged brown (7.4 percent), corrugated brown (24.5 percent), and Cibola White Ware (5.2 percent) groups were represented. Corrugated pottery was represented by roughly equal frequencies of sherds exhibiting plain corrugated and indented corrugated textures. Some sherds

Table 4.44. Ceramic Types by Provenience, LA 89846

	General Fill	
	N	Row %
Alma Plain rim	7	100.0
Alma Plain body	155	100.0
Alma Rough rim	13	100.0
Alma Rough body	222	100.0
Reserve smudged body	41	100.0
Filletted rim smudged	1	100.0
Reserve Plain corrugated	57	100.0
Reserve corrugated indented	57	100.0
Reserve corrugated smudged indented	4	100.0
Tularosa corrugated patterned	4	100.0
Incised corrugated	9	100.0
Smudged fillet rim	5	100.0
Alternating corrugated	1	100.0
Plain smudged rim	5	100.0
Indeterminate corrugated	19	100.0
Indeterminate	4	100.0
Cibola late unpainted	13	100.0
Cibola late painted	13	100.0
Cibola Red Mesa Black-on-white	2	100.0
Cibola Tularosa Black-on-white	5	100.0
Total	637	100.0

also exhibited patterned corrugated and incised corrugated texture. While Tularosa Black-on-white is the most common formal white ware type, Red Mesa Black-on-white sherds are also present. Thus, ceramic distributions indicate that the great majority of the pottery from LA 89846 was ultimately derived from a Tularosa phase context dating to the late twelfth or the thirteenth century.

LA 39968 (Spurgeon Draw)

A total of 19,370 sherds were recovered during investigations of LA 39968 (Table 4.45). The majority (53.8 percent) of the sherds represent plain brown wares. Mogollon slipped red (.8 percent), early textured brown (.3 percent), Mimbres White (.3 percent), White Mountain Red (.2 percent), and

Table 4.45. Ceramic Type by Provenience, LA 39968

Type	General Fill		Pit Structure		Room Block 1		Jacal Structure		Room Block 2		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Indeterminate white ware	3	.0									3	.0
Late indeterminate white ware			1	.0			2	.1			3	.0
Indeterminate red ware	1	.0	1	.0							2	.0
Alma Plain rim	229	2.3	198	3.0	10	2.6	39	2.5	10	1.4	486	2.5
Alma Plain body	3779	37.5	2931	44.2	119	31.2	661	41.9	335	46.9	7845	40.4
Alma Rough rim	77	.8	30	.5	4	1.0	17	1.1	9	1.3	138	.7
Alma Rough body	1309	13.0	316	4.8	50	13.1	232	14.7	80	11.2	1990	10.2
Alma scored			1	.0							1	.0
Alma incised	3	.0	1	.0							4	.0
Alma punched	1	.0	4	.1			1	.1			6	.0
Fillet Alma neckbanded			3	.0							3	.0
Three Circle neckbanded	14	.1	6	.1	4	1.0	1	.1			25	.1
Reserve smudged body	1571	15.6	1144	17.3	66	17.3	144	9.1	86	12.0	3012	15.5
Filletted rim smudged	1	.0	5	.1							6	.0
Reserve Plain corrugated	531	5.3	255	3.8	24	6.3	86	5.5	24	3.4	929	4.8
Reserve Plain corrugated smudged	65	.6	44	.7	3	.8	23	1.5	5	.7	141	.7
Reserve corrugated	215	2.1	96	1.4	5	1.3	32	2.0	20	2.8	369	1.9
Reserve corrugated smudged indented	31	.3	47	.7	4	1.0	9	.6	1	.1	92	.5
Tularosa corrugated pattern	9	.1	2	.0			1	.1			12	.1
Tularosa corrugated smudged pattern			1	.0			1	.1			2	.0
Incised corrugated	500	5.0	223	3.4	15	3.9	92	5.8	23	3.2	854	4.4
Incised corrugated smudged	41	.4	22	.3			5	.3	8	1.1	76	.4
Alternating corrugated	26	.3	14	.2	3	.8	5	.3	1	.1	49	.3
Overlap corrugated	460	4.6	337	5.1	18	4.7	81	5.1	22	3.1	920	4.7
Overlap corrugated smudged	57	.6	56	.8	1	.3	2	.1	2	.3	118	.6
Plain smudged rim	154	1.5	173	2.6	6	1.6	25	1.6	14	2.0	372	1.9
Indeterminate corrugated	149	1.5	133	2.0	4	1.0	23	1.5	7	1.0	320	1.6
Indeterminate	9	.1	5	.1	1	.3					15	.1
Punctuated corrugated	19	.2	1	.0							20	.1

Table 4.45. Continued.

Type	General Fill		Pit Structure		Room Block 1		Jacal Structure		Room Block 2		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Smudged painted	2	.0	5	.1							7	.0
Pinched	7	.1	5	.1			7	.4			19	.1
Punched incised	1	.0	2	.0			1	.1			4	.0
Alma applique			2	.0							2	.0
Single fillet rim	1	.0									1	.0
Slip unpainted	7	.1	6	.1			2	.1	2	.3	17	.1
Slip painted, red			1	.0							1	.0
Mimbres/ Reserve indeterminate	8	.1	6	.1			1	.1			15	.1
Transitional Black-on-white	1	.0									1	.0
Classic Black-on-white	14	.1	13	.2			1	.1			28	.1
Mimbres/Reserve Polychrome			1	.0							1	.0
San Francisco Red	81	.8	22	.3	7	1.8	13	.8	7	1.0	130	.7
Other red slipped	15	.1	8	.1			2	.1	1	.1	26	.1
Corrugated red slipped			1	.0							1	.0
Cibola Neckcoiled	1	.0									1	.0
Cibola early painted	1	.0									1	.0
Cibola late unpainted	163	1.6	121	1.8	9	2.4	12	.8	24	3.4	329	1.7
Cibola late painted	139	1.4	86	1.3	5	1.3	13	.8	17	2.4	260	1.3
Cibola Red Mesa Black-on-White	1	.0	3	.0							4	.0
Cibola Puerco Black-on-White	1	.0					2	.1			3	.0
Cibola Reserve Black-on-White	139	1.4	104	1.6	3	.8	16	1.0	7	1.0	269	1.4
Cibola Tularosa Black-on-white	141	1.4	146	2.2	19	5.0	14	.9	7	1.0	327	1.7
Cibola Reserve/Tularosa Black-on-white	47	.5	20	.3			2	.1			69	.4
Cibola hatchure	3	.0	1	.0							4	.0
Cibola indeterminate Black-on-white	2	.0									2	.0
Cibola indeterminate White Mountain Red	21	.2	5	.1	1	.3	5	.3	2	.3	34	.2

Table 4.45. Continued.

Type	General Fill		Pit Structure		Room Block 1		Jacal Structure		Room Block 2		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Cibola Wingate Polychrome	2	.0									2	.0
Cibola Puerco Black-on-Red			3	.0							3	.0
Puerco late painted	2	.0									2	.0
Late unpainted basalt	8	.1	4	.1			2	.1			14	.1
Late painted basalt	15	.1	6	.1			2	.1	1	.1	24	.1
Hatchure with basalt			8	.1							8	.0
Total	10081	100	6629	100	381	100	1577	100	715	100	19426	100

Cibola Gray (trace) are present in very low frequencies. A total of 17.5 percent of all sherds represent plain smudged brown wares. Corrugated brown wares consist of 20.1 percent of all pottery and include Reserve Plain corrugated, Reserve Plain corrugated smudged, Reserve corrugated indented, Reserve corrugated smudged indented, Tularosa patterned corrugated, Tularosa patterned corrugated smudged, incised corrugated, incised corrugated smudged, alternating corrugated, overlapping corrugated, overlapping corrugated smudged, and indeterminate corrugated. Corrugated pottery is dominated by plain corrugated forms, and incised forms outnumber indented ones. Cibola white wares make up 6.8 percent of all pottery and include early painted white, late painted white, Red Mesa Black-on-white, Puerco Black-on-white, Reserve Black-on-white, Tularosa Black-on-white, Reserve/Tularosa hatchure black-on-white, and indeterminate white (trace). Most of the decorated white wares from this site exhibited styles transitional between Reserve Black-on-white and Tularosa Black-on-white as noted at other sites, and their assignment to these types often proved to be a very difficult and not completely satisfying task.

While slightly over half of the white wares were classified as Tularosa Black-on-white, a reexamination of many of these sherds indicates characteristics transitional between Reserve Black-on-white and Tularosa Black-on-white. This resulted in the recognition of high numbers of both types, although slightly more Tularosa Black-on-white sherds were noted than Reserve Black-on-white. Most of these sherds do not exhibit the combinations of small motifs, very fine hatching, and high polish common in Tularosa Black-on-white from thirteenth century

sites. In retrospect, many of the sherds classified as Tularosa Black-on-white could have been classified as Reserve Black-on-white as well.

Ceramic distributions probably indicate a Reserve Tularosa/transitional (Apache Creek phase) or early Tularosa period assignment (possibly during the late part of the twelfth century, although given problems associated with white ware typology at this site, this assignment must still be considered speculative. This dating is partly supported by archaeomagnetic dates indicating a span during the late twelfth and early thirteenth century and is somewhat supported by the latest radiocarbon dates at this site (Zamora, this report). Earlier radiocarbon dates in the eleventh century were also noted, although given architectural evidence and similarities in ceramic distributions from various proveniences, it is unlikely that occupation in more than one phase is represented. Thus, these earlier dates may reflect the use of old wood.

LA 3279 (Hough Site)

LA 3279 is the largest site excavated during the Luna Project. A number of rooms and a great kiva were excavated (Oakes and Zamora, this report). Ceramic distributions at the Hough site differ in several aspects from other sites at the Luna Project and reflect the late dating of this site (Table 4.46). This is the only site in which plain brown wares do not make up the majority of the pottery. They represent 26.1 percent of all sherds. Plain brown wares were outnumbered by smudged brown wares (28.7 percent) and corrugated brown wares (35.1 percent). Much of the smudged pottery from this site appears to be derived from Tularosa fillet rim bowls. A wide

Table 4.46. Ceramic Type by Provenience, LA 3279

Type	General Fill		Room 1		Room 2		Room 5		Room 6		Room 7		Room 8		Room 9		Room 10		Room 11		Room 12		Room 13		Kiva		Total		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Alma Plain rim	135	4.1	45	3.1	42	5.1	21	5.5	7	7.1	28	6.3	21	6.6	30	9.3	17	4.8	37	8.1	8	7.5	34	7.9	200	8.7	629	5.7	
Alma Plain body	542	16.5	206	14.0	119	14.4	63	16.4	22	22.4	38	8.6	42	13.2	52	16.1	56	15.7	52	11.5	13	12.1	46	10.7	129	5.6	1400	12.7	
Alma Rough rim	37	1.1	16	1.1	1	.1	6	1.6	1	1.0	8	1.8	3	.9	5	1.5	2	.6	7	1.5	1	.9	7	1.6	55	2.4	161	1.4	
Alma Rough body	169	5.2	48	3.3	24	2.9	8	2.1	1	1.0	9	2.0	6	1.9	8	2.5	10	2.8	12	2.6	7	6.5	17	3.9	38	1.6	360	3.3	
Alma scored	5	.2	1	.1	1	.1											1	.3					1	.2	6	.3	15	.1	
Alma incised	6	.2											2	.6					1	.2			2	.5	9	.4	21	.2	
Alma punched	6	.2									1	.2	1	.3					3	.7			2	.5	6	.3	19	.2	
Filet Alma neckbanded	5	.2	3	.2	1	.1	1	.3					1	.3													11	.1	
Three Circle neckbanded			1	.1			6	1.6												2	.4						9	.1	
Reserve smudged body	370	11.3	134	9.1	92	11.2	46	11.9	10	10.2	23	5.2	17	5.3	24	7.4	25	7.0	28	6.2	5	4.7	12	2.8	55	2.4	853	7.8	
Filet rim smudged	58	1.8	34	2.3	11	1.3	5	1.3	3	3.1	6	1.4	5	1.6	7	2.2	3	.8	8	1.8			4	.9	21	.9	166	1.5	
Reserve Plain corrugated	356	10.9	158	10.7	74	9.0	43	11.2	12	12.2	63	14.3	24	7.5	12	3.7	39	11.0	34	7.5	14	13.1	55	12.8	177	7.7	1081	9.8	
Reserve Plain corrugated smudged	51	1.6	26	1.8	24	2.9	10	2.6	4	4.1	12	2.7	6	1.9	6	1.9	7	2.0	5	1.1	1	.9	6	1.4	25	1.1	185	1.7	
Reserve corrugated indented	419	12.8	251	17.1	116	14.1	51	13.2	7	7.1	43	9.8	16	5.0	43	13.3	29	8.1	46	10.1	8	7.5	38	8.8	228	9.9	1326	12.1	
Reserve corrugated smudged indented	100	3.1	59	4.0	32	3.9	14	3.6	2	2.0	15	3.4	7	2.2	5	1.5	6	1.7	14	3.1	1	.9	7	1.6	47	2.0	318	2.9	
Tularosa corrugated pattern	34	1.0	24	1.6	15	1.8	6	1.6			3	.7	2	.6	5	1.5	7	2.0	7	1.5			8	1.9	57	2.5	174	1.6	
Tularosa corrugated smudged pattern	5	.2	3	.2	1	.1	1	.3	1	1.0	5	1.1	2	.6	1	.3										15	.7	34	.3
Incised corrugated	48	1.5	21	1.4	18	2.2	6	1.6	2	2.0	12	2.7	10	3.1	4	1.2	12	3.4	12	2.6	6	5.6	14	3.2	36	1.6	206	1.9	
Incised corrugated smudged	11	.3									2	.5											2	.5	1	.0	17	.2	
Smudged fillet rimmed	172	5.2	79	5.4	59	7.2	18	4.7	2	2.0	41	9.3	12	3.8	24	7.4	15	4.2	39	8.6	6	5.6	25	5.8	405	18.9	944	8.6	

Table 4.46. Continued.

Type	General Fill		Room 1		Room 2		Room 5		Room 6		Room 7		Room 8		Room 9		Room 10		Room 11		Room 12		Room 13		Kiva		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Plain smudged rim	122	37	46	3.1	24	2.9	13	3.4	1	1.0	35	7.9	23	7.2	15	4.6	12	3.4	26	5.7	6	5.6	35	8.1	140	6.1	502	4.6
Indeterminate corrugated	61	1.9	24	1.6	11	1.3	7	1.8	6	6.1	1	.2	5	1.6	15	4.6	16	4.5	17	3.7	1	.9	12	2.8	31	1.3	211	1.9
Mogollon Red-on-brown	1	.0																									1	.0
Indeterminate	25	.8	1	.1	2	.2	1	.3	1	.2	1	.2	3	.9	1	.3	3	.8	3	.7	3	6	1.4	6	.3	53	.5	
Punctuated corrugated	44	.4	5	.3	2	.2					5	1.1	3	.9	2	.6	3	.8	1	.2	2	1.9	6	1.4	19	.8	62	.6
Smudged painted	2	.1	2	.1	1	.1					3	.7	5	1.6	6	1.9	2	.6	2	.4	3	.7	3	.7	8	.3	34	.3
Pinched	3	.1																							1	.0	4	.0
Punched incised	1	.0																	2	.4						3	.0	
Alma aplique																									9	.4	9	.1
Single filet rim	4	.1																	1	.2						5	.0	
Incised, punched, and corrugated	2	.1																				2	.5	2	.1	6	.1	
Local fired clay	3	.1	1	.1					2	2.0							1	.3							2	.1	9	.1
Slip un painted	2	.1																	1	.3	2	.4				5	.0	
Mangus Black-on-white			1	.1																					3	.1	4	.0
Mimbres Reserve Indeterminate	6	.2	4	.3	3	.4	1	.3	1	1.0	2	.5	3	.9			2	.6	4	.9	1	.9			22	1.0	49	.4
Transitional black-on-white					1	.1									1	.3									5	.2	7	.1
Classic Black-on-white							1	.3														2	.5	1	.0	5	.0	
Tularosa White-on-red	13	.4	7	.5	12	1.5	3	.8			4	.9	1	.3	2	.6	2	.6	1	.2	1	.9	1	.2	24	1.0	74	.7
San Francisco Red	82	2.5	44	3.0	18	2.2	9	2.3	6	6.1	15	3.4	8	2.5	6	1.9	15	4.2	18	4.0	7	6.5	15	3.5	68	2.9	317	2.9
Other red slipped			4	.3	1	.1											2	.6	1	.2					3	.1	11	.1

Table 4.46. Continued.

Type	General Fill		Room 1		Room 2		Room 5		Room 6		Room 7		Room 8		Room 9		Room 10		Room 11		Room 12		Room 13		Kiva		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Cibola St. Johns Black-on-red	8	.2	2	.1	2	.2	3	.8	2	2.0	2	.5			1	.3	4	.9			2	.5	9	.4	35	.3		
Cibola St. Johns Polychrome	1	.0							2	.5					1	.3					1	.2	7	.3	14	.1		
Cibola Springer Polychrome																							2	.1	2	.0		
Finsdale Polychrome	2	.1			1	.1																	3	.1	6	.1		
Puerco late unpainted					3	.4																			3	.0		
Puerco Tularosa Black-on-white	6	.2							5	1.1															11	.1		
Total	3277	100	1472	100	824	100	385	100	98	100	441	100	318	100	323	100	454	100	107	100	431	100	2306	100	11004	100		

variety of corrugated types are represented, including Reserve Plain corrugated, Reserve Plain corrugated smudged, Reserve indented corrugated, Reserve indented corrugated smudged, Tularosa patterned corrugated, Tularosa patterned corrugated smudged, Reserve incised corrugated, Reserve incised corrugated smudged, alternating corrugated, clapboarded corrugated, and indeterminate corrugated. This is also the only Luna Project site in which the majority of the corrugated sherds exhibited indented corrugated manipulation. Pottery represented in low frequencies include Mogollon slipped red (3.1 percent), Mimbres White (.1 percent), White Mountain Redware (.2 percent), and Cibola Gray Ware (trace).

Cibola white wares represent 6.0 percent of the pottery from this site. The types of Cibola white wares and other decorated ceramics at LA 3279 differ from those recorded for the other sites and reflect the late dating of this site. Tularosa Black-on-white is by far the most common formal white ware, followed by Klageto Black-on-white, Reserve Black-on-white, and Pinedale Black-on-white. The combination of these types indicates an occupation dating to the Late Tularosa phase. In contrast to other Luna sites, most of the Tularosa Black-on-white sherds were very distinct from Reserve Black-on-white pottery in terms of polish, thickness, hatched treatments, and size of motifs. The most difficult problem in classifying white ware types from LA 3279 involved the separation of Tularosa Black-on-white and Klageto Black-on-white. Other unique characteristics noted in the decorated ceramics include the presence of St. Johns Polychrome as the most common White Mountain Redware and the presence of very low frequencies of Springerville Polychrome and glaze painted red ware from the Little Colorado or Zuni areas.

This combination of types indicates an occupation during the very late Tularosa period, during the end of the thirteenth century and possibly just into the fourteenth century. This represents the latest occupation in the Reserve and Luna areas, although later occupations in areas to the west, such as the Springerville area, may reflect the continuation of the ceramic developments noted at LA 3279.

Other sites with small pottery assemblages exhibit combinations of types commonly associated with pithouse and pueblo components. Examples of such assemblages were noted at LA 8947, LA 43766, and LA 7591.

LA 89847 (Red Ear Site)

A total of 444 sherds were recovered from LA 89847 (Table 4.47). These sherds appear to have derived from a site upslope (Moiola, this report). Most (57.4 percent) of these sherds represent plain brown wares. Alma Plain outnumbers Alma Rough about four to one. Other ceramics groups at this site include plain smudged brown (22.7 percent), corrugated brown (13.3 percent), Mogollon slipped red (3.2 percent), Mimbres White (.2 percent), and Cibola White (2.7 percent). These ceramic distributions indicate that much of the pottery was derived from components dating to the Pueblo period, although the lack of diagnostic white wares makes it impossible to determine the associated phase. These frequencies may also indicate the initial presence of pottery derived from the Late Pithouse or Early Pithouse phase.

Table 4.47. Ceramic Types by Provenience, LA 89847

Type	General Fill		Total	
	N	%	N	%
Alma Plain rim	6	1.4	6	1.4
Alma Plain body	192	45.2	192	45.2
Alma Rough rim	3	.7	3	.7
Alma Rough body	41	9.6	41	9.6
Reserve smudged body	80	18.8	80	18.8
Reserve Plain corrugated	34	8.0	34	8.0
Reserve corrugated indented	2	.5	2	.5
Incised corrugated	14	3.3	14	3.3
Smudged fillet rim	2	.5	2	.5
Plain smudged rim	16	3.8	16	3.8
Indeterminate corrugated	5	1.2	5	1.2
Indeterminate	2	.5	2	.5
Punctuated corrugated	1	.2	1	.2
Classic Black-on-white	1	.2	1	.2
San Francisco Red	14	3.3	14	3.3
Cibola late un painted	1	.2	1	.2
Cibola late painted	11	2.6	11	2.6
Total	425	100	425	100

LA 43766 (Old Peralta)

Only 150 sherds were recovered from the general fill of LA 43766 (Table 4.48). The low number of sherds at this site indicates that LA 43766 dates mainly to the Archaic period (Oakes, this report). Sherds in the upper fill of this site were apparently washed down from a small fieldhouse upstream. The majority (84.7 percent) of the sherds represent plain brown wares. Alma Plain sherds greatly outnumber Alma Rough. The remaining groups are represented by low frequency of types and include early textured brown (.7 percent), plain smudged brown (2.7 percent), corrugated brown (4.7 percent), Mogollon slipped red (.7 percent), Mimbres White (1.3 percent), and Cibola White (5.3 percent).

Table 4.48. Ceramic Types by Provenience, LA 43766

Type	General Fill	
	N	%
Alma Plain rim	3	2.0
Alma Plain body	113	75.3
Alma Rough rim	2	1.3
Alma Rough body	9	6.0
Alma scored	1	.7
Reserve smudged body	4	2.7
Overlap corrugated	5	3.3
Punctuated corrugated	2	1.3
Slip unpainted	2	1.3
San Francisco Red	1	.7
Cibola late unpainted	6	4.0
Cibola Reserve/Tularosa Black-on-White	2	1.3
Total	150	100.0

The presence of Reserve/Tularosa Black-on-white and overlapping corrugated sherds indicates that some of these sherds were derived from a Pueblo period component, although it is not possible to identify a specific phase. These sherds are probably from a small Reserve phase fieldhouse upstream from this site.

The relatively low frequency of sherds belonging to late types from LA 43766 and unusually high frequency of plain brown wares, however, may indicate a mixture of sherds derived from Early or Late

Pithouse period contexts and Pueblo period contexts. Contamination from Pithouse period sites may also be indicated by a high frequency of rim sherds belonging to seed jars, a form that is common during the earliest Mogollon occupations but very rare during the Pueblo period.

LA 75791 (Ladybug Junction)

A total of 144 sherds were recovered from LA 75791 (Table 4.49). Structures from this site appear to represent occupations by Apache groups during the protohistoric period. All but one of the sherds appear to represent material associated with early Mogollon occupations. The single late sherd is red slipped and tempered with basalt and may reflect a trade ware from Piro groups along the southern Rio Grande. Other ceramic groups include plain brown ware (75.7 percent), smudged brown ware (2.8 percent), corrugated brown ware (11.8 percent), slipped red ware (2.2 percent), Mimbres White Ware (2.1 percent), and Cibola White Ware (4.2 percent). These distributions probably reflect pottery derived from sites dating to several phases of the Mogollon. The high frequency of plain brown wares indicates ceramics from sites dating sometime during the Pithouse periods, while the presence of corrugated types and Reserve Black-on-white indicate material from Pueblo period sites. It is likely, then, the pottery at this site derived from several upstream sites dating to various periods.

Radiocarbon samples from this site dated to the seventh, ninth, and seventeenth century and probably indicate occupations dating before and after many of the ceramics from this site were deposited. The high frequency of plain brown wares may indicate that some of the plain ware sherds could have been associated with the Early Pithouse period. A single protohistoric slipped sherd, possible of Puebloan origin, is probably associated with a protohistoric Apache occupation of this site.

Pueblo Dating Summary

Similarities between the Pueblo period sites in the Luna Project indicate that most of the sites date to the Reserve phase, while some date to the Tularosa phase. Various combinations in the relative frequencies of Reserve Black-on-white and Tularosa Black-on-white and variation in ceramic scores indicate that the sites date to different spans within both periods.

Reserve Black-on-white without Tularosa

Table 4.49. Ceramic Types by Provenience, LA 75791

Type	General Fill		Pit Structure 1		Pit Structure 2		Pit Structure 3		Total	
	N	%	N	%	N	%	N	%	N	%
Alma Plain rim	2	2.2	4	20.0	1	4.3			7	4.9
Alma Plain body	51	57.3	11	55.0	13	56.5	8	66.7	83	57.6
Alma Rough rim					1	4.3			1	.7
Alma Rough body	14	15.7	2	10.0	2	8.7			18	12.5
Reserve smudged body	3	3.4					1	8.3	4	2.8
Reserve Plain corrugated	2	2.2			1	4.3			3	2.1
Reserve corrugated indented			1	5.0					1	.7
Reserve corrugated smudged indented							3	25.0	3	2.1
Tularosa corrugated pattern	2	2.2							2	1.4
Incised corrugated	1	1.1							1	.7
Overlap corrugated	3	3.4							3	2.1
Indeterminate corrugated	3	3.4	1	5.0					4	2.8
Mangus Black-on-white	2	2.2							2	1.4
Transitional black-on-white					1	4.3			1	.7
Other red slipped	3	3.4			1	4.3			4	2.8
Cibola late painted					3	13.0			3	2.1
Cibola Reserve Black-on-White			1	5.0					1	.7
Cibola hatchure	1	1.1							1	.7
Puerco late unpainted	1	1.1							1	.7
Red slipped Athabaskan	1	1.1							1	.7
Total	89	100	20	100	23	100	12	100	144	100

Black-on-white was found at several sites (LA 45510, LA 75792, LA 39972, and LA 3563), which appear to date to the early part of the Reserve phase. For the most part, ceramic scores assigned to these sites are lower than those noted at other Pueblo period sites. In addition, other sites (LA 39969, LA 70189, and LA 70185), while definitely dominated by Reserve Black-on-white, contain low frequencies of early forms of Tularosa Black-on-white and appear to date to the late part of the Reserve phase. With one exception, ceramic scores from these sites are slightly higher than at those dominated by Reserve Black-on-white. A single site (LA 89846), containing a small number of Tularosa Black-on-white sherds without Reserve Black-on-white sherds, dates to the Tularosa period. LA 39968 has slightly more Tularosa Black-on-white than Reserve Black-on-white and appears to date to the Early Tularosa phase. Ceramic scores at this site are as high as or slightly higher than at sites assigned to the Reserve period. LA 3279 is dominated by a late form of Tularosa Black-on-white along with lower frequencies of Reserve Black-on-white and Klagetó Black-on-white and dates to the Late Tularosa phase. The ceramic score assigned to this site is significantly higher than that noted at other Pueblo period sites. Ceramic distributions at LA 89847, LA 43766 and LA 75791 indicate an occupation during the Pueblo period along with a mixture from an earlier pithouse occupation. Thus, ceramic distributions associated with various Luna Project sites appear to support a continual occupation during the Pueblo period from A.D. 1000 to 1300.

SMALL UNDATED ASSEMBLAGES

The nature of some of the very small assemblages from several sites precluded assigning them to a specific component.

LA 78439 (Leaping Deer Ridge)

A total of six sherds, five plain brown ware and one corrugated brown, were recovered from LA 78439, which dates to the Archaic or Late Pueblo periods. These sherds probably represent contaminants from nearby Mogollon sites. Types include Alma Plain body, Alma Rough body, and plain overlapping corrugated. While most of these types could have been produced anytime during the Mogollon occupation, the presence of plain overlapping corrugated may indicate an occupation during the Pueblo period.

LA 37917 (Rocky Hill)

A single sherd classified as an Alma Rough body sherd was recovered from the artifact scatter during the surface stripping of the site. LA 37917 is a protohistoric Apache site (Oakes, this report), and the single sherd is probably a contaminant from a nearby Mogollon site, which could date to any phase.

LA 37919 (Apache Woods)

A total of nine plain brown ware sherds were examined from LA 37919. While this site is presumed to have been primarily occupied during the protohistoric period (Oakes, this report), all the sherds represent Mogollon types, including Alma Plain body and Alma Rough body, and they could be associated with any period of the Mogollon occupation. They are probably contaminants from LA 70189, diagonally across the highway.

LA 70191 (The Black Hole)

Only seven sherds were recovered from LA 70191 (Table 4.50), a redeposited site within a small streambed. Sherds identified from this site include one Alma Plain body, two Alma Rough body, one Reserve smudged body, two Reserve Plain corrugated, and one indeterminate White Mountain Redware sherd. If these sherds are derived from a single component, it probably dates sometime during the Pueblo period.

Table 4.50. Ceramic Types by Provenience, LA 70191

Ceramic Type	General Fill	
	N	%
Alma Plain body	1	14.3
Alma Rough body	2	28.6
Reserve small body	1	14.3
Reserve Plain corrugated	2	28.6
Indeterminate White Mountain Redware	1	14.3
Total	7	100.0

LA 9721 (Twin Pines)

A single Alma Rough body sherd was recovered from LA 9721, which appears to be associated with a possible fieldhouse outside of the right-of-way.

CONCLUSION

Ceramic data from sites excavated during the Luna Project indicate a long and mostly continuous occupation by ceramic-producing groups beginning as early as A.D. 200 and ending at about A.D. 1300 with the abandonment of the northern Mogollon Highlands. The initial ceramic occupation of the northern Mogollon Highlands is represented by components from four sites assigned to the Early Pithouse period. While these components were not further grouped into phases, there is some evidence that all these assemblages are not necessarily contemporaneous. The next ceramic occupation is represented by components from four sites assigned to the Late Pithouse period and low frequencies of pottery derived from Late Pithouse period components in later assemblages at several sites. Ceramic distributions indicate the presence of distinct components from one site dating to the San Francisco phase, two

sites dating to the Three Circle phase, and one site dating to both the San Francisco and Three Circle phase. One possible hiatus in the sequence of occupation in Luna Project assemblages may be reflected in the general absence of Mogollon Red-on-brown, which may indicate the absence of a component clearly dating to the Early San Francisco period phase. A total of 13 sites exhibit assemblages indicating components dating to the Pueblo period. Of these components, seven date to the Reserve period and three to the Tularosa phase; three represent small Pueblo assemblages with some mixing from earlier components. Variation in types dated to various Pueblo period phases also indicates occupations spanning these phases. For example, assemblages dating to both the earlier and later part of the Reserve and Tularosa phase were identified. Extremely small ceramic assemblages that could not be dated were recovered from five other sites.

CLAY DISTRIBUTION, USE, AND POTTERY PRODUCTION IN THE NORTHERN MOGOLLON HIGHLANDS

C. Dean Wilson and Patrick Severts

This chapter presents information relating to the collection and characterization of ceramic clays utilized by prehistoric potters in the northern Mogollon Highlands and adjacent areas in west-central New Mexico. These data were accumulated over a period of several years as part of the Luna Project. This chapter focuses on data resulting from the examination and comparisons of clays from local geologic sources and archaeological contexts. Data relating to the comparison of these clays to clay pastes found in pottery from Luna Project sites are also discussed. These data provide for the subsequent examination of patterns of local production, determining the influence of ceramic resource distributions and characteristics on Mogollon ceramic technology, and the recognition of locally produced pottery.

CLAY PASTES AND CERAMIC TRADITIONS

This study stemmed from the need to better evaluate models used to explain ceramic distributions and trends at sites in the Mogollon Highlands. Observations relating to the distributions of ceramic paste characteristics have long contributed to the recognition of pottery types thought to be associated with various regional ceramic traditions. Mogollon and Anasazi pottery types were produced with similar construction and decoration methods but differ in surface color and manipulation (Haury 1936a; Colton 1939). In general, Mogollon brown wares are distinguished from Anasazi gray and white wares by brown, dark gray, or red paste or surface colors, rather than gray or white colors. Brown and reddish colors are often attributed to oxidizing firing atmospheres postulated for Mogollon Brown Ware vessels (Colton 1939; Hall 1950). Such methods are often contrasted to the reduction or neutral atmospheres thought to have been used to fire Anasazi gray and white ware vessels (Haury 1936a; Hall 1950). Other distinct traits noted in the Mogollon include the presence of fine sand or igneous temper, the common occurrence of polishing on utility ware surfaces, and smudged interior surfaces. Most Mogollon painted types exhibit pastes identical to

those found in Mogollon brown wares but are covered with white slips and painted decorations on at least one surface, allowing for the differentiation of Mimbres tradition white ware and Cibola "Anasazi" white wares.

As previously indicated, investigations in west-central New Mexico often assumed that ceramic traditions practiced by people associated with different southwestern cultures were the major factor influencing the characteristics of pottery found in different areas. The distribution of ceramics assigned to different traditions and ware groups based on paste and temper characteristics has thus played an important role in the recognition and differentiation of various prehistoric culture areas and regions of the Southwest (Gladwin and Gladwin 1934; Colton 1939; Wheat 1955; Danson 1957; Gladwin 1957; Martin and Plog 1973; Haury 1985a). Paste characteristics resulting in the assignment of the majority of ceramics from sites in different areas of west-central New Mexico to one ceramic tradition or the other are often interpreted as reflecting cultural boundaries of distinct peoples (Hall 1950; Danson 1957). For example, the dominance of Mogollon brown wares over Anasazi gray and white wares at sites in the northern Mogollon is often used to define the distribution and boundaries of the Anasazi and Mogollon cultures (Danson 1957; Martin and Plog 1973). In addition, shifts from brown ware to gray and white ware dominated assemblages occurring in some areas are often used as evidence of movements of various groups and shifts in cultural identity, as well as the mixing or mingling of distinct cultural traditions (Mera 1934; Wendorf 1953; Danson 1957; Dittert 1959; Ruppé 1966). For example, Mimbres white wares were the dominant painted ware in the northern Mogollon Highlands until A.D. 1000, after which the majority of painted white ware sherds represent Cibola Anasazi types. This change is often assumed to reflect increased Anasazi influence on local potters resulting from an Anasazi intrusion into the Mogollon Highlands (Danson 1957; Martin 1979).

It appears, however, that the use of paste and

surface characteristics of pottery from sites in different locations commonly used to define major culture areas has detracted from the investigation of the actual causes of such variation (Tainter and Gillio 1980; Tainter 1982; Speth 1988; Wilcox 1988; Tainter and Plog 1994; Wilson et al. 1996). Geologically related distributions of different types of clays may also have contributed to regional patterns of variation noted in pottery produced in the upland Southwest. For example, it has long been noted that ceramic distributions, often equated with cultural boundaries, are also closely correlated with the distribution of geological and geographic features. Such distributions may have influenced clay availability and characteristics (Martin and Rinaldo 1951; Colton 1953; Martin 1979), but very few studies have examined the influence of material distributions on the ceramics found in this region.

LUNA PROJECT CLAY SOURCE SURVEY

This study examines distributions and characteristics of clay sources that were available to and utilized by potters in the northern Mogollon Highlands and adjacent areas. The strategy employed is similar to those employed in recent studies involving the documentation and comparisons of patterns of clay resource distribution and use conducted in various regions of the Southwest (Habicht-Mauche 1993; Zedeño and Mills 1993; Zedeño 1994; Hegmon et al. 1995).

The examination of patterns and influences of clay resource availability and use in the northern Mogollon Highlands involves several steps. First, data regarding the distribution and characteristics of locally available clays were amassed through the survey, collection, and characterization of samples. Next, data relating to the characteristics of clays from various local sources were compared to clays and ceramic pastes recovered from archaeological contexts at Luna Project sites. This allows us to distinguish pottery that could have been produced from local clay sources from that which could not.

Clay surveys conducted during this study involved the location and characterization of broad and representative ranges of sources that would have been available to prehistoric potters at Luna sites. Examination of ethnographic literature from around the world indicates that the distance traditional potters go to obtain clays without the aid of modern transportation is seldom more than 5 km and seldom more than 3 km for temper (Arnold 1976, 1981, 1985). In contrast, potters may go much greater distances to acquire slip clays and paint materials

(Arnold 1985). Exchange of vessels between prehistoric groups in the upland Southwest commonly involved distances well beyond the clay and temper catchment (Shepard 1942; Franklin 1980; Toll 1985; Plog 1986; Habicht-Mauche 1993; Zedeño and Mills 1993). Thus, pottery that can be demonstrated to contain clay or temper resources not available within the maximum catchment distance noted for these resources can usually be assumed not to have been produced locally. Thus, the presence of pottery exhibiting such pastes can be interpreted as reflecting exchange with groups in areas where these resources were locally available. The identification and collection of local pottery clays may also provide important information concerning the influence of clays from local sources with particular characteristics and working qualities on the development of various manufacturing, decorative, and firing conventions employed in pottery produced in the northern Mogollon Highlands.

An attempt was made to locate and characterize clay sources within and just outside the clay catchment area of sites on the Luna Project. In order to locate a broad and representative range of available clays, information concerning potential clay-bearing deposits were first examined through a review of geological reports, field guides, and maps. Sources within the catchment area of various sites on the Luna Project were documented and collected. Geological profiles associated with various outcrops and roadcuts were also examined and collected. A total of 32 clay samples were located and described during surveys of the Luna Project. Appendix 4.1 presents information on clay sources examined during this study.

Samples from clay sources were described in the field, collected, and characterized in the lab. Samples from all clays were fired and compared to pastes in pottery from assemblages on the Luna Project in order to determine what sources may have been used by potters residing at various sites. In addition to the small sample of clay collected for all sources, larger amounts of clay were collected from some of the best-quality pottery clay sources. This clay was used to make pottery vessels during replication studies conducted by staff at the Office of Archaeological Studies. Experiments were also conducted on vessels produced during replication studies in order to evaluate the suitability and performance characteristics of these sources. All clay samples recovered during excavations of Luna sites were also characterized and described like samples from local sources. Samples from archaeological contexts are illustrated in Appendix 4.2.

CHARACTERIZATION OF CLAY SAMPLES

Methods relating to the collection and analysis of clay samples from geological sources and archaeological contexts vary depending on basic research and analytical goals (Wilson et al. 1988; Hegmon and Neff 1993; Hill 1993). The present study involved fairly simple observations and descriptions, allowing for a basic characterization and comparison of ceramic clays. Each clay source collected was initially described, formed into tiles, and fired in a controlled oxidizing atmosphere, after which the refired color was recorded. During this process, various attributes relating to the characteristics and quality of these clays were recorded, including form, plasticity, natural color, refired color, and associated inclusions.

Clay form refers to the basic type of deposit and degree of weathering. The recording of clay form provides information concerning the associated formation processes and the amount of processing that would have been required to convert material from a given source into a usable clay. For example, some shale and certain igneous-derived sources can be converted into high-quality clays but may require considerable processing. In contrast, many of the more weathered deposits require little to no processing. Such differences would have obviously influenced decisions by prehistoric potters to use one source over another.

After clay from each source was ground and processed, attempts were made to judge associated plasticity and workability. This was done by wetting and manipulating each sample. Wetted clay was judged subjectively by forming clay coils between the fingers. Based on the ease by which a sample could be formed into a coil, samples were assigned to categories reflecting plasticity (excellent, good, moderate, fair, or poor). These judgments reflect the suitability of a clay for the manufacture of pottery and allow for the recognition of ceramic-quality clay sources. Other information recorded was limited to determining suitable plasticity for ceramic manufacture.

Natural color was recorded for all samples using a Munsell soil chart. Color was recorded after a particular sample had been formed into a tile and dried but before it was refired in standardized oxidation conditions. Samples were also assigned to color categories: green, gray, gray-brown, red-brown, or brown.

Refiring analysis provides for a comparison of colors based on mineral impurities in clay and ceramic pastes. This technique involved firing sam-

ples in oxidizing conditions to temperatures of 950 degrees C. Such firings standardize the oxidation of iron compounds in clays and burn out organic material. This allows for the common comparison of sample color and reflects types and amounts of mineral impurities (particularly iron). The color of samples was recorded with Munsell color categories. During the present study, sherds exhibiting hues of 10R to 2.5YR were described as red, hues of 5YR as yellow-red, hues of 7.5YR as pink, and hues of 10YR, 2.5YR, and 5YR as buff.

While refiring analysis does not provide information about specific clay composition, a comparison of colors recorded for raw clays and ceramic pastes may allow for the identification of clay sources that could have been exploited. Interpretations of data from refiring studies rely on the assumption that clays from the same source area should contain similar mineral impurities, and thus they should fire to the same color ranges. A number of factors limit interpretations using this technique. One problem is that a number of sources exhibiting different characteristics may occur within the catchment area of a potter at a given site. Also, clays from distinctive sources may sometimes fire to similar colors, or specific deposits firing to a particular color may occur over a wide area. Despite problems, differences in clay availability and selection may be observed. These include strong correlations between paste color and temper or other attributes of pottery produced at a particular site, indicating that potters in specific areas often did consistently select distinct clay and temper resources. Some problems may be controlled by accumulating a wide range of data relating to the range of variation present in sources actually available to potters, raw clay recovered from a particular source, and paste clay dominating the local ceramic assemblages.

The presence and characteristics of nonplastic inclusions found in clays from various sources were also recorded. Associated inclusions were described so that they could be compared with temper categories recorded during ceramic analysis. Samples of self-tempered clays were also submitted to petrographic analysis and compared to inclusions associated with ceramics from the same sites (Hill, this report).

DESCRIPTION OF CLAY SOURCES FROM THE MOGOLLON HIGHLANDS

Comparisons of clay and ceramic samples indicate an extremely good match between clay from local sources, clays recovered from archaeological con-

texts, and pastes associated with various Mogollon brown wares from Luna Project sites. Characterization of clays from local sources and archaeological contexts from the Luna Project area indicate that clays of suitable plasticity to form ceramic vessels appear to have been limited to alluvial or pedogenic clays that were abundant throughout the Mogollon Highlands. Such deposits are quite common in the upper geological deposits and result from weathering and associated soil formation of rock ultimately derived from volcanic outcrops dominating the geology of the Mogollon Highlands. Surrounding outcrops consist of a complex series of interbedded rhyolitic tuffs and basalts resulting from extensive Tertiary volcanic activity (Rhodes and Smith 1976; Ratté and Finnell 1978). These include material deposited from central volcanoes that are some of the largest cauldrons or volcanic depressions on earth (Elston 1989). The average thickness of the associated volcanic layers is over 1 km. The Mogollon-Datil volcanic field represents one of several mid-Tertiary fields that overlap the relatively stable Colorado Plateau. Volcaniclastic sandstones and breccias, formed through the filling of the valleys with material eroded from surrounding mountains are also present, often interbedded with the igneous rocks. In the Luna area such formations are represented by the Gila Sandstone formation (Rhodes and Smith 1976; Ratté and Finnell 1978). The thick and extensive volcanic deposits in the Mogollon Highlands obscure clay-bearing sedimentary formations common in other areas of the upland Southwest, particularly the Colorado Plateau.

This geological setting results in the occurrence of clay sources in the Mogollon Highlands that are surprisingly different in characteristics and workability from shale-derived clays of sedimentary origin commonly occurring in a number of different formations in the Colorado Plateau (Wilson 1994). Characterization of clay sources in the vicinity of the Luna Project area as well as from broad areas of the Mogollon Highlands indicates that clays derived from igneous sources throughout this region are quite similar. This contrasts with the variability noted in the sedimentary clays from localities in the Colorado Plateau. Clay sources collected throughout the Mogollon Highlands display remarkable consistency in color, inclusions, and working characteristics. The closest quality shale clays exhibiting distinctive characteristics clearly outside the range of the volcanic clays described here were derived from shale outcrops north of the towns of Datil and Quemado.

While in many of the steeper areas of the

Mogollon Highlands, only basalt, rhyolite, or tuff were exposed as bedrock, most of the flatter areas had deep soil deposits reflecting the weathering, redeposition, and soil formation processes at work on the surrounding volcanic rocks. These processes resulted in the formation of relatively thick lenses of high-quality clays fairly close to the surface. In the Mogollon Highlands, high-quality clays commonly occurred in thick B soil horizons, often covered by very thin organic A horizons. Similar high-quality clays are commonly visible in alluvial fans and the upper exposures of road profiles, test pits, and stream cuts.

Soil deposits in this area generally reflect the weathering of a wide variety of volcanic and volcanic-clastic parent rocks. Soil surfaces of this area are described as gray loam, stony loam, or gravelly loam (Maker et al. 1972). Subsurfaces of these deposits often consist of a brown gravelly clay loam or clay. Content of gravels and stones associated with soils is highly variable. Clays and other deposits collected from such sources are similar in appearance, but the size of clay, sand, or rock inclusions may vary dramatically between adjacent lenses. This content is represented by layers of varves of fine clay, loam, and sand textures, as well as layers consisting of large igneous cobbles.

A characteristic of most upper soil or alluvial exposures is the presence of lenses or varves of high-quality clays ranging from less than an inch to more than a foot in thickness. Clays from these lenses tend to be very hard when dry and very sticky when wet. When dry, this clay breaks off in very large chunks, aiding the identification, collection, and separation of lenses of high-quality clay from those in other varves.

Deposits of similar igneous-derived clays are present in most areas in the northern Mogollon Highlands, and almost all sites in the Luna Project area are directly over clay-bearing soil deposits. Activities such as digging pithouses and pits would have exposed considerable quantities of high-quality pottery clays. Thus, there would have been little need to search for pottery clay sources.

Clays from these sources are dark gray, brown-gray, and brown. Regardless of natural color, the amount of iron impurities results in red or yellow-red colors of samples exposed to standardized oxidation conditions, although occasional slip sources may fire to a deep red. Pastes from most pedogenic or alluvial clay sources collected during this study as well as Mogollon Brown Ware ceramic pastes consistently burned to similar colors when fired to standardized temperatures and oxidizing conditions.

Local clays and pastes as well as Mogollon brown wares also exhibit similar textures and soft surfaces.

Visual examination with a binocular microscope and petrographic analysis of processed clay local sources and archaeological samples (Hill, this report) indicate that the inclusions in clay samples from sources in the Luna Project area are extremely similar to those noted in Mogollon brown wares dominating sites dating to all occupational periods. Using a binocular microscope, aplastic inclusions were recorded for a significant number of sherds from Luna sites as well as for refired tiles of clays derived from local sources and archaeological contexts. Analysis of inclusions in Mogollon brown wares consisted of the identification and recording of three distinctive groups apparently reflecting slight variation of inclusions associated with local clay sources. As indicated earlier, several temper or inclusion classes were differentiated based on shape and sheen of associated fragments. Sands found along local streams also exhibit similar characteristics because they also result from the weathering of material from local volcanic outcrops and volcanic clastic formations. Comparisons of the characteristics of inclusions found in local clay deposits and clays and sherds from archaeological contexts indicate that these inclusions are very similar and indicate the use of local self-tempered clays.

Petrographic analysis of local clays and sherds also indicates the use of local self-tempered clays containing rock fragments of various sizes derived from weathered volcanic or volcanic-clastic formations. Petrographic characterization of ceramic pastes and fired tiles made from local clays indicate the presence of very similar ranges and types of rocks. This indicates the use of self-tempered clays from local alluvial or pedogenic deposits.

The finest of these local igneous clays tends to shrink considerably and crack during drying. Because they are derived from nearby volcanic outcrops, most contain sufficient rock particles. Thus, the addition of separate aplastic tempering was usually not necessary. These inclusions occur as silt- and sand-sized particles of rounded sand and angular igneous rock. The average and maximum size of associated aplastic particles grades significantly within various varves or lenses occurring in alluvial or soil profiles. While sources tend to be hard and chunky and contain numerous rock fragments of varying sizes, they are easily processed by simply grinding dried clay along with these aplastic inclusions. Grinding these chunks into a fine powder results in the occurrence of rock inclusions similar in size, shape, and color to those noted in the major-

ity of Mogollon brown wares from Luna Project sites. In the few cases where it may have been necessary to add additional aplastic material as temper, lenses of sand-sized material from other soil or alluvial lenses or nearby streambeds could have been used. Such materials are identical in appearance and composition to rock fragments naturally occurring in the clay, so their addition to a clay body can usually not be determined.

While the basic composition and form of inclusions noted in pottery from separate sites in the Luna area and other localities of the Mogollon Highlands are similar, some differences might occur in the range of variation of inclusions in similar pottery types from sites in different locations. Further, compositional analysis of ceramics from different volcanic sources in the Mogollon Highlands is needed to determine the nature of this variation.

While the composition of inclusions noted in different brown wares from a given site is very similar, particle size in smudged brown wares appears to be generally smaller than that in utilitarian types. Unpolished brown wares tend to exhibit the largest aplastic particles. This indicates differences in the degree of processing and grinding of clay used in the manufacture of vessels belonging to different ware groups and forms associated with varying degrees of surface polish and smudging.

Experimental firings indicate that vessels made from these volcanic clays become durable at relatively low firing temperatures, which are well within the range of normal wood firings. To determine the role of firing atmospheres employed in the production of brown wares, replicated vessels using alluvial igneous clays from sources in the northern Mogollon Highlands and shale clays from sources in the southern Colorado Plateau were placed together during several experimental firings. When exposed to a low-oxidation or neutral atmosphere, vessels produced from igneous-derived clays collected from the Mogollon Highlands consistently fired to gray-brown or brown, while those constructed with shale clays from the Colorado Plateau fired to the white or gray commonly noted in Anasazi gray and white wares. Another observation was that vessels made from Mogollon Highland volcanic clays tend to be weak and often crack when fired in true oxidation atmospheres. Thus, Mogollon clays were not suited for oxidation firings. In contrast to the oxidation atmosphere generally thought to have been utilized in the firing of Mogollon tradition brown ware, it appears that similar neutral or low oxidation atmospheres were employed on both Mogollon and Anasazi vessels.

Replication studies also indicate that the characteristics of pedogenic or alluvial clays derived from volcanic rock employed in the Mogollon Highlands are so distinct that construction of vessels using these clays would have required construction techniques and conventions distinct from those used during the manufacture of sedimentary clays utilized in the Colorado Plateau. Volcanic rock-derived clays from the Mogollon Highlands often exhibit extremely high plasticity and stickiness. This combination of characteristics contributes to the very high working quality of these clays, which appear to be among the most workable pottery clays occurring anywhere in the Southwest. This high plasticity allowed for the construction of long thin coils, and the stickiness allowed for the easy joining of these coils. This clay is also very malleable and provides for considerable control during vessel construction. Therefore, these clays were very well suited for the construction of a wide range of surface textures and vessel forms. Corrugation and coil patterns noted in late Mogollon brown wares, such as Tularosa corrugated, indicate a level of construction control and aesthetic expression not equaled in utility ware forms produced in almost any other areas of the Southwest and made possible through the use of high-quality volcanic-derived clays found in the Mogollon Highlands.

Despite their plasticity and incredible working qualities, the shrinkage of such clays creates problems and difficulties during vessel construction. Each coil must be joined to the rest of the vessel very quickly. If significant time elapses between the joining of coils, the associated coil junctures become very weak, resulting in subsequent vessel cracking or breakage. Thus, vessels constructed with clay sources from the Mogollon Highlands had to be made very quickly, while the clay was still wet. Usually it would not have been possible to stop and then resume construction. In contrast, construction with many of the shale clay sources from the Colorado Plateau is not only possible, but often easier, if one routinely stops during the coiling process. Vessels made from these clays tend to be stronger if portions of the vessels are allowed to dry and strengthen before construction is resumed. In Mogollon Highland clays, small cracks tend to form along the base of coil junctures if vessels dry too quickly. Thus, during the drying process, the covering and storage of brown ware vessels was very important.

The tendency for Mogollon Highland clays to fire to dark gray, brown, or yellow-red when fired in any atmosphere also limited the application of painted decoration. Several solutions to this constraint

used by Mogollon potters may contribute to the uniqueness of Mogollon brown wares. These include the utilization of intricate surface texture and smudged surfaces to achieve striking decorative effects as well as the application of red and white slips over brown ware paste clays.

Clay sources that could have been used to create the red surfaces on San Francisco Red and other red slipped Mogollon types are rare but were identified in the general area. One source in the Apache Creek National Forest, north of the Luna Project area, contained clays with an unusually high amount of iron and would have been an excellent source of red slip. This and other high-iron slips appear to have resulted from the weathering of rhyolite and other volcanic exposures with high iron content. Most of these high-iron clay sources were very localized and are so high in iron that touching them results in deep red staining. Experiments also indicate that the amount of such clay required to slip a single vessel surface was very small, so it would have been easy to transport sufficient quantities of these clays for use as red slips from the sources identified.

White slips used in decorated Mimbres White Ware appear to have been derived from weathered volcanic tuff that was suitable as a slip clay but not plastic enough to be used for paste clays. Layers of volcanic ash exhibiting a wide range of forms and weathering appear to be fairly common throughout the Mogollon Highlands. Most of the material collected during the present study required considerable processing before they were of suitable quality for use as a slip, although some that can be readily used as slips were located. Potential slip clays from local sources near Pueblo Creek Ranch and slips occurring in Three Circle Red-on-white contain numerous mica inclusions, indicating they were the sources of the early red-on-white pottery. Later Mimbres white wares do not contain these inclusions and also display a slightly different surface appearance. It is possible that most of the Mimbres Black-on-white vessels found at Luna Project sites were produced in other areas, possibly in the Mimbres region to the south, although more detailed characterization of clay paste is required before this issue can be resolved.

Smudging over polished surfaces was also a common decorative treatment that required high-iron clays for the best effect. Intentionally sooted or smudged surfaces are very lustrous and are covered with an organic layer deposited during the final stages of the firing process. Vessels may be smudged by smothering the fire during the final stages, pro-

ducing blackened deposits on one or both vessel surfaces, although in the prehistoric Southwest this treatment is most common in interior surfaces. Interior-smudged surfaces may be produced by simply placing organic material such as bark in an upside-down vessel. Experimental firings indicate that vessels made with clays from the northern Mogollon Highlands retained these smudged deposits very well. Smudged interior surfaces on Mogollon pottery are usually highly lustrous and black and contrast dramatically with unsmudged exterior surfaces. The application of interior smudging and exterior surface textures provided a means to effectively decorate vessels made from high-iron clays. Smudged surfaces, however, may have been produced for functional as well as aesthetic reasons. Smudged treatments may also provided solutions to other potential shortfalls of vessels produced from clays employed in the Mogollon Highlands. Smudging apparently helped produce hard durable surfaces and reduced permeability to liquids.

IMPLICATIONS OF CLAY-BASED DISTRIBUTIONS

Examination of clay sources available to and utilized by potters in the northern Mogollon Highlands resulted in explanations for the spatial variability of pottery in west-central New Mexico that are very different from those previously proposed. These examinations indicate that characteristics of local Mogollon ceramics attributed to cultural or ethnic influences actually reflect differences in raw materials available within different geological provinces. This is supported by observations indicating that surface textures and designs not constrained or influenced by differences in clay resources are very similar over wide areas of the upland Southwest. Differences in the prehistoric pottery found in the northern Mogollon and southern Anasazi country appear to have been strongly influenced by characteristics of material sources available in different geographic and geological settings of the upland Southwest. Mogollon brown wares reflect the characteristics of the distinctive self-tempered, high-iron, homogenous colluvial clays long utilized by potters in the Mogollon Highlands. Despite the obvious differences in surface color between ceramics of the Mogollon and Anasazi regions, firing technologies between the areas were not as different as often assumed, because strong oxidation was avoided during the production of both Mogollon and Anasazi pottery.

Thus, information concerning the distinctive nature of the clays available and used by prehistoric potters in the northern Mogollon Highlands contributes to our understanding of regional ceramic patterns. First, these data provide insights concerning the influence of the distinct and homogeneous clay resources occurring in the Mogollon Highlands on the development and characteristics of pottery traditions produced in this area. Given the similarities of early pottery produced in the northern Mogollon Highlands and Colorado Plateau, later differences may be explained in terms of conventions that developed in response to different regional clay sources (Wilson et al. 1996). A comparison of ceramic developments within these areas provides the opportunity to examine influences of cultural and historic factors as well as resource distributions on associated ceramic traditions and technology. It appears that certain decorative conventions (neckbanding and corrugations) were introduced into various areas of the upland Southwest at about the same time and may reflect widespread interaction and the flow of information concerning appropriate means to decorate pottery between separated areas. The differences between Anasazi and Mogollon pottery appears to reflect characteristics of and manufacturing conventions suitable for the clays found in the two regions. It should not be surprising, then, that boundaries defined for these cultures almost directly correspond to geological distributions that would have strongly influenced characteristics of the pottery clay available.

In addition, data from clay surveys and related studies provide critical information concerning the recognition of pottery within the northern Mogollon Highlands, as opposed to that produced in other geological provinces. In particular, these data provide new perspectives relating to changes that occurred in white ware distributions in the northern Mogollon country after A.D. 1000. Prior to this time, the great majority of decorated ceramics from Luna sites represent slipped brown wares such as Three Circle Red-on-white and Mangus Black-on-white. While brown ware continued to dominate utility ware forms at sites dating after A.D. 1000, at later Mogollon sites they are associated with Anasazi-style Cibola white wares such as Reserve Black-on-white and Tularosa Black-on white, which represent the dominant decorated type during three centuries of occupation (A.D. 1000 to 1300) during the Pueblo period. It has often been assumed that brown ware and white wares found at northern Mogollon Highland sites were locally produced, reflected by the fact that white wares such as Reserve Black-on-

white and Tularosa Black-on-white are named after locations in the Mogollon Highlands. The joint association of Mogollon Brown Ware and Cibola white wares in the Mogollon Highlands has often been explained as reflecting an Anasazi intrusion into the northern Mogollon Highlands after A.D. 1000 (Danson 1957; Martin 1979). In this scenario, the Mogollon culture is sometimes characterized as having disappeared as the result of an Anasazi "takeover," explained in terms of the Anasazi socio-cultural system and its expansion into the Mogollon Highlands at the expense of the Mogollon system (Danson 1957; Martin 1979). As a result, some archaeologists placed the end of the Mogollon period as a distinct Southwest culture area at A.D. 1000 (Wheat 1955; Haury 1988). The intermingling of groups with distinct ceramic traditions resulting from this intrusion is further assumed to have resulted in the joint production of Mogollon Brown Ware

and Cibola White Ware at sites in the northern Mogollon Highlands (Danson 1957; Martin 1950a).

Data resulting from the collection of raw sources indicate, however, that pottery-quality clay sources firing to light colors and exhibiting characteristics noted in late Anasazi types such as Reserve Black-on-white and Tularosa Black-on-white were not available within a reasonable clay catchment distance at Luna Project sites. These data indicate that white wares such as Reserve Black-on-white and Tularosa Black-on-white could not have been locally produced at Pueblo period sites in the northern Mogollon Highlands, even though they represent the dominant white ware type at these sites. Thus, the replacement of Mimbres White Ware by Cibola White Ware reflects changes in white ware exchange rather than a shift in culturally influenced pottery-making practices.

CERAMIC TRENDS AT LUNA PROJECT SITES

C. Dean Wilson

Ceramic data from Luna Project investigations provide information concerning various changes and trends occurring in the northern Mogollon country from A.D. 200 to 1300. This chapter examines pottery changes and developments documented during the Luna Project that may provide information relating to the interaction and relationship between adjacent groups as well as responses to local conditions such as the influence of local ceramic resources, environmental and subsistence change, and population pressures on the ceramic technology.

CERAMIC DISTRIBUTIONS IN REGIONAL PERSPECTIVE

A comparison of ceramic distributions at Luna sites from various periods with those of contemporaneous sites in surrounding areas of the Mogollon Highlands and Colorado Plateau may provide important insights concerning the nature of interaction and relationships with surrounding groups at a given time. Clues concerning this interaction may be indicated by the geographic distribution of pottery traits occurring at contemporaneous sites, ultimately reflecting the flow of information regarding the appropriate way to make and decorate pots as well as evidence of the actual exchange of pottery vessels through the recognition of nonlocal pottery.

As discussed in previous chapters, data concerning the distribution of ceramic types in the Southwest have long been used to document and define the boundaries of ceramic regions or traditions. Archaeologists have most commonly interpreted pottery distributions in various regions as reflecting different Southwest cultures or peoples who practiced different ceramic traditions (Kidder 1924; Gladwin and Gladwin 1934; Colton 1939). For example, sites in west-central New Mexico dominated by Mogollon brown wares were assumed to reflect occupations by the Mogollon people, while those dominated by Anasazi white and gray wares were thought to reflect Anasazi occupations. High frequencies of ceramics assigned to several traditions were assumed to represent the mixing or min-

gling of peoples and cultural traditions, and changes in frequencies of pottery associated with various traditions is sometimes interpreted as reflecting the expansions of various cultural groups (Martin and Rinaldo 1950a; Danson 1957; Martin 1979).

The validity of the concept of the Mogollon culture tradition has been recently challenged (Speth 1988; Wilcox 1988; Tainter and Plog 1994). While ceramic typologies and characterizations long used by southwestern archaeologists provide a useful first step for the documentation of ceramic distributions on the Luna Project and their comparison to ceramic patterns at sites in surrounding areas, problems result when patterns documented through such distributions serve as ends in themselves. For example, explaining the unique distributions noted at Luna Project sites and contemporaneous sites in surrounding areas simply in terms of the boundaries of the Cibola branch of the Mogollon and later changes in terms of cultural intrusions (Martin 1979) does not adequately explain the causes of the changes noted. Instead, it is necessary to account for pressures and influences actually responsible for distributions of pottery belonging to various types and traditions through time and across space. For example, as noted in the previous chapter, while the choice to use a particular combination of ceramic resources and manufacturing and decorative technique is partly a reflection of the techniques and styles of a particular cultural tradition, these choices are also influenced by the quality of local ceramic resources. Characteristics of the pottery produced will also be influenced by changes in the social roles of pottery as well as the use of pottery in various activities within a changing subsistence economy. Thus, it is important to characterize this pottery in a manner that allows for the monitoring of a variety of factors, including resource use, methods of pottery manufacture, exchange, and uses associated with various behaviors and activities.

While the boundaries of culture areas are sometimes characterized as having been relatively stable, the nature of broad geographic distributions in ceramic assemblages from the Luna Project area and surrounding regions appears to have changed dra-

matically through time. In fact, the relationship between ceramic distributions in sites of the Cibola branch of the Mogollon and other regions of the west changed dramatically at least three times. These changes appear to correspond with the three basic periods defined for the northern Mogollon.

Early Pithouse Pottery in Regional Perspective

Distributions of the pottery from all four sites with Early Pithouse period occupations are very similar. All assemblages dating to the Early Pithouse period are dominated by polished and unpolished forms of plain brown wares classified as Alma Plain and Alma Rough, with low frequencies of similar forms with red slips classified as San Francisco Red. Textured and painted pottery was largely absent.

The pottery from Pithouse phase components in the Luna Project area is remarkably similar to the earliest assemblages from other areas of the Mogollon Highlands (Haury 1936b; Haury and Sayles 1947; Wheat 1955; Fitting 1973; Lightfoot 1984; Crown and Wills 1996), as well as the Anasazi (Blinman and Wilson 1995; Reed et al. 1997) and Hohokam (Whittlesey et al. 1994; Stark 1995) regions. The earliest pottery from scattered sites in all southwestern regions is represented by similar unpainted plain brown wares that are often assigned to various regional types. Similar brown ware from a number of Southwest regions have been assigned to a number of types, including Alma Plain, Adamana Brown, Woodruff Brown, Obelisk Gray, and Sambrito Utility, depending on their area of recovery. It is very difficult, and almost impossible, to distinguish pottery produced from widely separated regions without compositional or mineralogical characterization of the temper and clay.

Some archaeologists have suggested that the early brown ware found throughout the Southwest was first produced in the Mogollon Highlands and later spread into other regions (Wendorf 1953; Lucius 1981; Haury 1988). Such scenarios, however, may be more a reflection of the history of southwestern archaeological research than actual evidence. These initial models may have resulted from the fact that the first ceramic occupations that clearly dated prior to A.D. 400 were in the northern Mogollon Highlands (Haury 1988). These included sites excavated by Martin that are very near some of the Luna Project sites (Martin 1943; Martin and Rinaldo 1947) and sites in the Forestdale region (Haury and Sayles 1947). These early dates, as well as observations concerning the long history of pro-

duction of similar brown wares in the Mogollon Highlands as compared to other southwestern regions with distinct pottery traditions, seemed to point to an early date of origin in the Mogollon Highlands and subsequent spread of the Mogollon culture (Haury 1988). Later, when early brown ware was noted in other regions, it was interpreted as indicating the early spread and very wide distribution of early Mogollon groups (Wendorf 1953; Dittert et al. 1963; Lucius 1981; LeBlanc 1982a).

More recent investigations have cast doubt on interpreting the widespread distributions of early brown ware as simply a reflection of the spread of Mogollon groups (Blinman and Wilson 1995; Wilson et al. 1996; Reed et al. 1997). Recent studies indicate that pottery appeared in the Anasazi region at least as early as in the Mogollon region and even earlier in the Hohokam region (Whittlesey et al. 1994; Stark 1995; Reed et al. 1997). Thus, the distribution of early brown ware is probably best described in terms of a pan-Southwest distribution of a similar ceramic technology, rather than reflecting a particular regional culture or tradition. Similarities in the early brown wares occurring over extensive areas represent an early expedient ceramic technology dependent on the use of widespread alluvial or pedogenic clays (Wilson et al. 1996). By A.D. 500 in the Hohokam and Anasazi regions, alluvial clay-based brown ware was being replaced by wares more suitable to the abundant resources of these regions (Wilson, this volume). After this time, the early brown ware technology was limited to the Mogollon Highlands, where ceramic-quality sources were limited to self-tempered and high-iron clays suitable for the production of brown ware forms. Thus, for the upland Southwest, the production of brown ware ceramics cannot be viewed as a distinctive Mogollon trait until after A.D. 500. The distinctions that developed between the Anasazi and Mogollon ceramic technology appear to reflect the development of technological and manufacturing conventions suited to distinct regional clay sources more than factors related to cultural affiliation or ethnicity.

Late Pithouse Pottery in Regional Perspective

The appearance of distinct regional traditions in the Southwest after A.D. 500 resulted from the development of distinct technologies more suitable for ceramic resources in various regions and the use of textured and painted decorations that provided the potential for greater variation in the pottery. Even

after the appearance of distinct Anasazi gray and white and Hohokam Buff Ware ceramic traditions, similar plain brown wares continued to be produced throughout the Mogollon Highlands. As compared to developments in other regions, changes in pottery produced in the Mogollon Highlands after this time were relatively minor and included the gradual development of textured and smudged brown ware and painted Mogollon or Mimbres White Ware forms. Similar brown wares appear to have been produced throughout the Mogollon Highlands in New Mexico and Arizona throughout the Late Pithouse period.

The presence of early Mogollon painted or Mimbres white wares as the major painted group during the Early Pithouse period is more geographically restricted. The apparent continuum from Mogollon Red-on-brown to Three Circle Red-on-brown and then Mangus Black-on-white appears to be mainly limited to areas in the Mimbres and Cibola branches of the Mogollon. In areas of the Mogollon Highlands just north of the Luna Project area, such as the Gallo Mountains, utility ware assemblages are dominated by brown wares identical to those in the Luna Project area, while the dominant decorated pottery is represented by Cibola white wares such as Red Mesa Black-on-white. In areas of the Colorado Plateau, such as Mariana Mesa, similar white wares are associated with early plain and neckbanded Cibola gray wares. In Arizona, to the west and southwest, decorated types are often dominated by local variants of Mogollon types, along with intrusive types from the east such as Three Circle Red-on-white and Mangus Black-on-white (Sayles 1945; Wheat 1954, 1955; Breternitz 1959; Haury 1985b, 1985c).

Thus, the Luna Project and other areas along the Upper San Francisco drainage appear to be in the very northernmost part of the range, where decorated types often described for the Mimbres areas dominate Late Pithouse period assemblages. Architecture and ceramic patterns found in the Luna Project area are similar to those in San Francisco and Three Circle phase components in areas to the south. Mogollon Village is located along the San Francisco drainage south of the Luna Project and exhibits substantial evidence of occupation during the Late Pithouse period (Haury 1936b; Mauldin et al. 1996). A number of Late Pithouse sites exhibiting these decorated types are in the Mimbres region along portions of the Gila and Mimbres drainages (Bradfield 1931; Haury 1936b; Anyon and LeBlanc 1980; Anyon 1984), and major Late Pithouse sites are known as far south as the Burro Mountains

(Woosley and McIntyre 1996) and as far east as the Rio Grande drainage near Truth or Consequences (Schutt et al. 1994). Sites exhibiting similar architectural and ceramic patterns are found over a relatively wide area covering much of the southwest quarter of New Mexico and just barely extending into southeast Arizona. Most of the major Late Pithouse villages, however, appear to be clustered within fairly small areas along the San Francisco, Gila, Mimbres, and Rio Grande drainages and associated tributaries.

Similarities in pottery and architecture in the northern Mogollon Highlands and the Mimbres region is sometimes interpreted as indicating the northern range of the Mimbres cultural tradition during the San Francisco or Three Circle phase. Similarities in ceramics, however, may also reflect distributions of clay resources available to potters in different areas of the Mogollon Highlands. Thus, the combination of brown pastes and white slips utilized in the production of Mimbres White Ware reflects attempts to produce white ware pottery. The volcanic-derived clay resources occur over very wide areas of the Mogollon Highlands. Similarities in styles between pottery found in this area of the northern Mogollon and sites in the Mimbres region, however, also indicate the flow of information between potters in these regions.

Pueblo Period Pottery in Regional Perspective

Similarities between the pottery distributions in areas of the northern Mogollon in the Luna and Reserve area and those within the Mimbres branch ended at about A.D. 1000. While there are some slight differences in the range of styles in the brown corrugated pottery between these areas at this time, the major geographic change that occurred is reflected by the appearance of Cibola White Wares such as Reserve Black-on-white as the major white ware group. In contrast, Mimbres white wares such as Mimbres Classic Black-on-white continued to dominate assemblages dating to the eleventh and twelfth century at sites throughout the Mimbres region.

Similar developments reflected by the occurrence of Cibola White Wares such as Reserve Black-on-white and Tularosa Black-on-white, along with brown utility wares including corrugated and smudged types, took place over a wide area of the Mogollon Highlands just south of the Colorado Plateau. Thus, similar combinations of pottery occur at Pueblo period sites covering a long band running east-west along the edges of the Mogollon

Highlands. In west-central New Mexico, similar white ware distributions probably begin just west of the town of Magdalena, although some traits between these white wares are shared with sites containing Chupadero Black-on-white found as far east as the Pecos River (Lekson 1996). Similar distributions continue into the Mogollon Highlands of Arizona, including the Upper Little Colorado drainage and the Tonto Basin (Martin and Rinaldo 1960a; Martin et al. 1961, 1962, 1964; Doyel 1980; Heidke and Stark 1995). In some regions of Arizona, Cibola white wares replaced various regional Mogollon decorated types, and in other regions they replaced Hohokam buff wares. Thus, from A.D. 1000 to 1300, similar combinations of Mogollon Brown and Cibola types occur along the northern part of the Mogollon Highlands and beyond eastern New Mexico to as far west as central Arizona.

Along most of this zone, frequencies of Mogollon brown and Cibola white wares are gradational. In areas of the northern Mogollon Highlands, frequencies of Cibola white and gray wares at Pueblo period sites tend to increase at sites closer to the Colorado Plateau and decrease moving south into the Mogollon Highlands. This results in a series of zones containing different mixes of sherds belonging to different traditions. Zones containing various combinations of ceramic types belonging to both the Mogollon and Anasazi traditions have sometimes been characterized as reflecting distinct cultures in their own right that are neither Anasazi nor Mogollon (Dittert 1959; Ruppé 1966).

The shift in pottery and architecture represented in the Luna Project area as well as other areas of the northern Mogollon region has sometimes been interpreted in terms of an Anasazi intrusion into the northern Mogollon Highlands resulting in the mingling of different peoples and ceramic traditions (Martin and Rinaldo 1950a; Danson 1957; Martin 1979). In these scenarios, this combination of ceramics was assumed to be the result of the local production of both Mogollon tradition brown ware and Anasazi white wares in the northern Mogollon country. Factors relating to the occurrence of the spread of pottery appear, however, to reflect more than the simple emergence or mingling of different regional traditions.

EXAMINATION OF PATTERNS OF PRODUCTION AND EXCHANGE

Many of the spatial and temporal patterns of ceramic distributions reflect factors influencing the pro-

duction and exchange of ceramic vessels. Aspects of pottery production, exchange, and function ultimately represent interrelated components of larger economic systems and must be considered together (Blinman 1988; Pool 1992). For example, factors preventing or encouraging the production of certain pottery forms may influence the exchange of pottery between different areas. The increasing number of studies examining the production and exchange of pottery vessels in various regions of the Southwest indicates the importance in examining the nature and role of pottery exchange in the prehistoric Southwest (Toll 1981; Blinman 1988; Mills 1995; Blinman and Wilson 1993; Habicht-Mauche 1993, 1995; Zedeño 1994; Zedeño and Mills 1993; Crown 1995; Hegmon et al. 1995; Heidke and Stark 1995; Wilson and Blinman 1995). These studies indicate that, while over the entire span of prehistoric occupations in the Southwest pottery was almost always produced at the household level, potters in various regions throughout the Southwest often produced certain pottery forms distinct to that region. Such pottery is often represented by elaborate decorated types which appear to have been exchanged over wide areas. Other pottery classes, such as utility ware, appear to have been consistently produced for local use and do not appear to have been widely exchanged.

Examination of Relative Rates or Volume of Pottery Production (with David Hayden)

One factor seldom examined in Southwestern studies, but an important consideration in an area such as Luna, where pottery was utilized over such a long period, concerns the relative rate of production and discard of pottery vessels. Previous studies of ceramic accumulation rates in the Southwest have generally relied on information relating to concise demographic and temporal trends. Rates are defined by the number of items necessary to fill their role per population unit and the rate at which they are discarded (Varien et al. 1993). Estimates of ceramic accumulation rates are derived from equations considering the total number of ceramics represented at a site through systematic sampling. The quantities of ceramics represented is then evaluated in terms of evidence relating to population size, length of occupation, and the influence of types of activities in which ceramics were used in order to estimate rates of pottery breakage rates and accumulation. Because of the constraints associated with CRM projects, however, most of the Luna-Reserve excavations represent slices rather than systematic samples of the

full range of activities that would have occurred at a given site. Without an opportunity to define concise occupational time frames, and without sufficient knowledge to determine site population size, the development of accurate, quantitative accumulation rates is difficult.

Because of these constraints, Luna Project investigations employed another approach to examine relative rates of pottery accumulation. This involved establishing a baseline from which the changes in the relative quantities of different classes of artifacts deposited from a particular site can be determined. Measurements of relative rates of pottery accumulation may be accomplished by comparing quantities of pottery with other artifacts found in the same contexts. Lithic flakes appear to represent the most appropriate material class for such a comparison because of their common occurrence at Luna sites and because examination of the lithic debitage from Luna sites indicates remarkable consistency through time in terms of morphology, platform type, utilization, and material type from all ceramic-bearing sites. These similarities were interpreted as long-term consistency in lithic technology. If this is correct, it should be possible to assume that quantities of discarded lithic flakes were constant through time and to use the relationship between the two classes to examine relative rates of ceramic deposition or discard.

In order to obtain relative measurements of ceramic discard, lithics and ceramics from various sites were weighed in grams and used to determine mass accumulated for each artifact class for a given context or site. Weights were used instead of counts because the latter would reflect too much of the effects of breakage resulting from postdepositional processes. Cores and formal tools were excluded

because of potential biases resulting from the comparably large size and weight of individual items. For each site, a relative frequency ratio of weight between the two artifact classes was derived by dividing the total weight of the ceramics by the total weight of the lithics. Increases in this ratio are assumed to reflect higher rates of breakage and discard of pottery vessel associated with increased use.

Comparisons of the ceramic to flake ratios from various Luna sites (Table 4.51) indicate definite temporal trends in the relative rate of breakage and discard of ceramic vessels. Sites dating to the pit-house periods display about a one to one ratio of ceramic to lithic flake weight. During the Reserve phase period, however, there is an increase in the ratio of pottery by three to four times, culminating in a tenfold increase by the late Tularosa phase. If assumptions about the conservatism of the lithic technology at Luna Project sites and accumulation rates are correct, this trend reflects increased breakage of ceramic vessels associated with their increased importance through time. If this is not the case, then it nevertheless shows a change in the relative discard of the two material classes and an increased emphasis on activities related to ceramic breakage compared to those involving the discard of flaked stone debris.

Evidence of Ceramic Production

Other examinations relating to patterns of ceramic production are highly dependent on studies of clay resources described in the previous chapter. These studies provide the basis for identifying locally produced pottery and an evaluation of the influences of local resources on the local pottery technology in this area of the northern Mogollon Highlands. The

Table 4.51. Ceramic/Lithic Ratios for Selected Luna Project Sites

Site	Period	Ceramic (g)	Lithic (g)	Ratio (C/L)
LA 39975	Early Pithouse	12 286	14 523	0.9
LA 45507	Late Pithouse	66 937	69 354	1.0
LA 70196	Late Pithouse	6 535	7 935	0.9
LA 70201	Late Pithouse	3 875	6 351	0.6
LA 70185	Early Pueblo	80 834	21 147	3.8
LA 75792	Early Pueblo	9 262	2 964	3.1
LA 45510	Early Pueblo	22 676	3 437	6.6
LA 3279 (Rooms 7-9 only)	Late Pueblo	73 844	7 403	10.0

occurrence of production waste (pottery clay) and tools (scrapers with distinctive wear) in a particular context may indicate that pottery production took place (Wilson and Blinman 1995). Given the nature of ceramic production, such evidence tends to be very rare, and large collections are required to reliably determine whether ceramic production took place in a given context.

Evidence of ceramic production in the form of pottery clay is present at Luna Project sites in extremely low frequencies, indicating that pottery production took place at most sites, including those dating to all phases. Occurrences of ceramic-quality clays were rare at Luna sites and in all cases represented material utilized in the production of brown ware vessels.

By far, the strongest evidence of pottery production came from a single site (the Hough site), the largest site investigated during the Luna Project. Large numbers of pottery manufacturing tools and some clays from this site appear to indicate a greater emphasis on pottery production than at other sites. Evidence of concentrations of tools and waste indicative of ceramic production was recovered from several rooms at the Hough site by OAS staff as well as during earlier investigations (Wendorf et al. 1963). Even considering the relative high quantity of material recovered from the Hough site compared to other Luna Project sites, the intensity of pottery production appears to have been greater at this site, although it still appears to have been well within the range of household production. All the clays recovered from archaeological contexts are very similar in color, texture, and associated inclusions to those represented in the overwhelming majority of brown ware recovered from this site. Clays located in soil lenses directly within the sterile deposits below the Hough site are extremely similar to those in clays from other archaeological contexts and brown ware pastes (Hill, this volume). In contrast, the buff to white firing clays utilized in the production of painted Tularosa Black-on-white and other Cibola white wares at this site were not recovered during excavations of the Hough site or represented at local sources. A high number of sherds from this site represent well-made and elaborately textured types such as Tularosa fillet rim and Tularosa pattern corrugated, known to occur over wide areas well outside their probable area of manufacture. It is quite possible that much of the finely textured and smudged pottery produced at the Hough site was exchanged to other areas, including the Colorado Plateau, where Mogollon trade wares occur at late Pueblo III sites. In turn, Tularosa

Black-on-white produced in Pueblo III sites in the Colorado Plateau appears to have been widely traded to groups in the northern Mogollon Highlands.

Trends in Ceramic Manufacturing Conventions

Studies described in the previous chapter indicate an extremely long-lived pottery technology involving the production of similar brown utility ware vessels. This technology was strongly influenced by the long-term use of high-quality and homogenous volcanic-derived alluvial and pedogenic clays common in the northern Mogollon Highlands. Clay studies indicate that pottery associated with all basic forms and manipulations could have been locally produced using clay sources near all Luna Project sites. Distributions of data related to surface texture and finish allow for the examination of changes in manufacture and decorative conventions. Table 4.52 illustrates the overall frequency of various groups of unpainted Mogollon Brown Ware sherds from various dated sites.

These examinations indicate that similar Alma Plain pottery dominates all but the latest (Late Tularosa phase) Luna Project ceramic assemblages. While the distribution of vessel forms did change through time, no difference in the paste, firing techniques, or surface manipulations of plain brown wares (Alma Plain) from assemblages dating to different periods was noted. During later periods, a wide variety of other forms were produced along with Alma Plain, including red slipped, early textured, plain smudged, and corrugated types. In most occupations these forms appear along with higher frequencies of plain brown pottery, and once a basic brown utility ware form appeared, it appears to have always been produced alongside plain brown wares and other forms. Thus, changes through time in local brown ware production are best described in terms of the gradual addition of new brown ware forms around a plain brown technological core that basically remained unaltered for over a millennium.

Assemblages dating to the early span of the Early Pithouse period are dominated by plain brown ware along with lower frequencies of red slipped pottery exhibiting similar pastes and manipulations (San Francisco Red). During the late part of the Early Pithouse period, small but significant quantities of a variety of textured pottery began to be produced. Early textured types reflect the range of surface decorations employed during the Late Pithouse period, including striated, incised, punctated, neck-

Table 4.52. Distributions of Textured and Surface Treatments of Unpainted Brown Ware Types

Phase, Site %, and N	Plain		Red Slipped		Early Textured		Plain Smudged		Corrugated	
	N	%	N	%	N	%	N	%	N	%
LA 70188, Early Pithouse, some Pueblo period mixing (52)	35	67.9	17	32.7	0	0	0	0	0	0
LA 39975, Early Pithouse (2322)	1969	84.8	314	13.5	31	1.3	8	.3	0	0
LA 45508, Early Pithouse (251)	239	95.2	11	4.4	0	0	0	0	1	.4
LA 39972, north area, Early Pithouse period (710)	618	87.0	68	9.6	0	0	22	3.6	2	.3
LA 70196, San Francisco (1040)	864	83.1	21	2.0	50	4.8	104	10	1	.1
LA 45507, Three Circle phase (16098)	12292	76.4	42	.3	1000	6.2	2480	15.4	284	1.7
LA 43786, probably Three Circle Phase (71)	58	81.7	4	5.6	4	5.6	3	4.2	2	2.8
LA 70201, mostly Late Pithouse (1100)	884	80.4	172	15.6	17	1.5	1	.1	24	2.2
LA 45510, Late Pithouse early Reserve transition (7702)	5751	74.6	160	2.1	14	.2	568	7.4	1209	15.7
LA 75792, Reserve phase (2421)	1874	77.4	38	1.6	11	1.8	44	1.8	454	18.7
LA 39969, Reserve Phase (5395)	3056	56.6	40	.7	21	.4	1277	23.7	1001	18.5
LA 39972, south area Reserve Phase (1282)	742	57.9	2	.2	4	.3	288	22.5	246	19.25
LA 3563, Reserve, some Three Circle phase mixture (2335)	1566	67.1	42	1.8	13	.5	286	12.2	428	18.3
LA 70189, Reserve phase (428)	317	74.1	2	.5	8	2.5	39	9.1	62	14.5
LA 70185, late Reserve phase (13893)	8376	60.3	78	.6	26	.2	2546	18.3	2867	20.6
LA 89846, Tularosa phase (600)	397	66.2	0	0	0	0	47	7.8	156	26
LA 39968, early Tularosa phase (17980)	10459	58.2	157	.9	65	.4	3387	18.8	3902	21.7
LA 3279, late Tularosa phase (84762)	23789	28.1	2785	3.3	136	.2	26114	30.8	31938	37.7
LA 89847 indeterminate Pueblo and Pithouse mixed (429)	255	59.4	14	3.2	0	0	101	23.5	59	13.8
LA 43766, Reserve phase and early mixed (140)	127	90.7	1	.7	1	.7	4	2.9	7	5
LA 75791, Late Pithouse and Pueblo mixed (134)	109	81.3	4	3.0	4	3.0	0	0	17	12.7

banded, and neck coiled forms. While pottery exhibiting sooted interiors is present in the earliest ceramic assemblages in the Mogollon Highlands, a distinct smudged technology reflecting the intentional application of a layer of carbon soot over a highly polished surface appears as a common manipulation during the Late Pithouse period. The final technological addition is represented by the appearance of corrugated and painted smudged forms during the early A.D. 1000s. A very wide range of corrugated textures is represented in assemblages dating to the Pueblo period, including plain corrugated, indented corrugated, incised corrugated, patterned corrugated, and zone corrugated forms. Coils on corrugated surfaces tend to be fine, and patterns are often intricately executed and partly reflect the very plastic nature of local clays. While the areal distribution of a wide range of corrugated forms has been interpreted as indicating differential production and intraregional exchange (Brunson 1985), examination of pastes and spatial distributions of forms at Luna sites indicates that a wide variety of textured forms were produced at various Luna sites. During the late Tularosa phase, corrugated pottery became the dominant brown ware. A very low frequency of the brown ware produced during later periods also exhibited smudged interiors and painted decorations in the interior, as in Starkweather smudged painted, or white clay exterior decorations as in Tularosa White-on-red.

Thus, changes in the manufacture and surface form of brown ware vessels are best described as accumulative, and an increasingly wide range of forms were represented. While similar brown ware (Alma Plain) dominates assemblages for a millennium, the number of basic ceramic groups and types in pottery assemblages steadily gets larger through time. These trends contrast with developments in the Anasazi area, where plain gray wares dominating early utility wares are almost totally replaced by corrugated gray wares during later occupations. Changes in Anasazi assemblages are better considered sequential than cumulative.

The long duration of plain polished brown wares in the Mogollon Highlands may reflect the success of the early plain brown ware technology in the production of vessels that were apparently suitable for a wide range of uses. Plain polished brown utility wares, then, appear to represent a highly successful vessel manufacturing and firing technology well adapted to local clays.

EVIDENCE OF CERAMIC EXCHANGE

Attempts were also made to examine the nature of the exchange of pottery produced by groups in widely separated areas through the documentation of frequencies of pottery from other regions. Pottery on the Luna study, clearly derived from other regions, includes White Mountain Redware and Cibola gray wares. Studies of clay use and distribution from the Luna Project also provide important information relating to ceramic exchange. These studies indicate that Cibola White Ware, sometimes characterized as having been produced in this area, could not have been locally produced but probably originated in areas in the Colorado Plateau where low-iron geological clays suitable for the production of Cibola white wares occur. There is also some evidence that, at least during some periods, Mimbres white wares at Luna sites may not have been locally produced (Hill, this report). Relative frequencies of types broadly indicative of area of origin are illustrated for various sites in Table 4.53.

Early Pithouse Period Exchange

Early Pithouse period assemblages are overwhelmingly dominated by Mogollon Brown Ware exhibiting similar temper and paint. The lack of pottery clearly assigned to nonlocal types may be, in part, a problem in identification, because similar brown wares were produced throughout the Southwest. For example, it is often impossible to distinguish brown wares made throughout most of the Mogollon Highlands from those made in the Luna Project area. Still, types such as Adamana Brown and Obelisk Utility, which contain distinctive temper, were not identified from Early Pithouse sites on the Luna Project. While the latest part of the Early Pithouse period does overlap with the time of production of the earliest Cibola white and gray types, these are not associated with any of the Late Pithouse components represented. It also seems unlikely that plain undecorated brown ware vessels would have been exchanged over wide distances. Examination of tempers and refiring analysis indicate an extremely good match between local pastes and tempers. Petrographic analysis of very small samples also indicates a strong match between inclusions in pottery from Early Pithouse sites and local clay sources (Hill, this volume). Therefore, it seems likely that the great majority of pottery on Luna Project sites dating to the Early Pithouse period could have been locally produced, although not beyond a responsible

Table 4.53. Distribution of Spatially Distinct Ceramic Tradition and Ware Groups

Phase, Site %, and N	Mogollon Brown		Mimbres White		Cibola White		Cibola Gray		White Mountain Red	
	N	%	N	%	N	%	N	%	N	%
LA 70188, Early Pithouse, some Pueblo period mixing (57)	52	91.2	0	0	5	8.8	0	0	0	0
LA 39975, Early Pithouse (2322)	2322	100	0	0	0	0	0	0	0	0
LA 45508, Early Pithouse (253)	251	99.2	0	0	2	.8	0	0	0	0
LA 39972, north area, Early Pithouse period (710)	710	100	0	0	0	0	0	0	0	0
LA 70196, San Francisco (1224)	1040	8585.0	142	11.6	41	3.3	1	.1	0	0
LA 45507, Three Circle phase (17346)	16098	92.8	952	5.5	114	.7	176	1.0	0	0
LA 43786, probably Three Circle phase (75)	71	94.7	4	5.3	0	0	0	0	0	0
LA 70201, mostly Late Pithouse (1166)	1100	94.3	58	5.0	8	.7	0	0	0	0
LA 45510, Late Pithouse early Reserve transition, (8020)	7702	96.0	29	.4	280	3.5	0	0	5	.1
LA 75792, Reserve phase, (2547)	2421	95.1	0	0	115	4.5	0	0	0	0
LA 39969, Reserve phase (5843)	5395	92.3	30	.5	410	7.0	1	0	3	.1
LA 39972, south area, Reserve phase (1327)	1282	96.5	2	.2	42	3.2	0	0	0	0
LA 3563, Reserve, some Three Circle phase mixture (2544)	2335	91.8	83	3.3	117	4.6	0	0	7	.3
LA 70189, Reserve phase (458)	428	93.4	0	0	24	5.2	0	0	0	0
LA 70185, late Reserve phase (14389)	13893	96.5	3	trace	427	3.0	1	trace	20	1.1
LA 89846, Tularosa phase (637)	600	94.2	0	0	33	5.2	0	0	0	0
LA 39968, early Tularosa phase (19426)	17980	92.6	63	.3	1316	6.8	1	trace	43	.2
LA 3279, late Tularosa phase (90986)	84762	93.2	130	.1	5460	6.0	trace	.2	313	.3
LA 89847, indeterminate Pueblo and Pithouse mixed (444)	429	96.6	1	1.2	12	2.7	0	0	0	0
LA 43766, Reserve phase and early mixed (150)	140	93	2	1.3	8	5.3	0	0	07	0
LA 75791, Late Pithouse and Pueblo mixed (143)	134	93.7	3	2.1	6	4.2	0	0	0	0

doubt.

Late Pithouse Period Exchange

While pottery assemblages dating to the Late Pithouse period are still overwhelmingly dominated by brown wares probably of local origin, types of definite nonlocal origin are consistently present in relatively low frequencies. These include both Cibola gray and white wares produced on the Colorado Plateau. Anasazi pottery in Late Pithouse assemblages includes plain gray body, plain gray rim (Lino Gray), White Mound Black-on-white, and Red Mesa Black-on-white. Of the three Late Pithouse period sites yielding relatively large numbers of sherds, one contains a higher frequency of gray than white ware, and the other two contain a higher frequency of white than gray ware. In part, the appearance of Cibola gray and white wares at these sites reflects the production of Anasazi pottery on the Colorado Plateau, although there appears to have been some delay in the initial production of Anasazi pottery and its occurrence in Luna Project assemblages. For example, Basketmaker III types are absent in all of the Early Pithouse assemblages even though there is some overlap between the Early Pithouse and Basketmaker III phases. Thus, pottery from the Cibola region is probably represented in components dating to the late eighth or early ninth centuries and is represented by a mix of gray and white wares.

Brown ware from Late Pueblo sites exhibits pastes and inclusions similar to those in Early Pithouse assemblages. Thus, visual and petrographic analysis indicate that almost all of the brown utility ware sherds from Early Pithouse contexts could have been derived from vessels produced in the Luna Project area, although it is possible they originated in other areas, such as the Mimbres region, where similar temper was used to produce brown utility ware vessels.

The great majority of the decorated pottery from Late Pithouse phase components is Mimbres White Ware. It is difficult to determine whether Mimbres White Ware from various phases was locally produced, although information relating to the paste and slip characteristics provides some important clues. Collection of potential sources of white slip clay from weathered tuff deposits indicate that local sources contained mica inclusions and fired to yellowish to pinkish white. Slips from Three Circle Red-on-white sherds closely match local slips. Those occurring in Mangus Black-on-white

and Mimbres Classic Black-on-white are clearly different in color, texture, and inclusions from those represented in local sources. Given these differences and strong similarities in Mimbres White Ware from the Mimbres region, it is quite likely that while Three-Circle Red-on-white may have been locally produced, later Mimbres white wares probably were not. While visual examination of inclusions of Mimbres White Ware sherds from Luna sites indicate similar volcanic-derived inclusions as in brown wares, sherds containing distinctive amounts of larger tuff particles are more common in the Mimbres White Ware sherds and match inclusions commonly noted in similar white ware from the Mimbres region. Further evidence of nonlocal production of Mimbres White Ware is indicated by petrographic analysis, indicating that the inclusions occurring in Mangus Black-on-white and Classic Mimbres Black-on-white from the Luna Project area are distinct from those noted in brown ware pastes recovered from the same site (Hill, this volume). Inclusions in Mimbres White Ware sherds also appear to be very similar to those noted in samples from the Mimbres region.

Thus, the occurrence of later Mimbres Black-on-white may reflect the increasing importance of exchange with areas in the Mimbres region during the Late Pithouse period. Evidence of this shift from local to nonlocal production of Mimbres White Ware may be indicated by the drop in total frequency of Mimbres White Ware from the San Francisco phase (where it is 11.6 percent of the total sherds) to the Three Circle phase (5.5 percent). These trends contrast dramatically with those for most surrounding areas, where there was an increase in the total proportion of white ware sherds through time. The distinct nature of trends in the frequencies of white ware from the Luna Project may indicate that they were only produced in the northern Mogollon country for a very short time and were probably limited to Three Circle Red-on-white. The occurrence of Mimbres Black-on-white in diminishing frequencies through time probably reflects declining exchange with the Mimbres region.

Pueblo Period Exchange

The great majority of the pottery from Pueblo period sites on the Luna Project is brown utility ware with temper and pastes similar to those in brown ware from earlier components. This pottery indicates, then, a continuity of local production using similar resources. Some variability was noted in the

size of the aplastic inclusions occurring in different brown ware groups. For example, smudged brown ware tended to exhibit very fine inclusions, while polished brown ware tended to exhibit larger inclusions, and that for unpolished brown wares was often even larger. These differences appear to reflect different degrees of processing associated with different brown ware forms rather than the utilization of different sources.

Other ware groups represented in varying amounts at Luna sites represent pottery produced in a number of surrounding regions. The great majority of nonlocal pottery during the Pithouse period are Cibola white wares. For Pueblo period sites, the total frequency of Cibola White Ware sherds ranges from about 3 to 7 percent. While the appearance of significant frequencies of Cibola White Ware in the northern Mogollon was earlier interpreted as resulting from the migration of Anasazi groups who subsequently produced white ware vessels alongside brown ware vessels, examinations of clay resources discussed in the previous chapter indicate that these white wares could not have been locally produced. Instead, this pottery was most likely produced in the Colorado Plateau, where clays suitable for the production of white and gray ware are readily available.

Most of the Cibola White Ware sherds from Pueblo period sites are tempered with sand and sherd temper, although similar ranges of variation are represented by examples exhibiting sherd or sand temper only. Such sherds usually exhibit similar white to gray pastes that consistently fire to buff colors. Pastes and manipulations of these sherds are very similar to those in Cibola White Ware, found, and apparently produced, over a very wide area of the Colorado Plateau. Petrographic analysis indicates a great deal of variability in the composition of paste in Cibola White Ware (Hill, this report) and may indicate that all samples were produced at different sources. In addition, some Cibola White Ware sherds contain darker pastes with higher iron content that may reflect additional sources, possibly to the west. Low frequencies of Cibola White Ware sherds associated with Pueblo period occupations were tempered with basalt and occasionally other igneous rock. Small isolated grains of basalt were also noted in two samples examined during petrographic analysis (Hill, this report). These indicate additional sources for Cibola White Ware, possibly in eastern Arizona, although analysis of material from this area is needed to verify such speculation. It appears, then, that Cibola White Ware occurring in Pueblo period contexts may have been produced from numerous sources, indicating Cibola pottery was maintained

through ties with groups in a number of areas in the Colorado Plateau.

The overall frequency of Cibola White Ware is similar for assemblages dating to different phases of the Pueblo period. For Reserve phase sites, the total frequency of pottery assigned to Cibola White ranges from 3 to 7 percent and for Tularosa phase types from 5.2 to 6.8 percent. This may indicate the long duration of similar ties or networks allowing for the movement of Cibola White Ware into the Mogollon Highlands.

Gray wares are either absent at Pueblo period sites on the Luna Project or occur in very low frequencies (.2 percent or lower). The few gray wares recovered from Pueblo sites on the Luna Project exhibit buff pastes and sand temper identical to the gray ware dominating sites in the southern Colorado Plateau. Unlike the white wares produced in the southern Colorado Plateau, gray wares do not appear to have been widely exchanged into the northern Mogollon Highlands. This may have been because locally made brown utility ware was already used for cooking and storage, which gray utility ware vessels would have replaced.

Mimbres white wares tend to be very rare at Pueblo period sites and usually make up less than .5 percent of the pottery. Both visual examination and petrographic analysis of Classic Mimbres Black-on-white from Pueblo period sites indicate it was not produced locally in the Luna Project area but probably derived from areas in the Mimbres region. Mimbres Classic sherds are present in sites dating to the Pueblo period, possibly indicating a longer period of production than sometimes thought, extending into the thirteenth century.

Other nonlocal pottery is represented by White Mountain Redwares. These are represented in very low frequencies and indicate very limited exchange of vessels from areas along the Little Colorado drainage to the northwest. White Mountain Redwares are extremely rare at components dating to all phases but tend to be slightly more common in the later phases.

Thus, evidence from Pueblo period sites indicates that while nonlocal pottery types are rare, they are represented by pottery from a variety of regions and directions. The great majority of nonlocal pottery that can be identified is comprised of Cibola white wares that were apparently produced over a wide area in the Colorado Plateau. The presence of low frequencies of Mimbres White Ware and White Mountain red wares also indicates the movement of low amounts of pottery from other areas.

CAUSES OF EXCHANGE PATTERN SHIFTS

Thus, ceramic trends noted in the northern Mogollon country, previously interpreted as reflecting cultural boundaries or intrusions, may be better explained in terms of processes affecting the production of certain forms as well as exchange networks and ties. There is extremely little, if any, nonlocal pottery at assemblages dating to the Early Pithouse period. The first change in the movement of ceramics that can be recognized occurred sometime between the Early Pithouse and Late Pithouse periods and is reflected in the appearance of, and increase in, the pottery that clearly was produced in the other regions. The presence of Cibola White and Gray Wares indicate some exchange with groups to the north. However, if the premise that Mimbres Black-on-white types found on assemblages dating from A.D. 900 to 1000 were not locally produced is correct, then during the Late Pithouse period in the northern Mogollon area, the majority of nonlocal pottery originated in the Mimbres region. A major shift took place sometime between the Three Circle and Reserve phases resulting in the movement of significant amounts of Cibola White Ware vessels into the northern Mogollon country. This continued during all phases of the Pueblo period during which the great majority of painted ceramics at Luna Project sites represent intrusive Cibola White Wares. Much smaller amounts of pottery moving from other regions is reflected by extremely low frequencies of Mimbres White Ware from the south and White Mountain Redware from the northwest.

Thus, various trends noted for northern Mogollon ceramic assemblages may be more a reflection of factors influencing social and economic interaction between separated groups than the boundaries of distinct peoples associated with a particular cultural tradition. Tainter and Plog (1994) attribute similar patterns of mixed and changing assemblages along the southern San Juan Basin to weak patterns associated with small undifferentiated sparsely settled groups. They contrast these patterns with the strong patterns associated with the Chaco redistribution network to the north (Tainter and Plog 1994). In the former, economic ties were simple and informal, and exchange was probably based on informal, reciprocal, or kinship-based relations.

The widespread local production of similar pottery during the Early Pithouse period is not surprising given the nature of early ceramic production and settlement patterns. Very similar "brown ware" pottery was produced by groups in almost all regions of

the Southwest between 300 B.C. and A.D. 400, although the A.D. 200s date represented in the northern Mogollon appears to reflect the beginning of ceramic production in much of the Southwest. The widespread appearance of pottery at this time probably reflects the increasing reliance on technologies associated with extracting more and more nutritional yields from cultigens through boiling as populations grew and groups became increasingly more dependent on horticulture (Crown and Wills 1996). The expansion of such a technology may have resulted in the widespread introduction of similar undecorated brown ware vessel technologies using alluvial clays found throughout the Southwest. Given the simple nature of this technology, the range of vessel forms required could easily be produced by potters at a given household. In addition, the low population densities during this time and the probable availability of unused land with agriculture potential may have made interaction and exchange between separated groups less critical than in later periods.

The nature of the economic and interaction systems in which groups in the northern Mogollon Highlands participated may have been influenced by population growth and warming trends noted for much of the Southwest from A.D. 700 to the 900s. In the northern part of the Anasazi region, for example, mass movements and agglomeration of groups into areas higher in elevation occurred during the late A.D. 700s and 800s, resulting in the formation of the first "pueblo" villages in this area (Eddy 1972; Kane 1986; Wilshusen 1992). In lower elevations in the Colorado Plateau, there appears to have been a hiatus in occupation during much of the A.D. 800s.

While little is known concerning the actual prehistoric environmental trends in the Mogollon Highlands during this time, there appears to have also been a similar agglomeration of groups into large pithouse villages as pithouse dwellers in the Mogollon Highlands apparently became increasingly sedentary and dependent on agriculture after A.D. 500 (Diehl 1997). For example, if estimates of 50 to 100 pithouses associated with the Three Circle phase are correct for Luna Village (Oakes and Zamora, this report), it may represent one of the largest villages at this time anywhere in the Southwest. Similar villages have been noted in the Mimbres region and often underlie Mimbres phase pueblos (Bradfield 1931; Anyon 1980, 1984; Wosley and McIntyre 1996). In contrast, contemporaneous sites in the southern Colorado Plateau are rare and small.

Distinct developments in the Mogollon

Highlands at this time may reflect the efficient and unique exploitation of the Mogollon Highlands by relatively small but growing populations. Thus, during the Late Pithouse period, interaction between separated communities mainly involved groups in similar environmental settings tied together by comparable economic systems and material culture. Still, differences in elevations of different areas in the Mogollon Highlands would have produced some environmental variation that may have been exploited through exchange and interaction between separated groups. Thus, distributions of such boundaries may reflect a combination of population size, environmental conditions, and economy of this area of the Mogollon Highlands. Thus, movement of information and goods was mainly between groups in similar settings within the Mogollon Highlands, resulting in unique ceramic distributions roughly corresponding to geographic boundaries within areas of the Mogollon Highlands. The specialized production of well-made early Mimbres Black-on-white may have facilitated exchange between separated groups residing in pithouse villages. Such a network is difficult to identify archaeologically because the majority of pottery produced in the Mimbres region cannot be distinguished from pottery produced locally at Luna Project sites.

A potential weakness of a system centered within the Mogollon Highlands is that in times of stress, groups in the same basic environments may have experienced shortages at the same time, limiting the benefits of distribution of food surpluses between separated groups. Thus, dealing with increased population and environmental uncertainty during the early A.D. 1000s may have required new strategies of interaction on the part of groups residing in both the Mogollon Highlands and Colorado Plateau. In the San Juan Basin to the north, a response to such conditions may be represented by the development of the complex Chacoan network, associated with a series of outliers established in surrounding regions, which may have included a pan-regional redistribution network (Judge 1979b; Judge et al. 1981; W. Toll 1985; Mathien 1993).

A simpler option available to the smaller and more dispersed groups along the boundaries of major geographic provinces such as that represented in west-central New Mexico was the establishment of reciprocal ties allowing for the movement of information and goods with groups in distinct environmental settings (Tainter and Gillio 1980). In areas of northwestern New Mexico, ties between groups in adjacent areas of the Mogollon Highlands and Colorado Plateau may have been particularly

suitable for this strategy. North-south ties between adjacent groups in the Mogollon Highlands and Colorado Plateau would have tied together groups in different environmental zones that would have experienced food shortages and surpluses at different times (Tainter 1984; Tainter and Gillio 1980). For example, warming trends could have facilitated agricultural production in the Mogollon Highlands and limited production in lower areas of the Colorado Plateau, while cooling trends may have resulted in the opposite relationship.

While ties between environmentally diverse areas would have been beneficial during times of shortages, such interactions would not have been necessary during optimal periods, when shortages were not experienced. It was only during the rare intervals when groups faced shortages that such ties would have been critical. Thus, mechanisms allowing for the maintenance of exchange ties between small, undifferentiated, and separated groups during good years would have also been critical. A possible solution was the movement of certain desired goods between separated areas. While such exchange ties could have ultimately resulted in the movement of foodstuffs critical to the survival of groups in a particular setting, during other years, exchange ties between groups may have been made simply to acquire a desired item whose acquisition could have been driven by the relative status of certain nonlocal pottery forms. Thus, some of the pottery desired by groups in certain areas could have only been produced in geological provinces where suitable resources were available. The production of increasingly elaborate and specialized white ware in the southern Colorado Plateau and elaborately decorated and smudged brown ware in the northern Mogollon Highlands from about A.D. 1000 to 1300 may have further facilitated the desire to obtain pottery produced in adjacent regions among groups residing in these areas. The painted white ware produced in the Colorado Plateau, for example, may have been desirable to potters in the Mogollon Highlands lacking clay resources that could be used in the production of white ware vessels. Likewise, the elaborately textured and highly smudged utility ware forms that gradually evolved in the northern Mogollon region may have also been sought after by groups in the Colorado Plateau. Thus, selective factors that may have influenced the production of functionally superior or elaborately made pottery technologies in various clay resource zones may have also influenced the long-distance exchange between groups and ultimately reinforced potentially beneficial ties between separated groups.

Similar specialized regional technologies developed during this time resulted in the production of specialized forms in other regions of the Southwest, including Mimbres White Ware, White Mountain Redware, Tsegi Orange Ware, and organic painted San Juan White Ware types (Carlson 1970; Smith 1971; Wilson and Blinman 1995).

Along the Mogollon-Anasazi periphery the demand for specialized pottery produced in adjacent regions is apparently reflected by the increased southern movement of Cibola White Wares such as Reserve Black-on-white and Tularosa Black-on-white into the northern Mogollon Highlands and the northern movement of elaborately textured and smudged brown wares into the southern Colorado Plateau between A.D. 1000 and 1300. While pottery produced in various regions continued to be produced at the household level, potters in certain locations produced additional qualities of pottery for export. For example, evidence at the Hough site indicates the production of unusually high quantities of well-made brown wares such as Tularosa filleted rim and Tularosa patterned corrugated. These pottery types are found well outside their range of production, and some of them could have been produced at the Hough site.

The gradual changes in the overall frequency of Cibola White Ware and Mogollon Brown Ware across space at contemporaneous components along the Mogollon-Anasazi periphery indicate a simple system of distribution, probably reflecting a series of short exchange ties between related groups. Thus, the Mogollon-Anasazi transition zone, as previously described, rather than representing a distinct or intermediate culture influenced by repeated migrations and intermingling of Mogollon or Anasazi people (Ruppé 1953; Danson 1957; Dittert 1959; Bullard 1962; Marshall 1991), reflects the informal exchange and gradual northern movement of Mogollon Brown Ware and the southern movement of Cibola White Ware through this network. Thus, changes in ceramic distributions in west-central New Mexico, often described in terms of cultural intrusion or intermingling, may in fact indicate economic shifts in the movement of resources and goods (including ceramic vessels) between distinct environments. While the presence of very low frequencies of Mimbres White Ware and White Mountain Redware at Pueblo period sites indicates some interaction with groups to the south and northwest, the very low frequencies do not seem to indicate the degree or consistency of exchange represented by Cibola White Ware vessels.

While factors resulting in the exchange of pot-

tery between small groups in the Mogollon Highlands may have ultimately arisen because of aesthetic choices and social interaction rather than the movement of food during times of shortages, their survival or expansion may have been facilitated by such factors. In most societies there is much more to exchange than economic advantage, and associated ties and actions involve the common transfer of items that have symbolic and categorical associations (Hodder 1982). The exchange of appropriate forms of social obligations, status, and power ultimately legitimized various exchanges and networks (Hodder 1982). Thus, while the cause of specialized production and exchange of pottery in separate environments may reflect historic factors related to the development of specialized technologies and personal and social needs by groups in various regions, in times of shortages these relationships may have been critical to the survival of a particular group. Thus, whatever the ultimate cause of conventions and preferences associated with the production and exchange of various nonlocal forms, during times of shortages, ties with exchange partners in different environments, facilitated by the long-term exchange of distinct vessel forms, would have presented a selective advantage, resulting in the persistence and expansion of such networks.

These factors may have contributed to the gradual expansion of trade of pottery between groups in the northern Mogollon Highlands. For example, while the great majority of the white ware sherds at sites in the Luna Project area dating to the tenth century represent Mimbres white wares, the majority of the white ware sherds at contemporaneous sites in the Gallo Mountains to the north represent Cibola white wares such as Red Mesa Black-on-white, which occur along with Mogollon brown wares (Kayser 1972b, 1975; Smith 1973). Similar Red Mesa Black-on-white pottery was probably produced at an increasing number of sites along the southern fringes of the Colorado Plateau such as along Mariana Mesa (McGimsey 1980). The appearance of Reserve Black-on-white as the dominant white ware type in sites in the Luna and Reserve area may simply represent the southern expansion of north-south ties.

At the same time, in areas along the southern Colorado Plateau, where Cibola white wares occur alongside local gray ware produced with the same clays, there appears to have been a gradual increase in the frequency of Mogollon Brown Ware from about A.D. 1000 to 1100 (Danson 1957; Dittert 1959; Kayser and Carroll 1988; Marshall 1991). Thus, increased movement of pottery from and into

the Mogollon Highlands is represented during this time. Similar factors appear to have resulted in similar situations in other areas along the Mogollon-Anasazi transition zone, including the Acoma area, Little Colorado drainage, and Tonto Basin (Martin and Rinaldo 1960a; Martin et al. 1961, 1962, 1964; Heidke and Stark 1995). Similar patterns noted in these widely separated areas involving the associating of similar locally produced Mogollon brown wares and intrusive Cibola white wares may ultimately indicate the value of pottery-reinforced ties between groups in the northern Mogollon Highlands and southern Colorado Plateau.

VESSEL FUNCTION AND USE

Another source of information provided by ceramic distributions from the Luna Project concerns the types of functions and activities for which pottery was used. The production of ceramic vessels is ultimately a reflection of the activities and functions for which a specific pottery container was required. A variety of attributes reflect the uses and function of pottery—vessel shape, size, wear patterns, soot deposits, surface manipulation, technological attributes, and paste characteristics—which even out spatial and temporal heterogeneity in subsistence resources. This resource heterogeneity was dealt with by earlier mobile groups through mobility, and thus pottery provides technological alternatives to full-scale mobility (Mills 1989). During later ceramic period occupations, containers were used to cope with resource heterogeneity.

One model for understanding functionally related changes in ceramic production and manufacture involves the distinction between maintainable and reliable systems (Bleed 1986; Mills 1989). Maintainable systems sacrifice durability for other factors, such as modularity and portability, while reliable systems are designed for increased durability. The expected characteristics of containers resulting in maintainable systems include ease of manufacture and repair, involvement of little time for manufacture and use, lack of backup systems, portability, utilization for a limited number of tasks, and simple and easily movable construction and firing techniques. Containers resulting from reliable production systems tend to be abundant and sturdy, involve more specialized forms, are resistant to failure during a specific task, and may require more specialized manufacturing and firing techniques that may be relatively time consuming. Mills (1989) notes definite trends from reliable to maintainable

production systems in the Anasazi from the Basketmaker III to Pueblo II period.

As previously indicated, the basic ceramic technology associated with Mogollon brown wares was more conservative and consistent through time than that associated with the Anasazi tradition to the north. It was noted that this partially reflects a technology suited to clay sources occurring in the Mogollon Highlands. It is also important to determine if differences also reflect differences in use and associated activities of potters in the Mogollon Highlands that have been associated with the more mobile patterns of small dispersed groups.

The nature and resolution of interpretations based on the distribution of sherds differs from that derived from whole or partially complete vessels. Advantages of sherd-based data are that they are usually represented by large samples distributed through a variety of contexts. Sherds, however, represent limited and incomplete samples of the vessels from which they were derived and are often not recovered from their actual context of use. Because bowl and jar body sherds of vessels produced in the Mogollon Highlands often exhibit polishing on both sides, it is often difficult to determine the vessel form from which a given body sherd derived. Thus, some discussions on vessel forms are limited to the sample of rim sherds recovered (Table 4.54). The whole vessels from Luna provide more complete information concerning the use of specific containers in particular contexts. The recovery of whole vessels, however, is rare, and they are often absent in many contexts. Therefore, data concerning the distribution of all sherds (including those belonging to reconstructible vessels) and complete and partial vessels are presented separately.

Sherd-Based Functional Trends

For pottery from many regions of the Southwest, useful functional information is provided by distributions of ware and vessel form categories. For example, in many southwestern ceramic traditions, sherds derived from jar body sherds can be identified by the presence of decorations on the exterior surface only, while bowls are recognized by decoration or polishing on the interior. Particularly useful in some regional assemblages is the dichotomy between utility and decorated wares. Unfortunately, such distinctions are not as useful in the northern Mogollon Highlands, because Mogollon brown wares appear to have been employed in a wide range of activities. An examination of sherds from brown

Table 4.54. Distribution of Selected Rim Forms by Site

Phase, Site #, and N	Bowl Rim		Cooking/Storage		Seed Jar Rim	
	N	%	N	%	N	%
LA 70188 Early Pithouse, some Pueblo period mixing (4)	1	25	3	75	0	0
LA 39975, Early Pithouse (107)	38	35.5	16	15.0	53	49.5
LA 45508, Early Pithouse (9)	4	44.4	3	33.3	2	22.2
LA 39972, north area, general (139)	81	58.3	51	36.7	7	5.3
LA 70196, San Francisco, (87)	45	51.7	41	47.1	1	1.1
LA 45507, Three Circle phase (1206)	654	54.2	544	45.1	8	.6
LA 43786, probably Three Circle phase (4)	3	75	0	0	1	25
LA 70201, mostly Late Pithouse (52)	30	57.7	18	34.6	4	7.7
LA 45510, Late Pithouse early Reserve transition (366)	181	49.5	182	49.7	3	.8
LA 75792, Reserve phase (157)	62	39.5	91	58	4	2.5
LA 39969, Reserve phase (492)	276	56.1	214	43.5	2	.4
LA 3563, Reserve, some Three Circle phase mixture (177)	112	63.3	65	36.7	0	0
LA 70189, Reserve phase (45)	28	62.2	15	33.3	2	4.4
LA 70185, late Reserve phase (1209)	659	54.5	543	44.9	7	.6
LA 89846 Tularosa phase (39)	22	56.4	17	43.5	0	0
LA 39968, early Tularosa phase (1223)	663	54.2	553	45.2	7	.5
LA 3279, late Tularosa phase (7664)	5158	67.3	2399	31.3	7	.1
LA 89847, indeterminate Pueblo and Pithouse mixed (31)	22	71	7	22.6	2	6.5

ware vessels indicates that there was often no association between vessel shape and the presence or location of polishing. Therefore, some of the sherds polished on both sides were simply assigned to a polished unknown category. Thus, functional interpretations based on ware and vessel distributions must be more conservative than those for many areas of the Southwest. Ultimately, many of the interpretations of ceramic use in Mogollon occupations must be limited to rim forms, where it is possible to determine the shape of the vessels.

Still, very basic distributions between unpainted utility (Mogollon Brown and Red and Anasazi gray ware) and painted (Mimbres White, Cibola White, and White Mountain Red) indicate very little change through time (Table 4.55). The most distinctive change is the appearance of decorated pottery during the transition between the Early Pithouse and Late Pithouse periods. Assemblages continue to be overwhelmingly dominated by Mogollon Brown Ware during the entire Mogollon occupation of this area. Interestingly, the highest frequency of decorated white ware is during the San Francisco phase,

because the ceramic assemblage from LA 70196 is the only one from any Luna Project site where more than 10 percent of the pottery represents decorated white ware. This may indicate that white wares were produced only in the Luna Project area during the San Francisco phase. For later assemblages, decorated types make up about 5 percent of all pottery. This strongly contrasts with trends from other areas of the Southwest. For example, in much of the Anasazi region, a gradual increase in the total frequency of decorated white wares occurred through time beginning in the Basketmaker III period, in which decorated types make up less than 5 percent of all pottery, into the Pueblo III period, in which decorated types may represent half of all ceramics (Wilson and Blinman 1995).

The differences in trends associated with frequencies of white ware pottery in the two regions of the upland Southwest may be partly a lack of the production of local white wares. In addition, during later Anasazi occupations, the unpainted gray utility ware forms were increasingly limited to wide mouth cooking/storage jars. By A.D. 1000, most of the

Table 4.55. Vessel Form by Ware

Vessel Form	White Wares		Brown Wares		Total	
	N	%	N	%	N	%
Indeterminate body polished	23	0.2	4098	2.6	4121	2.4
Bowl rim	669	6.7	7328	4.6	7997	4.7
Bowl body	2803	28.3	48531	30.5	51334	30.4
Jar body	5453	55.0	65808	41.4	71261	42.2
Cooking jar rim	125	1.3	4631	2.9	4756	2.8
Cooking jar neck	516	5.2	22598	14.2	23114	13.7
Jar body corrugated and polished			1010	0.6	1010	0.6
Corrugated exterior bowl			358	0.2	358	0.2
Indeterminate	253	2.5	4214	2.6	4467	2.6
Seed jar rim	6	0.1	107	0.1	113	0.1
Handle only	12	0.1	35	0.0	47	0.0
Pipe			5	0.0	5	0.0
Olla rim	54	0.5	26	0.0	80	0.0
Ladle			8	0.0	8	0.0
Effigy/fetish	2	0.0	29	0.0	31	0.0
Canteen rim	1	0.0	3	0.0	4	0.0
Jar miniature			63	0.0	63	0.0
Isolated single coil			15	0.0	15	0.0
Olla neck	5	0.1	16	0.0	21	0.0
Indeterminate bowl/jar corrugated exterior			246	0.2	246	0.1
Plate rim			2	0.0	2	0.0
Whole jar			4	0.0	4	0.0
Total	9922	100.0	159168	100.0	169090	100.0

other forms such as bowls and narrow jars are solely represented by polished white ware exhibiting pastes and surface treatments very distinct from those noted in gray utility ware. In Mogollon assemblages, a variety of similar forms are represented by both white ware and brown ware (Table 4.55), and bowls are only slightly more common in white wares than brown wares. Rim radius measurements indicate that the diameters of white and brown ware bowls were similar, indicating similar use (Table 4.56). Thus, there does not appear to be as much distinction and specialization between forms associated with unpainted brown and decorated white wares in Mogollon assemblages as represented in Anasazi forms. For example, late (Pueblo II and Pueblo III) Anasazi gray utility ware appears to consistently

represent specialized wide mouth cooking jars. Exteriors tend to be unpolished and corrugated. In contrast, during all Mogollon occupations, brown wares with similar pastes are represented by vessels exhibiting a very wide range of forms, surface manipulations, and decorations. While pottery produced in both regions served a wide range of functions, variability in Anasazi assemblages was between gray ware forms functioning for cooking and storage and white ware forms functioning for serving and water storage. In contrast, Mogollon brown wares were commonly used in the full range of activities represented by both Anasazi gray and white ware vessels, and the low frequencies of white ware appear to have simply further complemented activities also served by brown ware vessels. The

Table 4.56. Rim Radius of White and Brown Ware Vessels

Ware	Vessel Form	Mean	Minimum	Maximum	SD	N
White	Bowl rim	10	3	20	3	229
	Cooking jar rim	6	2	20	3	59
	Olla rim	4	2	7	1	23
Brown	Bowl rim	11	1	30	4	2074
	Cooking jar rim	10	1	60	5	1488
	Olla rim	4	2	7	1	18

gradual increase in the range of surface manipulations on Mogollon Brown Ware vessels may reflect a series of gradual developments resulting in the production of brown ware vessels suited for more uses and activities. For example, the application of smudging over a well-polished surface would have provided for less porous vessels used to store or transport liquids. The wide range of shapes and forms represented by brown wares at Pueblo period occupations indicates they were used in a large and varied number of activities.

Vessel form distributions and radiuses as well as selected rim forms (Table 4.57 and Fig. 4.41) indicate that a wide range of forms and sizes were used during all occupations, with slight changes through time. During all but the earliest occupations, rim sherds are dominated by bowl or cooking/storage necked jars. The exception is the Early Pithouse period, where sherds from seed jars may dominate the assemblages. The majority of nonrim sherds from these assemblages were classified as jar body sherds and cannot be distinguished from those derived from necked jars. Bowl rims are the next most dominant form at Early Pithouse sites, and cooking/storage jars are present but rare.

Similar trends, including the dominance of seed jar forms, have been noted at other Early Pithouse sites, as well as contemporaneous assemblages throughout the Anasazi region. In many regions the overall frequency of seed jars drops during the seventh and eighth centuries. It has been postulated that early seed jars were a multipurpose vessel serving a variety of functions, including cooking, storage, and food processing (Skibo and Blinman 1996). The globular vessel shape and curved surfaces of seed jars may have resulted in a durable vessel form that could withstand a variety of uses. Thus, the brown ware seed jar may have been a suitable form for a generalized container.

While jar body sherds are the most common at Late Pithouse period sites, the majority of rim sherds

at all sites dating to this period belong to bowls. Cooking/storage jars represent the second most common forms, and seed jars are usually present but represented in very low frequencies. Bowls make up the majority of forms in Late Pithouse assemblages. Smudged pottery also becomes a common type during the Late Pueblo period. The appearance of white ware and smudged bowl forms reflects the increased importance of activities for which nonporous bowls were used.

Similar trends were noted at sites dating to the Pueblo period where, and with one exception, the majority of rim sherds were from bowls. While a similar range of forms is represented, the majority of white ware at Pueblo sites is from jars. White jars tend to exhibit thinner diameters than brown ware forms. For example, white ware vessels classified as cooking/storage average 6 cm, while brown ware vessels average 10 cm. This indicates that white ware jar forms were probably used for different functions from brown ware necked jar forms, possibly the storage and transport of water. Vessels representing some of these forms sometimes exhibit handles and may be pitchers or forms associated with the storage or transport of water.

Another functional trend is reflected by the increase in brown ware sherds exhibiting smudged exteriors. Smudged interior surfaces are often highly lustrous and black, contrasting dramatically with unsmudged exterior surfaces. Smudging is a way to decorate vessels high in iron that would otherwise be difficult to decorate other than with surface texture. Smudged surfaces, however, may have been produced for functional as well as aesthetic reasons. Smudging apparently helped produce a hard durable surface and reduced permeability to liquids. Data from Luna Project sites indicate a gradual increase in pottery exhibiting smudged interiors through time (Table 4.58). Smudged surfaces are rare to absent in assemblages dating to the Early Pithouse period. Evidence of interior smudging appears on the interi-

Table 4.57. Distribution of Vessel Forms by Site

Site	Indeterminate Body Polished		Bowl Rim		Bowl Body		Jar Body		Cooking Jar Rim		Cooking Jar Neck		Jar Body Corrugated and Polished		Corrugated Exterior Bowl		Indeterminate		Seed Jar Rim		Handle Only	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Brown Ware																						
LA 70188	4	7.7	1	1.8	36	69.2	3	5.8	7	13.5	0	0	0	0	0	0	0	0	0	0	0	0
LA 39975	155	8.7	38	1.8	170	7.3	1575	67.8	16	.7	266	11.5	9	.4	0	0	38	1.8	53	2.3	0	0
LA 46508	31	12.4	4	1.8	21	8.4	147	58.8	3	1.2	20	8.0	0	0	0	0	23	9.2	2	.8	0	0
LA 39972	10	.9	75	3.8	682	34.1	804	40.4	51	2.6	264	13.3	0	0	0	0	94	4.7	7	.4	2	.1
LA 70196	118	11.3	22	2.1	178	16.9	507	48.8	37	3.6	177	17.0	0	0	0	0	3	.3	0	0	0	0
LA 45607	1088	6.5	484	3.0	5366	33.3	6570	40.8	532	3.3	1920	11.9	0	0	0	0	108	.7	8	.0	12	.1
LA 43766	2	2.8	3	4.2	8	12.7	47	86.2	0	.0	8	12.7	0	0	0	0	0	0	1	1.4	0	0
LA 70201	0	.0	23	2.1	344	31.2	554	50.5	18	1.8	151	13.8	0	0	0	0	5	.5	4	.4	0	0
LA 45510	223	2.8	167	2.2	1545	20.1	4094	53.2	175	2.3	1001	13.0	0	0	0	0	492	6.4	3	.0	1	.0
LA 75792	81	3.3	54	2.2	258	10.7	1447	58.8	90	3.7	468	19.3	0	0	0	0	18	.7	4	.2	0	0
LA 39669	18	.3	225	4.2	2428	45.0	1442	26.7	214	4.0	1021	18.9	0	0	0	0	42	.8	2	.0	0	0
LA 3563	864	36.9	87	3.7	419	17.9	425	18.0	65	2.8	362	15.5	54	2.3	26	1.1	44	1.9	0	0	0	0
LA 70189	8	1.9	28	6.1	136	31.8	165	38.6	12	2.8	78	18.2	0	0	0	0	1	.2	2	.5	0	0
LA 70185	837	6.0	906	4.4	4093	29.5	4762	34.3	536	3.9	2208	15.9	0	0	0	0	836	6.0	6	.0	3	.0
LA 89846	15	2.5	21	3.5	52	8.7	200	33.3	17	2.8	61	10.2	0	0	0	0	234	39.0	0	0	0	0
LA 39668	288	1.5	584	3.2	6386	35.5	5980	33.3	543	3.0	4043	22.5	0	0	0	0	146	.8	7	.0	6	.0
LA 3279	384	.5	4881	5.9	26240	31.0	36700	43.3	2302	2.7	10473	12.4	947	1.1	332	.4	2079	2.5	5	.0	11	.0
LA 89847	0	.0	21	4.9	94	21.9	215	50.1	7	1.8	41	9.6	0	0	0	0	51	11.9	0	0	0	0
LA 43766	0	.0	0	0	57	40.7	65	46.4	2	1.4	13	9.3	0	0	0	0	0	0	3	2.1	0	0
LA 75791	1	.7	6	4.5	48	35.8	57	42.5	9	6.7	13	9.7	0	0	0	0	0	0	0	0	0	0
LA 78439	0	.0	0	0	1	16.7	4	66.7	0	0	1	16.7	0	0	0	0	0	0	0	0	0	0
LA 37917	0	.0	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LA 37919	0	.0	0	0	2	22.2	7	77.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.57. Continued.

Site	Indeterminate Body Polished		Bow Rim		Bow Body		Jar Body		Cooking Jar Rim		Cooking Jar Neck		Jar Body Corrugated and Polished		Corrugated Exterior Bowl		Indeterminate		Seed Jar Rim		Hande Orly	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Brown Ware																						
LA 70191	0	.0	0	.0	2	33.3	3	50.0	0	.0	1	16.7	0	.0	0	.0	0	.0	0	.0	0	.0
LA 9721	0	.0	0	.0	0	.0	1	100.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Total	4098	28	7624	4.8	48531	30.5	65908	41.4	4631	2.9	22596	14.2	1010	.6	368	.2	4214	2.6	107	.1	35	.0
White Ware																						
LA 70188	0	.0	0	.0	2	40.0	1	20.0	0	.0	0	.0	0	.0	0	.0	2	40.0	0	.0	0	.0
LA 45508	0	.0	0	.0	0	.0	2	100.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 36972	0	.0	6	13.9	23	52.3	13	29.5	0	.0	1	2.3	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70196	4	2.2	23	12.8	113	61.7	30	16.4	4	2.2	8	4.4	0	.0	0	.0	0	.0	1	.5	0	.0
LA 45507	0	.0	170	15.9	816	76.5	70	6.6	4	.4	6	.6	0	.0	0	.0	0	.0	0	.0	0	.0
LA 43766	0	.0	0	.0	4	100.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70201	0	.0	7	10.8	56	83.3	4	6.1	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 45510	2	.8	13	4.2	87	28.2	131	42.4	8	1.9	28	9.1	0	.0	0	.0	39	12.6	0	.0	0	.0
LA 75792	0	.0	9	7.8	33	28.7	57	49.5	1	.8	13	11.3	0	.0	0	.0	3	2.6	0	.0	0	.0
LA 36969	1	.2	50	1.4	187	38.0	194	44.1	0	.0	18	4.1	0	.0	0	.0	3	.7	0	.0	0	.0
LA 3563	6	3.9	24	12.6	188	54.5	51	25.5	0	.0	3	1.5	0	.0	0	.0	7	3.5	0	.0	3	.7
LA 70189	0	.0	2	.8	9	37.5	10	41.7	3	12.5	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70185	2	.9	50	11.9	115	26.7	207	48.1	7	1.8	31	7.2	0	.0	0	.0	6	1.4	1	.2	0	.0
LA 89846	0	.0	1	3.0	3	9.1	24	72.7	0	.0	1	3.0	0	.0	0	.0	4	12.1	0	.0	0	.0
LA 36968	6	4	71	5.1	314	22.8	861	63.9	7	.5	77	5.8	0	.0	0	.0	7	.5	0	.0	0	.0
LA 3279	2	.0	241	4.3	840	15.8	3764	67.3	93	1.7	330	5.9	0	.0	0	.0	102	3.3	2	.0	9	.2
LA 89847	0	.0	1	7.7	1	7.7	9	89.2	0	.0	0	.0	0	.0	0	.0	0	.0	2	15.4	0	.0
LA 43766	0	.0	0	.0	8	90.0	1	10.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 5791	0	.0	2	22.2	3	33.3	4	44.2	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Total	23	2	669	8.7	2803	28.3	5453	55.0	125	1.3	516	5.2	0	.0	0	.0	253	2.5	6	.1	12	.1

Table 4.57. Continued.

Site	Pipe		Olla Rtm		Ladle		Effigy/Fetish		Canteen Rtm		Jar Miniature		Isolated Single Ccl		Olla Neck		Indeterminate Bowl/jar Corrugated Exterior		Plate Rtm		Whole Jar	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
BrownWare																						
LA 70188	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 39975	0	.0	0	.0	1	.0	0	.0	0	.0	1	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 45608	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 39972	0	.0	0	.0	0	.0	0	.0	1	.1	2	.1	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70196	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 45607	4	.0	8	.0	0	.0	2	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 43766	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70201	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 45510	0	.0	0	.0	0	.0	1	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 75792	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 39969	0	.0	2	.0	0	.0	0	.0	1	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 3563	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70189	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70185	1	.0	2	.0	1	.0	3	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 88846	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 39968	0	.0	4	.0	4	.0	1	.0	1	.0	3	.0	1	.0	0	.0	0	.0	0	.0	0	.0
LA 3279	0	.0	12	.0	2	.0	22	.0	0	.0	57	.1	14	.0	18	.0	248	.3	2	.0	4	.0
LA 88847	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 43766	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 75791	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 78439	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 37917	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 7919	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0

Table 4.57. Continued.

Site	Pipe		Olla Rim		Ladle		Effigy/Fratish		Canteen Rim		Jar Miniature		Isolated Single Col		Olla Neck		Indeterminate Bow/Jar Compled Exterior		Plate Rim		Whole Jar	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Brown Ware																						
LA 70191	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 9721	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Total	5	.0	26	.0	8	.0	28	.0	3	.0	83	.0	15	.0	18	.0	246	.2	2	.0	4	.0
White Ware																						
LA 70188	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 45508	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 39972	0	.0	0	.0	0	.0	1	2.3	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70196	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 45507	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 43766	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70201	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 45510	0	.0	3	1.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 75792	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 39969	0	.0	3	.7	0	.0	3	.7	0	.0	3	.7	0	.0	0	.0	1	.2	0	.0	0	.0
LA 3563	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70189	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 70185	0	.0	11	2.6	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 89846	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 39968	0	.0	16	1.2	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 3279	0	.0	21	.4	0	.0	1	.0	0	.0	0	.0	0	.0	5	.1	0	.0	0	.0	0	.0
LA 89847	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 43766	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
LA 75791	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Total	0	.0	54	.5	0	.0	2	.0	1	.0	0	.0	0	.0	5	.1	0	.0	0	.0	0	.0

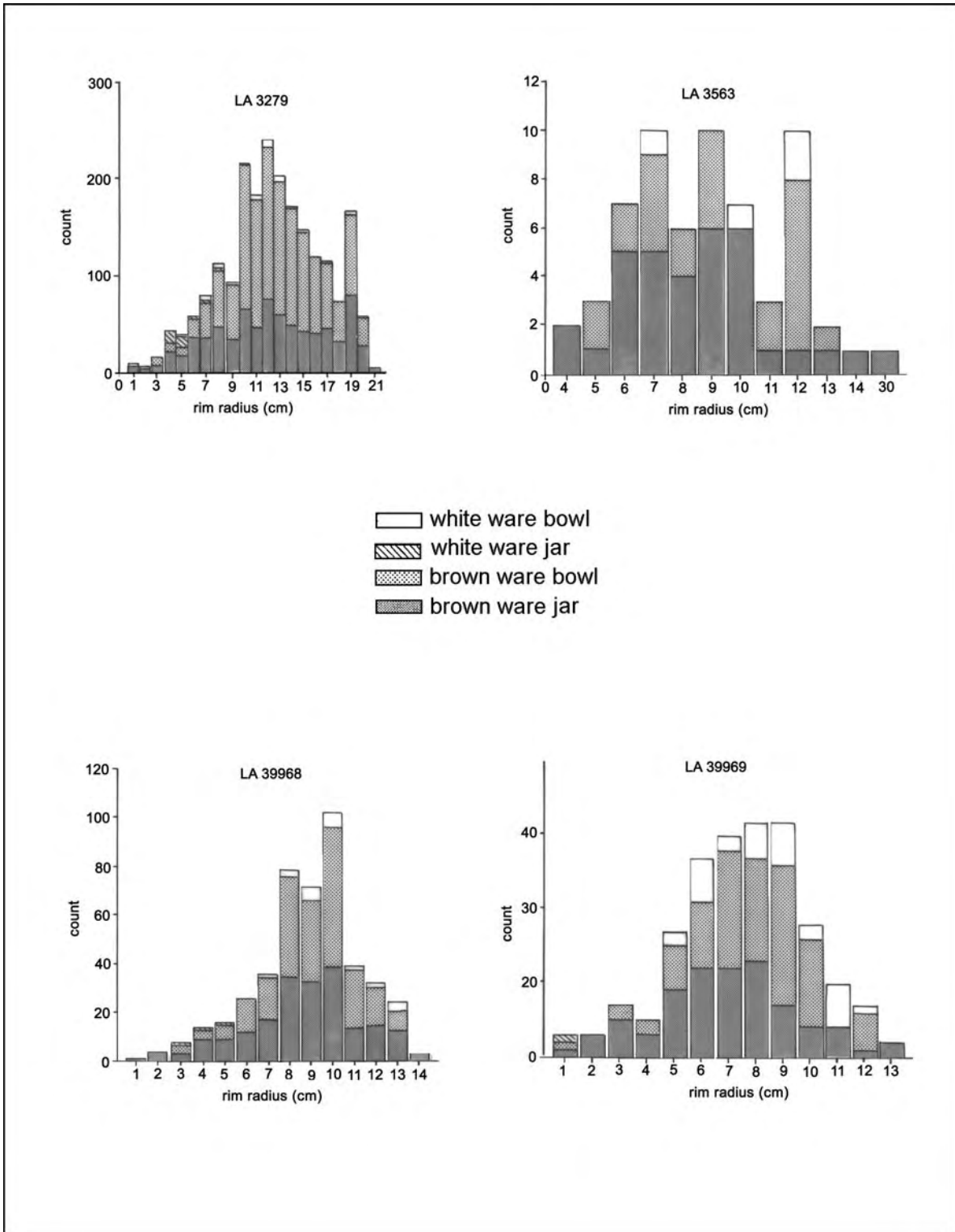


Figure 4.41. Rim radius by site and vessel form.

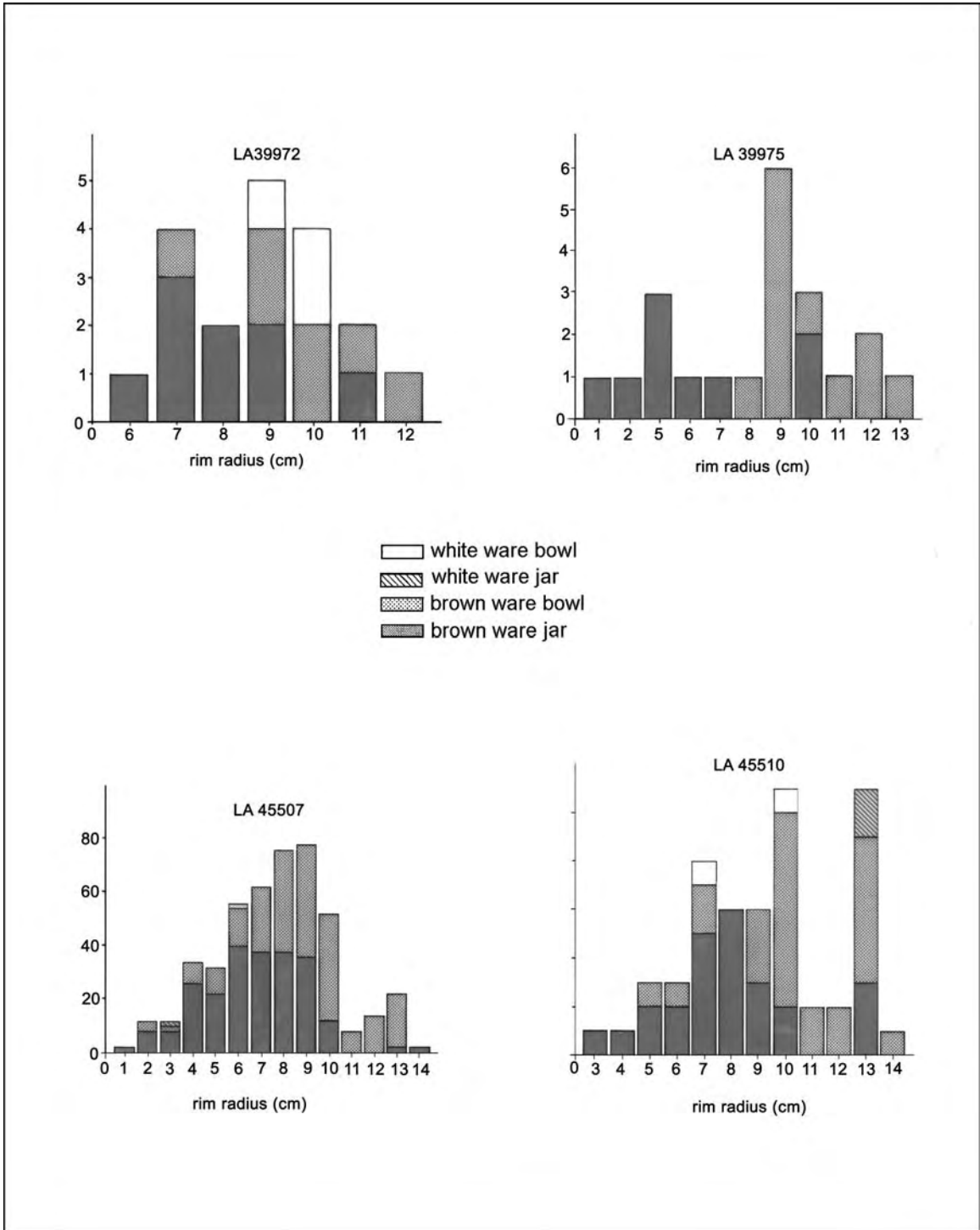


Figure 4.41. Continued. Rim radius by site and vessel form.

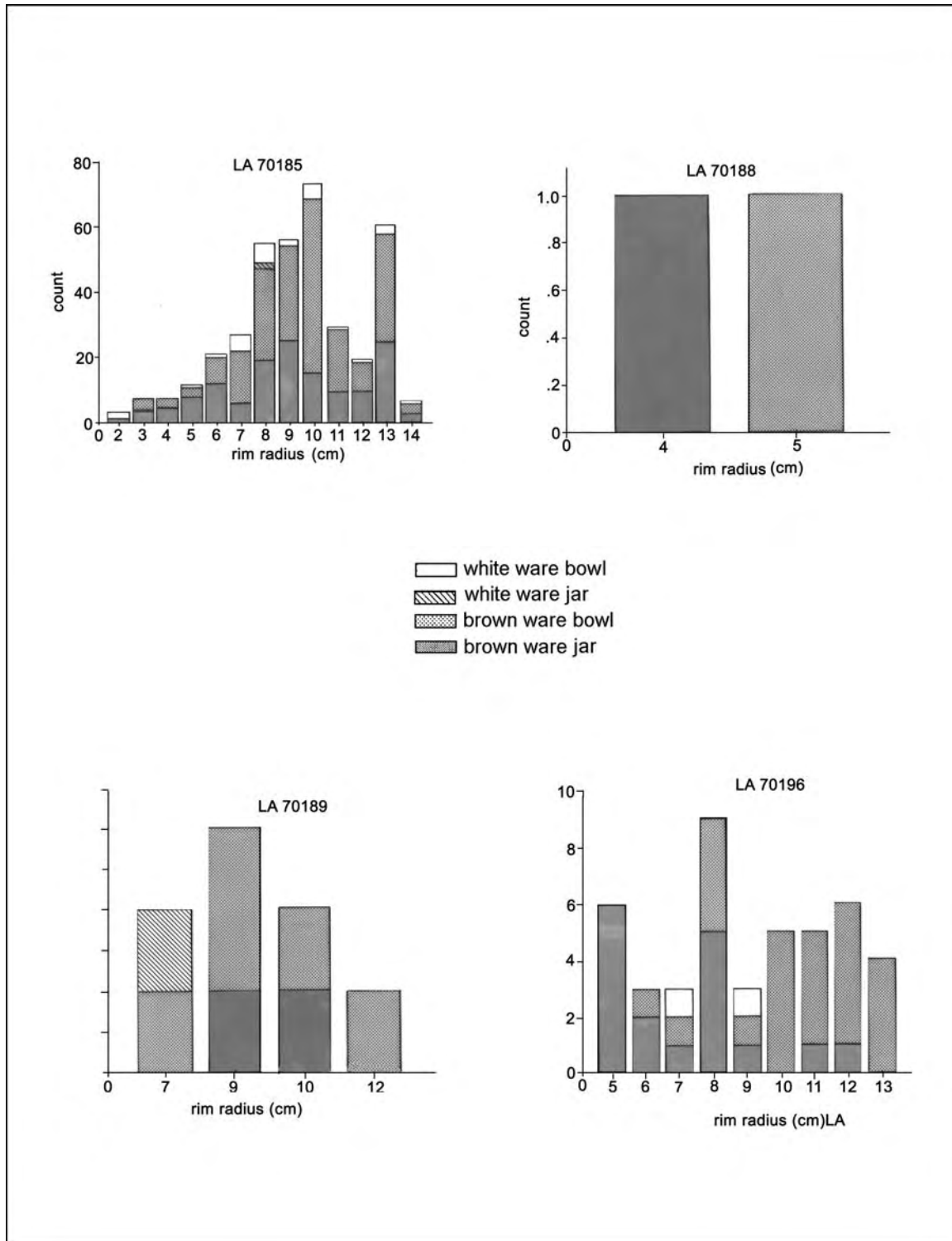


Figure 4.41. Continued. Rim radius by site and vessel form.

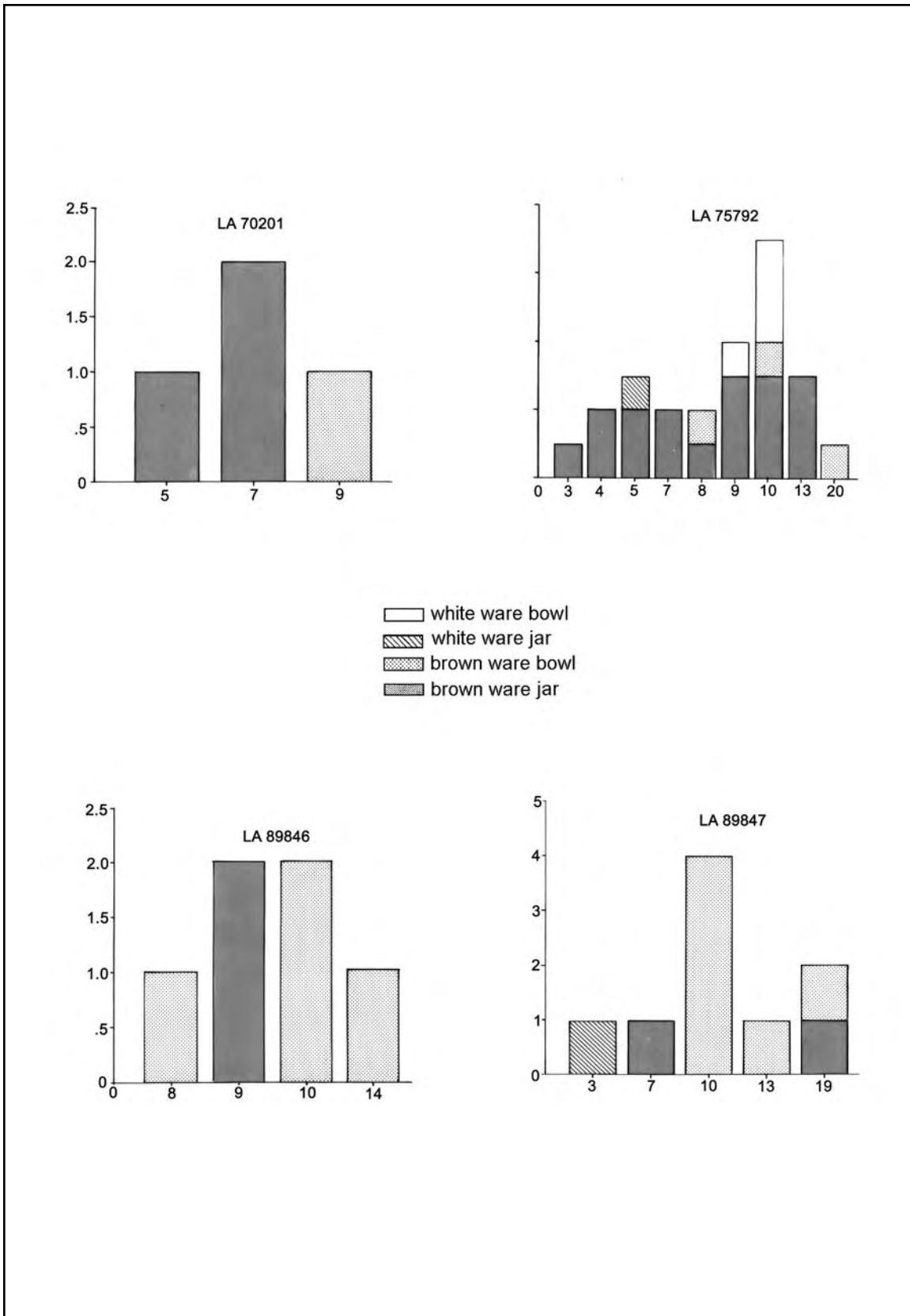


Figure 4.41. Continued. Rim radius by site and vessel form.

Table 4.58. Interior Smudging of Brown Ware Types

Site	Smudged		Other		Total	
	N	%	N	%	N	%
LA 70188			52	100.0	52	100.0
LA 39975	8	0.3	2314	99.7	2322	100.0
LA 45508			251	100.0	251	100.0
LA 39972	328	16.5	1664	83.5	1992	100.0
LA 70196	103	9.9	937	90.1	1040	100.0
LA 45507	2476	15.4	13624	84.6	16100	100.0
LA 43786	3	4.2	68	95.8	71	100.0
LA 70201	1	0.1	1097	99.9	1098	100.0
LA 45510	583	7.6	7119	92.4	7702	100.0
LA 75792	46	1.9	2375	98.1	2421	100.0
LA 39969	1398	25.9	3997	74.1	5395	100.0
LA 3563	342	14.6	1993	85.4	2335	100.0
LA 70189	39	9.1	389	90.9	428	100.0
LA 70185	2853	20.5	11040	79.5	13893	100.0
LA 89846	57	9.7	529	90.3	600	100.0
LA 39968	3859	21.5	14121	78.5	17980	100.0
LA 3279	29483	34.8	55190	65.2	84762	100.0
LA 89847	103	25.2	305	74.8	429	100.0
LA 43766	4	2.9	136	97.1	140	100.0
LA 75791	7	5.2	127	94.8	134	100.0
LA 78439			6	100.0	6	100.0
LA 37917			1	100.0	1	100.0
LA 37919			9	100.0	9	100.0
LA 70191	1	16.7	5	83.3	6	100.0
LA 9721			1	100.0	1	100.0
Total	41694	26.2	117350	73.8	159168	100.0

or surface of about 10 percent of the brown ware sherds from San Francisco phase assemblages, about 15 percent from Three Circle phase assemblages, 15 percent to 25 percent from Reserve phase assemblages, and 20 to 35 percent from Tularosa phase assemblages. This probably reflects the increased importance of bowls with hard surfaces in areas where the white ware bowl form was never that common.

It appears then, that functional trends in the northern Mogollon appear to have been remarkably conservative, as reflected by similar distributions of

forms and the long-lived domination of brown wares. This may be a fairly stable and long-lived subsistence strategy. The more dramatic shift from maintainable to reliable technologies noted in the Anasazi region did not fully occur in the northern Mogollon Highlands. Thus, during all Mogollon phases, a wide range of forms continued to be made with the same basic brown ware technology. Plain polished vessels continued to be the dominant form during all occupations. Some functional change is represented by certain developments, including the introduction of intentionally smudged interiors and

exterior surface structure. These changes may reflect a wider range of activities associated with pottery vessels during later occupations, although vessels often represented fairly generalized brown ware forms. As previously indicated, these changes were gradual and cumulative, because all but the latest assemblages were dominated by similar polished plain brown ware forms. In part, the conservative nature of Mogollon ceramics may reflect the basic suitability of the plain brown vessel as a container for a wide range of activities. It may also reflect more generalized requirements of vessel patterns that may be associated with more conservative social, settlement, and economic patterns in the Mogollon Highlands.

Complete Vessels

Additional information on vessel form and function is provided by data recorded for the whole or partial vessels from various sites. Attributes recorded for each of the complete or partially complete vessels include type, completeness, form, wear patterns, sooting patterns, rim diameter, and height. The profile of each vessel was sketched.

A total of 67 vessels were examined from Luna Project sites. Tables 4.59-4.62 present data relating to characteristics of each vessel analyzed from sites dating to various phases. These include information on 2 vessels from Early Pithouse sites, 18 from Late Pithouse sites, 25 from Reserve phase sites, and 22 from Tularosa phase sites. Components dating to all phases are dominated by brown wares (Table 4.63). The range of types represented by complete vessels increases through time.

The great majority of vessels are represented by a few basic forms (Table 4.64). Most of these represent brown ware jars consisting of globular bodies and curving necks (Fig. 4.42). Many of these display wide diameters relative to the vessel size. This appears to be a common shape in both Mogollon Brown Ware and Anasazi gray ware vessels and is interpreted here as reflecting a basic cooking/storage

category. The use of this form in cooking activities is indicated by the occurrence of sooting on the exterior, which is rare on other forms, such as bowls (Table 4.65). The wide range of sizes and surfaces noted for brown wares belonging to this form may indicate that they were used for a range of activities. Other vessels display similar shapes but would have been too small to have served the same cooking and storage purposes and were assigned to a small jar or miniature jar category. The next most common category represented is bowl forms, which includes plain and smudged. Other vessel forms represented by the whole or partial vessels from Luna Project sites include ollas, beaker-shaped jars, pipes, small-necked jars, miniature jars, and effigies.

Both of the vessels from Early Pithouse sites are represented by Alma polished forms from LA 39975. These include one small bowl dipper and one beaker-shaped jar. Other vessel forms commonly occurring in Pithouse period sites were not represented by whole vessels and may reflect postdepositional factors.

Vessels from Late Pithouse components include 2 examples from LA 70196 and 16 from LA 45507. All of these vessels represent brown wares and include Alma Rough, Alma polished, Alma scored, Alma punched, Three Circle neck coiled, and Reserve smudged. The great majority of vessels recovered from Late Pithouse sites are cooking/storage jars. Rim diameter of these cooking storage jars ranges from 9 to 19 cm with an average of 14.8 cm. Other vessels include bowls, effigies, and pipes.

Vessels from Reserve phase components include 9 examples from LA 39969, 10 from LA 70185, and 1 from LA 39972. All but one of these vessels are brown ware forms. Types represented include Alma Rough, Alma Plain, Reserve smudged, Reserve Plain corrugated, Reserve incised corrugated, and Reserve Black-on-white. The majority of the forms are represented by equal numbers of bowls and jars. The diameter of cooking storage jars ranges from 8 to 29 cm and averages 13 cm. The diameter of bowls range from 8 to 29 cm

Table 4.59. Vessels from Early Pithouse Phase Sites

Site	Vessel Number/ Type	Vessel Form/ Completeness	Surface, Paint, and Slip	Wear and Sooting	Diameter (cm)	Height (cm)
LA 39975	1/ Alma scored	Beaker shaped jar 60	Unpolished horizontal striations	Sooted exterior	8	14
LA 39975	2/ Alma polished	Small bowl dipper 100	Plain unpolished	Fire clouding of bowl exterior. Rim abrasion on bowl rim.	4	2.5

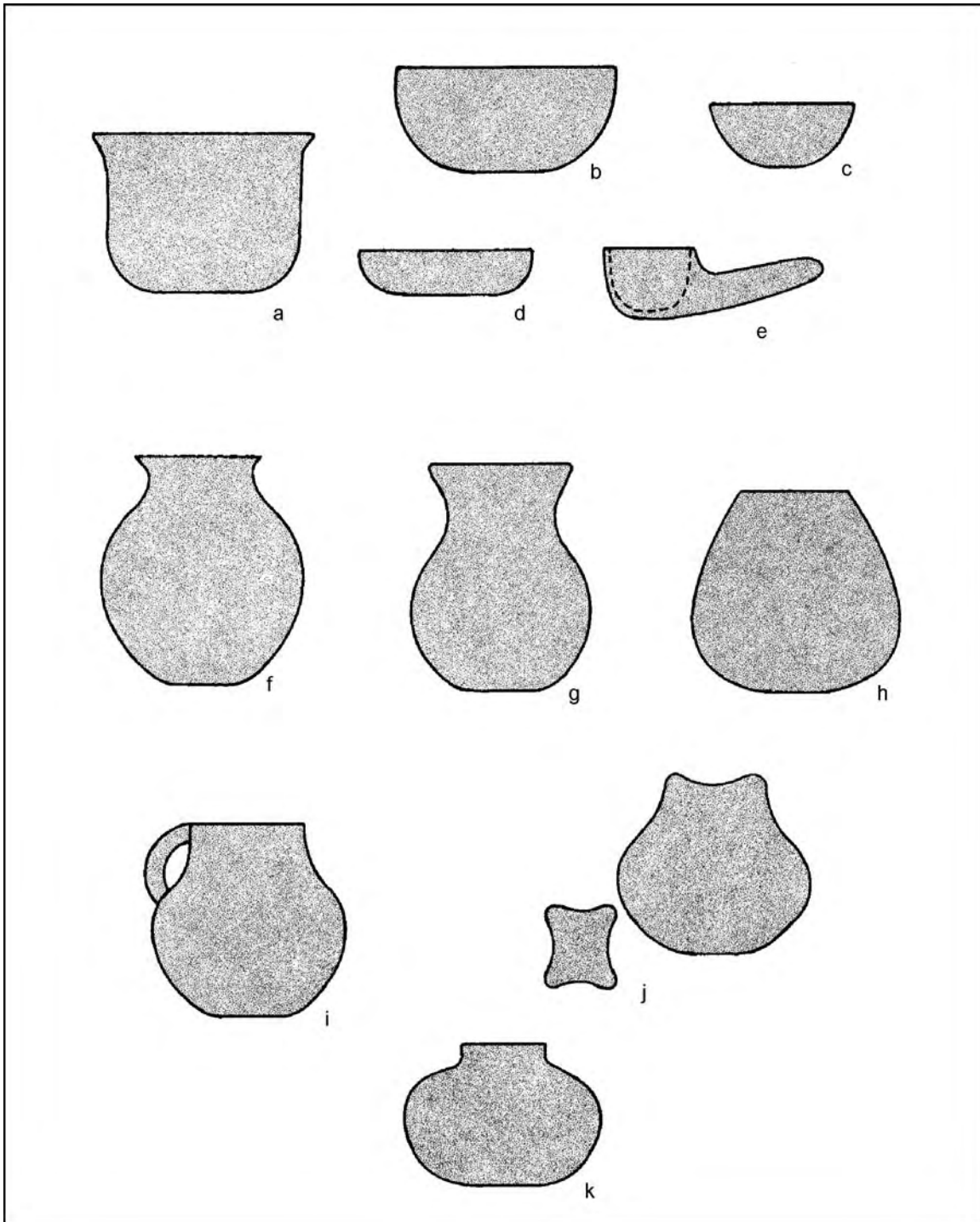


Figure 4.42. Vessel forms from the Luna Project; (a-d) bowls, (e) dipper bowl, (f-g) cooking/storage jars, (h) seed jar, (i) pitcher, (j) unusual jar form, (k) olla.

Table 4.60. Vessels from Late Pithouse Sites

Site	Vessel Number/ Type	Vessel Form/ Completeness	Surface, Paint, and Slip	Wear and Sooting	Rim Diameter (cm)	Height (cm)
LA 70196 FS	1/ Alma scored	Cooking/storage jar 30	Scored neck, polished interior	Sooted, slight rim abrasion, firing clouding.	16	?
LA 70196	2/ Reserve smudged	Bowl 50	Both sides polished, Sooted interior	Slight basal abrasion	15.5	5.5
LA 45507	1/ Alma scored	Cooking/storage jar 5	Scored neck polished body	Sooted inside and out, slight rim chipping	?	?
LA 45507	2/ Alma scored	Cooking/storage jar 10	Scored neck, polished body	Both sides sooted, some interior abrasion	?	?
LA 45507	3/ Alma polished	Cooking/storage jar	Polished both sides	Interior sooting, exterior fire clouding	?	?
LA 45507	4/ Alma neckbanded	Cooking/storage jar 10	Neckbanded with polished body	None observed	?	?
LA 45507	5/ Alma polished	Cooking/storage jar 10	Polished exterior	Fire clouding and spalling on exterior	?	?
LA 45507	6/ Alma neckbanded	Cooking/storage jar 2	Banded neck, polished body	Fire clouding on both sides	?	?
LA 45507	7/ Alma neckbanded	Cooking/storage jar with handle (pitcher) 85	Sooted all over with slight rim chipping	Sooting all over, slight rim chipping	9	14
LA 45507	8/ Alma polished	Cooking/storage jar 15	Polished both sides	Sooted interior, fire clouding on exterior	?	22
LA 45507	9/ Alma polished	Cooking/storage jar 2	Polished both sides	Entire vessel is sooted, spalling on interior	?	?
LA 45507	10/ Alma polished	Cooking/storage jar 40	Polished both sides	Sooted both sides, interior erosion	?	?
LA 45507	11/ Alma neckbanded	Cooking/storage jar 80	Polished exterior, smudged interior	Neck abraded	15	?
LA 45507	12/ Alma polished	Large cooking/storage jar 40	Polished both sides	Interior abrasion with both sides sooted	?	?
LA 45507	13/ Alma neckbanded	Large cooking/storage jar 80	Neck banded with polished body	Fire clouding both sides	19	28
LA 45507	14/ Three Circle neckcoiled	Cooking/storage jar 40	Neck coiled with polished body	Interior and exterior sooting		
LA 45507	15/ Alma Rough	Effigy 95	Unpolished	Slight sooting		2.5
LA 45507	16/ Alma polished	Pipe 100	Polished	Fire clouds	2.5	8

Table 4.61. Vessels from Reserve Phase Sites

Site	Vessel Number/ Type	Vessel Form/ Completeness	Paint and Slip	Wear and Sooting	Rim Diameter (cm)	Height (cm)
LA 39969	1/ Three Circle neck corrugated	Cooking/storage jar/ 100	Corrugated neck polished body	Slight basal abrasion, rim chipping and full sooting	7	12
LA 39969	2/ Reserve smudged	Small bowl/ 100	Polished both sides, smudged interior	Fire clouding on exterior	10	5
LA 39969	3/ Alma Rough	Bowl/ 100	Unpolished	Small fire cloud	12	4
LA 39969	4/ Reserve smudged	Bowl/ 100	Polished both sides, smudged on interior	Fire clouding on exterior, some rim chipping	16	6
LA 39969	5/ Alma Rough	Cooking/storage jar/ 98	Not polished or slipped	Slight basal abrasion	8	9
LA 39969	6/ Alma polished	Cooking/storage jar/ 95	Polished exterior	Fire clouding on exterior	?	10
LA 39969	7/ Reserve smudged	Bowl/ 25	Polished both sides, smudged interior	Extensive basal abrasion with chipped and abraded rim	20	9
LA 39969 FS	8/ Alma Rough	Miniature jar/ 75	Not polished	None		
LA 39969 FS	9/ Alma polished	Small bowl/ 100	Not polished	Spalled bottom, fire clouding both sided	8	4.5
70185	1/ Reserve Plain corrugated	Cooking/storage jar/ 25	Plain corrugations	Bottom third of vessel eroded, interior spalling found		
LA 70185	2/ Incised corrugated	Cooking/storage jar/ 10	Incised corrugated neck, polished body	None		
LA 70185	3/ Reserve Plain corrugated	Medium jar/ 10	Corrugated neck polished body	Fire cloud on exterior, slight interior abrasion	?	?
LA 70185	4/ Reserve smudged	Medium bowl/ 60	Polished both sides, smudged interior	Interior abrasion, fire clouding on exterior	15	14
LA 70185 FS 768	5/ Reserve smudged	Large bowl/ 85	Polished both sides, smudged interior	Basal abrasion, interior fire clouding	29	15
LA 70185 FS	6/ Alma Rough	Effigy/ 50	Not polished	Slight sooting		3.5
LA 70185	7/ Alma polished	Effigy/ 40	Polished	Heavily sooted		2
LA 70185 FS 768	8/ Alma Rough	Cooking/storage jar/ 100	Not polished	Moderate basal abrasion, abraded rim, exterior fire clouding	29	15
LA 70185	9/ Alma Rough	Small dipper/ 100	Not polished	Abraded rim	2.5	1.5
LA 70185	10/ Alma polished	Effigy/	Polished	Legs and underside abraded		3.5
LA 39972	1/ Reserve Black-on-white	Effigy handle/ 5	Black mineral paint on polished white slip	None observed	?	3 ?

Table 4.62. Vessels from Tularosa Phase Sites

Site	Vessel Number/ Type	Vessel Form/ Completeness	Paint and Slip	Wear and Sooting	Rim Diameter (cm)	Height (cm)
LA 39968	1/ Reserve Plain overlapping corrugated	Cooking/ storage jar/ 100	Corrugated neck polished body	Rim chipping	8	9.5
LA 39968	2/ Alma polished	Cooking/ storage jar/ 100	Unpolished	Slight basal abrasion	10	10
LA 39968	3/ Alma polished	Small jar/ 100	Polished body	Slight basal abrasion	4	6.5
LA 39968	4/ Alma neckbanded	Small jar/ 100	Banded neck polished body	Moderate basal abrasion and fire clouding	6	8
LA 39968	5/ Reserve smudged	Small jar/ 100	Banded neck, polished body	Moderate basal abrasion and sooting	6	8
LA 39968	6/ Reserve incised corrugated	Cooking/ storage jar/ 90	Incised corrugated neck	Sporadic fire clouding	8	10
LA 39968	7/ Alma Rough	Small jar/ 100	Unpolished	Sporadic fire clouding	2.5	3.5
LA 39968	8/ Reserve Plain corrugated	Bowl/ 33	Polished interior, plain corrugated exterior	Sooted interior smudged exterior	?	?
LA 39968	9/ Reserve Plain corrugated	Cooking/ storage jar/ 35	Neckbanded polished body	Entire surface sooted, slight rim chipping	17	?
LA 39968	10/ Reserve smudged	Bowl/ 75	Polished exterior, smudged interior	Sooted exterior	20	12
LA 39968	11/ Alma polished	Effigy/ 70	Unpolished	None	?	?
LA 39968	12/ Reserve Black-on- white	Jar body/ 6	Mineral paint over polished white surface	Fire clouding on exterior	?	?
LA 39968	13/ Reserve Plain corrugated	Cooking/ storage jar/	Plain corrugated, polished from shoulder down	Some fire clouding		
LA 3279	1/ Tularosa filleted rim	Bowl/ 98	Smudged interior exterior corrugated band near rim	Interior use wear, exterior fire clouding	23.5	9.5
LA 3279	2/ Tularosa filleted rim	Bowl/ 99	Smudged interior exterior corrugated band near rim	Interior use wear, exterior fire clouding, rim chipped	17.5	8.5
LA 3279	3/ Reserve indented corrugated	Olla/ 100	Corrugated exterior	Exterior wear, fire clouding	7	12
LA 3279	4/ Tularosa Black-on- white	Olla/ 80	Mineral paint over white slip	Exterior fire clouds	8.5	21
LA 3279	5/ Tularosa Black-on- white	Cooking/ storage Jar/ 60	Corrugated exterior polished neck	Some basal abrasion spalling, minor sooting, rim chipping	?	19
LA 3279	6/ Tularosa corrugated	Cooking/ storage jar/ 25	Corrugated exterior, polished neck	Light sooting	28.5	30
LA 3279	7/ Reserve indented corrugated	Cooking/ storage jar/ 100	Corrugated exterior	Slight basal abrasion, neck sooting	14	15
LA 3279	8/ Reserve indented corrugated	Cooking/ storage jar/ 80	Corrugated exterior	Rim reshaped through chipping, exterior sooting		27
LA 3279	9/ Reserve corrugated indented	Cooking/ storage jar/ 40	Corrugated exterior	Exterior fire clouding	24.5	28

Table 4.63. Whole Vessel Types From Luna Project Sites

Type	Early Pithouse Period		Late Pithouse Period		Reserve Phase		Tularosa Phase	
	N	%	N	%	N	%	N	%
Alma Rough	0	0	1	5.6	6	30	1	4.5
Alma polished	2	100	6	33.3	4	20	3	13.6
Alma scored	0	0	4	22.2	0	0	0	0
Alma neckbanded	0	0	5	27.8	0	0	1	4.5
Three Circle neckcoiled	0	0	1	5.6	1	5	0	0
Reserve smudged	0	0	1	5.6	5	10	2	9.1
Tularosa filleted smudged	0	0	0	0	0	0	2	9.1
Reserve indented corrugated	0	0	0	0	0	0	4	18.2
Reserve Plain corrugated	0	0	0	0	2	10	5	22.7
Reserve incised corrugated	0	0	0	0	1	5	1	4.5
Reserve Black-on-white	0	0	0	0	1	5	1	4.5
Tularosa Black-on-white	0	0	0	0	0	0	2	9.1
Total	2		18		20		22	

Table 4.64. Vessel Forms Represented by Whole Vessels from Luna Project Sites

Type	Early Pithouse Period		Late Pithouse Period		Reserve Phase		Tularosa Phase	
	N	%	N	%	N	%	N	%
Brown ware bowl	0	0	1	5.6	7	35	4	18.2
Brown ware cooking/storage jar	0	0	14	77.7	7	35	9	40.9
Brown ware cooking/storage jar with handle (pitcher)	0	0	1	5.6	0	0	0	0
Brown ware olla	0	0	0	0	0	0	1	4.5
Brown ware small necked jar	0	0	0	0	0	0	4	18.2
Brown ware beaker-shaped jar	1	50	0	0	0	0	0	0
Brown ware effigy	0	0	1	5.6	3	15	1	4.5
Brown ware pipe	0	0	1	5.6	0	0	0	0
Brown ware dipper bowl	1	50	0	0	1	5	0	0
Brown ware miniature jar	0	0	0	0	1	5	0	0
White ware effigy	0	0	0	0	1	5	0	0
White ware jar	0	0	0	0	0	0	1	4.5
White ware olla	0	0	0	0	0	0	1	4.5
White ware cooking/storage jar	0	0	0	0	0	0	1	4.5
Total	2	0	18		20		22	

Table 4.65. Sooted Deposits on Whole Vessel Forms from Luna Project Sites

Type	None or Indeterminate		Sooted		Fire Cloud	
	N	%	N	%	N	%
Brown ware bowl	2	16.7	2	16.7	8	66.7
Brown ware cooking/storage jar	6	20	17	56.7	7	23.3
Brown ware cooking/storage jar with handle (pitcher)	1	100	0	0	0	0
Brown ware olla	0	0	0	0	1	100
Brown ware small necked jar	1	25	1	25	2	50
Brown ware beaker-shaped jar	0	0	1	100	0	0
Brown ware effigy	2	40	3	60	0	0
Brown ware pipe	0	0	0	0	1	100
Brown ware dipper bowl	0	0	0	0	2	100
Brown ware miniature jar	1	100	0	0	0	0
White ware effigy	1	100	0	0	0	0
White ware jar	0	0	0	0	1	100
White ware olla	0	0	0	0	1	100
White ware cooking/storage jar	0	0	1	100	0	0

and averages 15.3 cm. Other forms include bowl dipper, miniature jar, brown ware effigy, and white ware effigy.

Vessels from Tularosa phase components include 13 items from LA 39968 and 9 from LA 3279. Vessel forms include Alma Rough, Alma polished, Alma neckbanded, Reserve smudged, Tularosa filleted smudged, Reserve indented corrugated, Reserve Plain corrugated, Reserve incised corrugated, Reserve Black-on-white, and Tularosa Black-on-white. A total of 19 of these vessels represent brown ware forms, while 3 are white ware types. Most of the brown ware vessels are necked jar forms. The contrast in size of these jar forms resulted in the assignment of some to a cooking/storage jar category and others to a small jar category. The rim diameter of items classified as cooking storage jars ranges from 8 to 28.5 cm and averages 15.5 cm. Those classified as small jars display diameters from 2.5 to 6 cm and average 4.6 cm. The next most common category are bowls. Rim diameters for bowls range from 17.5 to 23.5 cm and average 20.4 cm. Other vessel forms at Tularosa phase components include effigies and white ware jar bodies.

SHERD MASS AND POST-DEPOSITIONAL INFLUENCES

Post-depositional factors may also influence ceramic distributions. One of the most obvious effects of

postdepositional influences is on mean sherd mass. Contexts where artifacts are continually affected by surface weathering and breakage are more likely to exhibit small mean mass, while those from more quickly buried contexts should exhibit larger mean sherd size. Mean sherd mass distributions indicate a high degree of variation in mean sherd mass in large assemblages (over 1,000 sherds) ranging from 2.83 to 6.56 g and averaging 5.52 g. Time of occupation appears not to be a factor in sherd mass because two of the largest mean sherd sizes for large assemblages are from assemblages dating to the Early Pithouse period (LA 39975) and the Late Tularosa phase (LA 3279). Assemblages with larger sherd mass tend to be those in which a large amount of pottery was recovered from floors and the immediate fill, while those with smaller sizes included those in which a large proportion of the sherds were associated with surface contexts and redeposited fill. Mean sherd mass may also influence the typological categories assigned to sherds from a given site. For example, a large proportion of white sherds from those yielding large sherd mean size may be assigned to a specific white ware type such as Reserve Black-on-white or Tularosa Black-on-white, based on surface decoration.

PETROGRAPHIC ANALYSIS OF SELECTED CERAMIC AND CLAY SAMPLES

David V. Hill

Petrographic analysis was conducted on 42 sherds from a series of sites between Reserve and Luna, New Mexico; 4 from Mogollon Village, above the San Francisco River, ten miles north of Glenwood; 4 from geological sources; 2 from archaeological contexts; and on 1 sandstone sample.

REGIONAL GEOLOGY

The project sites are within the drainage pattern of the San Francisco River. The surrounding region is comprised of a complex series of interbedded rhyolitic tuffs and basalts, the result of extensive Tertiary volcanic activity. Volcaniclastic sandstones and breccias are also present, often interbedded with the igneous rocks (Ratté and Finnell 1978; Rhodes and Smith 1976). Overlaying the volcanic rocks within the valley is an extensive conglomeritic formation known as the Gila Conglomerate, formed from the filling of the valleys with the erosional material produced from the surrounding mountains.

METHODOLOGY

The samples for petrographic analysis were selected to reflect the range of variation in the types of ceramics recovered from the Luna Project. Additional ceramic samples from Mogollon Village along with samples of clay and sandstone from the Luna Project area were also analyzed (Table 4.66).

The ceramic and clay samples were analyzed using a Nikon Optiphot-2 petrographic microscope. The sizes of the natural inclusions and tempering agents were described in terms of the Wentworth Scale, a standard method for characterizing particle sizes in sedimentology. These sizes were derived from measuring a series of grains using a graduated reticle built into one of the microscope's optics. The percentages of inclusions in the ceramic and clay samples were estimated, using comparative charts (Matthew et al. 1991; Terry and Chilingar 1955).

Analysis of the petrographic samples was conducted in three stages. The first stage consisted of the initial determination of rock and mineral types

present in each sample, and the identification of rough groupings of sherds sharing similar pastes and tempers. The second phase of the analysis involved point-counting each sample for 300 points. Because of the small size of Sample 11, this sherd was only counted for 256 points. When an inclusion was encountered during point-counting, X and Y measurements were made to the nearest millimeter. Grains under .01 mm were not measured since it was assumed they represented natural inclusions in the ceramic clays. Results of these analyses are presented in Tables 4.67-4.68. A final phase of analysis consisted of comparing the rough composition groups with the point-count and measurement data.

RESULTS OF ANALYSIS

Pre-A.D. 1050 Sherds

With few exceptions, virtually all of the pre-A.D. 1050 sherds had very similar pastes. These ranged from a light, yellowish brown to a dark brown and contained abundant microinclusions. The lighter-colored pastes were confined to three sherds of Mangus Black-on-white. These microinclusions consist primarily of feldspars and rock fragments that are often altered to opacity. The larger inclusions consisted of igneous rock fragments and isolated mineral grains. Trachytic basalts, rhyolite porphyries, and rhyolitic tuffs are present in all of the samples in varying proportions. The trachytic basalts contained variable amounts of magnetite that are often altered to hematite. The amount of magnetite within the basalt fragments is highly variable, even within rock fragments observed in the same sherd. Chalcedony, also infrequently present, was probably derived from secondary alteration of the tuffs. A single aggregate mass of a calcium-cemented volcaniclastic sandstone was observed in Sample 14.

The mineral grains present in the pastes of the sherds were derived from the rock fragments or as isolated detrital grains. Sanidine, plagioclase, and microcline were the most common minerals. Quartz,

Table 4.66. Petrographic Sample

Sample	LA Number	FS Number	Ceramic Type
1	NA	NA	sherd made from self-tempered clay
Sherds from sites near Reserve Turnoff			
2	70196	213	Three Circle Red-on-white
3	70196	254	Alma Plain
4	75792	201	Tularosa Corrugated
5	75792	37	Smudged Brown
6	70201		Mangus Black-on-white
7	70201	231	San Francisco Red
8	39975	31	Alma Plain
9	70195	31	Three Circle Red-on-white
10	70121	257	Mangus Black-on-white
Sherds from LA 45507 near Luna			
11	45507	255	Mangus Black-on-white
12	45507	255	Alma Plain
13	45507	223	Three Circle neck corrugated
14	45507	229	Mangus Black-on-white
15	45507	257	Alma Plain
Source Samples			
16	45507	NA	clay exposed in trench
17	70189	NA	clay from archaeological context
18	NA	NA	Gila conglomerate collected near Sample 1. Clay source.
Ceramic Samples from Mogollon Village			
19	11568	1137	Alma Plain
20	11568	1186	Mogollon Red-on-brown
21	11568	1137	Alma Plain
22	11568	1137	Alma Plain

orthoclase, brown biotite, and augite were also present but uncommon in the samples.

Two sherds had slightly different compositions from the other samples. Sample 4 has a brown paste similar to the other samples, with abundant microinclusions. The major type of inclusion observed is an andesite porphyry. The groundmass is cryptocrystalline and is highly altered to sericite and clay minerals. Also contained in the groundmass is magnetite that is often altered to hematite. The amount of magnetite and the degree of alteration is variable between rock fragments within the sherd. Sparse biotite is present in some of the rock fragments and is altered to hematite along the margins. The plagioclase

contained prophyritics within the groundmass and is classifiable as bytownite. These plagioclase grains are also frequently altered to sericite and clay minerals.

Sample 12 has a homogeneous brown paste containing abundant microinclusions. The predominant inclusion within the paste is a trachytic basalt. The groundmass of these rock fragments is often highly altered to sericite and clay minerals. Magnetite, often altered to hematite, is occasionally present in these rock fragments. The porphyritic feldspars with the groundmass are classifiable as bytownite. A few fragments of rhyolitic tuff are also present in the paste. Occasional grains of sanidine,

Table 4.67. Point Count Data

Sample	Paste	Void	Basalt	Tuff	Rock Other	Plagioclase	Sanidine	Mineral Other
1	256	3	0	18	chalcedony: 1	4	17	Quartz: 1
2	271	2	1	9	chalcedony: 1	3	11	Quartz: 1
3	284	1	13	1	0	0	2	0
4	267	2	0	0	Andesite porphyry: 30	1	0	0
5	284	0	11	4	0	0	0	Orthoclase: 1
6	276	1	1	19	chalcedony: 2	1	0	0
7	288	0	0	0	0	0	2	0
8	283	2	3	18	0	0	4	0
9	284	0	0	9	0	2	4	Microcline: 1
10	277	6	7	9	0	0	1	0
11*	250	0	0	1	0	2	3	0
12	272	0	0	2	Trachytic basalt: 21	0	5	0
13	276	2	3	10	0	3	6	0
14	279	6	3	6	0	2	4	0
15	268	3	9	13	0	4	3	0
16	284	7	3	0	0	0	6	0
17	285	4	0	5	0	0	6	0
19	279	0	10	5	chalcedony: 1	2	3	0
20	267	2	3	22	chalcedony: 1	0	6	0
21	273	3	8	10	0	1	5	0
22	272	3	10	10	0	0	5	0

* short count on a small sample

Table 4.68. Petrographic Analysis Measurement Data (sq mm)

Sample	Basalt		Tuff		Other		Plagioclase		Sanidine		Other	
	A	SD	A	SD	A	SD	A	SD	A	SD	A	SD
1	*	*	1.07 / 1.32		(47X.39)		.03 / .07		.09 / .08		(47X.57)	
2	(1.25 X 1.1)		.2 / .19		(1.22 X .7)		.02 / .03		.09 / .15		* *	
3	.28 / .24		(32 X .68)		* *		* *		.02 / .53		* *	
4	*	*	.35 / .29		* *		(12 X .17)		* *		* *	
5	.28 / .19		.11 / .19		* *		* *		* *		(73 X .47)	
6	1.0 / 1.2		.25 / .21		.03 / .09		(45 X .32)		* *		* *	
7	*	*	*	*	*	*	*	*	.02	.01	* *	
8	.04 / .11		.33 / .3		* *		* *		.06 .11		* *	
9	*	*	.48 / .53		* *		.02 / .04		.02 / .03		(28 X .31)	
10	.25 / .21		.31 / .29		* *		* *		(57 X .37)		* *	
11	*	*	(4 X .38)		* *		.28 / .31		(24.2 X 10.9)		* *	
12	.3 / .24		5.5 / .02		* *		* *		.03 / .07		* *	
13	.2 / .37		.22 / .16		* *		.04 / .07		.08 / .19		* *	
14	.12 / .16		.45 / .19		* *		.12 / .28		.05 / .07		* *	
15	.23 / .22		.27 / .16		* *		.04 / .08		.01 / .04		* *	
16	.09 / .17		* *		* *		* *		.09 / .06		* *	
17	*	*	.42 / .44		* *		* *		.13 / .1		* *	
19	.61 / .48		.45 / .3		* *		.1 / .13		.18 / .2		* *	
20	.03 / .11		.4 / .25		(55 x .6)		* *		.06 / .11		* *	
21	.25 / .29		.26 / .19		(45 x .37)		(44 x .25)		.04 / .05		* *	
22	.31 / .27		.34 / .3		* *		* *		.07 / .1		* *	

brown biotite, augite, and quartz are present as isolated mineral grains in the paste.

In addition to the ceramic samples, three samples of clays and one of sandstone were analyzed. Sample 1 is a clay derived from the Luna area. The clay contains sparse microinclusions consisting mostly of altered feldspars. Larger isolated grains of volcanic quartz, sanidine, tuff fragments, and a fragment of chalcedony were also observed. The tuff fragments displayed axiolitic texture.

Sample 16 is derived from a clay outcrop just below where Sample 18, a sandstone, was collected. The clay has a strong reddish color. It contained abundant microinclusions consisting mostly of altered feldspars and tuff fragments. Larger grains of trachytic basalt and rhyolite porphyry were also present. One of the basalt fragments is more than 3 mm in diameter, the largest single grain observed during the analysis. These larger mineral grains are subrounded to angular. The grains are somewhat

more angular than those observed in the sherd sample. Isolated grains of sanidine along with sparse quartz and plagioclase were also present.

Sample 17 is a clay sample derived from LA 70189. The clay has abundant microinclusions also consisting of altered feldspars. The larger rock fragments consist of trachytic basalt and rhyolite. Isolated grains of sanidine, plagioclase, and sparse quartz were also present. These mineral grains tend to be rounded to subangular.

Sample 18 was derived from an outcrop above the location from where Sample 1 was collected. This sample is a medium to coarse-grained volcanoclastic sandstone. Subrounded to angular fragments of trachytic basalt, rhyolite, and chalcedony, along with isolated mineral grains of quartz, sanidine, plagioclase, and microcline, were present. The feldspars are frequently altered to sericite and clay minerals, often to the point of opacity. The grains are held by calcium cement.

The sandstone sample was derived from Gila Conglomerate (D. Wilson, personal communication). However, other sandstones whose constituents were derived from volcanic sources are known from the region (Rhodes and Smith 1976).

Post-A.D. 1050 Sherds and Clay Samples

Sample 23, Reserve Plain Corrugated Smudged. The paste of this sherd is an opaque black. Contained within the paste are abundant arkosic sands. The sands are moderately well sorted and range in size from very fine to medium-sized. The inclusions make up about 25 percent of the ceramic matrix. The untwinned feldspars are usually altered to sericite and clay minerals, sometimes to the point of opacity of the grains. The quartz grains display undolose extinction. Rock fragments are present in the sands and account for about 3 percent of the total inclusions. The most common rock type observed is an intergranular basalt. The plagioclase (andesine) is often slightly clouded. Ferro-manganese is present between the feldspar laths along with black opaque material that may be highly altered glass. One fragment contains highly altered olivine. A few chert grains are also present in the sands.

Sample 24, Reserve Plain Corrugated Smudged. The paste of this sherd is a dark opaque black. The paste was tempered using crushed latite porphyry. The rock fragments range in size from medium to very coarse and make up about 20 percent of the groundmass. The feldspars are slightly weathered. Ferromanganese cubes are disseminated throughout the groundmass. Some of these cubes are altered to hematite around their margins. A few sparse grains of volcanic quartz were also present. Also present were sparse laths of hornblende and augite.

Sample 25, Reserve Black-on-white. The paste of this sherd is light gray and contains about 10 percent silt-sized to very fine, rounded quartz grains. Also present in the paste were sparse medium-sized, silty, rounded black inclusions. The paste was tempered using crushed potsherds. The sherd temper accounted for about 1 percent of the paste. The sherd temper appears to have the same type of fabric as the matrix of the sherd. A few of the sherd fragments ranged from white to grayish.

Sample 26, Reserve Black-on-white. The paste of this sherd is quite similar to that observed in Sample 25. This sherd was also tempered using crushed potsherds.

Sample 27, Reserve Black-on-white. The paste

of this sherd is light gray. The paste contains about 20 percent silt-sized to fine, rounded quartz grains. The paste contains dark brown to black opaque inclusions. The origin of these inclusions is unclear. They surround some small voids suggestive of reduction taking place with the combustion of organic materials within the clay body. Other dark inclusions appear as stains and have indistinct boundaries. The inclusions may also represent some sort of decomposition product. These opaque inclusions are fine to medium-sized. They make up about 3 percent of the paste.

Sample 28, Mimbres Classic Black-on-white. The paste of this sherd is light gray mottled with brown. Isolated mineral grains and rock fragments form a continuous size distribution from silt-sized to coarse. These inclusions make up approximately 15 percent of the paste and appear to represent natural inclusions rather than added materials. Sanidine is present as isolated mineral grains. The sanidine grains range from subangular to rounded. The sanidine is usually weathered to clay minerals. Slightly less common are laths of andesine plagioclase. The plagioclase also presents a weathered appearance. Very sparse brown biotite, brown hornblende, and opaque inclusions make up the rest of the isolated grains.

Volcanic rock fragments are also present in the paste of this sherd. Two types of fragments were observed. The most common are fragments of basalt. The basalt is highly variable in texture. One type of basalt is an intersertal variety having a brown glassy groundmass containing abundant ferro-manganese cubes. The plagioclase in these fragments is classifiable as an andesine. The other basalt has an intergranular texture and contains brown glass and ferro-manganese cubes in the interstices between the plagioclase (andesine) lathes. The intergranular basalt was much less common than the intersertal texture. Also present in the paste were fragments of a reddish glass containing sparse, highly weathered plagioclase. These glassy fragments were even less common than the basalt grains.

Sample 29, Reserve Indented Corrugated. The paste of this sherd is a strong brown and slightly birefringent. The paste was tempered using crushed latite, possibly quartz latite. Slightly more pyroxene is present in this sherd than in Sample 24. The rock fragments appear similar to those observed in Sample 24, however. The latite constitutes about 15 percent of the paste. The rock fragments range from medium-sized to a few that were very coarse.

Sample 30, Reserve Plain Corrugated. The paste of this sherd is golden brown and birefringent.

The paste contains about 15 percent rounded, sandy inclusions. These inclusions range in size from medium to coarse. The major mineral type observed in these sands is a highly weathered sanidine. Also present are rock fragments that have a cryptocrystalline groundmass and contain sparse ferro-manganese cubes and brown biotite. The groundmass of these rock fragments is clouded through weathering to clay minerals. One coarse-sized fragment of reddish gray welded tuff was also observed in the paste. Two inclusions of intergranular basalt were also present. This basalt contained brown glass and ferro-manganese grains between the andesine plagioclase laths.

Sample 31, Reserve/Tularosa-Black-on-white. The paste of this sherd is light gray. Contained within the paste are about 10 percent silt to medium-sized, rounded quartz grains. These inclusions are likely naturally present in the source of the clay. Also present in the paste was a single, medium-sized grain of intergranular basalt. The ferro-manganese grains found in the interstices between the plagioclase laths displayed halos of hematite. A single, medium-sized fragment of fine-grained sandstone was also present. Sparse rounded to subangular silty inclusions were also present.

Sample 32, Red Mesa Black-on-white. The paste of this sherd is light gray. This paste contains silt to medium-sized, rounded quartz sand grains that most likely represent natural inclusions in the ceramic clay. These sand grains make up about 5 percent of the paste. The clay also contains rounded inclusions. These rounded inclusions range from coarse to very coarse in size and range in color from dark gray to a light gray that is almost indistinguishable from the ceramic paste. These inclusions most likely represent fragments of clay that were not well mixed into the clay body.

Sample 33, Reserve Black-on-white. The paste of this sherd is light gray. Contained within this matrix are about 20 percent silt-sized to very fine quartz sands. Two fragments of fine-grained sandstone were also present, along with a few medium-sized isolated quartz grains.

Sample 34, Mimbres Classic Black-on-white. The paste of this sherd is brownish gray. Contained within the paste are silt-sized to fine, isolated grains of quartz, sanidine, and sparse plagioclase. Also present, possibly as an added tempering agent, are fragments of glassy tuff. A few tuff fragments have a rhyolitic composition. The tuff fragments display variable weathering with some inclusions having a grayish brown color, while the majority appear to be only slightly kaolinized. The matrix of the tuff is

glassy with occasional inclusions of sanidine, andesine plagioclase, or biotite. Two pieces of tuff have a cryptocrystalline groundmass. A few pieces of secondary chalcedony were also observed. The tuff fragments make up about 20 percent of the ceramic fabric and range between medium to very coarse in size.

Sample 35, Reserve Plain Corrugated. The paste of this sherd is golden brown. The paste and inclusions in this sherd are quite similar to those observed in Sample 30 and reflect the use of a common source of raw materials. The inclusions make up about 15 percent of the sherd's matrix and range in size from fine to very coarse. Sparse fragments of intergranular and intersertal basalts were observed, like those in Sample 30.

Sample 36, Reserve Indented Corrugated. The paste of this sherd is golden brown. The paste contains crushed latite temper like that observed in the paste of Samples 24 and 29. The slightly birefringent brown paste of the present sherd is very similar to Sample 29. The latite has a microcrystalline groundmass and contains andesine plagioclase porphyritically. The latite particles constitute 15 percent of the paste and range in size from medium to a few very coarse examples.

Sample 37, Reserve Indented Corrugated. The paste of this sherd is brown and has a very gritty texture. Abundant grains of multilithic sands are present in the paste. These grains range in size from silt-sized to a few very coarse rock fragments. The sands appear to represent a natural constituent of the ceramic paste and account for about 30 percent of the volume. Rounded to subangular grains of quartz, slightly kaolinized feldspars, and rock fragments are present. The rock types observed include intergranular basalt, fine-grained rhyolite, welded tuff with axiolitic texture, and one very coarse fragment of chalcedony. These rock fragments probably make up less than 3 percent of the total inclusions.

Sample 38, Starkweather Smudged Decorated. The paste of this sherd is dark brown and has a very gritty texture. The paste contains sands that constitute 15 percent of the paste. These sands range in size from silt-sized to medium. The sands are rounded and consist predominantly of quartz, although there are also grains of untwinned feldspar, plagioclase, and sparse hornblende. Black opaque spots were common in the paste. These spots likely represent biotite altered to hematite and clay minerals. Two very coarse-sized fragments of rhyolitic welded tuff were observed. Axiolitic texture was observed in both tuff fragments. These two tuff fragments contained porphyritic sanidine.

Sample 39, Reserve Plain Corrugated Smudged. The paste of this sherd is opaque black. Contained within the paste are fragments of an andesite porphyry. The groundmass is cryptocrystalline and contains abundant, very fine ferro-manganese inclusions giving a dark appearance to the rock fragments. Some of the ferro-manganese grains display alteration to hematite around their margins. Contained porphyritically are laths of andesine or bytownite, plagioclase, and occasionally blue-green pyroxene, probably augite. Plagioclase and augite are also present as isolated mineral grains in the paste. A few rock fragments have a distinctly glassy matrix and trachytic texture that suggest a basaltic andesite. Some sparse quartz is present as chalcidony. These rock fragments and mineral grains range in size from medium to very coarse and make up about 35 percent of the clay body.

Sample 40, Reserve Black-on-white. The paste of this sherd is a light brownish gray color. It contains about 5 percent silt-sized to fine, quartz and feldspar grains. A few medium-sized isolated mineral grains are also present. These inclusions represent natural inclusions in the clay body. A few medium-sized fragments of intergranular basalt were present in the sherd. The ferro-manganese grains in the matrix of these rock fragments had altered to hematite, and the feldspars had weathered to clay minerals, giving the laths a clouded appearance.

Sample 41, Reserve Plain Corrugated Smudged. The paste of this sherd is opaque black. The paste and andesite porphyry temper observed in this sherd are quite similar to that of Sample 39. The present sherd contains about 30 percent rock fragments and isolated mineral grains that appear to have come from the rock fragments. One difference between the two samples is that Sample 41 contains a few coarse to very coarse fragments of intergranular basalt. Ferro-manganese cubes, often displaying hematitic staining, augite, and sparse weathered olivines are contained between the andesine plagioclase lathes.

Sample 42, Tularosa Patterned Corrugated Smudged. The paste of this sherd is golden brown and birefringent. The paste and the inclusions in this sherd resemble Samples 30 and 35. This sherd contains glassy tuff and highly altered sanidine that range in size from medium to very coarse. This material constitutes about 15 percent of the matrix of the sherd.

Sample 43, Tularosa Fillet Rim Smudged. The paste of this sherd is an opaque black and was tempered using andesite porphyry like that observed in Samples 39 and 41. The andesite porphyry frag-

ments and isolated grains constitute 30 percent of the paste and range in size from medium to very coarse.

Sample 44, Tularosa White-on-red Smudged. The paste of this sherd is an opaque brown color and has a very gritty texture. The gritty paste resembles that of Samples 37 and 38 in that it contains rounded quartz, untwinned feldspars, and plagioclase along with trace amounts of hornblende, microcline, and biotite. Two very coarse-sized fragments of intergranular basalt were also present. The inclusions make up about 30 percent of the sherd's matrix and range from silt-sized to coarse in size.

Sample 45, Reserve Plain Corrugated Smudged. The paste of this sherd is golden brown and slightly birefringent. The paste and inclusions in this sherd resemble Samples 30, 35, and 42. Fragments of weathered sanidine, glassy tuff, and intergranular and intersertal basalt range from fine to coarse in size and make up about 10 percent of the paste.

Sample 46, Tularosa Black-on-white. The paste of this sherd is light gray. Sample 27 has a similar paste to this sherd. Dark brown, opaque, fine to medium-sized inclusions are present in the paste of this sherd. The quartz sands and inclusions make up about 20 percent of the paste and range in size from silt to medium-sized. A single very coarse quartz grain was also present in the paste.

Sample 47, Tularosa Black-on-white. The paste of this sherd has an uneven, gray mottled appearance. The paste contains sparse subrounded to rounded quartz sands and three fragments of fine-grained intergranular basalt. The paste of the parent vessel was tempered using crushed potsherds. The sherd particles range in size from medium to coarse and do not contrast strongly with the paste. The sherd temper constitutes about 10 percent of the paste.

Sample 48, Klagetoh or Snowflake Black-on-white. The paste of this sherd is a yellowish gray color. The paste is tempered with crushed potsherds. Also present in the paste are grains of subrounded quartz, untwinned feldspars, plagioclase, and sparse microcline and augite. A few fragments of an andesite porphyry were also present. The andesite has a cryptocrystalline groundmass with finely disseminated ferro-manganese grains. Andesine plagioclase is the porphyritic mineral. A few rock fragments appear to be derived from a trachytic intergranular basalt. All of the mineral and rock fragments are found in both the clay body and the sherd temper. The sherd temper ranges from dark grayish brown and opaque to light gray, indicating the use of

sherds from different sources for use as temper. The inclusions range from medium to very coarse in size and make up 20 percent of the paste.

Sample 49, Reserve Indented Corrugated. The paste of this sherd is dark brown and has a gritty appearance. The inclusions in this sherd are similar to those observed in Samples 37, 38, and 44. However, slightly fewer silt-sized inclusions were observed in the paste of this sherd than in the previous samples. Like the previous samples, the paste contains subangular to subrounded quartz, untwinned feldspar, and plagioclase grains. Sparse hornblende, microcline, and brown biotite were also present. Rock fragments observed included intergranular and intersertal basalt and rhyolitic welded tuff. The mineral grains and rock fragments make up 15 percent of the paste and range in size from medium to very coarse.

Sample 50, Reserve Patterned Corrugated Smudged. The paste of this sherd has a distinctively gritty texture and is dark brown. The paste of the sherd strongly resembles that of Samples 37, 38, and 44. However, the most common rock type observed in the paste was a latite, like that observed in Sample 36. In some latite fragments, andesine plagioclase was contained porphyritically. Less commonly, brownish fragments of intersertal basalt were also present. The inclusions make up about 30 percent of the ceramic matrix and range from silt-sized to very coarse.

Sample 51, Clay from Soil Profile. The clay is a reddish-brown color. Contained within the clay body are a mixture of subrounded quartz, untwinned feldspar, and plagioclase grains. Also present are fragments of volcanic rock. The most common rock type is a fine-grained intergranular basalt. A few fragments of intersertal basalt were also present. The inclusions constitute about 20 percent of the clay body and range in size from fine to very coarse. The rock fragments are larger than the mineral grains, ranging from medium-sized to very coarse.

Sample 52, Clay from Soil Profile. The clay is reddish-brown. In terms of inclusions, this sample is virtually identical to Sample 51. A chalcedony fragment was present in this clay as well. The rock fragments and isolated mineral grains make up about 15 percent of the clay body and range in size from fine to very coarse.

Sample 53. The clay is light reddish-brown. Within the clay are abundant inclusions of isolated mineral grains and rock fragments. The most common rock type observed in this sherd was an intersertal basalt. The groundmass is a reddish-brown glass and contains plagioclase porphyritically. A few

fragments of a fine-grained intergranular trachytic basalt were also present. These inclusions range from silt-sized to medium and constitute about 15 percent of the clay matrix.

CONCLUSIONS

Sherds in the pre-A.D. 1050 analysis do not appear to have been tempered, but rather contained natural inclusions derived from volcanoclastic sediments, possibly Gila Conglomerate, that were later redeposited in the clays used for making ceramics. This conclusion is based on the presence of the same types of rocks and minerals in the clay samples derived from outcrop sources as in most of the sherds. Samples 4 and 12 have slightly different rock fragments from the other sherds. These two samples could represent items of exchange or simply reflect the variability of the local clay sources.

Previous petrographic analysis has been conducted on sixteen sherds from the SU site (Connolly 1943)—Alma Plain, Alma Rough, and San Francisco Red. All but one of the sherds were found to have similar pastes and tempers. The sherds contained predominantly rounded to subangular rock fragments rich in plagioclase that formed a constituent of andesitic or trachytic rock fragments. Quartz was also present as coarse or fine-grained fragments. Some magnetite was present in the rock fragments, often altered to hematite. The size of the temper ranged between .16 and .64 mm. A single sherd of Alma Rough was tempered using volcanic tuff containing sparse plagioclase and magnetite. These tuff fragments ranged between .16 and .8 mm.

Superficially, these materials resemble those found during the present study. There are, however, a number of critical differences that separate the two petrographic samples. First, the Luna Project samples often contained a wide range of rock types. Sanidine rather than plagioclase was the predominant feldspar. The rounded nature of many of the grains in the paste of the SU sherds indicates that either the temper was derived from crushed Gila Conglomerate, or like the Luna samples, clay beds adjacent to the Gila Conglomerate were exploited, and additional tempering material did not need to be added. If naturally tempered clays were used, the differences between the samples from the SU site and those from the current project are due to compositional variation in the source clays.

Samples 9 and 17 contained, almost exclusively, tuff fragments and are apparently similar to the volcanic ash-tempered specimen from the SU site.

The rounded and often highly altered nature of the tuffs indicated that, rather than having been obtained from outcrop sources, tuffs would probably have been derived from the Gila Conglomerate or as natural constituents of the clay.

Analysis of the post-A.D. 1050 ceramics has allowed for the identification of several fabric groups. Other ceramic samples could not be assigned to particular groups but, based on the minerals and rock fragments present, could be assigned to at least a general geological source.

Samples 30, 35, 37, 42, and 45 share a common brown birefringent paste. Contained within the clay body are a mixture of subrounded sands and volcanic rock fragments. The volcanic rock fragments are highly variable in terms of texture and composition. These sand and rock fragments usually make up about 15 percent of the clay body, except in the case of Sample 37, where the inclusions make up 30 percent of the body.

Petrographic examination of the inclusions in two of the three clay samples found a mix of sands and volcanic rock fragments similar to those observed in the above samples. Both of the samples from soil profiles contained 15 percent mineral grains and rock fragments. The inclusions in the five sherds ranged between fine to very coarse. The one clay sample from an excavated context had a mineral suite and amount of inclusions similar to the other two clay samples. However, the particle size of the inclusions extended from silt-sized to medium-sized.

Sands containing volcanic rock fragments were also observed within Samples 23, 38, 44, 49 and 50. The amount of the sands and variation in the rock fragments observed in these sherds indicates that they were derived from geological deposits similar to the samples that contained sands and volcanic rock.

Previous analysis of brown ware ceramics from earlier components excavated during the Luna Project revealed the use of clays containing rock fragments and mineral grains derived from the Gila Conglomerate. Evidence from the current analysis of ceramics and clays indicates that brown-firing clay containing detrital rock fragments from the Gila Conglomerate continued to be used for over 1,000 years.

Samples 24, 29, and 36 contain crushed latite temper and have similar enough pastes to have come from the same source. Several latite sources are available in the Tularosa Mountains, east of the project area.

The andesite or basaltic andesite observed in

Samples 39, 41, and 43 are likely to have been derived from the same source. All three of these sherds have a dark opaque paste. Andesites are present in the lower part of Tularosa Canyon and in the northern portion of the Tularosa Mountains (Rhodes and Smith 1976).

The two sherds of Mimbres Classic Black-on-white were derived from different productive sources. Neither of the sherds contained temper in the traditional sense but were made using clays that contained detrital rock fragments. Sample 28 contained basalt grains and glass fragments. Clay deposits are often associated with these formations (Hernon et al. 1965). Tuffs are also found redeposited in alluvial deposits in valley fill and certainly within the Gila Conglomerate, which outcrops along the Gila River and its major tributaries. It is from this type of source that the two sherds were derived.

The other white ware sherds appear to come from a number of different sources, none local. Samples 27 and 46 appear to have been derived from the same source. This assumption is based on the presence of fine to medium-sized opaque dark spots that appear to represent some sort of decomposition product.

Small isolated grains of basalt were present, but uncommon, in Samples 31 and 40, Reserve/Tularosa Black-on-white and Reserve Black-on-white. Both of these sherds also had a slightly brownish-gray paste. Basalt was also observed within the paste and sherd temper of Sample 48, Klagetoh or Snowflake Black-on-white. The sparse representation of intergranular basalt in these three sherds indicates that it was a natural inclusion in the ceramic clay and not an added material. The source of the basalts in these three sherds is unknown, given the lack of comparative material from contemporary assemblages in western New Mexico and eastern Arizona.

Fine quartz sands were present as natural inclusions in the rest of the Cibola white ware ceramics examined (Samples 25, 26, 32, 33, and 47). Due to the variability of the paste of these five sherds, they were likely to have been derived from five different sources. The fine white paste and sands suggest that the parent vessels may have been produced to the north on the Colorado Plateau.

It appears that only brown ware ceramics were produced at the Luna Project sites. The majority of the brown wares contained sediments derived from the Gila Conglomerate. Clays from the terraces where the sites are located would have served as a convenient source of raw materials for ceramic production. Several brown ware sherds contained basaltic andesite and latite. These materials would

have been available in the mountains to the east and in Tularosa Canyon. Sherds that contained these extrusive rock fragments represent local exchange or limited use of other materials than the Gila Conglomerate.

Decorated white wares appear not to have been produced in the area. The Mimbres white wares examined during this project are more likely to have been produced somewhere to the south and east. The

Cibola white wares, for the most part, appear to have been produced on the Colorado Plateau, where potters had access to illitic clays that contained little iron. The presence of volcanic rock fragments in a few of the white ware sherds points to additional sources of white ware, possibly in eastern Arizona. Analysis of white ware ceramics from sites in eastern Arizona would be necessary to illuminate the sources of these ceramics.

MISCELLANEOUS ARTIFACT ANALYSIS

Sonya O. Urban

This project produced a wide variety of objects that were classified as miscellaneous: ornaments, effigies, manuports, pipes, crystals, adobe casts, and minerals. The sites represent several consecutive time periods in the Mogollon area: the Archaic/Pinelawn phase through the Tularosa phase. Since the sites cover a wide time period in the Mogollon area, the analysis provided some insight into the changing needs and certain economic aspects of the communities studied. This is a diverse group of artifacts and potentially important to our knowledge of prehistoric trade routes, trade goods, personal adornment, and ceremonial items.

Each artifact will be discussed first according to morphology, then in more detail in the context of the site in which it was found. The sites and the significance of the artifacts found from the different time periods will be discussed at the end of this section. These collections of artifacts indicate certain trends of trade and cultural exchange.

METHODS

The analysis of the miscellaneous artifacts was completed using methodology developed specifically for the project. The criteria developed for previous OAS projects were also considered. Artifacts were analyzed primarily by assemblage and then in subgroups by provenience due to the relatively small size of the assemblage. The variables monitored include material type, morphology, shape, condition, drill hole type, drill hole measurements, manufacturing stage, surface treatment, wear polish, count, weight, length (and portion), width (and portion), thickness (and portion), and source of materials used.

All miscellaneous items were recorded and measured. Notable artifacts were photographed or drawn. All measurements were made in millimeters with a sliding caliper, and artifact weights were recorded in grams. Each artifact was examined with a binocular microscope to assist in the identification of material types and morphologies. The magnification varied from 15x to 80x, and the higher magnifi-

cations were used to closely examine drill holes, manufacturing stages, and wear patterns.

Material sources were identified by gross category unless specific sources were recognized. Figure 4.43 identifies terms used in reference to shell morphology in the manufacturing process. Wear pertains to the identification of characteristics present based on the use of the item, as opposed to its manufacture. Condition refers to whether the whole artifact is represented, or only a portion of the original piece.

All artifacts were recorded as whole or fragmentary. The material types, morphology, and sources were monitored to assist in the determination of possible trade routes, in addition to the use of local versus imported materials. Drill hole forms and measurements, manufacturing stages, and surface treatments were recorded to determine if the ornaments were locally produced or imported as finished goods. The shape of the artifact is used as a general indicator of the forms most often used.

ARTIFACT SUMMARY

A total of 541 miscellaneous items were collected from 17 of the 25 excavated sites in the project area. The artifacts are represented by whole and fragmentary objects, a broad variety of materials, locally available and imported goods, and a number of proveniences.

Minerals

Over the course of testing and excavation, 150 mineral samples were recovered from 12 of the 25 sites in the project area. Several different material types are represented, all of which exist in the region. Some of the mineral samples were soft enough to be used as pigments, and several show evidence of grinding (Table 4.69). Unfortunately, a few of the soft mineral samples were washed, so it is difficult to determine if the sample was actually ground.

A few chrysocolla samples showed evidence of grinding, which may indicate use as a pigment.

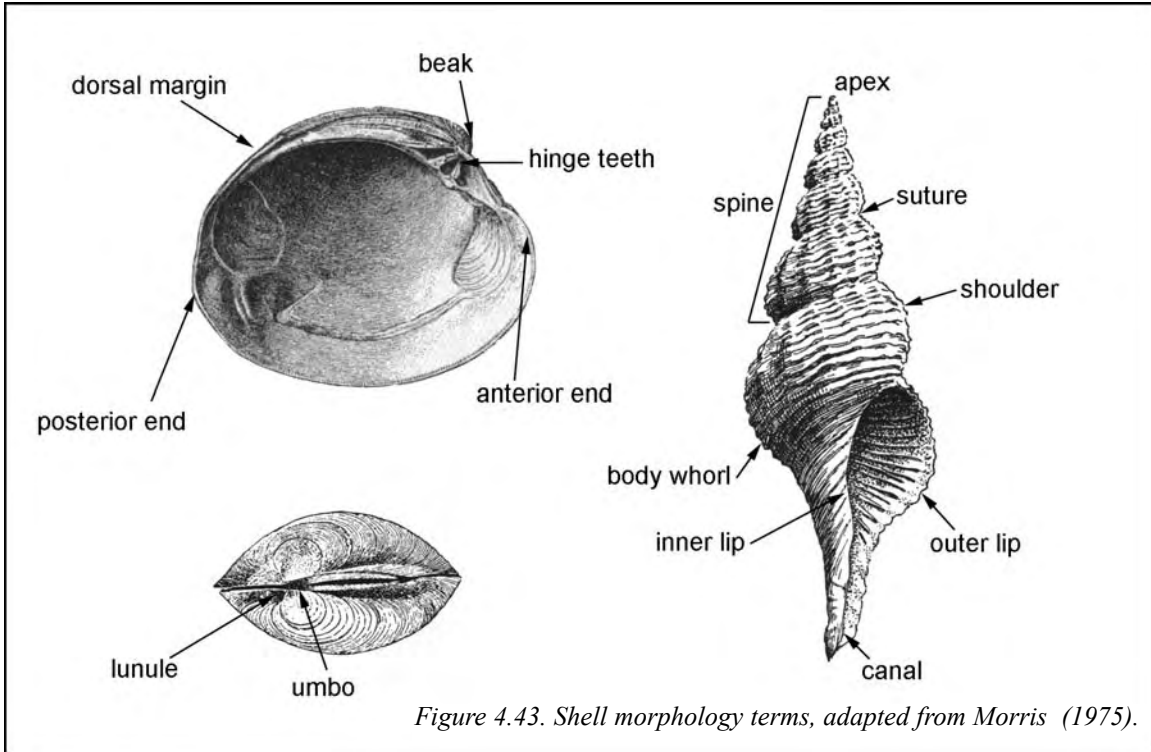


Figure 4.43. Shell morphology terms, adapted from Morris (1975).

Several pieces of the mineral were ground further into partially formed ornaments. This chrysocolla may have been used as a turquoise substitute (Sense 1967; Jernigan 1978) if the exotic commodity was difficult to find locally.

LA 3279 (Hough Site). A total of 65 mineral samples were collected from this site (Table 4.70). These samples consisted of chrysocolla (51), azurite (5), malachite (5), limonite (2), and one sample each of mica and azurite/malachite in matrix. The azurite measures an average of 6 by 5 by 4 mm, and the mica measures 5 by 4 by 2 mm. The chrysocolla fragments measure an average of 12 by 8 by 6 mm

and were primarily found in room fill; several were ground on one or more faces. The modified chrysocolla samples were found respectively in Rooms 6, 7, 8, and 15.

Room 2 contained three pieces of chrysocolla. All were found in the general room fill.

Eleven chrysocolla samples were recovered from Room 6; one of the larger pieces was ground flat on one side.

In Room 7, five fragments of malachite were found (originally as one or two pieces) in the fill approximately 15 cm above the floor. The largest piece measures 20 by 15 by 9 mm. Of the seven

Table 4.69. Number of Unmodified and (Modified) Minerals through Time

	Azurite/ Malachite	Chryso- colla	Azurite	Malachite	Mica	Pipestone	Gypsum	Hematite	Limonite	Total
Pinelawn								1 (1)	3	4 (1)
Georgetown		4						2		6
San Francisco								1 (1)	5 (3)	6 (4)
Three Circle		2 (1)	1 (1)				1 (1)	6	3	13 (3)
Reserve		14 (5)	1			1		3 (1)	2	21 (6)
Reserve/ Tularosa		5 (2)						2		7 (2)
Tularosa	1	62 (8)	19	6	1		1	1 (1)	2	93 (9)
Total	1	87 (16)	21 (1)	6	1	1	2 (1)	16 (4)	15 (3)	150 (25)

Table 4.70. Modified and Unmodified Minerals from LA 3279

Provenience	Material	Modified	Unmodified	Total
Room 2; general fill	chrysocolla		3	3
Room 5; general fill	chrysocolla		1	1
Room 5; general fill	azurite		2	2
Room 6; general fill	chrysocolla	1	10	11
Room 7; 15 cm above floor	malachite		5	5
Room 7; general fill	chrysocolla	2	5	7
Room 7; Feature 2	chrysocolla		1	1
Room 8; general fill	chrysocolla	3	1	4
Room 8; general fill	azurite/malachite		1	1
Room 10; general fill	chrysocolla		13	13
Room 10; Feature 3	chrysocolla		1	1
Room 10; between floors	limonite		2	2
Room 11; general fill	chrysocolla		4	4
Room 11; general fill	azurite		1	1
Room 12; floor fill	chrysocolla		1	1
Room 13; general fill	azurite		1	1
Kiva; general fill	chrysocolla	2	1	3
Kiva; general fill	mica		1	1
General site fill	chrysocolla		1	1
General site fill	chrysocolla		1	1
General site fill	azurite		1	1
Total		8	57	65

chrysocolla fragments found in the general fill, two are modified. One is ground on a single side, and the second, ground and abraded on several sides, may be an ornament blank (Fig. 4.44c). An unmodified piece was in the fill of Feature 2, a pit in the north-west corner of the room, along with a Reserve corrugated olla.

Of the four fragments of chrysocolla found in Room 8, two are ground on three sides, and a third is ground and partially shaped. In addition, a piece of azurite/malachite in matrix measuring 9 by 8 by 5 mm was found in the general fill.

Room 10 contained a fragment of unmodified chrysocolla in Feature 3, a pit adjacent to and partially underneath the west wall. In addition, two fragments of limonite measuring an average of 10 by 8 by 5 mm were found between floors in the remodeled southern area of the room.

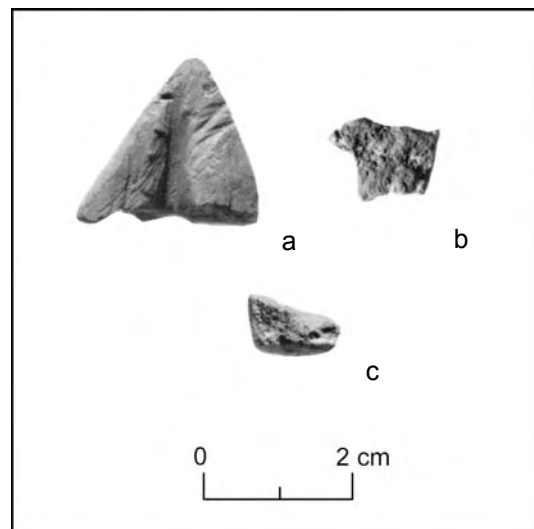


Figure 4.44. Possible ornament blanks from LA 3279.

Table 4.71. Modified and Unmodified Minerals from LA 39968

Provenience	Material	Modified	Unmodified	Total
Pit structure; general fill	gypsum		1	1
Pit structure; general fill	malachite		1	1
Pit structure; general fill	azurite		4	4
Pit structure; general fill	chrysocolla		7	7
Pit structure; general fill	hematite	1		1
Pit structure; entryway	azurite		4	4
Pit structure; below roof fall	azurite		1	1
Feature 10	chrysocolla		1	1
Roomblock 2	chrysocolla		1	1
General site fill	chrysocolla		2	2
General site fill	azurite		5	5
Total		1	27	28

The great kiva (Room 15) contained three pieces of chrysocolla. Two of the fragments have one end ground and shaped, one of these possibly as the start of an ornament (Fig. 4.44b).

LA 3563 (South Leggett Pueblo). Two pieces of soft hematite (red ochre) measuring 47 by 22 by 12 mm were found in the upper fill of the pit structure. Any evidence of cultural modification was lost when they were washed. Since the pit structure fill was redeposited, the artifact's context is suspect.

LA 39968 (Spurgeon Draw). A total of 28 mineral samples were recovered (Table 4.71). These samples consist of azurite (14), chrysocolla (11), and a single sample each of hematite, gypsum, and malachite. The azurite fragments measure an average of 10 by 8 by 4 mm, and the average measurement of the chrysocolla is 10 by 8 by 5 mm.

The pit structure contained the majority of minerals on the site. A fragment of gypsum measuring 27 by 22 by 17 mm, a single piece of malachite measuring 9 by 8 by 6 mm, and several fragments of azurite and chrysocolla were recovered. A piece of heavily modified hematite measuring 45 by 12 by 10 mm was also found in the pit structure. This artifact is ground and shaped into a form easily held between the fingers (Fig. 4.45a). It may have been used as a paint stick. No mineral samples were found in the floor fill or on the floor of the structure.

LA 39969 (Haury's Site). This site contained 20 mineral samples (Table 4.72), including chrysocolla (14), hematite (3), a single sample each of limonite, azurite, and pipestone. The average measurement of

the chrysocolla is 8 by 6 by 4 mm. The hematite samples are small, measuring an average of 14 by 13 by 7 mm.

A modified piece of chrysocolla was recovered from the floor fill of Room 1. This mineral sample was shaped into a pyramid with three ground surfaces.

A fragment of limonite measuring 32 by 22 by 6 mm was recovered from the fill of Room 2. The sample was washed, so any cultural modification is not apparent. A chrysocolla sample was recovered from the floor fill of this room. To the south of Room 2 was a flagstoned area, below which three

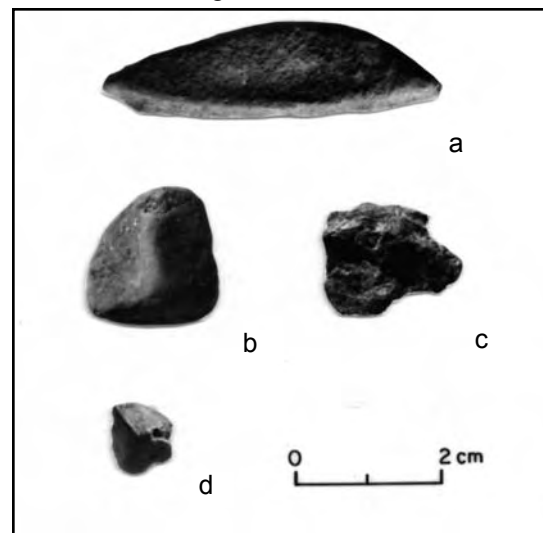


Figure 4.45. A selection of minerals; (a-b) hematite, LA 39968, (c) azurite, LA 39969, (d) hematite, LA 39972.

Table 4.72. Modified and Unmodified Minerals from LA 39969

Provenience	Material	Modified	Unmodified	Total
Room 1; floor fill	chrysocolla	1		1
Room 2; general fill	limonite		1	1
Room 2; floor fill	chrysocolla		1	1
South of Room 2	chrysocolla	1	2	3
Room 3; lower fill	azurite		1	1
Room 3; lower fill	hematite	1		1
Room 3; lower fill	chrysocolla	1	4	5
Room 3; floor fill	chrysocolla	1	1	2
Feature 9	chrysocolla	1		1
Feature 2	chrysocolla		1	1
Outside roomblock	pipestone		1	1
Outside roomblock	hematite		2	2
Total		6	14	20

chrysocolla fragments were found. One piece is ground and shaped and may have been formed to imitate the turquoise domed bead found on this site.

In Room 3 of the structure, several mineral samples were found. From the lower fill, a piece of azurite measuring 19 by 14 by 10 mm, a ground hematite sample, and five chrysocolla fragments (one of which is ground) were recovered (Fig. 4.45). Two additional chrysocolla pieces were recovered from the floor of the structure. One of these is ground and appears to be ornamental debris.

Near Feature 9 (an ash pit) a fragment of ground chrysocolla was recovered. A second piece of chrysocolla was found in the lower fill of Feature 2, a shallow pit to the west of Room 2. Two pieces of hematite were recovered outside of the rooms. A large sample of pipestone measuring 140 by 108 by 94 mm was also recovered outside the rooms, possibly cached for later use.

LA 39972 (SU Tanks). A single piece of hematite was found in the Pinelawn component of the site. This sample is shaped into a small pyramid (Fig. 4.45d) and was probably used as a pigment. The artifact shows evidence of grinding and abrasions on all four sides. It measures 10 by 9 by 6 mm.

LA 39975 (Lazy Meadows). Three pieces of limonite were found near the surface of the site. One fragment was washed, so any modification is lost. The samples may have been kept for eventual use as pigment, but their context leaves some doubt as to

their use. The mean measurements of these samples are 34 by 27 by 18 mm.

LA 45507 (Luna Village). Eleven mineral samples were found in Luna Village (Table 4.73). The materials were identified as: hematite (4), limonite (3), chrysocolla (2), and one sample each of azurite and gypsum. Three of the mineral samples are ground. The average dimensions of the limonite are 14 by 11 by 7 mm, and of the chrysocolla, 11 by 8 by 6 mm.

In Pit Structure 3, a single piece of ground gypsum was found on the floor (Fig. 4.46c). It measures 17 by 13 by 4 mm and is ground thin and flat.

Outside Pit Structure 9, a blocky chunk of hematite measuring 57 by 48 by 44 mm was found.

Recovered from the fill of Pithouse 12 was a piece of chrysocolla ground on one side. On the floor of this structure was a piece of ground azurite measuring 12 by 9 by 5 mm (Fig. 4.46e) that may have been used as pigment.

In the fill of Pithouse 13, an unmodified fragment of chrysocolla and a piece of hematite were found.

LA 45508 (Humming Wire). One mineral sample was recovered from this site. A piece of unmodified hematite measuring 23 by 18 by 16 mm was found in the upper fill of Pit Structure 1.

LA 45510 (SAK site). Five unmodified mineral samples were found in the upper 30 cm of fill on this site. Four are small fragments of chrysocolla, the

Table 4.73. Modified and Unmodified Minerals from LA 45507

Provenience	Material	Modified	Unmodified	Total
Pithouse 3; floor	gypsum	1		1
Pithouse 3; general fill	limonite		1	1
Outside Pithouse 9	hematite		1	1
Pithouse 12; general fill	hematite		3	3
Pithouse 12; general fill	chrysocolla	1		1
Pithouse 12; general fill	limonite		1	1
Pithouse 12; floor	azurite	1		1
Pithouse 13; general fill	chrysocolla		1	1
Pithouse 13; general fill	limonite		1	1
Total		3	8	11

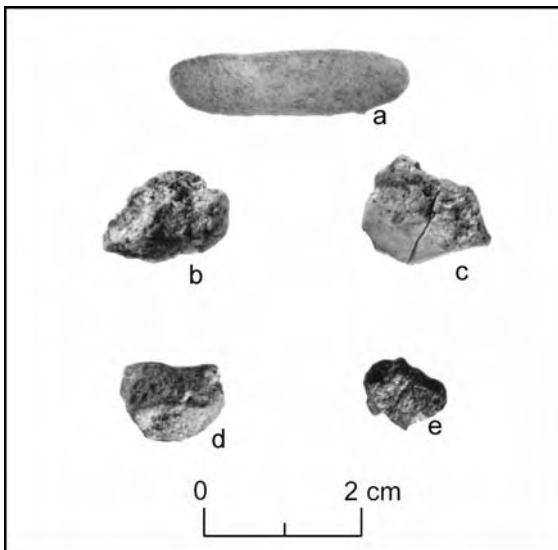


Figure 4.46. Modified minerals; (a) limonite, LA 70196, (b, d) chrysocolla, LA 70185, (c) gypsum, LA 45507, (e) azurite, LA 45507.

fifth, a blocky chunk of hematite. The chrysocolla measure an average of 4 by 3 by 2 mm, and the hematite measures 18 by 13 by 11 mm.

LA 70185 (DZ site). A total of seven mineral samples were found on this site: two pieces of hematite and five fragments of chrysocolla. The hematite measure an average of 22 by 13 by 8 mm, and the chrysocolla average 10 by 8 by 7 mm. Three of the five pieces of chrysocolla were found inside the roomblock. One chrysocolla fragment is ground on two sides and was found in the wall of Pit 8 in Room 1 (Fig. 4.46d). A second fragment was found in the fill of Room 2, and the last, ground on two

sides, was found in the ventilator shaft in the same room (Fig. 4.46b). One chrysocolla fragment, found outside the roomblock, was associated with a sandstone pendant. The remaining samples were found outside the structure.

LA 70196 (Fence Corner). A total of six mineral samples were found on this site. Five of these are limonite, the remaining, hematite. One limonite sample found in the floor fill of the pit structure measures 32 by 12 by 9 mm and is shaped to be held in the fingers easily (Fig. 4.46a). This sample may have been used as a paint stick. Another limonite sample was soft and may also have been used as pigment. Four of the samples show grinding on a flat surface, possibly from use as pigment; unfortunately, some of these samples were washed. Three of the artifacts were from the lower pit fill, two were from the surface, and the last was found in the floor fill. The average measurements of the minerals are 38 by 30 by 19 mm.

LA 75792 (Thunder Ridge). One piece of limonite was found in the upper 9 cm of the site. The piece measures 40 by 20 by 14 mm and was not culturally modified.

Miscellaneous Stone

LA 3279 (Hough site). Several miscellaneous stone items were recovered from this site (Table 4.74), including nine ball-shaped concretions and two obsidian nodules. The majority of these artifacts were in general room fill; some were in contexts that suggest they were placed deliberately.

Two sandstone concretions were recovered

Table 4.74. Miscellaneous Stone Artifacts from LA 3279

Provenience	Artifact Type	Material	Size (cm)	Total
Room 2; general fill	ball concretion	sandstone	14 x 12 x 10	1
Room 5; general fill	nodule	obsidian	7 x 6 x 5	1
Room 6; Feature 15	ball concretion	sandstone	37 x 36 x 31	1
Room 6; floor	ball concretion	sandstone	24 x 23 x 22	1
Room 7; floor fill	ball concretion	sandstone	25 x 25 x 23	1
Room 7; floor fill	ball concretion	sandstone	19 x 18 x 14	1
Room 10; general fill	nodule	obsidian	35 x 31 x 27	1
Kiva; Level 3	ball concretion	sandstone	21 x 20 x 19	1
General site fill	ball concretion	sandstone	20 x 19 x 17	1
General site fill	ball concretion	igneous	21 x 19 x 19	1
General site fill	ball concretion	sandstone	32 x 31 x 30	1
Total				11

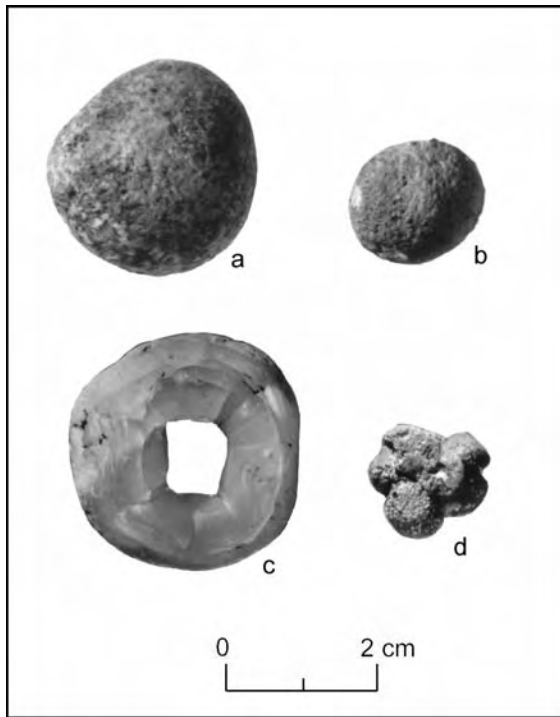


Figure 4.47. Miscellaneous stone items; (a-b) concretions, LA 45508, (c) geode, LA 39968, (d) concretions, LA 39968.

from Room 6. One was found in the fill of Feature 15, a storage pit partially underneath the southern wall of the room. The second concretion was found on the floor to the east of the hearth, also in the southern area of the room.

In Room 7, two sandstone concretions were recovered from the floor fill of the room. In Room 10, one obsidian nodule was recovered from the general room fill. The great kiva (Room 15) contained a single sandstone concretion.

LA 39968 (Spurgeon Draw). Two miscellaneous stone artifacts were recovered (Fig. 4.47c-d). The general fill of the pit structure contained a specular hematite concretion measuring 17 by 17 by 10 mm. An unmodified Luna Blue agate manuport was recovered within 2 m of the pit structure. It is a bowl-shaped, partially formed geode measuring 31 by 32 by 25 mm, with a rectangular interior hole measurement of 7 by 10 mm.

LA 45508 (Humming Wire). Three sandstone concretions were recovered from this site. These ball-shaped concretions, measuring an average of 29 by 26 by 25 mm, were found in association with Pithouse 2. The first was found to the south of the pit structure within 20 cm of the surface. The other two (Fig. 4.47a-b) were found inside the structure, one in the lower fill, and the other in the floor fill.

LA 70185 (DZ site). One sandstone concretion measuring 35 by 33 by 29 mm was found outside the structure on this site.

Crystals

A total of 174 quartz crystals were recovered from 13 of the 25 sites in the project area. Twenty-one of these crystals are culturally modified (Table 4.75), showing signs of rotary wear, grinding, abrasions,

Table 4.75. Modified and Unmodified Crystals through Time

	Modified	Unmodified	Total
Archaic		38 (3)	38 (3)
Pinelawn	5	15	20
Georgetown		2 (1)	2 (1)
San Francisco	7 (2)	5	12 (2)
Three Circle	5 (1)	28 (8)	33 (9)
Reserve	1	2 (2)	3 (2)
Reserve/ Tularosa		15 (2)	15 (2)
Tularosa	3 (1)	48 (21)	51 (21)
Total	21 (4)	153 (38)	174 (42)

The numbers in parentheses refer to crystals found in floor contact or in features.

and polishing. The majority of the specimens were found in room or pit structure fill, or on the floor of a structure. Almost one-fourth (24.7 percent) were found in features.

Quartz crystals are found throughout the region as a natural resource. Quartz occurs in plutonic, volcanic, and hypabyssal rocks. It crystallizes directly from igneous magma and often forms as geodes, crystal-lined pockets (veins), and crystal crusts (Prinz et al. 1978). In the area, it also forms alongside Luna Blue agate, which was used for lithic tools.

The sites in the project area are within 13 km of mountains with large concentrations of crystals. Since crystals are often in the soil, some quartz crystals in the structures may not have been deliberately placed there, but washed in after abandonment; others were found in contexts suggesting that they were deliberately placed. The total weight of the crystals is 1675.7 g. All utilized crystals, plus several that were found in features, were photographed (Figs. 4.48-4.51).

LA 3279 (Hough site). A total of thirty-seven crystals were recovered from this site (Table 4.76). Two of these show signs of cultural modification and were found in the great kiva and in the upper fill of Room 9. Several of the unmodified crystals show signs of erosion in the form of a tumbled, battered, and broken appearance. Crystals not found in features, especially those in the upper levels of fill, probably washed in after abandonment. The crystals measure an average of 24 by 11 by 9 mm.

Room 7 had a single crystal in the fill of Feature

Table 4.76. Modified and Unmodified Crystals from LA 3279

Provenience	Modified	Unmodified	Total
Room 2; lower fill		2	2
Room 5; lower fill		5	5
Room 6; upper fill		1	1
Room 7; Feature 8		1	1
Room 9; general fill	1		1
Room 9; lower fill		2	2
Kiva; upper fill		1	1
Kiva; middle fill		6	6
Kiva; Feature 8		1	1
Kiva; Feature 14		3	3
Kiva; Feature 2	1	2	3
General site fill		11	11
Total	2	35	37

8, a posthole in the southern area of the room. This crystal was found upright in the upper 10 cm of the fill. The crystal is rather large and measures 52 by 33 by 30 mm (Fig. 4.48a).

Room 9 contained one of the culturally modified crystals in the general fill (Fig. 4.48b). The artifact is ground heavily on all edges and shows some polishing on these edges as well, possibly indicating bag wear (this may have been a medicine bag item). Two more crystals were present in the lower fill, one of which was found in the doorway between Rooms 9 and 10. It was probably placed there deliberately.

Several quartz crystals were found in the fill of the great kiva (Room 15). Some of these were in features, suggesting they were deliberately placed. A single crystal was found in Feature 8, a small rock-lined pit. Three were present in the fill of Feature 14, a burial and associated pit (Fig. 4.48c-e). Three crystals were also found in the fill of Feature 2, a foot drum and subfloor ash pit. One of these crystals has evidence of grinding and wear, and a slight amount of polish on the edges.

Outside the structure, eleven quartz crystals were found. All of these were in the upper fill and were probably not deliberately placed.

LA 3563 (South Leggett Pueblo). A single culturally modified quartz crystal measuring 23 by 15 by 7 mm was found in the upper fill of the pit struc-

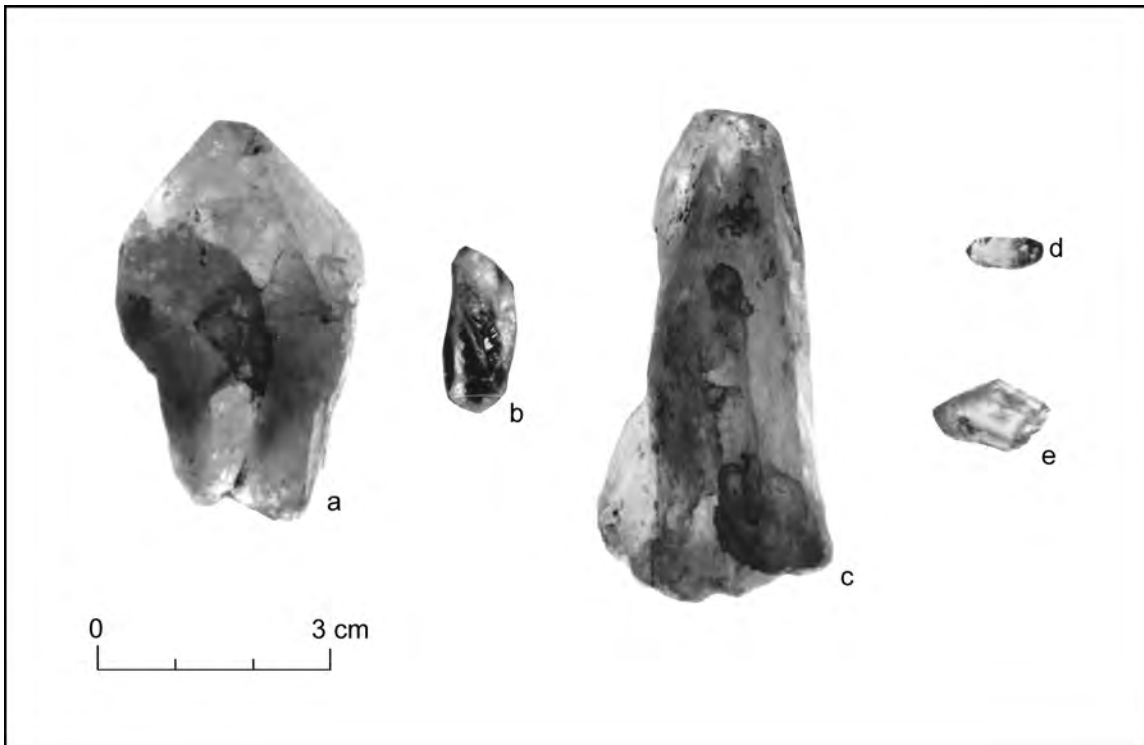


Figure 4.48. Crystals from LA 3279; (a) Feature 8, (b) general fill, (c-e) Feature 14.

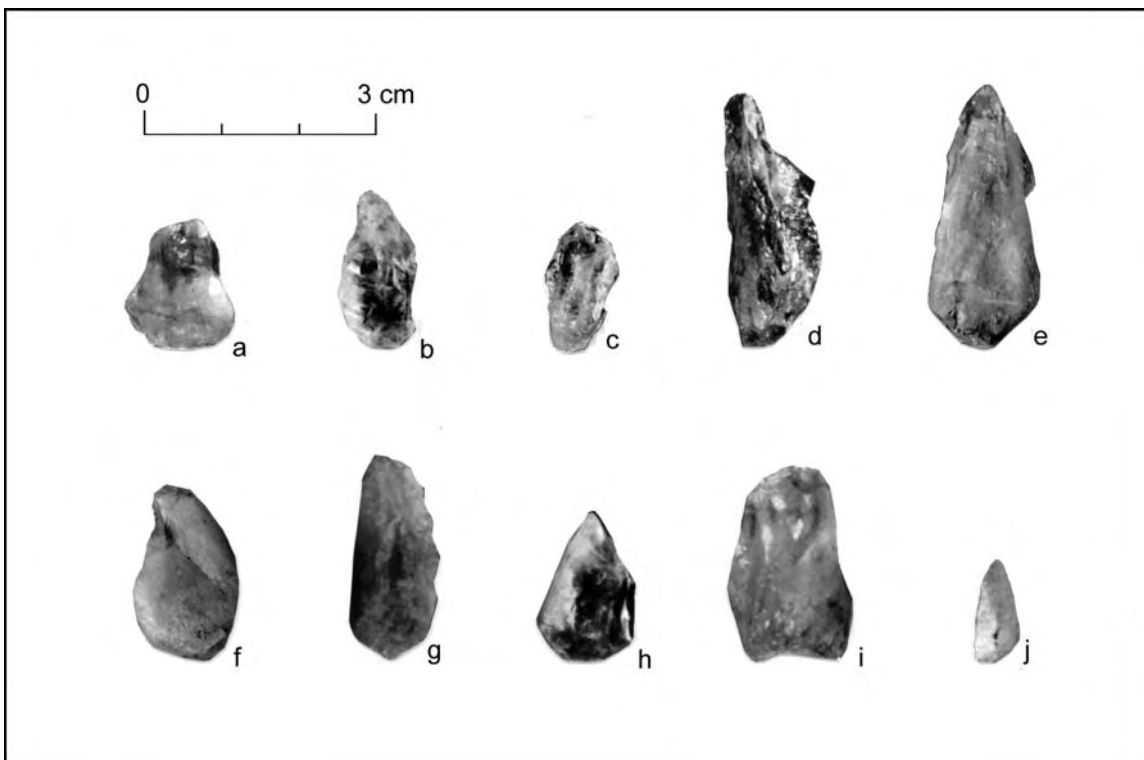


Figure 4.49. Modified crystals; (a) LA 43786, (b) LA 70189, (c-e) LA 45507, (f) LA 3563, (g-i) LA 39968, (j) LA 39969.

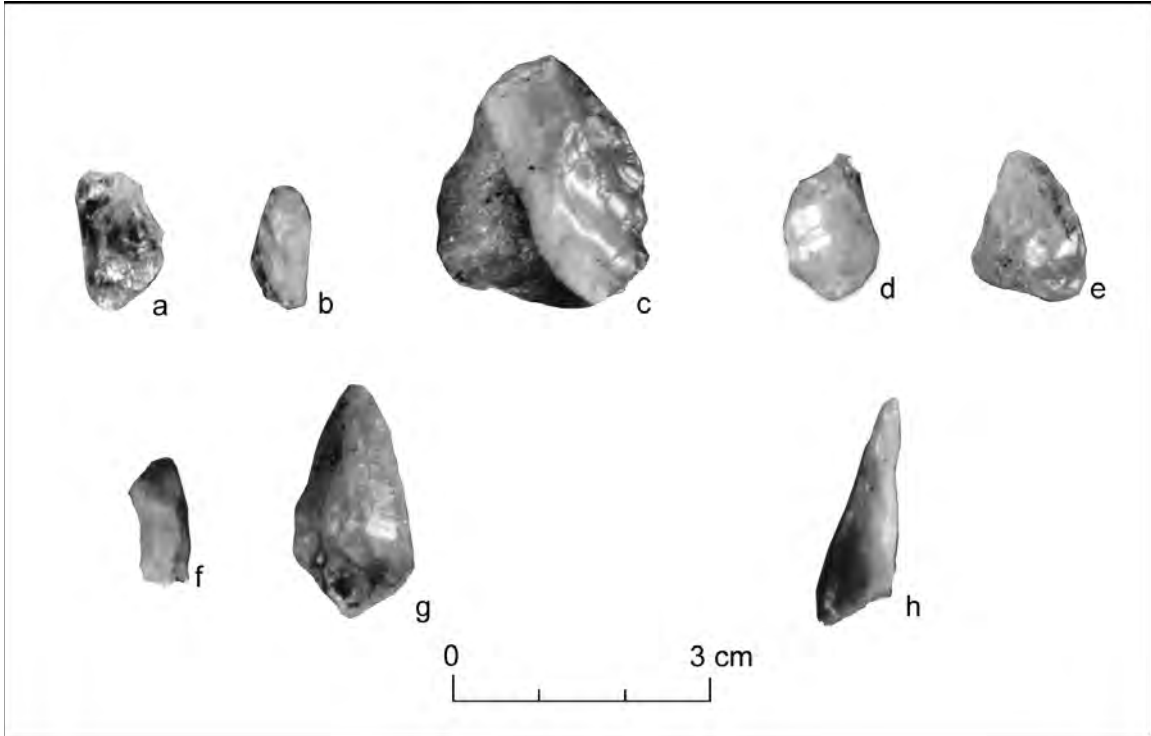


Figure 4.50. Modified and unmodified crystals; (a-e) modified crystals from LA 39975, (f-g) unmodified crystals found in features and floor contact, LA 45507, (h) unmodified crystal from LA 45508.

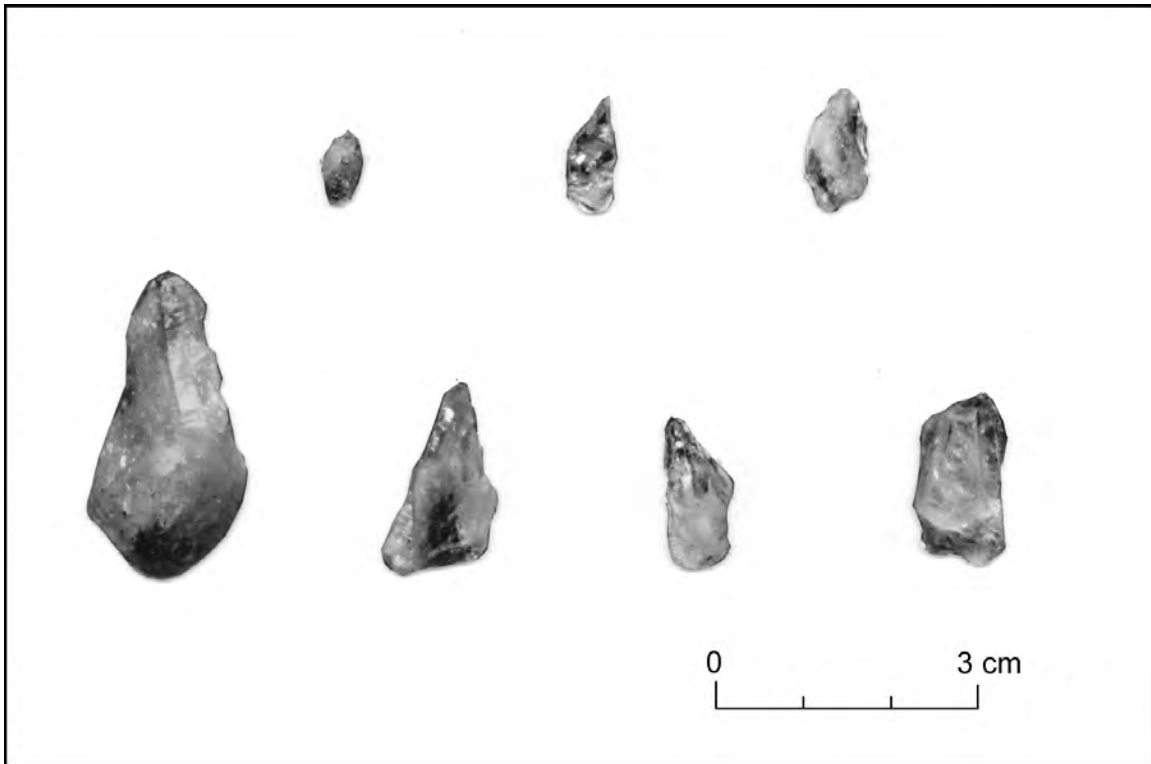


Figure 4.51. Modified crystals from LA 70196.

Table 4.77. Modified and Unmodified Crystals from LA 39968

Provenience	Modified	Unmodified	Total
Roomblock 2		4	4
Pit structure; upper fill		1	1
Pit structure; lower fill		6	6
Pit structure; floor fill		2	2
West of Room 2	1		1
Total	1	13	14

Table 4.78. Modified and Unmodified Crystals from LA 39975

Provenience	Modified	Unmodified	Total
Pithouse 1; upper fill	1		1
Pithouse 1; general fill	1	12	13
Pithouse 2; upper fill		2	2
Pithouse 3; general fill		1	1
Outside of structures	3		3
Total	5	15	20

Table 4.79. Modified and Unmodified Crystals from LA 45507

Provenience	Modified	Unmodified	Total
Pithouse 1; general fill		2	2
Pithouse 1; pit		1	1
West of Pithouse 1	1		1
Pithouse 3; floor	1		1
Pithouse 9; trash pit		1	1
Pithouse 12; upper fill		13	13
Pithouse 12; lower fill		4	4
Pithouse 12; floor fill		5	5
Burial near Pithouse 12		1	1
Pithouse 13; general fill	1	1	2
Total	3	28	31

Table 4.80. Modified and Unmodified Crystals from LA 70185

Provenience	Modified	Unmodified	Total
Room 1; general fill		2	2
Room 2; general fill		3	3
Room 2; Feature 1		1	1
Room 2; hearth		1	1
Room 2; near the bench		1	1
Outside the roomblock		7	7
Total	0	15	15

Table 4.81. Modified and Unmodified Crystals from LA 70188

Provenience	Modified	Unmodified	Total
Pit structure; general fill		19	19
Pit structure; lower fill		5	5
Pit structure; floor fill		2	2
Pit 3; general fill		8	8
General site fill		2	2
Total	0	36	36

Table 4.82. Modified and Unmodified Crystals from LA 70196

Provenience	Modified	Unmodified	Total
Pit structure; upper fill	1	2	3
Pit structure; lower fill	3	3	6
Pit structure; floor fill	1		1
Backhoe Trench 5	1		1
Outside structure	1		1
Total	7	5	12

ture. The crystal has abrasions on one tip, with some abrasions and polish evident on the edges (Fig. 4.49f). Although the artifact was modified, its original context is unknown, since the fill from the pit structure was redeposited from earlier excavations.

LA 39968 (Spurgeon Draw). A total of 14 quartz crystals were found on this site (Table 4.77). The majority showed signs of erosion in the form of a tumbled and waterworn appearance and probably entered the site through erosion. The artifacts measure an average of 22 by 13 by 10 mm. The only culturally modified crystal was found several meters west of Room 2 (Fig. 4.49h). This crystal shows some signs of erosion and has three intentionally removed flakes on one end.

Two crystals found in the floor fill of the pit structure (Fig. 4.49g, i) were probably deliberately placed. Four crystals were recovered in Roomblock 2, and all but one are tumbled; these may have entered the site through bioturbation. The crystals in the upper fill probably washed into the pit after the site was abandoned.

LA 39969 (Haury's site). Two quartz crystals were recovered from features on this site. One was recovered from Burial 1 (Fig. 4.49j), the other from Feature 2, a shallow pit to the west of Room 2. Both appear to have been deliberately placed and have average dimensions of 20 by 12 by 9 mm.

LA 39975 (Lazy Meadows). A total of 20 quartz crystals found here (Table 4.78) have a mean measurement of 22 by 15 by 11 mm. Some are waterworn and probably washed onto the site through erosional processes. Five are culturally modified and were probably used as drills (Fig. 4.50a-e). All have heavy abrasions on one end. Some show slight polishing on the edges, possibly indicating bag wear. Three of the utilized crystals were found outside the structures.

Of the fourteen crystals found in Pithouse 1, one modified artifact (a chalcedony flake with quartz crystals) was found in the upper levels. This artifact is included in the lithic analysis. In the fill of Pit Structure 2 were two crystals that may have washed in after abandonment. A crystal was also found in the fill of Pit Structure 3.

LA 43786 (Downslope site). A single crystal was found in the upper 5 cm of this site, 5 m north of a possible pit structure. This artifact appears to have been used as a drill at one time, because one end shows signs of rotary wear and polish (Fig. 4.49a). This point appears to have partially snapped off, and the rest of the crystal was probably carried in a pouch afterwards, since the edges are abraded and show some polish. The piece measures 16 by 15

by 10 mm.

LA 45507 (Luna Village). Crystals were found throughout this large pithouse village. Several were collected from each of the five excavated pit structures. A total of 31 crystals were found (Table 4.79), but only three are modified. A few are battered, waterworn, and tumbled, and eight are also in the original matrix, meaning that the inhabitants probably went to the source for them. The crystals found in the upper levels were probably a result of erosional processes rather than deliberate placement. The average measurement is 30 by 19 by 13 mm.

In Pithouse 1, three unmodified crystals were found, one of which was deliberately placed inside a small pit near the hearth (Fig. 4.50). A single modified crystal was found to the west of Pithouse 1 (Fig. 4.49).

In Pithouse 3, a single culturally modified crystal was found on the floor (Fig. 4.50). Another crystal was associated with the trash pit adjoining Pithouse 9. The majority of crystals on the site (22) were found in the fill of Pithouse 12, five in the floor fill. Another crystal was found in a burial next to Pit Structure 12 (Fig. 4.50). Pit Structure 13 contained two quartz crystals in the general fill, one of which was obviously modified (Fig. 4.50).

LA 45508 (Humming Wire). Two unmodified quartz crystals were found on this site and measure an average of 15 by 7 by 6 mm. In Pithouse 1, a single crystal was recovered from the upper fill. This quartz crystal may be associated with the occupation of a Reserve-phase roomblock on a hill overlooking the site. The second crystal was found in Pithouse 2, in the fill of Feature 2, inside a possible posthole. It was probably deliberately placed in this feature (Fig. 4.50c).

LA 70185 (DZ site). Fifteen crystals were collected from this site; none were modified, but several were found in the excavated rooms and features (Table 4.80). Many are battered, tumbled, and waterworn, and they have a mean measurement of 33 by 16 by 14 mm. The artifacts in the features appear to have been deliberately placed, while those in the upper fill probably washed in later.

Room 2 contained six crystals in all: three in the general fill, one in the hearth, one in Feature 1, and another near the bench.

LA 70188 (Raven's Roost). This site is on the side of a mountain where quartz crystals are part of the geologic formation. Many of these crystals washed out of the soil and tumbled down the mountain. Most show signs of the erosional process, such as heavy battering on the edges and facets of the material, as well as waterworn areas. A total of 36

Table 4.83. Effigies by Site

Site	Provenience	Surface	Size (mm)	Total	Site Total
LA 3279	Room 6; floor fill	rough	55 x 25 x 19	1	
	Room 7; general fill	rough	40 x 18 x 20	1	
	Room 11; lower fill	smoothed	44 x 18 x 20	1	
	Room 11; lower fill	smoothed	56 x 27 x 27	1	
	Kiva; general fill	rough, slight polish	45 x 29 x 15	1	
	Kiva; general fill	rough	66 x 22 x 33	1	
	Kiva; general fill	rough	63 x 18 x 31	1	
	Kiva; general fill	smoothed	44 x 28 x 40	1	
	Kiva; general fill	smoothed, slight polish	80 x 43 x 38	1	
	Kiva; general fill	smoothed	25 x 17 x 30	1	
	General site fill	rough	54 x 25 x 23	1	
	General site fill	rough	50 x 26 x 19	1	
	General site fill	rough	25 x 16 x 35	1	
	General site fill	rough	46 x 21 x 29	1	14
LA 39968	General site fill	rough	44 x 14 x 16	1	1
LA 39972	Pinelawn component	polished	19 x 15 x 16	1	
	Pueblo component	polished, painted	45 x 28 x 30	1	2
LA 45510	North area of site	rough	48 x 20 x 20	1	1
LA 70185	North of roomblock	smoothed	62 x 27 x 28	1	
	North of roomblock	smoothed	43 x 18 x 18	1	
	North of roomblock	smoothed	37 x 30 x 36	1	3
Total				21	21

crystals were found at various levels of the site (Table 4.81) and have a mean measurement is 19 by 9 by 7 mm. None are culturally modified.

Twenty-six crystals were found in the pit structure on the site, and eight came from the fill of Pit 3. The remaining two were recovered in the fill across the site. It is likely that the majority of these artifacts washed in after the site was abandoned. Possible exceptions are the two crystals found in the floor fill of the pit structure.

LA 70189 (Lightning Strike). A single quartz crystal was found outside the pit structure in the upper 30 cm of the site. The artifact was most likely in the trash associated with the nearby Reserve phase roomblock. The artifact measures 20 by 10 by 7 mm (Fig. 4.49) and has one ground end, with some rotary wear and slight polish evident.

LA 70196 (Fence Corner). A total of 12 quartz crystals were found on this site (Table 4.82), with a mean measurement of 18 by 11 by 8 mm. Seven out of the 12 were culturally modified, probably used as

drills (Fig. 4.51). These utilized artifacts show rotary wear, polish, and abrasions. The modified crystals were found primarily in the lower pit structure fill. One utilized crystal was found outside the pithouse just above the prehistoric surface.

Ten crystals were found inside the structure: six in the lower fill, and one in the floor fill. The crystal found on the floor of the pit structure had heavily abraded edges and tips, with some polish evident. This may indicate use as a medicine bag item (Fig. 4.51). The crystals found in the upper pit fill and outside the pit structure may have washed in after the structure was abandoned.

LA 78439 (Leaping Deer Ridge). Two unmodified crystals were recovered from this site, which is at the base of several mountain crystal deposits. A single crystal in Pit 2 and measures 13 by 6 by 4 mm. The second measures 17 by 10 by 8 mm and was found in the general site fill. The cultural association of these artifacts is unclear.

Effigies

Twenty effigies were recovered over the course of this project (Table 4.83). One was carved from a piece of quartz, and the remaining nineteen were clay. The ceramic effigies were made out of a local clay, which was also used for making vessels. The figurines were generally formed from a single coil of clay, with the legs and head molded separately and attached while still wet. The effigies are often smoothed but unpolished on the surface. Most appear to be zoomorphic quadrupeds, but the figures are incomplete. The recovered figures are of a similar size throughout the project area.

LA 3279 (Hough site). A total of thirteen ceramic effigies were recovered from this site (Figs. 4.52-4.53). The zoomorphic figures are Alma Plain Ware, and of a similar size. The average measurements are 50 by 24 by 27 mm. Most were found in room fill, and the remainder were recovered from outside the rooms.

The first effigy is a roughly made torso and head with a chipped tail and four broken legs (Fig. 4.52a). It has a rough, unpolished surface and was found in the floor fill of Room 6. The second effigy was recovered from the fill of Room 7. It is crudely formed, with a large head in relation to the body (Fig. 4.52b). This effigy has two broken legs and a rough, unpolished surface. The other two effigies were recovered from the lower fill of Room 11 (Fig. 4.52c-d). Both consist of only a torso, with the legs, tail, and head broken off. One has a hole from below the tail through the body to below the head. Both effigies have a smoothed, unpolished exterior.

Six ceramic effigies were found in the general fill of the great kiva (Room 15). One figurine (Fig. 4.52e) has an irregularly shaped head with broken ears and three broken legs. The exterior is rough but slightly polished. The surface is also somewhat burned and may have been fired with broken legs or refired at some point. The second effigy has a long torso and neck, a small head, and broken ears and legs (Fig. 4.52f). It was made without a tail and has a rough exterior. The third effigy is almost complete; the body is long and swaybacked, with stubby legs, and the head of the effigy has an open mouth (Fig. 4.52g). The ears and tail of this figure are broken, and it has a small hole below the tail. The exterior is rough, unpolished clay. The fourth effigy consists of a body with three broken legs, a broken tail and head, and a smoothed surface (Fig. 4.52h). The fifth from this area is part of a ceramic duck effigy (Fig. 4.53a). It is a hollow form, with only the body and

tail remaining. The surface is smoothed and slightly polished. The last figurine from this area consists of the hindquarters and tail of a zoomorphic figure (Fig. 4.53b). The exterior is a smoothed clay, and the hind legs are broken off.

The remaining three effigies were found outside the structures in the general fill. One is merely a torso with stumps where the head, legs, and tail used to be (Fig. 4.53g). The second effigy has the hindquarters and tail of a figurine; the legs are small stubs (Fig. 4.53i). The other figurine, partially broken by a pick, is missing two legs, a tail, and the ears (Fig. 4.53h). These three effigies have rough, unpolished surfaces.

LA 39968 (Spurgeon Draw). A single Alma Rough ceramic effigy was found outside the structures. The figurine is an unidentified zoomorphic quadruped with only the torso remaining. It is fully shaped, with a rough and unpolished surface.

LA 39972 (SU Tanks). Two zoomorphic figurines were found on this multicomponent site. The first effigy was recovered from the Pinelawn component and is carved from a piece of local quartz. Only the head was found (Fig. 4.54a), which resembles the head of a grasshopper. It is fully shaped and polished, and appears to have broken off at the neck, which was probably a weak point in the material. Two eyes were conically drilled into the head; each measures 5 mm in diameter.

The second effigy is a Reserve Black-on-white ceramic effigy handle (Fig. 4.54b). This ceramic figure was originally attached to a vessel and is fully shaped, with a polished, slipped, and painted surface. The ears, nose, neck, and back of the figure are all painted with black bands. The effigy was found on the Pueblo phase component of the site.

LA 45510 (SAK site). A single Alma Plain effigy was found on the northern end of this site (Fig. 4.54d). It is roughly shaped, with an unpolished surface. All four legs and the ears are broken.

LA 70185 (DZ site). Three Alma Plain ceramic effigies were found to the north of the roomblock. One of the animals is only a torso with a smoothed surface, a second is fully shaped, also with a smoothed surface. Both of these effigies (Fig. 4.54c, e) have a hole through the longest portion of the body (from the chest to rear end) that appears to have been formed by putting a reed through the central core of the body when the clay was wet. The diameter of this hole measures an average of 3 mm. The third effigy is only a large head (Fig. 4.54f). It is shaped and smoothed, has a broken ear, and has obviously broken off of a larger body.

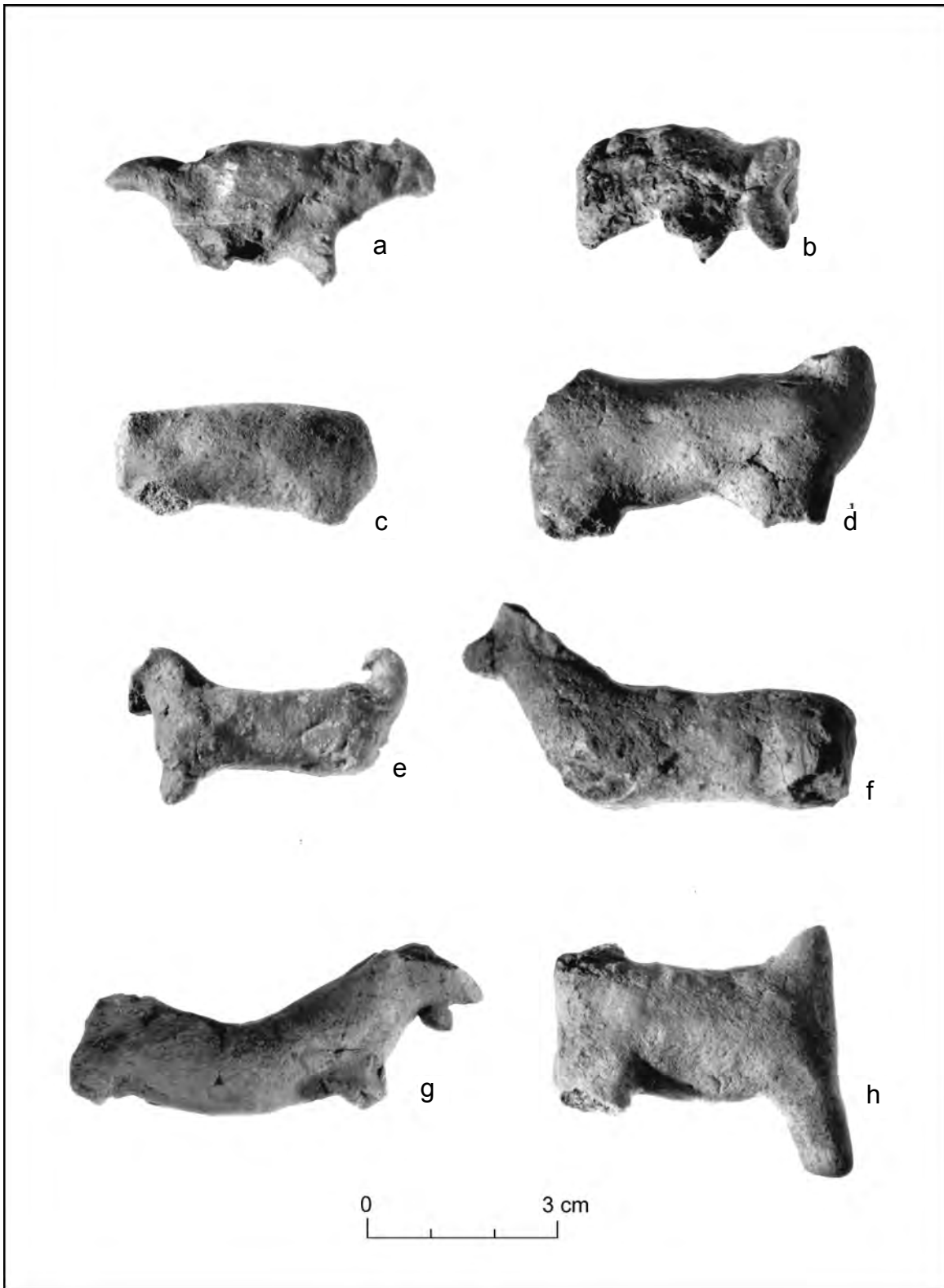


Figure 4.52. Effigies from LA 3279; (a) Room 6, (b) Room 7, (c-d) Room 11, (e-h) kiva.

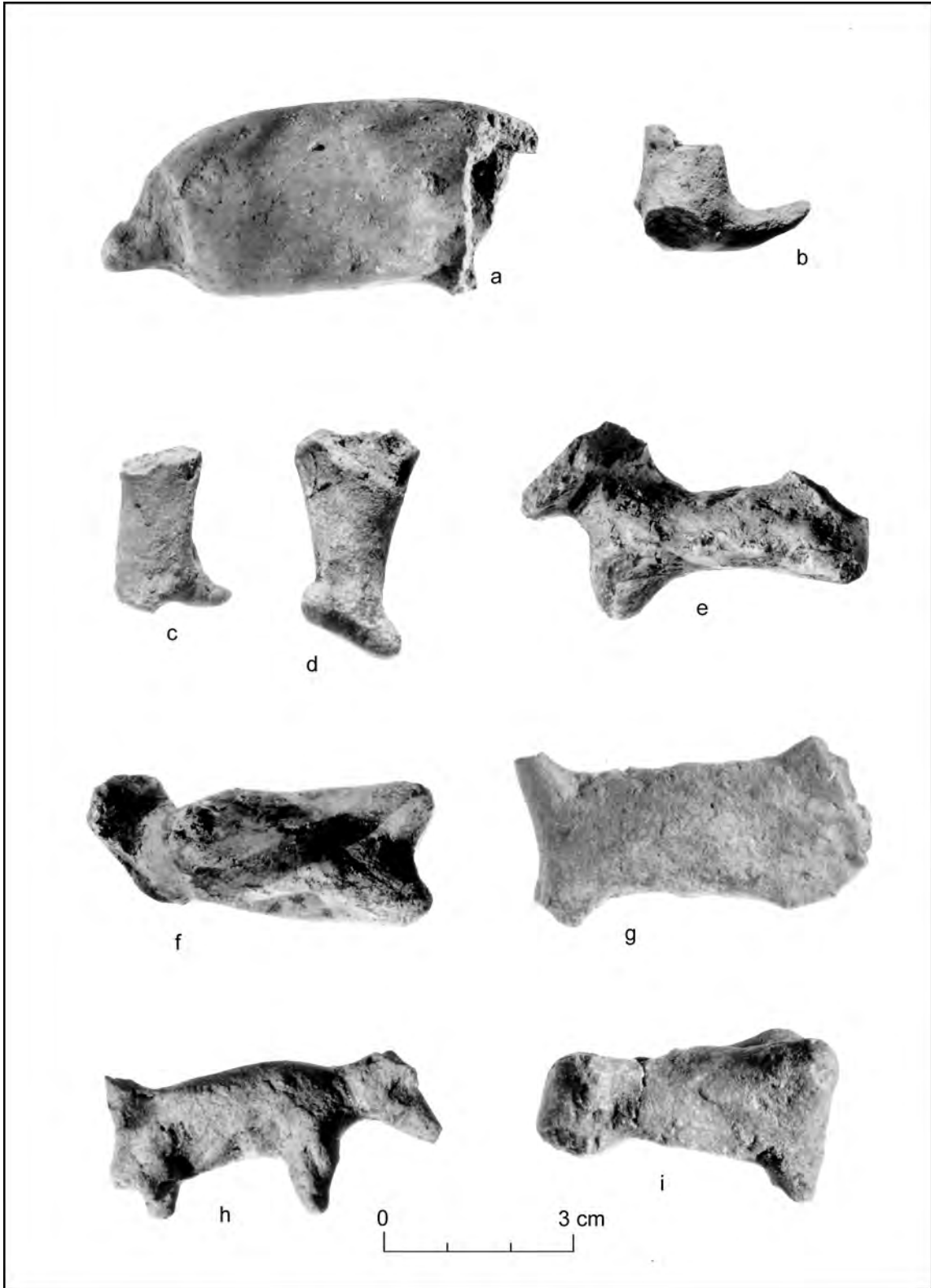


Figure 4.53. Additional effigies from LA 3279; (a-b) great kiva; (c-f) general fill, (g-i) outside of structures.

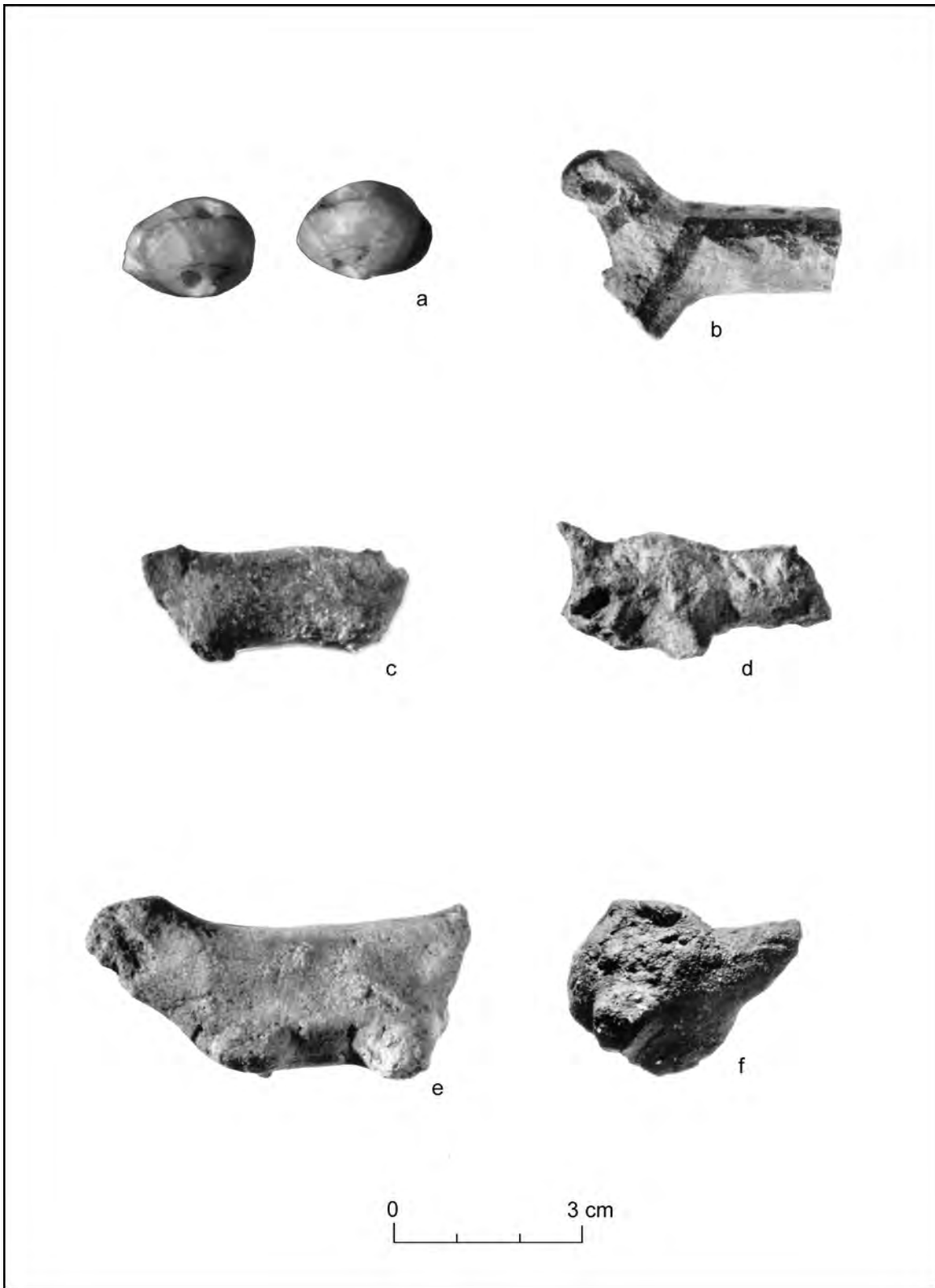


Figure 4.54. Effigies and fetishes; (a) two views of quartz effigy from LA 39972, (b) ceramic effigy handle from LA 39972, (c-e) LA 70185, (f) ceramic effigy head from LA 70185.



Figure 4.55. Possible loom weights from LA 70196.

Loom Weights

LA 70196 (*Fence Corner Site*). On this site, two possible loom weights were recovered (Fig. 4.55). These artifacts, which resemble four spindle whorls found at Snaketown (Haury 1976:259), are discussed later in this report. They were fashioned by putting a wet ball of local clay around a reed and firing it when dry. Both artifacts are round, fully shaped, and drilled, with a rough unpolished exterior-

or. They are somewhat crude and friable and have drill holes measuring 4 mm in diameter. One of the artifacts came from the upper fill of the pit structure and is broken; this fragment measures 22 by 13 by 18 mm. The other artifact is whole, measures 22 by 21 by 18 mm, and was found in the floor fill of the pit structure.

Pipes

LA 45507 (*Luna Village*). Two cloudblowers were recovered from Luna Village. Both artifacts have a residue of dottle on the interior of the pipe, which was analyzed to determine the materials smoked (see Cummings, this report). Both pipes are tapered cylinders, fully shaped, and drilled out of locally available materials.

One pipe is made of volcanic tuff, has a smoothed exterior surface, and is of fine craftsmanship (Fig. 4.56a). Only the mouthpiece end of the pipe remains. The pipe measures 43 by 41 by 37 mm and weighs 52.3 g. The drill hole measures 11 mm and 15 mm. This fragment was recovered in the fill of Pithouse 3, and the residue appears to consist of the remains of mixed grasses. The second pipe was found in the lower fill of Pithouse 9. It is a complete ceramic Alma Plain pipe with a polished exterior surface (Fig. 4.56b). It measures 81 by 44 by 42 mm and weighs 150.5 g. The drill holes measure 24 mm

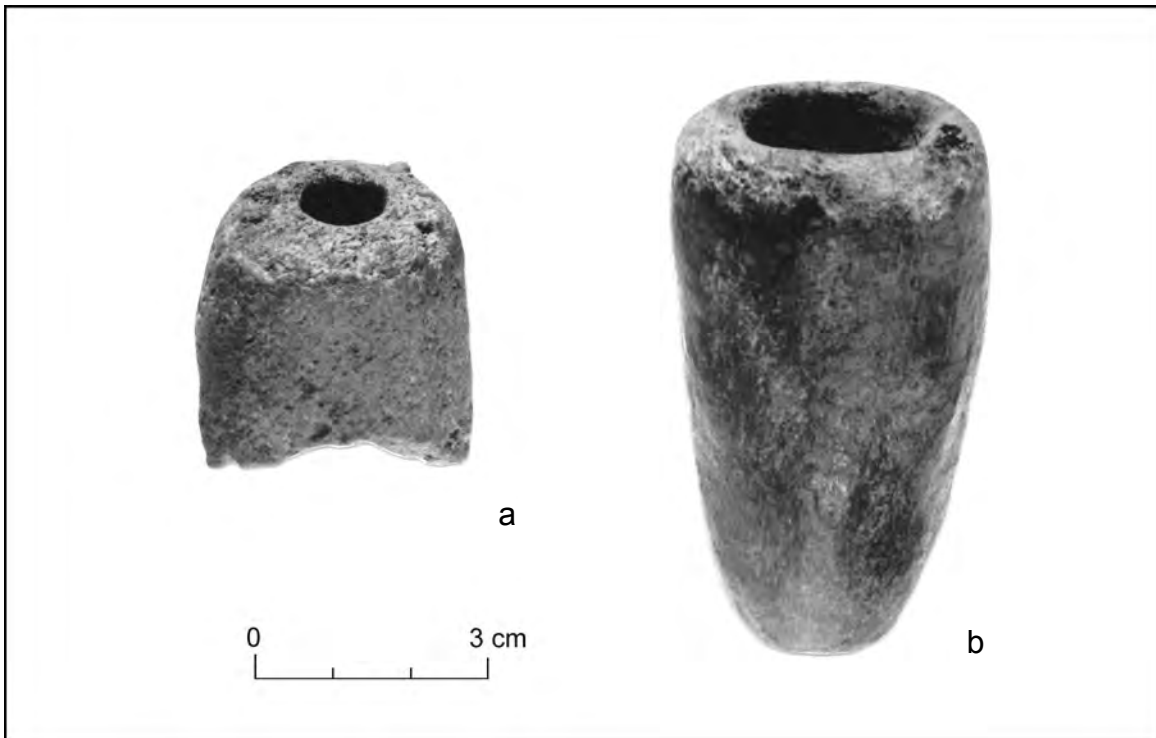


Figure 4.56. Pipes from LA 45507; (a) stone, (b) ceramic.

and 7 mm. The residue from this pipe was found to consist of native tobacco, mixed grasses, and a small amount of volcanic ash. These pipes appear to have been used in two different ways.

Indeterminate Artifacts

LA 3279 (Hough site). Three artifacts of indeterminate function were recovered from this site. The first is a tapered sandstone cylinder found in the lower fill of Room 8. It measures 30 by 41 by 43 mm and weighs 67.5 g. The cylinder is incomplete and broken. It is fully shaped and drilled, with a smoothed and slightly polished surface that is oxidized on one side (Fig. 4.57). It has a central biconical drill hole measuring 7 mm in diameter along the broken length. The perforation has no obvious wear, but the bottom of the object is flat and very worn.

The second indeterminate item was found below the floor in the southern area of Room 10, near two limonite samples. This artifact is a fragment of indeterminate shell, irregular in shape, and fragile. It has no obvious shaping or polishing and an unmodified surface. This fragment measures 14 by 11 by 1 mm and is probably an imported shell.

The last indeterminate item was recovered from Room 7, in the lower fill. It is a piece of pipestone ground flat and triangularly shaped. A groove is present down the center of one side of the artifact, with abrasions and small incisions visible on this same side. The opposite side is ground flat and smoothed, with slight polish in spots. The item measures 24 by 25 by 7 and appears to have broken off of a larger piece. This artifact may have been an

attempt at ornament manufacture (Fig. 4.44a).

LA 39969 (Haury's site). Two items of indeterminate function were recovered from this site. In the fill of Room 3, a pipestone object measuring 39 by 13 by 5 mm was found. The artifact is triangular in profile, with two ground and smoothed flat surfaces. It may have been an ornament still in the manufacturing process. The second item is a fragment of shell from the fill of Room 2. This artifact measures 33 by 21 by 2 mm and was probably imported. Its original shape and morphology are not known. The surface treatment, wear polish, and manufacturing stage are also unknown, due to erosion of the shell surface.

LA 70185 (DZ site). One item of indeterminate morphology was recovered from Room 2. It may be a bead or pendant blank made out of igneous material, but not enough of the original piece remains for a positive determination. The artifact has an irregular shape and is partially shaped with grinding and abrasions visible on one flat side. It measures 33 by 17 by 6 mm overall.

Bracelets

LA 3279 (Hough site). Two shell bracelet fragments were recovered from this site. The genus was not identified because of heavy erosion of the surface, which removed distinguishing characteristics. They are probably *Glycymeris* shell, imported through various trade routes from the Gulf of California area.

The first fragment is fully shaped, with some evidence of grinding still visible on the surface (Fig. 4.58). It measures 32 by 3 by 4 mm—less than half of the original ornament. It was found in the fill of Room 10. The second fragment is partially shaped, with grinding also visible. It measures 33 by 4 by 3 mm and was recovered from the fill of Room 11.

LA 39968 (Spurgeon Draw). One shell bracelet fragment was recovered from the floor fill of the pit structure. The artifact measures 28 by 9 by 5 mm (Fig. 4.58) and consists of the beak, dorsal margin and anterior end of a *Glycymeris* shell. The ornament is fully shaped and polished, with a few incised lines near the umbo of the shell.

LA 39969 (Haury's site). A bracelet fragment was found in the upper fill of Room 3. It is a shell fragment with an eroding surface. The shell is probably *Glycymeris*, but the distinguishing characteristics are missing. The ventral margin of the shell remains and measures 36 by 9 by 4 mm. It is fully shaped, with the remains of a heavily polished sur-

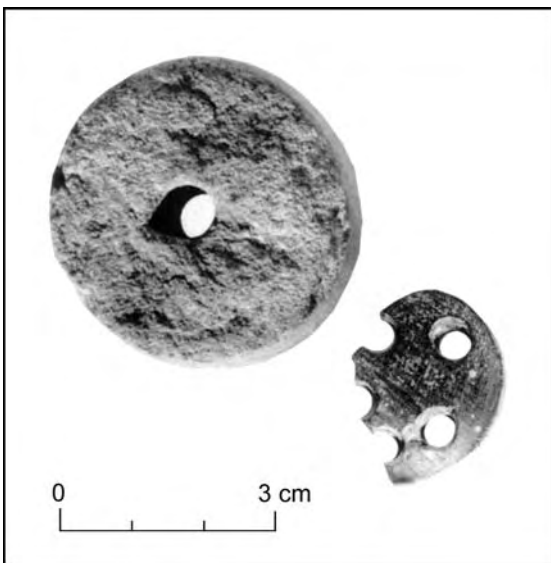


Figure 4.57. Two indeterminate items from LA 3279.

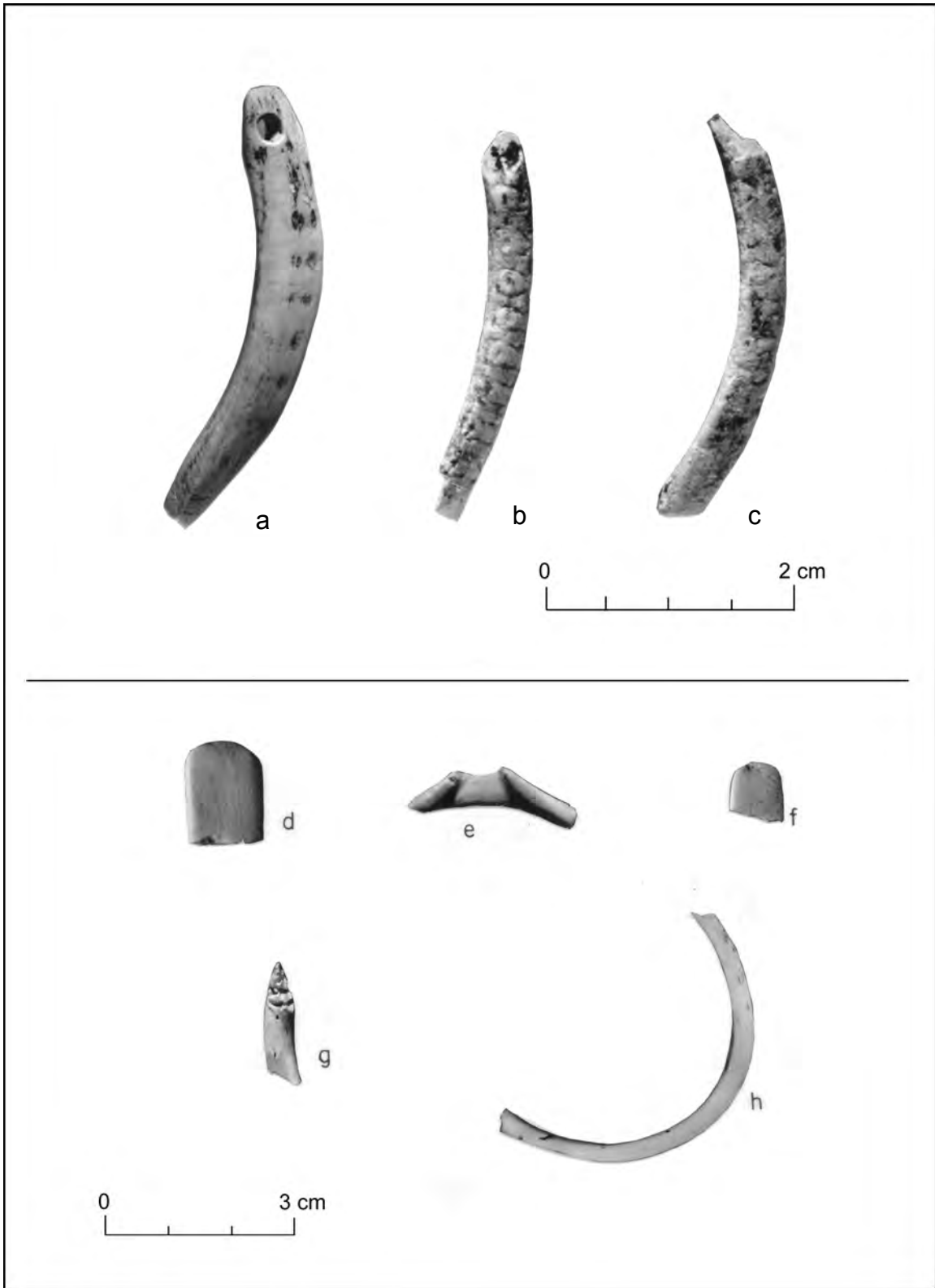


Figure 4.58. Shell artifacts; (a) pendant, LA 39969, (b-c) bracelet fragments, LA 3279, (d) pendant blank, LA 39968, (e) bracelet fragments, LA 39968, (f) pendant blank, LA 39969, (g-h) bracelet fragments, LA 45507.

face, and indeterminate wear polish.

LA 43786 (Downslope site). One shell bracelet fragment was found on the surface of the site. The piece was identified as Glycymeris shell. It measures 15 by 6 by 2 mm and is at an indeterminate point of manufacture. The fragment is irregularly shaped, with evidence of grinding and abrasions. This ornament probably washed out of a Three Circle phase pueblo just outside the right-of-way.

LA 45507 (Luna Village). Three shell bracelet fragments were found on this site. Two were recovered from the fill of Pithouse 12 (Fig. 4.58). Both pieces were identified as Glycymeris. They are less than half of the original bracelet and are fully shaped and polished. The larger piece measures 31 by 50 by 3 mm. The other fragment measures 20 by 5 by 4 mm and is made from a beach-eroded shell. The third fragment was recovered from the lower fill of Pithouse 3. It is fully shaped and made of an indeterminate shell (probably Glycymeris). The piece measures 25 by 7 by 5 mm and has a ground and eroded surface.

Pendants

LA 3279 (Hough site). Two triangular pendants were found at this site. Both are turquoise, with a biconical drill hole at the apex of each ornament. They measure an average of 11 by 8 by 3 mm and appear to have been formed from the same type of turquoise (blue-green, with no visible matrix). Both pendants are fully shaped and polished (Fig. 4.59). The first pendant was found in the lower fill of Room 11. The drill hole on this pendant is uneven, measuring 1.5 mm and 1.7 mm in diameter, with slight wear polish from stringing. The second pendant is roughly rectangular, with slight wear polish on the surface. The drill hole measures 1.7 mm in diameter, with no visible stringing wear. This pendant was recovered from the general fill of the great kiva (Room 15).

LA 3563 (South Leggett Pueblo). One effigy pendant was found on this site (Fig. 4.59). This pendant was made from a blue-gray metamorphic rock and measures 21 by 10 by 3 mm. The artifact is fully shaped and polished, with incised edges. It has a biconical drill hole 3 mm in diameter. A portion of the pendant is broken off, so the original shape is difficult to ascertain. Unfortunately, the ornament came from redeposited fill, so its original context is not known.

LA 39969 (Haury's site). One pendant was recovered from the fill of Room 3 (Fig. 4.58). This

complete ornament measures 36 by 9 by 4 mm and is formed from a shell bracelet fragment remanufactured into a pendant by perforating one end and grinding down the two broken ends. The pendant is probably made from a Glycymeris shell, but distinguishing characteristics are missing. It is roughly semicircular, with a biconical drill hole at one end measuring 2 mm and 4 mm in diameter. The ornament has a polished surface, heavy wear polish on the exterior, and slight stringing wear.

LA 70185 (DZ site). This pendant was found outside the roomblock, associated with a chrysocolla fragment. The ornament is made from a fine-grained sedimentary rock and is subrectangular (Fig. 4.59). The bottom portion of the pendant is broken off. The piece is fully shaped and polished, with a biconical drill hole measuring 2 mm in diameter. The artifact measures 17 by 13 by 3 mm and has no obvious wear polish.

LA 75792 (Thunder Ridge). A pendant was found to the south of the ramada (Fig. 4.59). It is made from a sedimentary pebble, probably found among the gravel in a nearby arroyo. Only the middle portion of the pendant remains; both ends have broken off (the top portion broke down the center of the drill hole). The drill hole is biconical and measures 6 and 5 mm, and the surface of the pendant is unmodified. It measures 15 by 16 by 6 mm overall, with no evident wear polish.

Pendant Blanks

LA 3279 (Hough site). A rhyolite pendant blank was recovered from this site, outside the structures. It is fully shaped, with striations from grinding still visible, and no visible wear polish. The blank is rectangular and measures 22 by 15 by 6 mm, with no apparent drilling.

LA 3563 (South Leggett Pueblo). A single chrysocolla pendant blank was recovered from this site. It is partially shaped and abraded and measures 18 by 13 by 10 mm. The basic shape, suggesting a tabular pendant, is formed, but the flat surfaces are incompletely ground.

LA 39968 (Spurgeon Draw). Two tabular pendant blanks were recovered from the pit structure. The first blank is made of sandstone and is fully shaped, with one unmodified surface. The edges and one flat surface show grinding from the manufacturing process. The artifact measures 40 by 27 by 4 mm and was found in the floor fill.

The second pendant blank is formed from an unidentified shell (Fig. 4.58) and was recovered

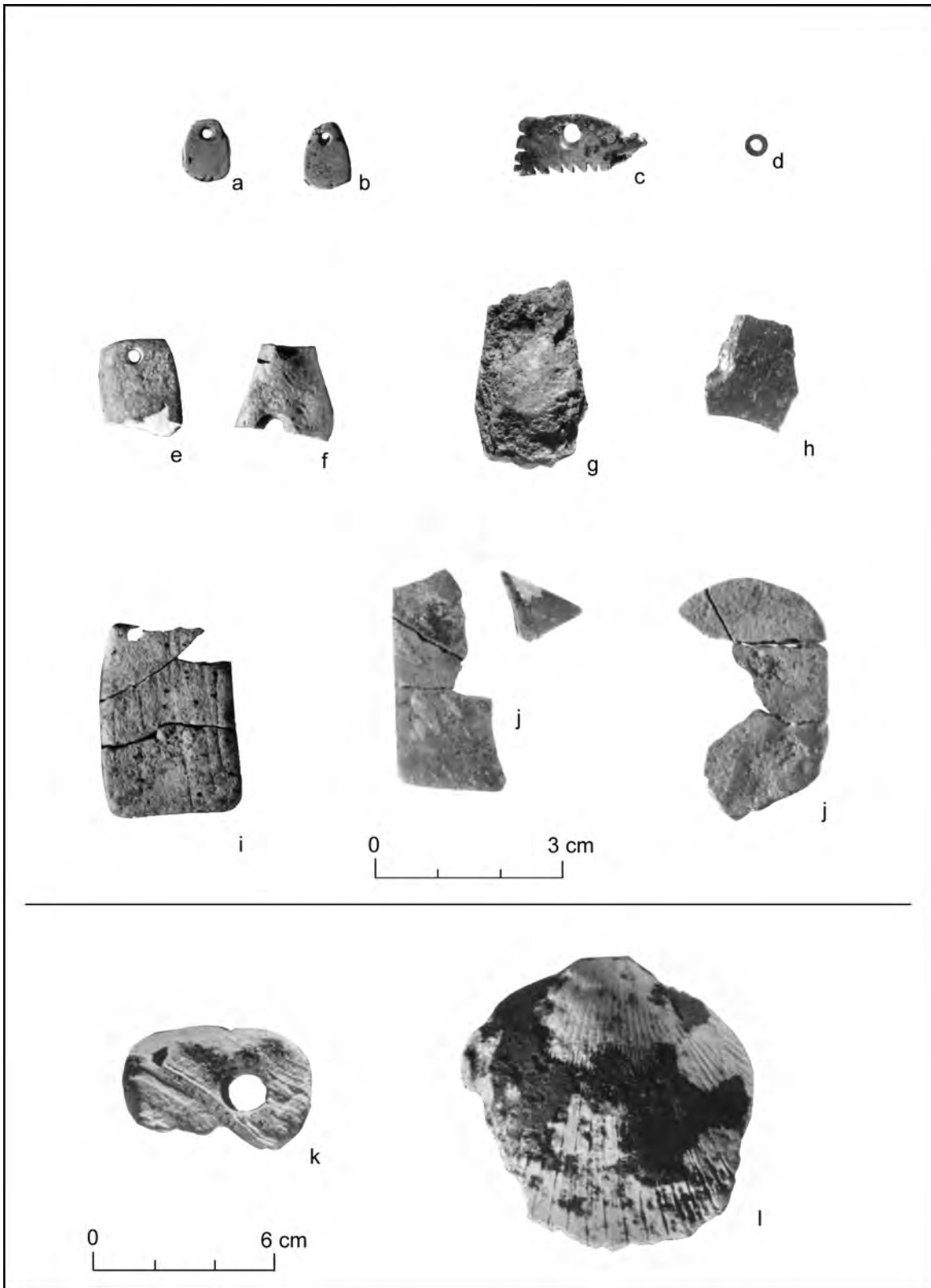


Figure 4.59. Ornaments and pendants; (a) LA 3279, (b) LA 3563, (c) LA 45510, (d) LA 70185, (e) LA 75792, (f) pendant blank, LA 45507, (g) pendant blank, LA 75792, (h-i) pendant blanks, LA 70185, (j) LA 70188, (k-l) shell ornaments, LA 3279.

from the lower fill. The ornament is lacking distinguishing characteristics that would aid in identification of genus. This blank is a partially shaped rectangle with two rounded corners. The surface is smoothed, and the entire piece measures 17 by 13 by 4 mm.

LA 39969 (Haury's site). One pendant blank was found east of Room 3. It is manufactured of white chert and is partially shaped, with a ground and abraded surface (Fig. 4.58). The pendant is oval to subrectangular and measures 10 by 9 by 2 mm.

LA 45507 (Luna Village). A semicircular jet pendant blank was found near Pithouse 13. It is broken across the length and width and measures 16 by 18 by 3 mm (Fig. 4.59). It has a smoothed surface and a conical drill hole measuring 7 mm and 3 mm. Too much pressure during drilling fractured the pendant across the drill hole. The jet was probably imported.

LA 70185 (DZ site). Four pendant blanks were recovered from this site. One blank, found outside the roomblock, is made of a hard, fine-grained, spotted material, possibly hematite. It is partially shaped and drilled (Fig. 4.59) and appears to have broken during drilling. The biconical perforation measures 3 mm and 5 mm. The blank is rectangular, with a ground and smoothed surface. Four fragments of the blank were found, and they measure 42 by 18 by 4 mm overall.

Four fragments of a second blank were scattered outside the roomblock at approximately the same depth. They are made of a fine-grained hematite, with a combined measurement of 37 by 31 by 5 mm. The ornament is ovoid (Fig. 4.59) and ground to an uneven thickness, with a smoothed surface. Although the blank is fully shaped, it probably broke during shaping since the material is fairly fragile.

A rectangular, red chert blank was found outside the roomblock. It is partially shaped and ground to a thin wafer. The blank was not drilled and measures 17 by 14 by 3 mm. This ornament is similar in material to an ornament found in Room 10 of LA 3279, tentatively identified as pipestone.

Another pendant blank is made of chrysocola. It is partially ground and shaped into a rough form; the edges show more shaping than the two flat faces. The blank is subrectangular, with no drilling, and was found during surface stripping. It measures 14 by 11 by 9 mm overall.

LA 70188 (Raven's Roost). A sedimentary pendant blank (Fig. 4.59) found here represents the earliest ornament recovered from the excavated sites. It is subrectangular, fully shaped, and has a smoothed

surface with visible striations from shaping. The blank measures 32 by 22 by 3 mm and broke into three fragments during drilling. The off-center drill hole is conical, measures 2 mm and 1 mm, and is on an upper corner. The upper portion of the pendant blank opposite the drill hole is missing.

LA 75792 (Thunder Ridge). A chrysocola pendant blank was found north of the ramada like structure. It is a subrectangular ornament, partially shaped and ground, with one smoothed surface. The basic shape is formed but still rough (Fig. 4.59), and it measures 31 by 19 by 10 mm.

Ornaments

LA 3279 (Hough site). Two ornaments were found in the general fill of Room 10. It is half of a bivalve shell with an eroded surface. It is partially drilled and partially shaped. The umbo is ground down to create an aperture for stringing (probably as a pendant), and the hinge teeth are also ground down (Fig. 4.59). It measures 24 by 21 by 2 mm, with no evidence of wear polish.

The second ornament collected from this room was broken. It is a sedimentary material, possibly pipestone or red argillite. Red argillite is similar to pipestone, and artifacts and outcrops of this material have been found in the southwest (Bartlett 1939; Jernigan 1978; McGregor 1941, 1943; Cosgrove and Cosgrove 1932). The ornament measures 18 by 9 by 1 mm and may be a pendant blank. It is partially formed, with one flattened and ground edge, and visible abrasions on the surface.

LA 39969 (Haury's site). A broken turquoise ornament was recovered from this site. Its original shape is unknown. The piece is ground into a thin slab, with a single rounded edge, and may have originally been part of a pendant or mosaic piece. It is manufactured from a blue-green, waxy-looking turquoise in matrix. The ornament is fully shaped and polished and measures 8 by 4 by 2 mm.

LA 39975 (Lazy Meadows). One bone ornament was found on this site. The material came from an animal identified only to the order Artiodactyla, and it is irregular in shape. The fragment is partially shaped and worked, with serrations cut along one edge (Fig. 4.60a), but of unknown function. It has a smoothed surface, with no obvious polish, and measures 54 by 38 by 11 mm.

LA 45507 (Luna Village). One broken ornament was recovered from this site. It is fully shaped and made of an indeterminate shell (probably *Glycymeris*). The piece measures 11 by 6 by 4 mm

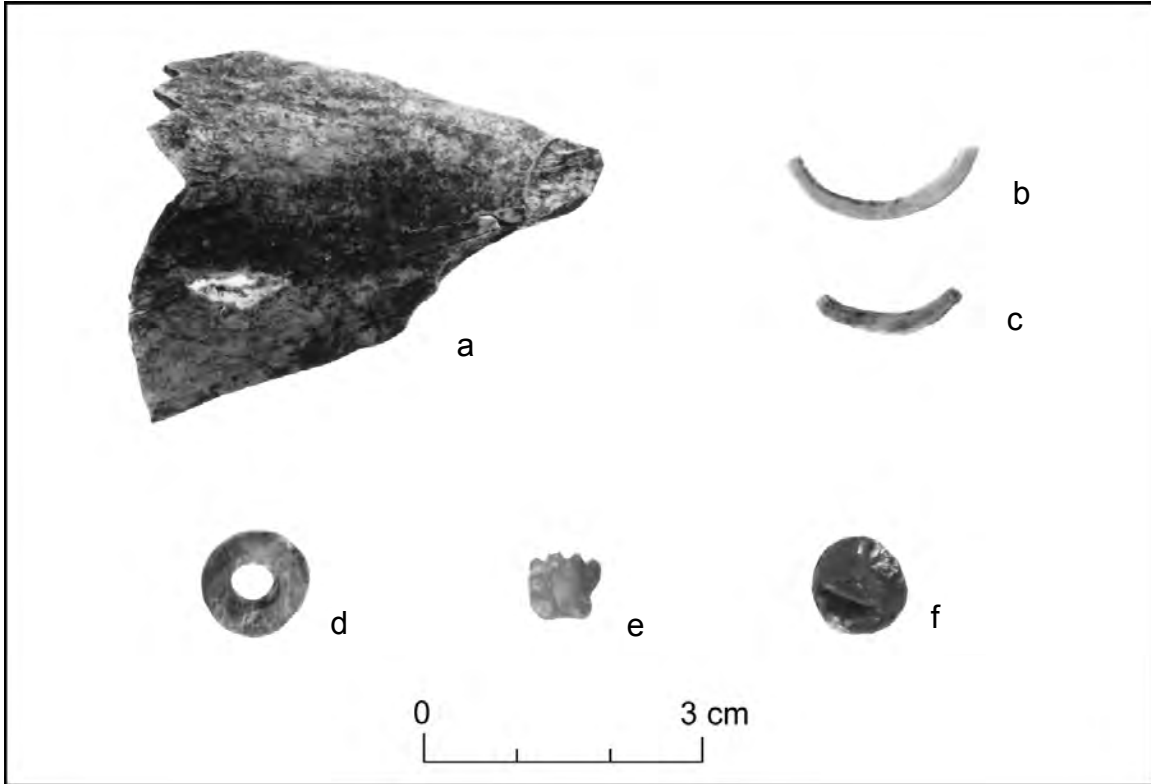


Figure 4.60. Miscellaneous ornaments; (a) worked artiodactyl bone, LA 39975, (b-c) bone ring fragments, LA 3279, (d) large bead, LA 39968, (e) turquoise mosaic piece, LA 39969, (f) chert inlay, LA 70185.

and may be a ring or bracelet fragment. It is gray, probably from burning, and was found in the fill of Pithouse 12. The ornament has a polished surface with medium wear.

Rings

LA 3279 (Hough site). Two bone ring fragments were recovered from this site. One is formed from the humerus of a large mammal (probably deer), while the second is from a medium mammal. The large mammal bone ring is fully shaped and polished, with heavy polish on both the exterior and interior of the ornament. It measures 22 by 4 by 2 mm, with approximately half the original ring present (Fig. 4.60b). It was found in the lower fill of Room 8. The second fragment measures 17 by 6 by 4 mm, with less than half the ornament remaining (Fig. 4.60c). It is fully shaped and polished, with medium wear polish overall. Both ends are slightly polished, indicating it may have been carried around after it broke. It was recovered outside the rooms.

Inlay and Mosaics

LA 39969 (Haury's site). A single mosaic piece measuring 8 by 8 by 2 mm was found in Feature 2, a shallow pit to the west of Room 2. It is made of a small piece of blue-green turquoise with matrix still attached to the back, and it is shaped into a thin square (Fig. 4.60e). The ornament is fully shaped and polished, with three incisions along one edge.

LA 70185 (DZ site). A single piece of inlay was recovered south of Room 4 within the wall fall. It is made from a small piece of orange, heat-treated Luna Blue chert and has been faceted and shaped into a cabochon (Fig. 4.60f) measuring 11 by 10 by 2 mm.

Discoidal Beads

LA 3279 (Hough site). Fifteen disc beads were recovered from the room fill on this site (Fig. 4.61). All the beads are whole and round; no fragments were recovered. Fourteen beads are made of stone, the last ceramic. The metamorphic and ceramic

Table 4.84. Discoidal Beads from LA 3279

Provenience	Material	Size (mm)	Drill Hole Type	Drill Hole Size (mm)	Number
Room 5; general fill	metamorphic	5 x 2	biconical	2	1
Room 5; general fill	ceramic	2 x 2	cylindrical	1	1
Room 6; general fill	metamorphic	6 x 3	biconical	2	1
Room 6; lower fill	metamorphic	5 x 1	conical	2	1
Room 6; lower fill	jet	4 x 1	cylindrical	2	1
Room 6; lower fill	jet	4 x 2	cylindrical	2	1
Room 9; Feature 4	metamorphic	5 x 2	cylindrical	1.5	1
Room 12; lower fill	unidentified	4 x 2	biconical	1	1
Kiva; upper fill	jet	5 x 1	biconical	1	1
Kiva; upper fill	jet	4 x 1	biconical	0.5	1
Kiva; upper fill	metamorphic	5 x 2	biconical	2	1
Kiva; upper fill	metamorphic	2 x 1	biconical	1	1
Kiva; lower fill	possibly shale	3 x 1	conical	1	1
Kiva; burial pit	metamorphic	5 x 1	conical	1	1
Kiva; burial pit	jet	4 x 1	cylindrical	1	1
Total					15

beads are made out of locally available materials, while the jet beads were probably imported. All the beads are fully shaped and drilled, and many have a polished surface. These ornaments were measured by diameter and thickness only (Table 4.84).

Two of the fifteen discoidal beads were found in the general fill of Room 5. The first is made from a metamorphic stone and has a smoothed surface with slight wear polish (Fig. 4.61). The second bead is formed from a local clay, and has a lightly polished exterior (Fig. 4.61). A cylindrical ceramic bead was also found in the general fill of this room; it will be discussed in the "other" bead category.

Room 6 contained four beads: two of metamorphic stone, and two of jet (Fig. 4.61). Both metamorphic beads have a polished surface and slight wear polish from stringing. The two jet beads have a polished surface, with no visible wear polish. When seen from the side, the jet beads appear slightly wedge shaped and show battering on the sides.

Room 9 contained a single bead formed from a metamorphic stone (Fig. 4.61). It was found in the fill of Feature 4, a shallow pit in the northwest quadrant of the room. The bead has a smoothed surface with slight wear polish.

Room 12 contained a single bead of an uniden-

tified material in the lower fill. It has a polished surface, with slight wear polish (Fig. 4.61). In profile it is slightly wedge shaped.

The great kiva (Room 15) contained the remaining seven beads. They are made of metamorphic rock, jet, and one unidentified stone (possibly burned shale). The beads are fully shaped and drilled, and all except the possible shale bead have wear polish on the surface.

In the upper fill of the great kiva, four beads were recovered (Fig. 4.61). The first two are made of jet and have a polished surface. The larger jet bead is slightly wedge shaped in profile and has some circular wear on one face from an adjacently strung bead. The remaining two beads are made from a metamorphic stone, are wedge shaped in profile, and have wear along one face from an adjacent bead. One has a polished surface, and the other has a smoothed surface.

In the lower fill of the kiva, a possible burned shale bead was recovered (Fig. 4.61). It has a smoothed surface and is slightly wedge shaped in profile.

The remaining two beads in the kiva were recovered from the fill of the burial pit in the floor (Fig. 4.61). One bead is made from a metamorphic

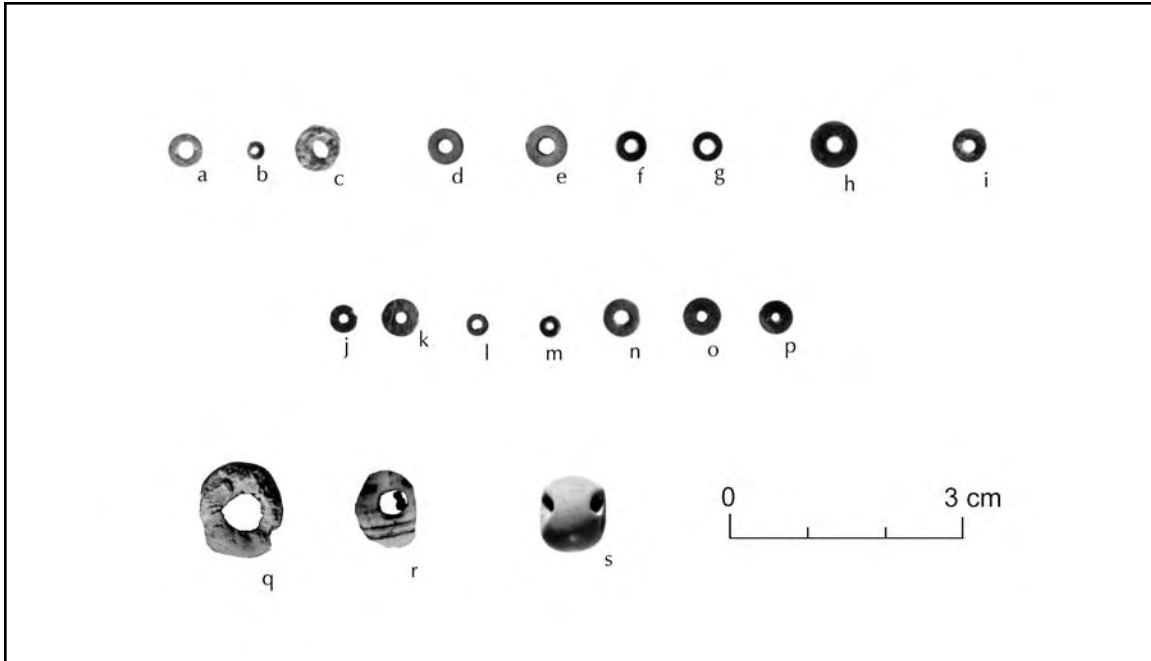


Figure 4.61. Discoidal and shaped beads, a-p are from LA 3279; (a-c) Room 5, (d-g) Room 6, (h) Room 9, (i) Room 12, (j-p) great kiva, (q-r) shaped beads from LA 39968, (s) shaped beads from LA 39969.

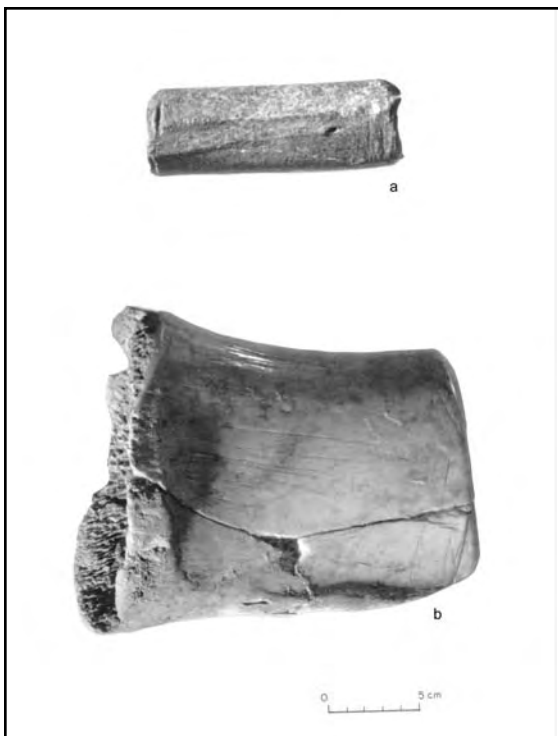


Figure 4.62. Bone tube beads; (a) LA 3279, (b) LA 45507.

stone, has a polished surface, and is slightly wedge shaped in profile. The second bead is made of jet, has a polished surface, and exhibits the most wear of all the beads found. It has heavy wear from adjacent

beads on both faces. The greatest wear alters the shape of the bead on one side. In profile, the bead has one flat side and one convex side.

LA 39968 (Spurgeon Draw). A discoidal bead measuring 12 by 5 mm and made of limestone was recovered several meters to the west of Roomblock 1. The ornament is fully shaped, drilled, and polished, and has a 4 mm cylindrical drill hole. Incised lines appear on one edge of the bead, which appear to be natural (Fig. 4.61).

LA 45510 (SAK site). A single discoidal bead (Fig. 4.61) was made of a gray metamorphic rock measuring 4 by 2 mm. It is a fully shaped, drilled, and polished bead, with a cylindrical drill hole measuring 1.5 mm in diameter. Little wear polish is evident.

Tube Beads

LA 3279 (Hough site). Two bone tube beads were recovered from this site. The first is made from a hollow section of a medium mammal bone that is incised and broken on the ends and further ground to create a smooth surface. It measures 33 by 12 mm and represents approximately one-fourth of the original bead, which split down the length. The fragment is fully shaped, with a polished and slightly worn surface, and has slight wear polish on the interior. The bead probably broke while being worn. It was recovered from the lower fill of Room 11.

The second bone bead was found outside the structures in the vicinity of an effigy and two chrysocolla fragments. This bead is made from a section of turkey bone, measures 34 by 12 by 9 mm, and is partially worked. The bead is incised and broken on the ends from the manufacturing process, with no further grinding evident (Fig. 4.62). It has an unmodified surface and slight wear polish on the interior.

LA 45507 (Luna Village). A single bone tube, possibly worn as a pendant, was found in the lower fill of Pithouse 12. It is made of deer bone, measures 52 by 45 by 32 mm, and is a fully shaped, tapered cylinder (Fig. 4.62). The surface is polished, with incisions from the manufacturing process. Medium wear polish is present along the upper, cut edge, and on the interior from stringing.

Other Beads

LA 3279 (Hough site). Two beads were recovered from this site. The first is a cylindrical bead made of local clay, fully shaped and drilled, with a rough, slightly polished exterior (Fig. 4.61). It has a cylindrical perforation (slightly oval in shape) measuring 2 mm, with no wear polish evident. The ornament measures 6 by 6 mm and is broken on the ends, probably as part of the manufacturing process. This bead was recovered from the fill of Room 5.

The second is a bilobed shell bead. The shell is unidentified due to the lack of distinguishing characteristics. The bead is fully shaped with a smoothed surface (Fig. 4.61). It has a biconical perforation through the upper lobe measuring almost 3 mm in diameter. The bead measures 15 by 9 by 5 mm overall and was found in the general fill of the great kiva (Room 15).

LA 39968 (Spurgeon Draw). Two beads were found in the general pit structure fill. Both are calcium carbonate and are fully ground and shaped. The material is too fragile and coarse to allow more than rough shaping. One bead is bilobed (Fig. 4.61), with a biconically drilled hole 4 and 5 mm in diameter, and measures 13 by 12 by 5 mm overall. The second bead has a rough "birdwing" shape (Fig. 4.61) and measures 11 by 9 by 4 mm. This ornament is cylindrically drilled, with a 4 mm diameter perforation.

LA 39969 (Haury's site). A domed bead was found in the fill of Room 3. It is a light blue turquoise, with little matrix. The ornament is oval in plan view, cabochon-shaped in profile (Fig. 4.61), and measures 10 by 9 by 4 mm. The bead is fully shaped and polished, with a biconical drill hole

measuring 3 mm in diameter running through a short end of the oval (the drill holes almost look like eyes). In addition, the drill holes show rotary and slight stringing wear. Wear polish is also evident on the edges of the flat side of the bead (which would have faced the wearer).

Gaming Piece

LA 3279 (Hough site). A bone gaming piece was found in the roof fall above the floor of Room 8. It is a rectangular fragment of large mammal bone (Fig. 4.63) measuring 22 by 14 by 5 mm. It is fully shaped and has a polished surface, with medium wear polish. The manufacturing abrasions are still visible.

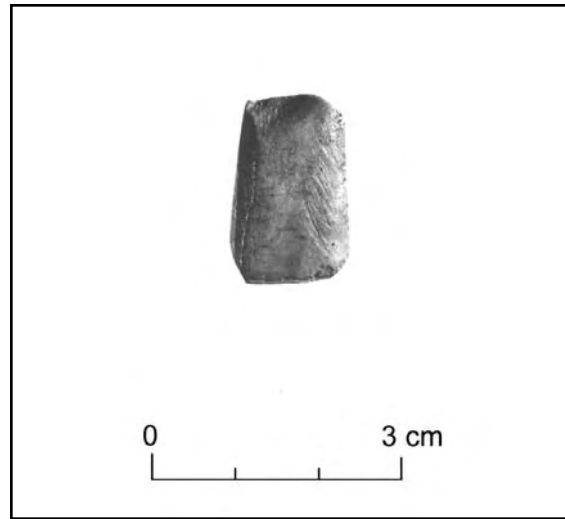


Figure 4.63. Gaming piece from LA 3279.

Raw Clay Ball

LA 3279 (Hough site). A piece of raw clay was found in the lower fill of Room 8. It is ball-shaped (from being rolled between the hands) and is made of local clay. It has a rough unpolished exterior and measures 33 by 32 by 28 mm. The artifact's function is unknown, and it was given to the ceramicists for study in that assemblage.

Historical Item

LA 39969 (Haury's site). A historic metal site tag was recovered from the surface of Room 1. The tag marked the area of a surface collection made by Gila Pueblo, Globe, Arizona.

Table 4.85. Adobe sample measurements, LA 3279

Provenience	Width of Impressions		Number
	Range (mm)	Average (mm)	
Room 6; roof fall	2 - 62	8.83	13
Room 8; general fill	2 - 37	14.26	13
Room 9; lower fill	4 - 33	16.83	4
Room 10; general fill	3 - 62	16.45	7
Room 11; upper fill	4 - 46	16.45	7
Room 12; lower fill	21 - 44	28.25	5
Room 13; upper fill	4 - 67	15.38	16
Kiva; general fill	1 - 47	16.33	3
Outside the roomblock	20 - 40	30	1
Total			69

Adobe Samples

Approximately 107 adobe samples were recovered from five sites in the project area. Most samples show impressions of the building materials used. Impression widths were measured in millimeters to ascertain the type of building materials utilized. However, identification of these materials is extremely difficult since these are only cast impressions of plant materials.

LA 3279 (Hough site). Sixty-nine adobe samples were collected from several rooms on this site; the majority were in Rooms 6, 8, and 13. All samples show impressions of building materials ranging from small to large widths (Table 4.85).

Room 6 contained samples of adobe roof fall, primarily with small impressions. Room 8 contained burned adobe throughout the fill, probably representing roof fall. Most of these samples have narrow impressions. The adobe samples in Room 9, all burned, were found in the lower fill. The impressions are generally narrow. In Room 10, the majority of samples were burned and came from the general fill; a few samples were recovered below or between the floors. The widths are generally small, possibly from the use of reeds or small twigs, as opposed to grasses. Room 11 contained several burned adobe samples in the upper fill, with impressions probably of small twigs. The adobe samples recovered from Room 12 were all burned and in the lower fill; the larger impressions may have come

from stripped branches. Several burned samples were collected from the upper fill of Room 13, one from just above the floor. The wider impressions seem to represent smooth, bark-stripped branches, while the narrow ones appear to be from reeds. The great kiva (Room 15) contained three burned adobe samples in the general fill. The larger ones may be the impression of a stripped branch, with thinner vegetal materials alongside. The last adobe sample was found outside the roomblock and is burned.

LA 3563 (South Leggett Pueblo). The fill from the pit structure was redeposited, so the context of the artifacts is suspect. All the adobe came from inside the structure, well above the floor. Only three samples show an impression of reeds or other building materials. The widths range from 12 to 26 mm (an average of 17.67 mm).

LA 45507 (Luna Village). Nine adobe samples were found on the site, all of which show reed and building material impressions. One sample came from Backhoe Trench 109, one from the fill of Pit Structure 13, and seven from the fill of Pit Structure 1. All are roof fall and are severely burnt and friable. The average width of the impressions is 4.16 mm, with a range of 2 to 15 mm, and the majority of the impressions are very narrow. The adobe sample from Backhoe Trench 109 turned out to a clay plug fragment, used in a ceramic vessel to keep rodents out of a supply of corn kernels (Fig. 4.64). Clay was smoothed over the vessel aperture and allowed to dry, sealing it from moisture and small foragers. A fire burned the plug, leaving impressions of the corn

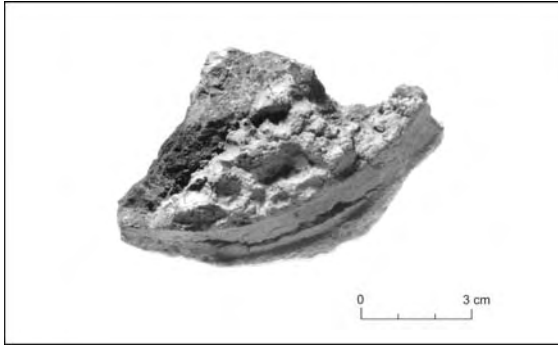


Figure 4.64. Adobe plug from LA 45507.

kernels and the mouth of the vessel in the adobe. The rim radius of the vessel would have been about 10 cm.

LA 45510 (SAK site). Six adobe samples were recovered from near the surface of the site. All show reed impressions. None can be considered roof fall, since they appear to have washed out of the nearby pit structure. The widths range from 2 to 26 mm, with an average of 5.69 mm. Most of the impressions are 3 mm wide. They appear to have been made by a mat of small reeds impressed into the clay. Only two of the samples have impressions over 3 mm, which resemble a cast of a stripped limb.

LA 70196 (Fence Corner). Approximately 20 adobe samples were recovered from this site, the majority of which came from Backhoe Trench 4. A single sample came from the pit fill, and five samples from the floor fill of the pit structure. These are probably representative of roof fall. Nearly all of the samples show impressions. The average width of the impressions is 19.22 mm in a range of 10 to 27 mm. Large impressions are more common, and the smoothness of the impression suggests that they were made by bark-stripped branches.

ORNAMENT AND OTHER ARTIFACT USE IN THE MOGOLLON AREA

A total of 541 miscellaneous artifacts were recovered from 17 of the 25 excavated sites. These assorted artifacts represent a period of approximately 1,400 years; the earliest site dates from A.D. 90, and the most modern is about A.D. 1300. The Mogollon utilized a variety of microenvironments during this time, including valleys, springs, and high-altitude (over 8,500 ft; 2,575.76 m) mountain areas, where they left behind signs of habitation, possible hunting camps, and shrines (Morris 1980). Artifacts classified as miscellaneous are often found in burials, caches, and middens associated with these areas.

Throughout the time that the Mogollon lived in the region, they left clues to their trading patterns, personal adornment, and ceremonial items in the form of crystals, ceramic effigies, ornaments, pipes, and more.

The residents of the Reserve area sites utilized a broad variety of local materials in addition to a number of imported items. These various imported items recovered from the excavated sites suggest that the residents had limited trading relations with several cultural groups. However, the assemblage is too small to support any hypothesis regarding frequency or intensity of trading between groups or permit an in-depth look at various trends, especially with respect to ornament utilization. Since these items generally are not recovered from sites of several consecutive time periods or in large enough quantities to allow for conclusions about the extent of contact between different cultures, often the only conclusion that can be drawn is that cultures traded material goods. However, these collections of artifacts may indicate certain trends of trade and cultural exchange.

Ornaments and Manufacture

While the artifacts included in the miscellaneous category are not just ornaments, but also pipes, minerals, crystals, and so on. Several methods of creating an ornament out of a raw material were used by the Mogollon. These methods were cruder at the earliest sites but appear more refined in the later sites. Some of these methods may reflect the influence of contact with other cultures.

Early ornaments were taken from the natural world and included perishable (seeds and wood) and sturdy materials (pebbles, animal teeth and claws, and bone). These early ornaments were modified very little from their original state. In later times, materials were heavily modified to create more refined adornments (small beads and turquoise and shell ornaments). These later ornaments were also modified to reflect the living creatures found in nature, like animals, birds, reptiles, and insects.

Ornaments were manufactured in different ways according to the material they were made of. Bone and univalve shells were often used for beads, since they need little modification to be worn. Univalve shells were usually ground on one or both sides, while bivalve shells were often ground down on the highest point (the umbo) for stringing as a pendant. Stone materials required the most work to fashion into jewelry. A suitable piece of raw materi-

al had to be found, ground into the appropriate shape, and drilled for suspension. This could be a lengthy process if the material was very hard, like turquoise, or if it was shaped into a complicated geometric form. In general, beads seem to be one of the most time-consuming of all the ornaments, being very small and uniform in shape. The manufacture of beads has been widely discussed in the literature (Cosgrove and Cosgrove 1932; Haury 1931; Haury and Gifford 1959; Jernigan 1978).

Two ceramic beads formed out of a local clay were present in the assemblage. They were probably formed by putting a moist blob of clay around a very thin material (fibers or grass stems) while wet, rolling it until it became a thin tube, and incising lines on the tube. The tube and encased fibers were then fired, burning out the organic material. The fired clay was snapped off in sections at the incisions, and the edges of the bead would have been abraded to remove the rough edges (Jernigan 1978; Haury 1931).

Bone tubes and rings would have been produced in a similar manner. A more-or-less tubular long bone would have been grooved at intervals with a saw, then the sections snapped off at the incision. The edges would have then been ground to create a smooth surface. One of the bone tubes in the assemblage appears to have been snapped, with no further abrasions on the edges.

Materials with no natural hollow cavity to use for suspension were perforated by a different method. These ornaments were drilled using a stone drill or (possibly) a cactus spine as a drill bit, plus an abrasive, to create an opening. Three types of drill holes have been noted in prehistoric ornaments: conical, biconical, and cylindrical. Conical and biconical drill holes are the most common. Biconical drilling has an advantage with fragile materials because the pressure can be minimized by drilling on both sides instead of a single side, as in conical drilling. To form a cylindrical hole through a material that has no inner cavity, a biconically drilled hole is formed then either evened out with an abrasive or smoothed through wear (which would tend to produce an uneven interior hole). Another way to form a cylindrical hole may be to use a drill with a uniform thickness. This method seems unlikely, because it would tend to fracture fragile materials and is inefficient.

The importance of drilling methods is interconnected with the type of material used. Some materials are more friable than others when drilled (jet and shale, for example) and may tolerate less pressure from drilling than sturdier materials (such as

turquoise and metamorphic rocks). Occasionally, the drill leaves a circular impression on the face of an ornament. In the case of beads, this type of circular wear pattern is more likely the result of the stringing of variable-sized beads. This type of wear is distinct from the manufacturing process and changes the face of the bead in a different way (Haury and Gifford 1959).

Several of the ornaments in the collection were manufactured from exotic materials. The assemblage data does not indicate the occurrence of ornament manufacture beyond a few partially manufactured adornments produced from local materials. Lacking on the sites were raw material caches, manufacturing tools, and manufacturing debris, indicating that manufacturing took place off site. Since there was little to no manufacturing debris of exotic material, it is likely that these ornaments were brought onto the sites in a finished state along trade routes associated with the Hohokam or the Colorado Plateau.

The Use of Miscellaneous Items through Time

Despite the relatively low number of miscellaneous artifacts found, several patterns emerge when the artifacts are grouped into time periods and use categories.

Archaic Period. The Archaic sites containing miscellaneous artifacts in the project area (LA 78439 and LA 70188) contained many quartz crystals, the majority of which were from LA 70188. Despite the large number, none were culturally modified. While it is possible that the high frequency of recorded crystals indicates the "caching" of items to be used or modified later, this seems unlikely in this situation, because the site was near the base of a mountain with major quartz crystal deposits. It is likely that the majority of the crystals were a result of erosion, especially considering the degree of weathering and tumbling evident. The only exceptions to the erosional theory may be the three crystals found in features.

A single crude pendant was found at LA 70188 (Fig. 4.59), a site that dates to the transitional period between the Archaic and the Pinelawn phase. It is the earliest of the 25 sites in the project area where any ornament was found. Typical jewelry of the time period consisted of "simple" artifacts like beads, pendants, and occasional (presumed) bird effigies (Martin 1939; Martin and Rinaldo 1947). Although locally available materials were most often utilized for jewelry, a shell bracelet, most likely imported as

a finished product, was noted (Martin 1939) on a temporally equivalent site.

Pinelawn Phase. The Pinelawn phase was represented in LA 39975 and an early component of LA 39972. From these sites, respectively, a highly modified piece of hematite and a quartz zoomorphic effigy were recovered. Pigments and effigies have been found on previously studied sites of this time period, including several from the SU site (Martin and Rinaldo 1947; Martin 1939). Several crystals (modified and unmodified) and a modified bone fragment with a serrated edge were also recovered from the Pinelawn sites in this project.

The quartz grasshopper head is reminiscent of several insect figurines seen in the Mimbres area and at Ridge Ruin (Jernigan 1978). Although the figurine was found on the earlier component, it was recovered from the upper 30 cm of the site and may actually be part of the later Pueblo assemblage.

The excavated sites dating from this time period show the first evidence of culturally modified crystals. Quartz crystals were modified by chipping or abrasion, possibly to use as drills or incising tools (Sayles 1945). Minerals began to appear in the archaeological record, and some trade with the Anasazi may have occurred at this time (Martin and Rinaldo 1947).

Georgetown Phase. The Georgetown phase showed a change in the material culture. At this time there was some trade with the Anasazi and an apparent influence from Mexico with the introduction of cotton and woven cloth to the Mogollon area (Martin 1954; Doyel 1991). Little variability in collected minerals is evident in the Georgetown (LA 45508, LA 45510) and the Georgetown/San Francisco transitional phase site (LA 75791). During this period, a slight increase was noticed in the gathering of minerals and manuports. Of the two unmodified crystals recovered from sites of this phase, one was found on the floor of a pit structure. After this phase, the deliberate placement of crystals in structures and features, and the modification of quartz crystals increased. This time period also yielded the first confirmed animal effigy from the excavated sites, a crudely formed quadruped of local clay. In addition, one ornament (a stone discoidal bead) was found.

San Francisco Phase. A clear shift in material culture occurred during the San Francisco phase (LA 70196). Hematite and limonite were the only minerals recovered. Most were ground, possibly for use as pigments. This phase had the largest number of culturally altered crystals, although few modified and nonmodified crystals were present in features

(see Table 4.75). One quartz crystal was a possible medicine bag item.

The possible clay loom weights from LA 70196 were remarkably similar in shape and size to four spindle whorls found at Snaketown during the 1964-1965 excavations of Sacaton phase associations (A.D. 900-1100). These are clearly different from the perforated sherd disc type of spindle whorl. It was suggested that the Hohokam got the idea for these whorls from trading with people in western Mexico, where they used the simpler forms (Haury 1976: 259).

No ornaments were recovered from this site.

Three Circle Phase. Three sites dated to this phase: LA 3563, LA 43786, and LA 45507. At this time the local population utilized local resources and imported materials. An expanding variety of minerals was collected, although few were ground. Crystals purposely placed in features were present on the sites, and several quartz crystals were culturally modified, although most were unmodified. One quartz crystal was found in a burial and may have had greater ceremonial importance than those in the trash or fill of the roomblock (Sayles 1945). Quartz crystals and mineral samples have been found on other sites of this time period as well (Martin and Rinaldo 1950b).

This phase exhibited the first obvious use of imported ornamental goods and technology at the sites studied. The variety of adornments expanded. Ornaments were probably made locally, and some adornments of exotic materials were imported. Chrysocolla was probably used as a substitute for turquoise (Sense 1967) at this time. Although the majority of ornaments were made from imported materials, since no ornamental manufacturing debris was recovered from any of the sites, it is presumed that all the ornaments of imported material (*Glycymeris* shell and jet) were brought into the area in a finished state.

Ornaments in the Three Circle phase became smaller and more skillfully produced, with a more distinctive Mogollon style, while some adornments superseded design styles of the Hohokam and the Anasazi (McNeil 1986). One example of shared design characteristics is the stone effigy pendant category (both the quadruped and bird forms), which was made in all three regions. One such pendant was recovered from LA 3563. The forms are stylistically similar to those found in Anasazi and Hohokam areas, but the execution is not as fine. In the Mogollon area, stone bird effigy pendants were generally blue, gray, or red and were represented with wings folded and incising on the wings and tail to

suggest feathers. These effigies are found in Pinelawn phase sites in the region (Martin 1939; Martin and Rinaldo 1947; Martin and Rinaldo 1950b) through the Three Circle phase (Martin et al. 1964) and are possibly an antecedent to effigies of historic times (Cushing 1974).

During this time there was much trade in foreign goods in the Southwest (Brand 1935; Colton 1941; Tower 1945) and trade with Mexico through the Mimbres area (Whalen 1987). The Hohokam were the closest group to the Mogollon involved in the trade of shells from the Pacific coast and Gulf of California (Hayden 1972; McGuire 1992), and trade between the two cultures has been previously documented (Danson 1957; Bronitsky and Merritt 1986). Aside from the imported ornaments, the Mogollon may have assimilated technology and ideas from these other cultures. Two pipes from Luna Village had no precedent in the previous phases studied during the project, and they appear more frequently in the Mogollon archaeological record after this phase.

After the Three Circle phase, there was an apparent increase in interaction between the Mogollon and the Anasazi (Reid 1989; Bluhm 1957), and several theories have been suggested for long-range commerce (Doyel 1991) among the Mogollon, Hohokam, and Anasazi during this time. It has also been suggested that the Mogollon were middlemen in trade between the Hohokam and the Anasazi (Jernigan 1978).

Reserve Phase. The Reserve phase was represented by LA 39969 (Haury's site), LA 75792 (Thunder Ridge), and LA 70189 (Lightning Strike). LA 70185 (DZ) was a Reserve/Tularosa transitional phase site. In addition, LA 39972 contained a component that dated to this time period. These sites contained a broad variety of minerals as well as a number of quartz crystals, a manuport, and several ornaments. Materials from local and distant sources were used during the Reserve phase and Reserve/Tularosa transitional period.

These later sites showed an increase in the frequency and variety of minerals used (see Table 4.69). Hematite, limonite, and occasionally chrysocolla were commonly used as pigments. Several of the minerals (chrysocolla was the most common) were ground on one or more sides, while others were recovered from contexts that suggest they were deliberately placed. Two pieces of chrysocolla and a piece of pipestone may represent on-site ornament manufacture at LA 39969. A single piece of ground and shaped chrysocolla may be a fragment of ornament manufacturing debris, while a second piece of chrysocolla discovered underneath a floor may have

been an attempt to reproduce a turquoise domed bead found on the same site. A large piece of unmodified pipestone was found at LA 39969 and may have been cached for later use. Some of the pipestone may actually be red argillite, which is similar in appearance. Artifacts and outcrops of red argillite have been found in the Southwest (Bartlett 1939; Jernigan 1978; McGregor 1941, 1943; Cosgrove and Cosgrove 1932). Other sites of the Reserve/Tularosa transitional period in the region had similar mineral samples and quartz crystals (Bluhm 1957; Martin et al. 1956).

Of the quartz crystals recovered from the Reserve and transitional phase sites, one was culturally modified. Few unmodified crystals were found in features on the sites, although many of the crystals were recovered inside or directly outside structures.

Several zoomorphic effigies were recovered from the Reserve phase sites. Although an effigy resembling an insect was recovered from the Pinelawn component of LA 39972, it more closely resembles figurines recovered from sites dating much later (Jernigan 1978), and the presence of a Reserve Black-on-white effigy handle on the same site lends weight to the argument that the quartz insect effigy came from the later component. While few effigies have been documented from the Mogollon period, their manufacture increased during the Reserve phase. Three effigies were recovered from LA 70185, and they resemble figures from Pecos (Kidder 1932), east-central Arizona (Martin et al. 1961), and Luna County (Lambert 1956). These later forms were generally more deliberately modeled and often drilled lengthwise through the body. Other sites of this time period in the region had similar animal effigies (Bluhm 1957; Martin et al. 1956; Martin and Rinaldo 1950a).

A variety of ornament types utilized in the embellishment of the human body were present at these sites. These adornments were typical of Reserve phase and Reserve/Tularosa phase sites in the area (Bluhm 1957; Jernigan 1978; Martin and Rinaldo 1950a; Martin et al. 1964). Imported and locally available materials were represented. This phase also had the only remodified ornament found during the project, a shell bracelet fragment that was ground and drilled to form a pendant. These modified shell bracelets are fairly common from the Reserve phase on and have been found at Hooper Ranch Pueblo (Martin et al. 1961), Ridge Ruin (McGregor 1941), Swarts Ruin (Cosgrove and Cosgrove 1932), and others (Sayles 1945; Martin and Rinaldo 1950b).

Several turquoise ornaments were recovered from LA 39969, including a mosaic piece and a domed bead. Mosaic pieces are not uncommon on sites of this time period (Jernigan 1978). In addition, side-drilled domed beads of turquoise have been found at several sites in the Southwest (Bahti 1970; Jernigan 1978), and a similar ornament made of shell was recovered from Ridge Ruin (McGregor 1941). These beads, variously called domed beads, frogs, or tadpoles, are typically manufactured from turquoise and perforated for suspension. Both the Hohokam (Bahti 1970; Jernigan 1978), and the Anasazi (McNeil 1986; Pogue 1972) had a similar type of side-drilled turquoise bead during the same time period. The domed bead could have come to the Mogollon region through trade with either culture but may be of Hohokam origin (Jernigan 1978).

A pebble pendant and a chrysocolla pendant blank were collected from LA 75792. They were large, roughly formed, and manufactured out of locally available materials. Although they were possibly associated with a Reserve phase roomblock, their cultural affiliation is unclear. The pendant appears to be more typical of an earlier time period.

On the sites studied, the local Mogollon people seemed to use slightly more locally available materials than imported ones for adornments. Pendants and pendant blanks were the most common ornaments; they were generally subrectangular in outline, although other shapes were also represented. Grinding was evident on the surface of several ornaments, while others showed either smoothed or polished surfaces. Most ornament manufacture was probably local, with some use of imported items and remodification of broken imported items.

Tularosa Phase. The change from the Reserve to the Tularosa phase brought a greater shift in material culture, with increased contact with the northern Anasazi (Bluhm 1957; Reid 1989). Two sites dating to this time period were excavated (LA 3279 and LA 39968). LA 3279 also had a Reserve phase component, so some of the material may actually date to that occupation.

This phase contained the largest number and variety of mineral samples collected from any of the excavated sites, most of which were recovered from LA 3279. The majority of the samples were found in structures and features, and all are items typically found on sites dating to this time period (Martin et al. 1956; Rinaldo 1959). Chrysocolla was the predominant material in the assemblage. Although a large number of minerals were collected, few were actually modified. Local ornament manufacture may be represented at LA 3279 by two pieces of chryso-

colla and a piece of hematite.

A large number of unmodified quartz crystals were recovered from sites of this phase. Most of the crystals were found in structure fill, while almost half were found deliberately placed in features. Only three crystals were modified. Of the two from LA 3279, one was recovered from the fill of a foot drum in the kiva, while the other may be a medicine bag item. The third crystal, from LA 39968, was found west of Room 2. As in earlier time periods, crystals were often modified by chipping or abrasion, and some may have been used as drills or incising tools (Jernigan 1978; Sayles 1945).

Several manuports were recovered from the Tularosa phase sites. This was the highest number of miscellaneous stone items found throughout the project. These objects included a number of ball-shaped concretions, obsidian nodules, a specular hematite concretion, and a partially formed geode. Most of these artifacts appear to have been discarded, and few were in a context suggesting any deliberate placement. Ball-shaped concretions, the most common manuport, are not an unusual find at Mogollon sites (Bluhm 1957; Martin 1939; Martin and Rinaldo 1950b).

Fourteen ceramic effigies were recovered from the Tularosa phase sites; thirteen were from LA 3279. Four were outside the structures, six were in the great kiva fill on LA 3279, and the remaining four were found within rooms at LA 3279. These effigies resemble those found throughout the region at this time (Martin et al. 1956; Rinaldo 1959). A single effigy had an usual hole from below the head through the body to below the tail.

Thirty-four ornaments were found on the Tularosa sites, mostly from LA 3279. This was the largest number and widest variety of adornments found during the project. The majority of the ornaments were fully shaped, while a few were partially formed. Local and imported materials were both represented, and the majority of ornaments were made of locally available materials. No evidence of on-site manufacturing was found. At LA 3279, ornaments (mainly disc beads) were found primarily in Rooms 5, 6, 10, 11, and 15 (great kiva). Shell fragments from LA 3279 were recovered from Rooms 10 and 11, while those from LA 39968 were found in the lower pit structure fill. Of the six ornaments from LA 39968, only one was found outside the pit structure. The ornaments found on these sites were not uncommon to the area, although several were ornamental types not seen in previous phases studied during the project.

The most common ornament was the disc bead,

made of both locally available and exotic materials. Several beads were wedge-shaped in profile and had wear polish from stringing and circular indentations from an adjacent bead. At LA 3279, Room 15 (the great kiva) contained the highest number of this type of ornament (seven). Several disc beads (also at LA 3279) were found with the burial in the kiva (one of which was heavily used), along with three quartz crystals. At some Mogollon sites, beads are found in association with quartz crystals and other apparently ceremonial gear in kivas, indicating the use of beads in religious ceremonies (Jernigan 1978).

Two ceramic beads were recovered from LA 3279. Minute clay beads are fairly rare in the Southwest, and concentrations center in the Salt and Gila River valleys and Casa Grande (Haury 1931). Some disc beads of clay were also found at Pueblo Bonito (Judd 1954), Ridge Ruin (McGregor 1941), and Swarts Ruin (Cosgrove and Cosgrove 1932). These ceramic beads resemble small stone beads and were sometimes colored with iron oxides (Haury 1931).

Bone tube beads and bone rings appear at several Tularosa sites (Martin et al. 1956; Rinaldo 1959) and in assemblages from other sites in the area from several time periods (Martin et al. 1961; Martin et al. 1964; Martin and Rinaldo 1950b; Sayles 1945). Undecorated bone rings are common in the Southwest, having been found at Swarts Ruin (Cosgrove and Cosgrove 1932), Point of Pines (Wendorf 1950), and other sites (Jernigan 1978). Since they are represented in assemblages from most areas and time periods, there is little to be inferred from their presence.

On LA 3279, a bone tube bead, a bilobed shell bead, and a turquoise pendant were found in the fill of Room 11. The shaped shell bead was common in both Mogollon and Hohokam areas during the same time period (Bluhm 1957; Jernigan 1978; McGregor 1941; Martin et al. 1956), and bilobed shell beads have also been found to the north, at Pueblo Bonito (Judd 1954). The pendant found in this room was one of two found on the site. The two pendants were turquoise, triangular, and of a similar size. Triangular pendants are fairly uncommon in the Mogollon area, and matching turquoise pendants (pairs) have been found in the Anasazi area as ear pendants (Jernigan 1978).

A bone gaming piece was also found at LA 3279. These artifacts are recovered from sites of many time periods (Cosgrove and Cosgrove 1932; Martin 1939; Martin and Rinaldo 1947; Martin et al. 1949; Martin and Rinaldo 1950b). It was found in Room 8, along with a cylindrical sandstone object

and several pieces of modified chrysocolla. These items may have been a cache of some sort.

Changes in Material Culture

There was a discernable shift in the material culture from the Archaic to the Tularosa phase. This trend of increasing variability is not uncommon in the region (Martin et al. 1949; Rinaldo 1959). The changes can be attributed to internal cultural growth and external influences. It has been established that the Mogollon had at least a limited amount of contact with other cultural groups (Hohokam, Anasazi, and Mexico), but the extent of that contact and how much it affected Mogollon society has not yet been determined. The results of the analysis suggest that the local Mogollon were not dependant on frequent trade with outside groups to bring in exotic goods and new ideas. They seemed to make do with materials available in the area, with limited outside contact.

The variety of materials recovered increased from the earliest phases (mostly crystals) to the later phases (various minerals, crystals, stones, clays, and shell). At the earliest sites, the minerals most commonly found were coloring agents such as limonite and hematite. During the later phases, there was an increase in the variety of forms created from a single mineral, and a greater assortment of minerals utilized. Minerals went beyond simple ochre and were used as ornamental material (chrysocolla, pipestone) and in a variety of manuports.

The crystals show a marked change in the way they were used and the possible importance attached to their use by the Mogollon. In the earliest phases, quartz crystals were unmodified, and few were placed in features. As the culture evolved, crystals were modified (used as drills, etc.) and more frequently placed in features. The practice of placing both modified and unmodified crystals in features increased during the Three Circle and Tularosa phases. Most quartz crystals from the later time periods were almost always found in or just outside of structures.

The early ornaments consisted of larger and more bulky items made out of locally available materials. A slow change in the nature of ornaments took place, with an increase in the number of adornments and variety of materials used to manufacture them (Table 4.86). Ornaments after the Georgetown phase became smaller and more skillfully produced with more exotic materials.

Typical later Mogollon jewelry consisted of small- to medium-sized beads, pendants made of

Table 4.86. Ornament Morphology and Material Types by Age of Site

	Archaic	Pinelawn	Georgetown	Three Circle	Reserve	Reserve/ Tularosa	Tularosa	Total
Bracelet				4 Glycymeris	1 shell		2 shell 1 Glycymeris	8
Pendant				1 metamorphic	1 shell 1 sedimentary	1 sedimentary	2 turquoise	6
Pendant blank	1 sedimentary			1 chrysocolla 1 jet	1 chert 1 chrysocolla	1 chert 1 chrysocolla 2 hematite	1 sandstone 1 shell 1 rhyolite	12
Ornament		1 bone		1 shell	1 turquoise		1 shell 1 sedimentary	5
Ring							2 bone	2
Inlay					1 turquoise	1 Luna blue		2
Disc bead			1 metamorphic				7 metamorphic 5 jet 1 clay 1 limestone 2 indeterminate	17
Tube bead				1 bone			2 bone	3
Other bead					1 turquoise		1 clay 1 shell 2 calcium carbonate	5
Total	1	1	1	9	8	6	34	60

turquoise and local stones, and shell bracelets. Fully shaped ornaments dominated the assemblage (Table 4.87), followed closely by partially worked ornaments. Beads and subrectangular pendants (including pendant blanks) were the most frequently found ornament. Pendant shapes did not appear to change much through time. Rectangular pendants seem to be the favored form (Table 4.88), along with other simple geometric shapes.

Attempts at ornament manufacture were evident in several phases, and the greatest concentration occurred after the Reserve phase. Although there is little evidence of ornament manufacture on-site, it is likely that most of the adornments made of local materials were made in the area. It is believed that the Mogollon were making their own disc beads by at least A.D. 900, and probably earlier, and it is not unlikely that they also traded for beads (Jernigan 1978). In addition, pendants were presumably fashioned locally, with the exception of those made of exotic materials.

The turquoise and shell ornaments recovered from the excavated sites are comparable to those found at sites in Arizona (Bronitsky and Merritt 1986). Pendants made of turquoise and local materials are common, and whole shell pendants are not uncommon. Tabular shell pendants are rarer (Jernigan 1978). Bilobed beads and bird-wing-shaped ornaments are also not uncommon, and the

bird shape is fairly typical of Mogollon style. Although turquoise mosaics have been found in the Mogollon region, they are generally not as well formed as those made by the Anasazi or Hohokam (Jernigan 1978). After A.D. 1100, it is harder to distinguish a clear-cut Mogollon style, since they borrowed from the Anasazi designs (Jernigan 1978).

Although evidence of cultural changes may be indicated most clearly in architecture and pottery (Martin and Rinaldo 1950b), this may simply reflect the comparative rarity of miscellaneous goods and ornaments. A more subtle change (especially in a "religious or ceremonial" sense) may be more visible in the miscellaneous items that show up in the archaeological record. Sometimes that change may be the adoption of technology or ideas from another group (using zoomorphic imagery, pipes, etc.) or something more palpable, like the imported material itself or any related finished goods. Shell bracelets, shell beads, and copper bells are well-known examples.

The variety of both imported and local materials used by the Mogollon grew during the Three Circle phase and peaked in the Tularosa period. These later sites represent a time when the cultures throughout the Southwest and Mexico were in flux, which is primarily reflected in the distribution of material goods. The rise in variability may be indicative of the increased contact between groups,

Table 4.87. Ornamnt Manufacturing Stages and Morphology by Age of Site

	Unknown	Partial Shape	Partial Drill/Shape	Broken in Drilling	Broken in Shaping	Fully Shaped/Drilled	Fully Shaped	Drilled	Remodified	Total	Site Total
Archaic pendant blank				1						1	1
Pineawn ornament		1								1	1
Georgetown disc bead						1				1	1
Three Circle bracelet	1					3				4	
Pendant						1				1	
Pendant blank		1		1						2	
Ornament							1			1	
Tube bead						1				1	9
Reserve bracelet						1				1	
Pendant								1	1	2	
Pendant blank		2								2	
Ornament							1			1	
Inlay							1			1	
Other bead								1		1	8
Reserve/Tularosa Pendant						1				1	
Pendant blank		2		1	1					4	
Inlay		1								1	6
Tularosa bracelet		1				1				3	
Pendant						2				2	
Pendant blank		1					2			3	
Ornament		1			1					2	
Ring							2			2	
Disc bead						16				16	
Other bead						4				4	
Tube bead		1								2	34
Total	1	11	1	3	1	30	11	1	1	60	60

Table 4.88. Shape of Pendants and Pendant Blanks by Age of Site

	Indeterminate	Oval	Triangular	Rectangular	Semicircular	Zoomorph	Total
Archaic				1 blank			1
Three Circle	1 blank				1 blank	1 pendant	3
Reserve	1 pendant	1 blank		1 blank	1 pendant		4
Reserve/ Tularosa		1 blank		1 pendant 3 blank			5
Tularosa			2 pendant	3 blank			5
Total	2	2	2	9	2	1	18

an outgrowth of the developing Mogollon culture, or a combination of the two. The trend of increasing variability is not uncommon in the region (Martin et al. 1949; Rinaldo 1959), and the changes can be attributed to both internal cultural growth and external influences. The foreign materials in the assemblage probably represent trade with several of the major southwestern cultures involved in exchanging goods. The obviously exotic materials occur during phases when there was increased trade between cultures, and these items provide a view into the economic practices in the Reserve area.

Regional Exchange

In general, a great deal of exchange occurred in southwestern prehistory, and the likely trade routes have been extensively researched (Brand 1935, 1938; Colton 1941; Tower 1945; Warren and Mathien 1985). These trade routes are often reconstructed based on the locations of river valleys, mountain passes, water sources, easily traveled landscapes, and routes used by ethnohistoric populations. The conjectured routes are also based on the distribution of archaeological materials of obviously exotic origin (Venn 1984), although some exchanges may not be evident if two groups are trading similar items. When cultures interact (exchange material goods) over a lengthy period of time, similar stylistic forms and design elements will develop as one group adapts an idea from another. This can be seen among the Hohokam, Mogollon, and Anasazi, especially in their ornaments (Jernigan 1978; McNeil 1986).

Trade is a necessary activity in a society. A community may be self-sufficient in certain raw materials and crafts, yet lacking in other areas. Exchanges with other groups can provide critical goods (ritual items, clothes, and possibly food) to replenish exhausted supplies or provide resources

that are not locally available. Regional trade is a form of foreign policy that is necessary for intertribal relations and maintaining boundaries and relations with others (Ford 1972). This transfer of materials could have been accomplished by mutual assistance, gambling and gaming, ceremonial redistributions, and trading or raiding parties. Several modern and ethnographic equivalents of these conjectured prehistoric exchange methods have been suggested (Ford 1972, 1983; Seymour 1988). Prehistoric procurement, production, and manufacture may have been practiced within a single family or accomplished by kin groups who then traded among other family/kin groups with possible Hohokam or Mexican "family" connections (Seymour 1988). Ornaments (especially beads) seem to be suitable as a trade item or currency, since they are so easily portable and can be "an anonymous means of exchange between people of different cultural worlds" (Graeber 1996).

Trade Items

Trade in exotic goods in the Southwest (Brand 1935, 1938; Colton 1941; Tower 1945) and trade with Mexico through the Mimbres area (Whalen 1987) increased after the San Francisco phase in the Mogollon area. At this time there was also an apparent increase in interaction between the Mogollon and the Anasazi (Bluhm 1957; Reid 1989; Martin and Rinaldo 1950a). Several theories have been suggested for long-range commerce (Doyel 1991) among the Mogollon, Hohokam and Anasazi. Some researchers suggest that there was very limited interaction between the Mogollon and the Hohokam but grudgingly admit to the many similarities between objects found in both areas (LeBlanc 1989b). Yet some trade between the two is evident, since intrusive elements appear in both areas.

Marine shells were prehistorically available

from several sources. The Hohokam were the closest group to the Mogollon involved in the trade of shells from sources primarily along the Gulf of California (Hayden 1972; McGuire 1992), and trade between the two cultures has been previously documented (Danson 1957; Bronitsky and Merritt 1986). In addition, the Mogollon may have been involved as middlemen in the shell trade between the Hohokam and Anasazi (Jernigan 1978). Hohokam shell manufacturing was at its height during the Sedentary period, approximately A.D. 900-1100 (Haury 1976), which coincides with the Three Circle and Reserve phases in the project area. Since there was no evidence for imported shell ornament manufacture on the sites excavated, it is presumed that these artifacts were obtained in a finished state, probably through trade with the Hohokam.

Evidence of on-site manufacture of turquoise ornaments was also lacking, and it is likely that prehistoric residents of the area also procured these ornaments in a finished state. While turquoise was a desirable commodity, several examples of ornaments potentially created to mimic turquoise have been found at other southwestern sites (Jernigan 1978; Judd 1954; McGregor 1943). Both the Anasazi and the Hohokam had access to turquoise and the skill to make those ornaments. In addition, the possibility that the Mogollon went to the mines, made the ornaments at the mining site, and brought finished adornments back to the area cannot be discounted.

Although none of the turquoise artifacts were chemically sourced, a number of prehistoric mines are potential sources of the raw material. Several prehistorically utilized turquoise mines are in the southwestern area of New Mexico (Anyon and LeBlanc 1984; Kayser 1971; McNeil 1986; Pogue 1972; Weigand et al. 1977) and in Arizona (Pogue 1972; Sigleo 1970). It is also possible that the raw material came from the vicinity of Cerrillos, since the area was mined prehistorically (Levine and Goodman 1990; Sigleo 1970; Warren 1976; Warren and Mathien 1985; Wiseman and Darling 1986) and saw an increase in use just before the Reserve phase.

Prehistoric Cerrillos turquoise has been found at many sites, including an extraordinary burial at Ridge Ruin near Flagstaff, Arizona (McGregor 1943), Chaco Canyon (McNeil 1986; Warren and Mathien 1985), Snaketown (Haury 1976), and Alta Vista, in northwest Mexico (Harbottle and Weigand 1992; Weigand 1982). The distribution of sites yielding turquoise artifacts seems to indicate a widespread use of the material, no matter what the original source, suggesting that turquoise was selected as a desirable commodity. The turquoise ornaments may have come from those areas, or else they were imported from some other area.

It is likely that at least some of the imported turquoise ornaments came through trade with the Anasazi, who had more influence in the Mogollon area in the later time periods. While the Mogollon, Anasazi, and Hohokam cultures had some stylistically similar ornaments, the shell items may have come through trade with the Hohokam.

CONCLUSION

The changes perceived in the assemblage through time are indicative of the growth of the Mogollon culture and increased contact with the Hohokam and Anasazi. This is evident when considering the adaptation of technology originally found in other areas (spindle whorls, effigy pendants) and the development of their own ornament-making technology. The results of this analysis suggest that although the local Mogollon traded with outside groups to bring in exotic goods and new ideas, they generally made do with resources available in the area.

A thorough investigation has not been made in the area to ascertain the frequency of imported goods versus those locally manufactured and the extent of the exchange of ideas, technology, and goods that comes with the meeting of several cultures. For improved knowledge on the subject, more ornaments from the region need to be studied.

BIOARCHAEOLOGY IN THE MOGOLLON HIGHLANDS

Linda Mick-O'Hara

Archaeologists have long speculated on the origins of the populations in the Mogollon Highlands. However, only a small number of excavated skeletal remains have been found in a condition that would allow for sound data collection to approach issues of origin, status, stature, and health. Preservation of human remains from the Luna-Reserve area is variable, and most remains are heavily eroded and fragmentary. Occasionally, drainage patterns and general context have resulted in excellent preservation, and it is these burials that can be used to address problems of population origin, stature, and health.

The four phases of the Luna-Reserve Project resulted in the recovery of nine burials of various completeness and numerous pieces of disarticulated human bone. The disarticulated human bone varied in condition. Table 4.89 contains information on sex, age, and conjoinable or articulated elements when this could be assessed. The burials recovered represent a small sample, but the lack of complete analysis of remains from the Mogollon Highlands makes any additional data valuable. Adding this information to the other burial analyses can only add to the body of knowledge about the people who lived in these highlands during both the Pithouse and Pueblo periods.

Each of the burials recovered is described and analyzed separately by site placement, location within the site, and site age. The burials are generally assigned to the Pithouse or Pueblo periods, but early and late divisions are made when noted changes in burial practices occur. To augment our small burial sample, data was collected on seven well-preserved skeletons from the Whiskey Creek and Apache Creek areas within the project area. These skeletal remains were only a few of the thirty-three individuals excavated during the 1970s, on previous projects undertaken by the Museum of New Mexico. Variable preservation among these remains drastically reduced the number of individuals that could be used in the comparative study. These individuals are compared with the Luna-Reserve sample and the remains from Starkweather Ruin (Nesbitt 1938). The comparison is restricted to cranial measurements at this time because of the

comparative analyses done by Nesbitt and the importance of speculation by Nesbitt and by Martin and Rinaldo (1951) as to the occurrence of two morphologically distinct populations within the Mogollon Highlands during the Pueblo period. Discussion of the results of these comparisons includes an evaluation of this argument as it relates to the burials from the Mogollon area of the greater Southwest.

METHODOLOGY

The OAS guidelines for the treatment of human remains were followed in recording and excavating all remains. All human remains were excavated under an approved ARPA permit and all appropriate USDA Forest Service guidelines. Consultation with the Zuni tribe, who claim remains from the Mogollon area as ancestral, resulted in a decision to conduct no destructive analysis of remains and to rebury them near the area of excavation after analysis.

All burials except that from LA 3279 were first returned to OAS for cleaning and analysis. Remains were cleaned by dry brushing, but adherent dirt was occasionally removed by minimal dampening of the bone. No exfoliation was noted on the bones that had been moistened to remove dirt. All human remains were then rehoused and stored in a secure area.

The analysis of each burial was as complete as possible. Preservation and completeness of elements determined the measurements and the details of the evaluations made on each set of remains. Measurements were taken whenever possible, and anomalies and pathologies of the elements were evaluated when cortical tissue and epiphyses were complete enough to make such analysis feasible. All evaluations of human skeletal remains were recorded on individual inventories and used in statistical comparisons.

The adult male burial from the great kiva at LA 3279 was recovered during the final phase of the Luna project, subsequent to a Gila National Forest decision that no human remains should be transport-

Table 4.89. Disarticulated Human Bone

LA Number	Field Specimen	Grid	Level	Sex	Age	Element Description
3279	83	Code 500	3	Unknown	Child	24 cranial fragments, 2 ribs, and 2 vertebrae fragments
3279	105	Code 600	3	Unknown		1 long bone fragment
3279	679	Code 600	5	Unknown	Child	1 deciduous molar
3279	715	Code 15 10 Kiva	6	Unknown	Adult	1 fourth metatarsal and 3 long bone fragments
3563	191	103N/96E	2	Unknown		1 temporal fragment and 1 parietal fragment
3563	375	106N/94E	2	Unknown		1 right temporal fragment
3563	398	105N/98E	2	Unknown	Adult	1 parietal fragment and 1 vertebra
3563	416	140N/99E	1	Unknown	Adult	1 left central incisor
3563	454	106N/94E	2	Unknown	Adult	1 cranial fragment
39968	2137	88N/95E	3	Unknown	Adult	8 cranial fragments
39968	2517	95N/104E	2	Unknown	Adult	1 fragment, mastoid process
39968	2132	87N/98E	5	Unknown	Adult	4 fragments, badly eroded sacrum
39968	555	87N/99E	2	Unknown	Adult	3 cranial/parietal fragments
39968	1276	86N/96E	2	Unknown	Adult	5 left parietal fragments
39968	1555	87N/95E	3	Unknown	Adult	1 third metacarpal
39968	1743	87N/98E	3	Unknown	Child	1 left inominate in fragments, 1 carpal, and 1 phalange
39968	1486	88N/88E	2	Unknown	Adult	5 right rib fragments
39968	1748	87N/98E Pit Structure	3	Unknown	Adult	1 mandibular lateral incisor
39969	157	103N/102E	2	Unknown	Child	1 femur fragment
39969	389	104N/99E	3	Unknown	New Born	1 right ilium and pubis with carnivore bite marks
39969	348	10N/103E	2	Unknown	Child	2 fibula fragments*
39969	1050	Feature 14	6	Unknown	Child	1 deciduous incisor*
39969	826	107N/108E	2	Unknown	Child	1 right ilium*
39969	941	108N/106E	2	Unknown	Child	1 left ilium*
39969	845	108N/101E	2	Unknown	Child	1 left femur*
39972	173	95N/86E	3	Unknown	Child	1 partial femur, 1 ischium
45507	32	104N/108E	2	Unknown	Child	1 parietal fragment
45507	33	104N/107E	2	Unknown	Child	1 deciduous molar and 1 cranial fragment
45507	34	105N/109E	2	Unknown	Child	1 cranial fragment
45507	56	105N/108E	2	Unknown	Child	12 cranial fragments
45507	85	105N/107EF	2	Unknown	Adult	1 right temporal (conjoins with FS 89, 91)
45507	89	130N/98E	2	Unknown	Adult	1 occipital, in fragments (conjoins with FS 85, 91)

Table 4.89. Continued.

LA Number	Field Specimen	Grid	Level	Sex	Age	Element Description
45507	91	130N/98E	2	Unknown	Adult	1 left temporal and parietal (conjoins with FS 85, 89)
45507	123	129N/98E	2	Unknown		1 cranial fragment
45507	137	102N/96E	2	Unknown	Adult	1 right petrous temporal
45507	1356	156N/242E	3	Unknown	Adult	1 cranial fragment
45507	1417	152N/299E	3	Unknown	Adult	1 rib fragment
45507	1525	154N/240E	4	Unknown	Adult	1 zygomatic fragment and 2 vertebrae fragments
45507	1542	155N/241E	3	Unknown	Child	1 radius and 4 phalange fragments
45507	1551	154N/239E Feature 12	3	Unknown	Child	1 vertebrae fragment
45507	1627	153N/241E Feature 13	3	Unknown	Child	1 metatarsal fragment
45507	1811	154N/241E Feature 13	3	Unknown	Adult	2 parietal fragments
45507	2125	153N/242E Feature 12	3	Unknown	Child	1 right ulna and 1 cranial fragment
45507	2089	151N/230E Feature 13	4	Unknown	Adult	1 metapodial fragment
45507	2177	154N/240E Feature 12	5	Unknown	Child	1 thoracic vertebrae
45507	2171	153N/240E Feature 12	3	Unknown	Child	4 rib fragments, 1 left ilium and pubis, and 1 metatarsal
45507	1709	154N/241E Feature 12	3	Unknown		1 cranial fragment, 5 long bone fragments, and 3 vertebrae fragments
45507	1498	151N/228E Feature 13	4	Unknown		13 cranial fragments
45507	1555	150N/231E Feature 13	4	Unknown		1 long bone fragment
45507	1580	151N/229E Feature 13	4	Unknown		3 long bone fragments
45507	1579	151N/228E	5	Unknown		2 long bone fragments
45507	656	103N/90E	2	Unknown		5 long bone fragments
45507	628	104N/88E	3	Unknown		4 cranial fragments and 1 rib fragment
45507	651	130N/99E	2	Unknown		1 right parietal fragment and 1 long bone fragment
45507	1493	152N/229E	4	Unknown		1 cranial fragment and 1 rib fragment
45507	1581	154N/214E	3	Unknown		1 cranial fragment
45507	652	131N/98E	2	Unknown		3 long bone fragments
45508	1932	154N/230E	3	Unknown		1 cranial fragment and 2 long bone fragments
70201	290	121N/113E	4	Unknown		1 left parietal fragment

* These remains are consistent in size and may be from the same child.

ed away from project areas. These remains were housed at the USDA Forest Service office in Luna, New Mexico, prior to their analysis. These remains were not cleaned before analysis was undertaken, and photographs of the remains were taken under less than ideal conditions.

After analysis, all human remains, burials, and disarticulated remains were returned to the project area for reburial. Through consultation with the Gila National Forest, it was decided that all remains would be reinterred away from the original sites but near them and out of danger. The Luna Project directors worked with Gila National Forest personnel to accomplish this task. Reburial locations are filed with the Gila National Forest and the New Mexico Cultural Resource Information System (NMCRIS), Historic Preservation Division, in Santa Fe.

BURIALS FROM LUNA VILLAGE (LA 45507)

Walter Hough (1907) uncovered a burial at LA 45507 (Luna Village) around the turn of the century, the discovery that brought the prehistoric pit structures of Luna Village to his attention. His later excavations provided information on the extent of these ruins and uncovered a "cemetery in which infants alone were buried" (Hough 1919:413). There were actually five burials in the cemetery and two others in pit structure context. These human remains, isolated during the two field seasons, were never analyzed beyond the initial excavation assessments. Thus direct information about the site occupants was never available.

During the recent excavations undertaken by the Office of Archaeological Studies, several more pit structures were exposed in the highway right-of-way from the Luna Village complex. Within two pithouses assigned to the Three Circle phase at Luna Village (Pit Structures 12 and 13), two burials were isolated. The first to be exposed was the burial of a young child interred in an oval pit dug into the edge of Pit Structure 12. The pit obviously postdated the use of the structure. The second burial was the partial remains of an adult female buried in the fill of Pit Structure 13.

Burial 1

Burial 1 was the partial but fully articulated remains of an adult female approximately 25 to 35 years of age at death, found during the excavation of Pit Structure 13. The remains consisted of a mandible, an eroded vertebral column, and most of the ele-

ments of the left arm of a single individual. Since all elements were in articulation, rodent disturbance or other post-depositional activities in the area disturbed the burial context. There was no apparent burial pit identified, but if the area had been disturbed after the initial interment of the individual, this disturbance may have obliterated evidence of a pit.

The elements present were eroded and fragile. Some of the missing elements may have eroded away through rodent disturbance and the altered drainage pattern that it created in the feature area. In this case, the elements remaining were probably those less directly affected by the drainage of water through the area. The remains still present exhibit varying degrees of erosion. Some ribs and vertebrae were documented during excavation but only retrievable as small fragments.

Though no burial pit was discernable during excavation, the position of the left arm and torso (eroded vertebrae) suggest that this individual was formally placed in the fill of the pit structure, on top of the roof fall. The body appeared to have been buried in a semiflexed position on its right side with the head pointing to the east.

In Ham's (1989:71-73) recent assessment of the burials from Nan Ranch Ruin (LA 15049), she found that burials positioned with their heads to the east accounted for 42.9 percent of her sample, while burials were semiflexed only 26.9 percent of the time and placed on the right side only 8.9 percent of the time. The partial remains of this female follow the major interment practices in inhumations from NAN Ranch Ruin and in the Mogollon area as a whole.

Sex was determined through an assessment of the mandible (Bass 1987:81; White and Folkens 1991:322), which was rounded rather than squared, and by measurements of the humeral head and the epicondylar width, which fall within the parameters for females (Bass 1987:150).

The age estimate of 25-35 years was made through observations on the mandibular dentition. There was occlusal wear on all dentition present, with particular wear on the buccal edge of the premolars. The molars exhibited varied wear from M1 to M3 and differing wear between left and right molars. Using Brothwell (1965:69), an assessment of molar wear would place this individual in the 25 to 35 year age group at the time of death. The more extensive wear on the right molars and premolars may indicate a preferential use of that side of the mouth for chewing. This preference has no apparent osteological origin in the mandible and could only

be assessed further if the maxillary dentition had been present.

The missing mandibular dentition appeared to have been lost after death and not because of any apparent pathology. There were pit caries noted on the mesiobuccal surface of left M1 and on the occlusal surface of right M1.

Burial 1 was eroded, and much of the cortical tissue was damaged enough to prevent identification of any pathologies affecting the surface of the bone. The postcranial remains that could be retrieved included thirty fragments of cervical and thoracic vertebrae. Both scapulae were present and eroded, but the glenoid fossa and acromion process were present in both elements. Both clavicles were also present but, again, extremely eroded. Rib fragments were identified, but refitting or assignment to side was not possible. The left humerus, radius, ulna, and most of the left hand were present, but no measurements were possible.

This burial was primary at this location, but rodent disturbance and erosion had destroyed many of the elements. Interment on top of roof fall suggests a less formal burial, which seems to be true of many of the Pithouse period burials in the area. There were no associated ceramic vessels or other grave goods, which occur frequently during the Pueblo period.

Burial 2

The second burial from Luna Village was that of a child 3.5-4.5 years of age at death, who was interred in a formal burial pit (Feature 14) dug into the eastern edge of Pit Structure 12. Feature 14 was an oval pit, 110 by 52 cm and 18 cm deep, excavated into the compact soils at the edge of the pit structure but lacking any formal lining. Several lithic artifacts and sherds were recovered from the fill of the burial pit along with one crystal and an awl fragment, which may have been included as a grave offering.

The burial had been impacted by previous road work and ground pressure due to its location just under the road shoulder gravels near the Luna gas station in the town of Luna, New Mexico. The skeleton was supine, in a semiflexed position, with arms down to the sides but legs flexed at the hip and knee. The head was pointing to the northeast, and the face was turned slightly to the west. The remains were eroded due to some rodent disturbance and drainage through the burial pit.

The cranium was complete but fragmented and had to be removed in pieces. The pieces were refit-

ted in the laboratory, but the refitting was only possible with individual elements. The skull had been extremely deformed by ground pressure, which made the refitting of elements difficult when fragments of cranium were missing. There was some cradleboard deformation at the right lambdoid suture, and there was parietal bossing concomitant with the immaturity of the remains.

The maxilla was fragmented but could be reconstructed, and both deciduous and developing permanent dentition were in place. All deciduous teeth were erupted, with slight wear apparent. Most of the permanent dentition was developing, and many of the crowns were fully formed, but with little resorption of the roots of the deciduous dentition. There were small pit caries on the mesio-occlusal surface of the deciduous right M1. The mandible of this child presented a similar picture. It was complete, with the first permanent molar crowns formed. All deciduous dentition was fully erupted and exhibited evidence of wear. Crowns for most permanent dentition were developed, but no deciduous root resorption was apparent. All molars were carious to the extent that both right and left M2 were severely reduced by the large caries that had taken most of the center of these teeth. Both left and right M1 had small carious lesions on the occlusal surfaces that had penetrated into the dentin. This dental pattern suggests that the child was weaned onto a largely carbohydrate diet and that chewing of meat or tough plant fiber that would tend to clean the teeth and reduce carious activity was not a significant part of the diet (Brothwell 1972; El-Najjar 1974; Berry 1985).

The occurrence of only slight wear on the dentition is noteworthy because, at four years of age, the child was certainly weaned and eating solid foods. This incongruence between the dental development and dental wear is also true of the dentition and the postcranial remains of the child.

In general, the postcranial remains recovered were eroded. This weakens inferences that could be made in an assessment of these remains and their comparison to the dental development of this burial. The postcranial remains are small for the dental age of the child.

The vertebrae present were fused arches and centrum fragments that were eroded and fragile. The fused vertebral arches suggest an age of three to seven years (Bass 1987:94), but the size of elements suggest a younger child. Fragments of both the atlas and axis and the five other cervical vertebrae were present along with more fragmentary thoracic and lumbar vertebrae. Other postcranials exhibit similar

erosion, and the elements of the right side are the most heavily eroded. The long bones have very thin cortical tissue and are fragile, which may indicate that the child was nutritionally deprived and/or in poor health for some time prior to death (Speth 1990).

It is interesting to note that the burial of this child postdates the occupation of Pit Structure 12. The burial pit was excavated into the east wall and fill of the pit structure. If this burial is related to the former occupants of this pithouse, it may also be related to the female buried in the pit structure fill.

Hough's (1919:413) excavations at Luna Village recovered several child burials accompanied by small pots, scrapers, and animal bone. Hough's excavated burials could not be located as a comparative sample, but the context of these burials alone can be used for comparison. All burials were of children less than 5 years of age. Both Burial 2 and Hough's burials were interred in formal pits in the wall or at the edge of abandoned pit structures. The care taken to inter an individual in the fill of an abandoned pithouse suggests that these children were related to the former occupants and that the interments were in "family space" (Schlanger 1992). If these child burials were related to the occupants of the pithouses near which they were buried, why did six children die at fairly similar ages? This may indicate that some nutritional factors and perhaps disease were affecting this age group. Burial 2 exhibits some reduction of cortical and trabecular tissue, which may suggest poor health for some time, but this cannot be used to suggest long-term health problems for other burials at the site.

BURIALS FROM SPURGEON DRAW (LA 39968)

During the third phase of the Luna Project in the Mogollon Highlands, six burials and a small amount of disarticulated human bone were recovered from two sites dating to the Pueblo period, after A.D. 1000. Three burials were recovered from Spurgeon Draw and three from the Haury site. All but one of the formal burials and most of the disarticulated bone are from child burials ranging in age from neonate to 10 years. The burials from LA 39968 and LA 39969 are shown on their respective site maps, showing the spatial relationship between the burials and the surrounding structural units.

The two formal burials from LA 39968 were young children. The graves contained vessels and corn pollen as part of the interment ritual. Burials excavated by Hough (1919) at LA 45507 were also

young children but primarily without grave goods. LA 45507 represents a Three Circle phase Pithouse period community, while the children and adult burials from the Pueblo period communities have ceramic vessels and frequently other items as well. This change in burial associations, which may reflect a change in ritual behavior, is apparent between these two periods and will be discussed in more detail later in this chapter.

Burial 1

Burial 1 was the remains of a nine to ten year old child interred in a shallow burial pit 1 m north of the entryway to the pit structure. The edge of the burial pit was extremely hard to define, but the pit was almost circular (40 by 40 cm) in plan view and approximately 10 cm deep. Six small vessels were associated with this Tularosa phase burial. Two Alma polished jars, one Alma neckbanded jar, and one Reserve smudged bowl were placed around the child's head with the bowl on top of the skull. The other two vessels, an incised corrugated jar and a Reserve smudged bowl, were found at the edge of the burial pit and for purposes of interpretation are associated with the burial. Vessel 2, an Alma polished jar, contained corn and buckwheat pollen, suggesting that the vessels and their contents were ritual offerings buried with this child.

The burial consisted of a number of cranial fragments from the occipital, parietals, sphenoid, and right temporal regions along with the maxilla in fragments with all maxillary dentition in place and fragments of both scapulae.

The maxilla was small and fragmented, but all dentition was present and in good condition. Both M3 crowns had developed but were still unerupted. All other permanent dentition had erupted, but little wear was apparent, and no pathologies were noted. Fragments of the left scapula were the only postcranial remains recovered from this burial. They were eroded and fragile, suggesting that drainage through the burial pit had destroyed most of the burial.

This child burial, interred in a shallow pit with ceramic vessels surrounding the skull and in the grave fill, represents a pattern seen again and again in juvenile and adult burials in the Mogollon Highlands during the Early and Late Pueblo periods (Nesbitt 1938; Kayser 1975). Burial practices seem at this point to be physically similar to those from the Pithouse period, but vessels, crystals, and other offerings are often an important part of the interment ritual.

Burial 2

Burial 2 was isolated 2 m north of Burial 1 in what was probably the southwest corner of Room 2. This burial was that of a six to nine month old infant interred in a shallow pit below the floor of Room 2. The pit edges could not be well defined, but it appeared to be a small circular pit, 30 by 25 cm and 17 cm deep. An alligator juniper had grown into the southern part of the burial pit. The cranium was fragmented, and numerous elements had been moved by root disturbance.

Assessment during excavation was that this was a fairly complete infant burial. The child had been interred on its back in a semiflexed position with knees bent and arms at the side of the body. The head was to the east with the face to the north, and the legs were to the west. Many of the epiphyses were not formed or were small, fragile, and not recoverable.

The elements of the cranium had been fragmented by root activity, but most were present and very fragile. These elements and fragments had been warped by ground pressure and were not entirely reconstructible. The maxilla was present with a few teeth or developing crowns in place. The left deciduous molars were present as unerupted crowns seated in the alveolar ridge. The left I2 had partial root development but was unerupted, while left I1 was preparing to erupt through the soft tissue, or had just done so. This dental pattern indicates an age of six to nine months (Ubelaker 1989).

The mandible was nearly complete with only the left coronoid process missing. The crowns of both the left and right deciduous molars were developed in the alveolar ridge but unerupted. The left and right canines and both left and right I2 were developed with the roots developing, but all were unerupted. Only the right and left I1 were erupted and showed slight wear. The estimated age from the development of the mandibular dentition is consistent with an infant six to nine months of age (Ubelaker 1989).

Most of the vertebrae were present during excavation but were unfused and fragile, so not all of them could be retrieved for complete identification. Part of the atlas and axis were recovered and identifiable along with four other cervical centrums and unfused arches. Ten thoracic centrums and unfused arches and five lumbar centrums and unfused arches were present and identifiable. These elements, considering the age of the individual, were fairly well preserved. The two halves of the vertebral arch fuse

between the ages of one and three years (Bass 1987:96), placing the child at less than one year of age, but the dental age is much more precise at this stage of development.

An inventory of the other postcranial remains (NMCRIS files) indicates that most of these elements were present as porous diaphyses and a few as developing epiphyses. The diaphyseal length of the left humerus supports other estimates of age by placing this infant in the newborn to 0.5 year group (Johnston 1962). Most of the ribs were present and nearly complete, but the left seventh rib exhibits a healed fracture of the body toward the sternal end with thickening of the porous cortical tissue extending from the point of fracture, indicating infection in the area of the fracture with some periosteal involvement. The left tibia had also been fractured at mid-shaft and was healed with extensive periosteal involvement around the area of the fracture. The tibia is thickened along the diaphysis from the infectious process that had followed the injury, but the fracture had resolved prior to the infant's death. In young children fractures may be fully consolidated in four to six weeks (Merbs 1989:163). The pattern of fracture healing and infection evident in this infant would be consistent with an accident (e.g., a fall or being dropped), followed by an infection that eventually was the cause of death. The fracture of the left seventh rib and the shaft of the left tibia suggests that the child was dropped or fell on that side, and though no cranial injuries were evident, there was probably other soft tissue involvement. The fall was hard enough or at a sufficient angle to break the tibia, and the force of the leg against the rib cage fractured the seventh rib. This accident eventually led to the child's death.

The interment of this infant with a single Alma neckbanded jar that contained some corn pollen suggests that some ceremony was involved in the burial of this infant. Infants and children from the Mogollon Highlands Pueblo period were often interred with grave goods similar to those that accompanied adult burials.

Burial 3

This burial was originally thought to be part of Burial 1 and was separated after remains were returned to the OAS laboratory for cleaning and analysis. These are the partial remains of an adult male 40+ years of age, recovered from the fill in the entryway of the pit structure, approximately 2 m south of Burial 1. Since these remains were scattered

in the fill of the entryway, they may be a secondary deposit from another location, but no other remains of equivalent age were isolated during the excavations undertaken at LA 39968.

The only cranial fragment recovered was the heavily eroded mandibular symphysis with two tooth roots still in place. The chin was large and squared, indicating that the individual was most likely a male (Bass 1987:81). The eroded postcranial remains consisted of the articulated vertebral segment, which was composed of parts of L3, L4, L5, and the first sacral vertebra. All of these elements displayed extensive arthritic lipping on the margins of each centrum and the left alae (wing) of the first sacral vertebra. This remodeling could be scored as a 1 (Buikstra and Ubelaker 1994:157). There was also one rib fragment present among these remains. The fusion of the vertebral fragments and the arthritic involvement place this individual in the 40+ age group.

BURIALS FROM HAURY'S SITE (LA 39969)

The excavations at Haury's site were restricted to a Reserve phase roomblock, associated pits, and activity areas. The excavation of a large trash pit (Feature 2) contained the remains of three infants along with numerous disarticulated fragments of human bone (Table 4.89). All of the burials from LA 39969 were infants, from newborn to approximately one year of age at death. The two burials recognized as formal interments also contained several ceramic vessels with food offerings, evidence of rituals involved in the interment of these children. Both of these infants were six months to one year of age at death, and because of the presence of cholla pollen, we can narrow the time of death to early summer. Both had evidence of trauma as a result of falling or being dropped. These traumas were healed, but the periosteal reaction in the area of the traumas, in both infants indicates that the infection had complicated the healing process and may have resulted in death in both cases. The likelihood of falls on the rough terrain of the Luna/Reserve area may have increased the risk of such trauma, both to adults and to the infants they carried.

Burial 1

Burial 1 was isolated within a basin-shaped burial pit (42 cm by 43 cm) only 7 cm deep and excavated into the underlying decomposing conglomerate layer. This burial pit was just outside the southwest

side of a large pit filled with trash. The pit showed no evidence of preparation or sealing. The edges of the pit and much of the interior fill had been disturbed by rodent activity, and many of the elements of the infant burial contained in this feature were also disturbed by this intrusive rodent burrowing. The burial was that of an infant six months to one year of age, but due to rodent disturbance and the fragile nature of these remains, many elements were not recovered. Three ceramic vessels were associated with this interment. One Alma Plain bowl excavated before this burial was found was 50 cm west of this burial and has been subsequently associated with it. A small Alma neckbanded jar was found on the north side of the burial pit, while a small bowl was found on the south side of this feature. Pollen from cholla flowers or buds and corn pollen were identified from the grave fill and the fill of the small jar. Both the flowers or fruit of the cholla and the corn were probably offerings made at the time of interment. The presence of cholla, which flowers and bears fruit in the late spring to early summer, indicates a spring or summer burial for this infant.

The cranium was fragmented in situ, but most of the individual elements were present. Evidence of cribra orbitalia was present in the superior orbitals, and porotic hyperostosis was apparent on both the right and left parietals. Both of these pathologies were not severe but exhibited no evidence of healing (see Buikstra and Ubelaker 1994). There had been excavation damage to the frontal, but periosteal reaction and some evidence of swelling and healing of the left frontal was apparent (Buikstra and Ubelaker 1994; score = 1 periosteal reaction). A small perforation also occurred in the right parietal along the sagittal suture 153 mm posterior to the coronal suture, 3 mm in diameter. This appears to be perimortem in nature, with no apparent healing. The infant suffered one blow to the head prior to the time of death with subsequent infection near the sight of injury and another near the time of death. The periosteal reaction at the first sight extends over a 20 by 20 mm area but shows healing of the outer cortical bone with no penetration into or through the diploe. The second small wound exhibits penetration through the skull and may have resulted in the death of the infant.

The maxilla of Burial 1 was fragmentary, and only a single unerupted molar crown was still present in the remains. The mandible was also in fragments, but the developing and erupting dentition of this burial were still in place. All dentition were unerupted developing teeth except the left I1 which had erupted with evidence of slight wear. According

to Ubelaker (1989) the dental development in this infant would place it between six months and one year of age at death.

The postcranial remains of this infant were eroded and fragile with many elements missing. The two vertebral fragments recovered included arches that were unfused (Bass 1987:96), indicating an age of less than one year. Fragments of the left scapula, ribs, right tibia, right fibula, and several metatarsals were present but fragmented and difficult to evaluate for any evidence of the trauma that the infant may have suffered in conjunction with the apparent head injuries.

Burial 2

Burial 2 consisted of the partial remains of a one year old child interred in a shallow pit near the north edge of the large trash-filled pit, 1 m west of Room 2. The burial pit was excavated into the underlying decomposing conglomerate layer. The burial pit was not well defined due to root disturbance in the area, and the fill consisted of gravels and sandy clays that may have been part of the postdepositional disturbance in the area. The cranium had been pushed to the south part of the pit by root disturbance, and a partial ilium and fragments of a sacrum were found just to the northeast of the burial pit, along with several other fragments of the burial that were recovered from adjacent grids within the larger pit. It was difficult to assess body alignment and face direction. The midline of the body was northwest to southeast, and the face direction probably west-southwest.

There were six ceramic vessels associated with Burial 2. Two vessels were recovered from the burial pit. These included an Alma Plain jar recovered from above the right arm and a partial Reserve smudged bowl recovered around the right shoulder of this infant. The remaining vessels, which included a Reserve smudged bowl, a small Alma Plain bowl, a small Alma Rough jar, and an Alma polished jar were recovered from Grid 105N/100E and associated with the burial.

The pollen analysis of the soils from around Burial 2 contained grass, aster, and corn pollen. The grass pollen could have been introduced as matting, or the grasses could have been windblown, but their combination with aster and corn pollen suggests that they were from items placed in the pit during interment of the infant. The pollen sample from Vessel 2 also contained cholla pollen, which may have been another offering. The pollen may be evidence that the child was buried in the early summer (Holloway,

this report).

The cranium of this infant had been displaced by ground disturbance and was fragmented. Most elements were present, but many were fragile and warped by ground pressure. Cribra orbitalia was evident but not severe in both orbitals (Buikstra and Ubelaker 1994:151-153), and cradleboard deformation was observed along the right lambdoidal suture. Only the right maxilla with dentition was present, and this element was eroded and fragile. The central incisors had erupted and displayed slight wear, and the right deciduous molar was erupting, but all other dentition was unerupted and still developing. This level of dental development would be consistent with an age at death of six months to one year (Ubelaker 1989).

Many postcranial elements were eroded and fragmentary or completely missing as a result of ground disturbance and erosion. Two thoracic arches were present and unfused (<1 year of age; Bass 1987:96), but the long bones isolated during excavation had developing epiphyses. The right humerus diaphysis and the proximal epiphysis were complete. The length of the humeral shaft placed the age at death between 0.5 and 1.5 years (Johnston 1962; Bass 1987).

The infant also exhibited signs of nutritional stress. Though the cause of death is not directly evident, poor nutrition may have contributed. The infant died in the early summer and was interred in a small shallow pit dug into the decomposing sandstone. The grave, though shallow, took time to prepare. The child was then buried with two to six ceramic vessels. Some of these vessels contained food offerings of cholla buds and corn. From pollen taken within the burial pit, we know that cornmeal may also have been sprinkled over the deceased at the time of burial. Thus, burial rituals were evidently performed during the interment of even the youngest member of the group that occupied this Pueblo period village.

Burial 3

This burial is that of a newborn infant that was stillborn or died shortly after birth. It was isolated in the fill of the large trash pit. No formal pit for this burial was observed at the time of excavation, and no associations were made between this burial and any ceramics recovered in the vicinity. There were also a few cranial fragments from an older child mingled with these remains. These cranial fragments were inventoried and are presented in Table 4.89 with the

other disarticulated human remains.

Only the zygomatic arches and a few other unidentifiable fragments remain of the cranium. The mandible consisted of the right horizontal ramus. The area of tooth development could be seen in the alveolar ridge, but all buds were missing.

The postcranial remains were fragmentary and fragile. Eight centra and eleven unfused arches were present from the vertebral column along with the two unfused halves of the atlas. The right clavicle, one rib, and the left humeral diaphysis were the other postcranials recovered. The length of the humerus places this infant in the fetal/neonate category at the time of death (Bass 1987:149, after Johnston 1962).

BURIAL FROM GREAT KIVA AT THE HOUGH SITE (LA 3279)

The Hough site (LA 3279) is a late Tularosa phase pueblo (A.D. 1275-1325) previously investigated by Walter Hough during his explorations of the Upper Gila and Salt Rivers (Hough 1907). During the recent excavations done by the Office of Archaeological Studies, a large rectilinear great kiva with a ramp entry was excavated toward the eastern end of the site. The burial of an elderly male (Burial 1) was isolated just to the northwest of the central posthole within the kiva. This individual was interred in what appeared to be a preexisting bell-shaped pit, which was modified slightly to accommodate these human remains. The pit was 160 cm north/south by 75 cm east/west and 51 cm deep. The burial pit was sealed by the floor in the kiva. The grave fill was dark, trash-filled deposits that date to the period of kiva use. There was evident rodent burrowing within the pit, which had disturbed the feet of the burial. The vertebral column was heavily eroded, and the elements of this burial ranged in condition from fair to poor. The burial was, as a whole, fairly intact, lying in a supine position with the head to the southeast and the face turned to the east. The arms were folded across the chest with the wrists crossed at the sternum, and the hands were bent at the wrist. The legs were flexed with the knees extending upward and slightly to the east. The burial had been discovered during excavation of the area with a pick, and the left temporal/parietal area was fragmented. Other parts of the cranium were also fragmented, and only a few measurements were possible.

The elderly male was interred with three ceramic vessels, two shell fragments, and an obsidian pro-

jectile point. Two Tularosa fillet rim bowls were placed one inside the other at the back of the cranium, in the southern part of the pit, while a single Reserve corrugated jar was placed at the left side of the body. The two fragments of shell were found on the right side of the torso and could have been part of an ornament worn around the arm. The projectile point was found lying flat on the left side of the cranium. The projectile was lying on the cranium. It does not appear to have been there as a result of trauma and was probably an offering to the deceased. Three crystals were also recovered from within the pit and were probably burial offerings as well.

The burial is that of an elderly male measuring 170.72 cm \pm 3.27 cm in height (approximately 5 ft 7 in \pm 1 in) (Bass 1987: 238). This estimation of living height used the left tibia for calculations. Sex was determined by nonmetric assessment of the attributes of the cranium and os coxae along with metric determinations from the humeral and femoral heads. The age at death was assessed at 65+ from suture obliteration on both the interior and external surfaces of the cranium (Meindl and Lovejoy 1985), extreme cranial thickening of the diploe, which happens mainly in old age (Mann and Murphy 1990:34), and severe dental attrition.

The cranium was robust with a pronounced brow ridge and a prominent occipital ridge. The diploe was extremely thick in the frontal, both parietals, and the occipital region. This hyperostosis appears related to the age of the individual, resembling that occurring in Paget's disease (Mann and Murphy 1990:34) but here restricted to the cranial bones of a male (Ortner and Putschar 1985:294). The cranium had suffered postdepositional fracturing, but most of the elements were present.

The maxilla was complete and exhibited evidence of extreme age, and all molars showed pre-mortem loss and tissue resorption of the alveolus. Left P2, right P2, and right P1 also exhibit pre-mortem loss, while left P1 was worn flat into the dentin. The right canine was decayed to the root, which was still in the alveolar ridge, and the left I1 and I2 were also lost sometime before the individual's death. The overall dentition shows severe tooth loss and bone resorption associated with advanced age and poor diet. Since dental attrition and caries are positively correlated with increasing carbohydrates in the diet (Dahlberg 1960; Kelley et al. 1987), this dental pattern suggests that the diet of this individual may have been higher in carbohydrates than those in the Pithouse period in the Mogollon Highlands.

The mandible of this individual displays a pat-

tern of dental attrition similar to that of the maxilla. All of the molars exhibited premortem loss, and there was resorption of the alveolar ridge. The left P1 and P2 and the right P1 and P2 had the entire crown worn away. The incisors and canines were lost after death, with resorption of the alveolar ridge. The remnants of the tooth socket for the right canine displayed a large apical abscess with a drain through the buccal surface of the mandible. This dental attrition pattern reinforces the conclusions arrived at through observation of the maxillary dentition. Age would have been a significant contributor to the tooth loss noted, but the abscessing and evidence of carious activity suggests a high-carbohydrate diet.

The cervical vertebrae were in excellent condition, while others were eroded and fragmentary. All thoracic and lumbar centrum fragments displayed arthritic remodeling and lipping, which, again, indicate advanced age. There are also arthritic changes noted on the os coxae, at the acetabulum, and on the distal tibiae. The left scapula exhibited eburnation of the medial aspect of the glenoid fossa, which suggests repeated dislocation of the left humeral head. The left humerus was heavily eroded at the proximal neck and humeral head, but some eburnation was evident on the parts of the posterior humeral head that remained. The right clavicle also exhibited extreme thickening at the sternal end, which may relate to the episodes of dislocation and perhaps infection in the area. Most of the upper limb bones exhibited reduced muscle attachments, probably associated with reduction in mobility and old age. All long bones were light for their size, suggesting some osteoporosis, again related to the age of the individual.

The left calcaneus exhibited a large lytic depression on the medial aspect. There was also a lytic depression on the proximal end of the left second metatarsal. The origin of these depressions is unknown.

This elderly male was interred near the center of a large rectilinear great kiva with three complete ceramic vessels, a projectile point, and two shell fragments. The placement of the burial alone would suggest that the individual was of some importance among the people belonging to that kiva group. Though pollen samples could not be taken from this burial, it could be postulated from other burials of this period that the burial of this individual was accompanied by a ceremony that included food offerings and other perishable grave goods, as well as the ceramic vessels that were recovered.

This individual was tall, even at his advanced age, and had a long face compared to other burials

from the area. Toward the end of his life, he must have required some assistance in eating (e.g., more processing of his foods) and walking (e.g., because of decreased muscle attachments). This person may have been of value to his community and was buried accordingly. To better understand this individual in the context of the few other burials complete enough and available for study from the area, a study was done of all comparable cranial measurements within the greater Mogollon area.

COMPARISONS AND DISCUSSION

The small sample of burials excavated during the various phases of the Luna project have provided a glance at the burial patterns and practices associated with the interment of the dead at these sites, and temporal variation in these patterns between the Three Circle and Reserve/Tularosa phases. The predominance of child burials in our sample also provides evidence on the pathologies affecting the overall population in this group.

In the following discussion of the excavated remains and their comparison with other assemblages from the Mogollon Highlands and the Mimbres Mogollon, we will look at interment practices and burial patterns along with the physical types represented among the burials of the Mogollon area. Pathologies and cranial deformation patterns will also be assessed, along with cranial anomalies that may be significant for the study area.

Children

Six of the nine burials (66.6 percent) recovered during the various phases of the Luna project were those of infants and children. These burials have provided data on interment practices associated with the young and evidence of trauma and infection indicating that a variety of circumstances affected the survivability of the younger segment of the population.

Other large Mogollon assemblages from the Mimbres area (Woosley and McIntyre 1996; Anyon and Le Blanc 1984) also have large numbers of immature burials in their overall assemblages, but these numbers are generally lower than those from our small sample. From the Wind Mountain site in the Mimbres area, 22 percent of the inhumations were infants or children (Woosley and McIntyre 1996), while at Galaz Ruin, 36 percent of the inhumations were in this age category. Martin's (Martin et al. 1957) burial sample from Jewett Gap pueblo

was approximately 32 percent children, while his excavations at Higgins Flat pueblo (Martin et al. 1956) recovered thirteen children and two adults. This suggests that our sample from the Mogollon Highlands is probably too small to be clearly representative of the percentage of immature burials for this area. Additionally, most of the other data available are skewed toward the analysis of adult individuals. In Hough's (1919) excavations at Luna Village, he uncovered five children buried outside one pit structure and another child interred within a pit structure, and in Martin's (Martin et al. 1956) Higgins Flat excavations, a note was made that the analysis of a fragile child would provide little data for the area. Though children were recovered in these early samples, they were much less likely to be fully analyzed when the collection of adult cranial measurements was critical to the analyst (Nesbitt 1938; Martin et al. 1956; 1957; 1961). There is no corresponding data on the probable cause of death in other samples, but, as evident in our small sample, children often did not survive trauma, infection, and disease, which became minor only after the advent of modern medical technology.

The child burial recovered from the edge of a pit structure at LA 45507 had no associated grave goods. This was the case with the remains of children recovered by Hough (1919) from this site, Ham (1989) for Nan Ranch, Woosley and McIntyre (1996) for Wind Mountain, and Anyon and LeBlanc (1984) for Galaz. This is typical of pithouse village burials throughout the Mogollon area. The four formal child and infant burials from the Reserve and Tularosa phase sites excavated in the project area were accompanied by one to six ceramic vessels. The pollen and ceramic analysis suggest that the burial of these children followed a ceremonial pattern similar to that of adults from the same time periods. Woosley and McIntyre (1989:279) and Anyon and LeBlanc (1984:185-186) indicate that the methods employed in the interment of infants, children, and adults converged during the Pueblo period in the Mogollon area and that similar percentages from each age category were accompanied by ceramics or other grave associated goods.

To quantify and compare this trend in ceramic association and age group, the small Luna sample was examined with other samples relevant to the study area (Fig. 4.65). Nesbitt (1938) was interested in the association of grave goods with individuals and found at Starkweather Ruin that 39 percent of the adult inhumations had one or two ceramic vessels in association, and 33 percent of the child burials showed this association. This comparison also

held true for those adults and children having three to five ceramic vessels in association, while adults were the only category exhibiting large numbers of vessels in grave associations. At NAN Ranch, 31 adult burials and 59 child inhumations had no vessels in association. The most frequent ceramic association was one or two vessels, a number found with 48 adult and 47 child interments (Ham 1989). NAN Ranch dates to around A.D. 1000, and perhaps it was this placement at the end of the Pithouse period that influenced the lack of ceramics in some burial contexts. In the Luna burial sample, the single adult from the Pueblo period and the four infants all had vessels in association, though two children were associated with the most vessels. These associations may reflect only the temporal placement of these burials and the general ritual involved with interment for this time period, or it may reflect the care given to these particular interments. The data to make this distinction are not available from the samples at hand.

Adults

There were three adult burials in the Luna Project sample. Only a single adult male from the Hough site (LA 3279) had complete burial context and adequate element representation to be used for a comparison with other remains isolated in the study area. Since the Luna burial was recovered from a Tularosa phase site, only burials from the Pueblo period will be used in comparison.

A number of burials excavated by the Museum of New Mexico during the Whiskey Creek project (Kayser 1971) are housed at the Maxwell Museum of Anthropology. To increase the comparative data set, a metric and nonmetric evaluation was done on these remains. Though all remains were present, most were fragmentary and heavily eroded, and only six adult individuals were in adequate condition for comparable data collection. Data collection focused on metric and nonmetric cranial data to assess conclusions made by Nesbitt (1938) in his assessment of individuals from Starkweather Ruin and their comparison with individuals from the Caddoan area, the Mimbres area, and the Upper Gila area.

It was clear from the initial cranial measurements and stature estimates that the remains of the male from the great kiva at LA 3279 was not average for the Puebloan Southwest. His cranial measurements were 181 mm in maximum cranial length and 142 mm in maximum cranial breadth. A stature of 170.72 cm (5 ft 7 in \pm 1 in) placed him with a

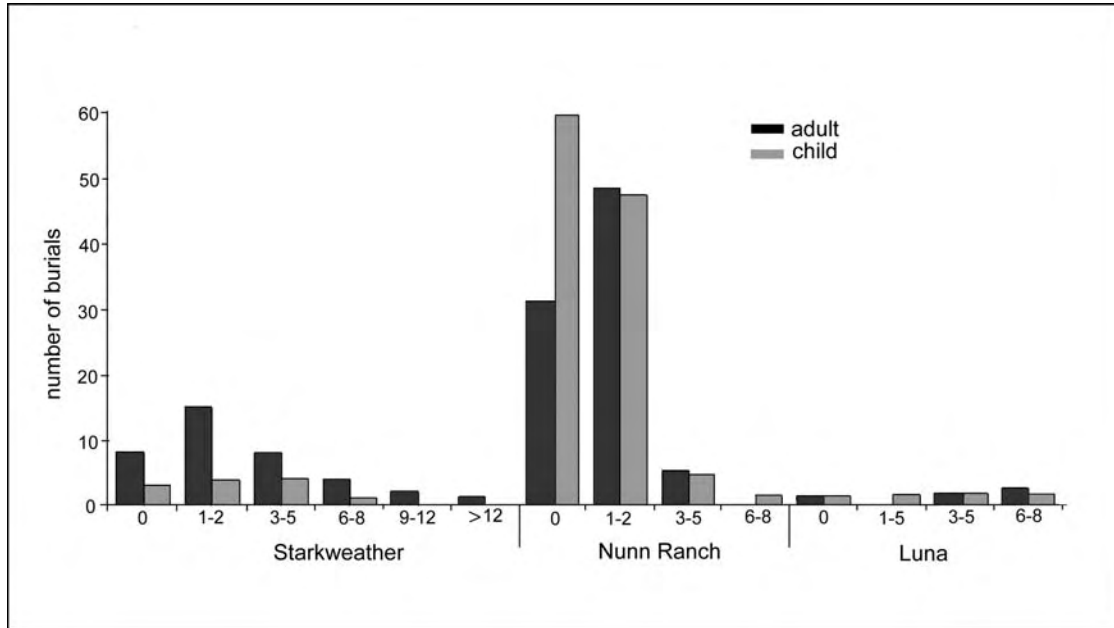


Figure 4.65. Comparison of adult and child burials and vessel associations.

small number of remains that were estimated as tall individuals compared to the averages for the Puebloan Southwest. These physical characteristics are also true of a single individual recovered during the Whiskey Creek project who had a maximum cranial length and breadth of 180 and 140 mm. This adult male was recovered from a room at Apache Creek pueblo (LA 2949), where grave associations are unclear, but physical characteristics are similar to those of the burial from LA 3279. The burial from LA 3279 and that from Apache Creek (LA 2949) are outliers compared to skeletal remains in the Whiskey Creek sample (164 mm length and 120 mm width) and to the averages for the Upper Gila region (160 by 141 mm) and the Mimbres region (158 by 133 mm). A sample t-test was performed to compare these cases to the Upper Gila and Mimbres averages. Both outliers were significantly different from the other samples. In the case of the adult male from LA 3279, who also was buried in a place of significance and accompanied by a number of ceramic vessels, shell, and a projectile point, some hierarchical differences may have existed. Frisbie (1978:220) suggests that high-status burials were evident in the Mogollon area, especially during late Mogollon times. He indicates that placement of the burial on a site (e.g., in a kiva) and items accompanying the burials were the primary lines of evidence used in assigning a high-status burial. These lines of evidence, also taking unusual physical characteristics into account, may apply to the elderly male from LA

3279.

Gilman (1990) suggests that no vertical or horizontal social differentiation exists in the Mimbres area. She explains differences in grave associations and placement as a difference in accrued wealth at the individual or family level. With the knowledge that certain individuals exhibit physical characteristics that vary from the norm and distinguish them, in addition to their burial in special locations and the number of grave associations, this conclusion should be reconsidered. In fact, increased ceramic and other burial associations along with physical distinctions may indicate that ascribed status existed in the Mogollon area and is evident in both adult and child burials.

CONCLUSIONS

The small number of burials recovered during the Luna project excavations provide a springboard for considering issues and proposing questions that may enlighten our views of the past through further analysis. The ratio of infants and children in our samples similar to that of the remains recovered from the Higgins Flat pueblo (Martin et al. 1956). Though we do not have a full analysis of the Higgins Flat remains, the high ratio of infants and children to adults in both areas may be an artifact of the small sample size, or it could reflect a mobility pattern not usually considered to be a conventional part of Pueblo period community behavior.

The ritual interment of both children and adults during the Pueblo period in the Mogollon Highlands is similar to that throughout the Mogollon area. Both children and adults are found in similar burial contexts and are accompanied by one or two ceramic vessels and sometimes other grave goods. Some researchers have interpreted this pattern as a lack of social differentiation, but it is suggested here that a closer look at burial location, amount and type of accompanying grave goods, and physical characteristics of these inhumations provides evidence indi-

cating status differentiation for adults and children.

The elderly male from LA 3279 was interred in a place of honor, but this alone does not suggest that he held a place of higher status within his community. He was accompanied by a variety of grave goods, but this also would not be a sufficient indicator of accrued or ascribed status. However, combined with his height, advanced years, severe dental attrition, and reduced muscle attachments, which suggest he depended on others for most of his needs, these lines of evidence indicate social differentiation.

BONE TOOL ANALYSIS

Yvonne R. Oakes

There are few in-depth studies of prehistoric bone tool assemblages and no mid-range experimentation, so to speak, on patterns of tool use or types of materials upon which tools are used, such as the studies on ground stone conducted by Zier (1981) and Adams (1996), for example. This chapter provides a description of the 162 bone tool artifacts recovered from the Luna Project and notes basic differences between them in form and, as much as possible, function. It also compares the assemblages from sites representing the various cultural periods in the Mogollon Highlands in order to assess potential cultural variability in tool selection and use.

METHODOLOGY

The overall research goal of the Luna Project was to examine changing subsistence adaptations through time and relate the findings to potentially increasing dependency upon agriculture. Analysis of bone tool artifacts may inform on activities carried out on the various sites and indicate patterns related to agricultural or hunting practices through time. Species of fauna used to produce bone tools is also useful in assessing faunal availability and preference. The Luna analysis describes the bone artifacts from each

site and classifies them by assumed function and also by species. It also looks at the different tool proveniences at sites as an indication of function at various sites. Measurements were taken of all tools, and type of modification, wear, portion of bone, and completeness were recorded. A binocular microscope was used to examine wear patterns and degree of polishing on some tools. Types of possible modification to produce the desired form include cutting, scoring, splitting, breaking, grinding, drilling, and shaping. Wear patterns may include various types of striations, scraping, incising, polishing, and grooving and occur on specific portions of the tools. Thermal alteration and potential reuse were also recorded for each tool.

BONE TOOL CLASSIFICATIONS

Only a limited number of bone tool artifacts were recovered from eight sites in the Luna Project. These are listed and tabulated by site within cultural periods in Table 4.90. Many (38.9 percent) are fragmentary, and tool type is unidentifiable. However, the majority are awls of different sizes modified in a variety of methods. Other tool types are only minimally represented.

Table 4.90. Bone Tools by Cultural Period

Artifact	Pine-lawn	San Francisco	Three Circle	Reserve	Tularosa		Athabaskan	Total	Pct
	LA 39972	LA 70196	LA 45507	LA 39969	LA 3279	LA 70185	LA 39968		
Indeterminate tool	1	6	11	4	34	1	6	63	38.9
Awls		5	8	6	51	3	12	86	53.1
Preforms		1			1	1	1	4	2.5
Tubes					3			3	1.9
Shuttles				1	1			2	1.2
Scrapers		1		1				2	1.2
Scoops					1			1	.6
Spatulates			1					1	.6
Total	1	13	20	12	91	5	19	162	100.0

Table 4.91. Types of Awl Points

Site	Fine	Medium	Coarse	Indeterminate	Total
LA 70 196	1	1	1	2	5
LA 45507	1	1		6	8
LA 39969		1	1	4	6
LA 70 185				3	3
LA 39968		6	3	3	12
LA 3279	5	5	8	33	51
LA 37917		1			1
Total	7	15	13	51	86
Percent of total	8.1	17.4	15.2	89.3	100.0

Awls

The relatively large number of awls recovered from the sites allows for comparisons of manufactured types, suggested functions, and change through time. Awls were generally used for perforating hides or weaving baskets or mats of fibrous material (Kidder 1932:203). Sizes usually vary from about 5 to 25 cm long, and the tool is shaped into a fine, medium, or coarse point at one end. Variations in thickness presumably represent use on materials of differing degrees of toughness. Awls with very fine tips are extremely fragile and subject to easy breakage. However, a number of fine-pointed awls were recovered unbroken at the Luna Project, which could indicate a nonutilitarian use of these tools. Table 4.91 is a breakdown of awl tip types by site. Many awls have been broken prehistorically, rendering their tip thickness unmeasurable. Medium- and coarse-tipped awls seem to be equally present on sites through time. Fine-tipped awls are less common and are only somewhat abundant at the Hough site, a Late Tularosa phase site.

It is believed that modality in lengths of bone awls could indicate differing uses for these implements (Breternitz 1982). Some sites exhibit a statistically valid variation between long and short awls, while others, such as Pueblo Alto in Chaco Canyon, do not (Miles 1987:659). On the Luna project, the awl lengths display a normal curve (Fig. 4.66). The mean length of 44 complete awls for all cultural periods is 10.5 cm, with a range of 3.0-17.8 cm. Three awls are distinctively shorter than the others (3.0-4.2 cm), of which the shortest is thought to be Athabaskan. Long awls measure over 12.5 cm. When broken down by period, awl lengths indicate no statistically significant

differences, except for the Athabaskan example (Fig. 4.67). The length of the implement may imply functional variation, but it seems that thickness may be a better measure of the ability to perform different tasks. Also, reduction through use is almost impossible to detect on awls and certainly affects interpretations based on length.

Kidder (1932:202), in a seminal study, compiled lists of types of awls. Most are formed from the ulnae or long bones of large mammals; however,

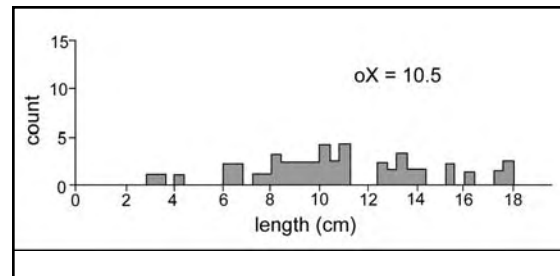


Figure 4.66. Length of awls (n = 44).

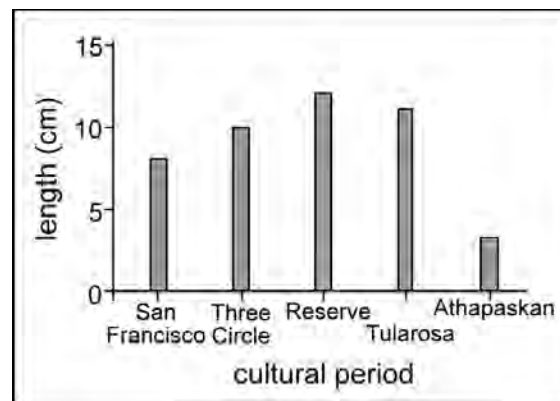


Figure 4.67. Mean length of awls by cultural period.

Table 4.92. Awl Formation Processes

Process	LA 70196	LA 45507	LA 39969	LA 70185	LA 39968	LA 3279	LA 37917	Total	Percent
Head intact	1		1		2	5		9	19.1
Head split		1	1		1	1		4	8.5
Head reduced		2		1	2	9		14	29.9
Head removed		2	2	1	2	4		11	23.4
Splintered	1				2	5	1	9	19.1
Total	2	5	4	2	9	24	1	47	100.0

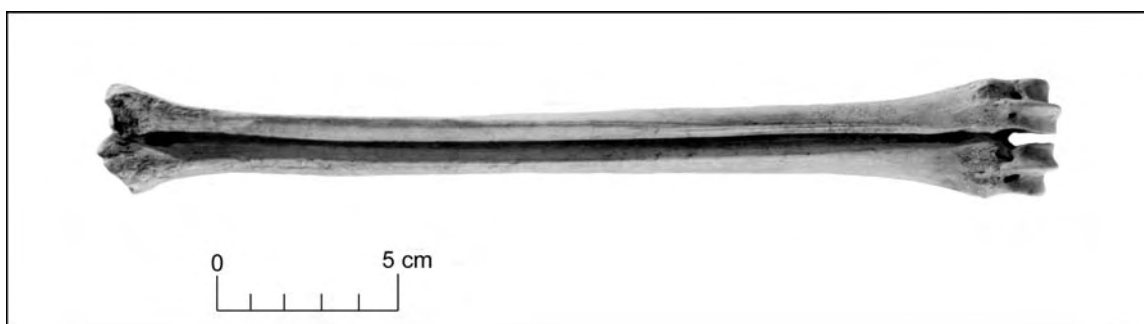


Figure 4.68. Preform with initial grooving prior to splitting.

ribs of mammals and shafts of bird bones are also employed. In mammal long bones, types include (1) head of bone left intact; (2) head of bone split; (3) head of bone reduced; (4) head of bone removed; and (5) splinters of long bones. Kidder's Types 1-3 retain a butt end for gripping the tool. Frequently, these are the strongest awl types. Those with the head removed are often the thinnest and have the sharpest points (Kidder 1932:211). Some of the finest awls are smoothed on all surfaces and are round in cross section. Splinter awls are usually expediently produced from remains of long bones. Ends can be quickly sharpened to a workable point.

All else being equal, such as tip thickness, ease of production seems to have had no bearing on the type of awl-reduction process used. All types are present at sites in the Mogollon Highlands. At LA 3279, a Late Pueblo roomblock, all forms are found in many of the rooms. Splinter awls and those with the head intact are the two easiest types to produce, and yet Table 4.92 shows that neither is the most common type made. Thus, we may not be able to correctly interpret the processes that produced the recovered awl forms. Splinters may be remains of broken awls that once had heads as well as being expediently used fragmentary long bones. Likewise, those found with the head removed may have previ-

ously fractured at the junction of the head (if formed from ulnae) and the shaft. Awls formed by splitting long bones may have been less favored on Luna sites because of the time involved to produce them (Table 4.92). Figure 4.68 shows a preform partially grooved as part of the initial process of splitting a long bone. It was recovered from a small exterior room at LA 39968.

Rib bone awls are frequently rounded at one end and may have been used as shuttles for weaving and as perforators. Sometimes, the end is flattened and exhibits polish from use in rubbing against hides or polishing interiors of small orifices of ceramic vessels, suggesting that these rib pieces were used in more than one way. Bird bone awls were usually made from the shafts of turkeys and can be quite long.

Shuttles

Shuttles are formed from the rib bones, usually of medium to large mammals, which are usually sawed in half lengthwise. The tips are flat and rounded on both ends. Shuttles are weaving implements, and polish is commonly evident at midshaft, along with grooving caused by fibers wearing into the bone from repeated use.

Tubes

Bone tubes are an ambiguous category because in many cases they can also be classified as ornaments, particularly large beads. If this type of bone artifact is over 11.5 cm in length, Kidder (1932:263) calls it a tube rather than a bead. Ends have sometimes been smoothed or ground down. However, Hodge (1920) suggests they may also have been used for drinking or sucking, as handles for other tools, or as preforms for flutes. Use for ceremonial purposes has also been suggested because they have been recovered in bundled packages in burials and caches (Kidder 1932:266).

Scrapers

Scraping tools are generally made from the leg bones (sometimes ulnae) of larger mammals and are used for the scraping or rubbing of hides. On the Luna project, one scraping/rubbing implement was formed from an antler tine. On shaft bones, the distal end of the bone is usually tapered or cut so that only a portion of the shaft remains. This end is then ground down or smoothed to a rounded shape. Sometimes these shaped ends are denticulated. High polish from use is characteristically found on these rounded ends.

Spatulates

Spatulates are multipurpose tools with one wide, flattened end and an awl projection at the other extremity. The flattened end is also rounded on the edges. Spatulates are usually formed from long mammal bones. It has been suggested that they may also be hairpins, delicate knives used in skinning processes, or tools for the weaving of rush or yucca mats or baskets (Kidder 1932:222).

BONE TOOLS BY SITE

LA 3279

This large Late Pueblo period site produced most of the bone artifacts found on the Luna Project (N = 91). The majority of these are awls (56.0 percent; Figs. 4.69-4.71). Other bone tools are minimally represented and include a preform, tubes, a shuttle, and a scoop (Fig. 4.72). LA 3279 also had the greatest diversity of bone tool types. A variety of awls occurs in most of the rooms as well as the two probable storage rooms and the great kiva. Hide working



Figure 4.69. Bone awls from LA 3279, head left intact.

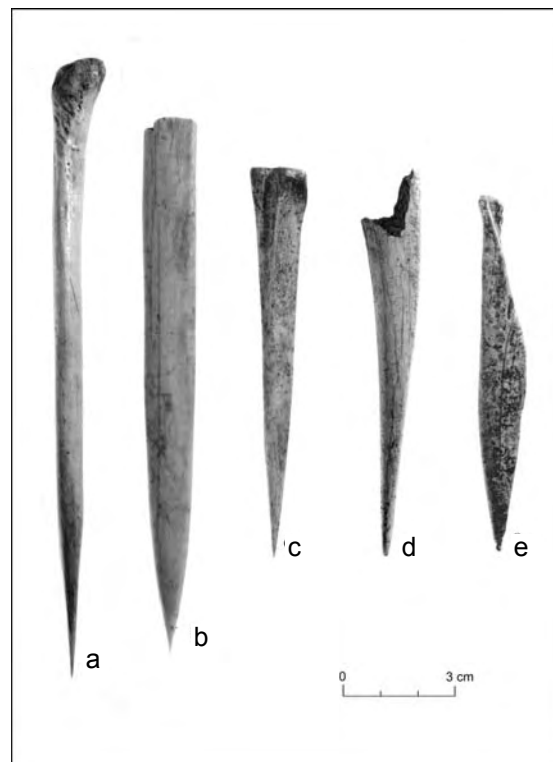


Figure 4.70. Bone awls, from LA 3279; (a-c) head reduced; (d) splinter; (e) splinter with rubbing tool on opposing end.

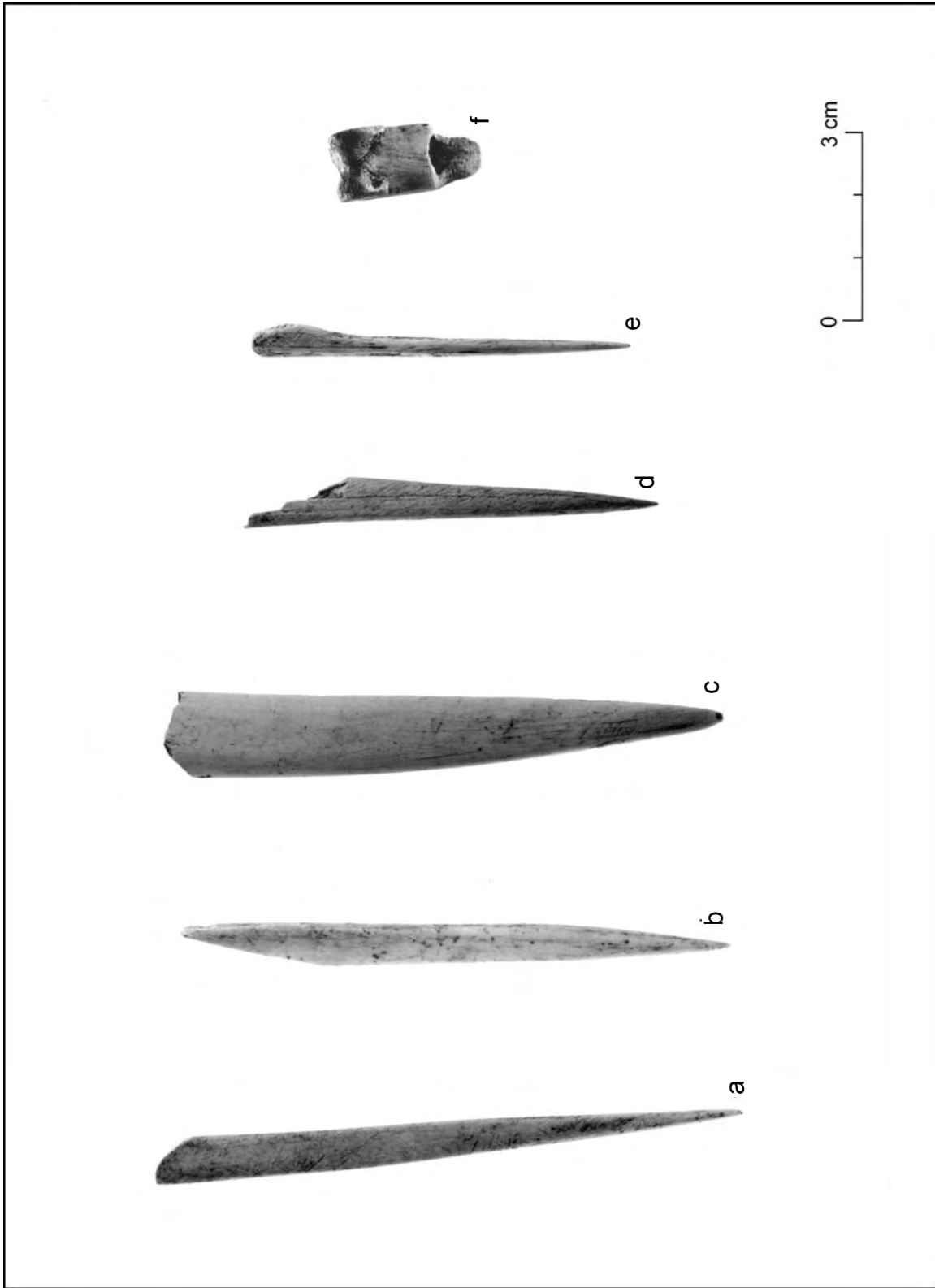


Figure 4.71. Bone awls from LA 3279: (a) head removed; (b) small scraper, head reduced; (c) splinter, head reduced; (d) splinter; (e) splinter; (f) head reduced.

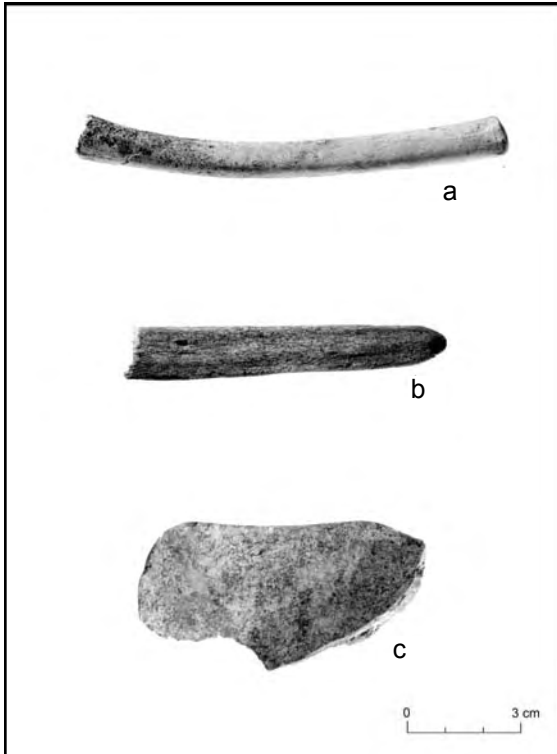


Figure 4.72. Bone tools; (a) tube, (b) shuttle, (c) scoop.

and weaving (as inferred from the shuttle) are indicated as activities. The ratio of large bones to smaller sizes is actually lower at LA 3279 than at the other sites. Large mammal bones provided 67.0 percent of the faunal species used for producing the bone tools; however, a greater variety of other species were also used than at any other site. These include antelope, canid, jackrabbit, pocket gopher, and turkey. The reasons for this variety in species usage are unclear. The sample is too small to suggest possible large mammal depletion; however faunal resource depression is suggested for this site based on faunal data in the following chapter.

LA 37917

Only one very small splinter awl was recovered from this Athabaskan campsite. It was obviously expediently made, and it is the crudest awl found at Luna (Fig. 4.73). Such a small tool would be easy to miss on survey but may be characteristic of the type of awls produced by Athabaskan peoples.

LA 39968

This Tularosa phase roomblock has a bone tool assemblage of 19 artifacts, 63.1 percent of which are

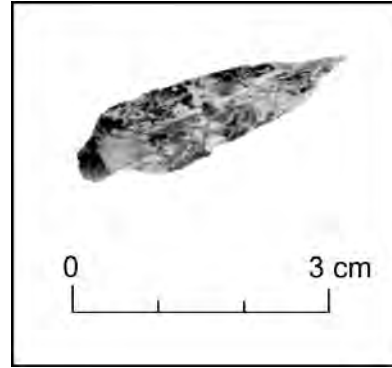


Figure 4.73. Athabaskan splinter awl from LA 37917.

awls, along with a preform (Fig. 4.74). The preform displays initial grooving of the bone prior to splitting of the head. All classifications of awls are represented, most deriving from the fill of the single pit structure. Large mammals are the largest group of faunal species represented (63.1 percent). Hide working is suggested as a component of the activities performed at the site.

LA 39969

LA 39969 is a Reserve phase roomblock that produced only 12 bone tools. Fifty percent of these are awls; however, one scraper and a shuttle were also recovered (Fig. 4.75). The scraper was made from a deer antler and is worn down and highly polished on the tip. It may have been used for scraping material from hides or for rubbing. The majority of tools are from large mammals (66.6 percent). Seventy-five percent of the tools derive from within the rooms, mostly within the largest unit, Room 3. Weaving and hide working are indicated.

LA 39972

Only one unidentifiable bone tool fragment was recovered from the Pine Lawn phase portion of this site. It was found in general fill and consists of a piece of large mammal bone. No conclusions regarding site activities can be made.

LA 45507

This large pithouse village produced 20 bone tools, of which 40 percent are awls, and one is a spatulate (Fig. 4.76). All were formed from large mammal bones. Seventy percent of the tools were found within pithouses at the site. Pithouse 12 is the largest pit structure, with features that may indicate communal

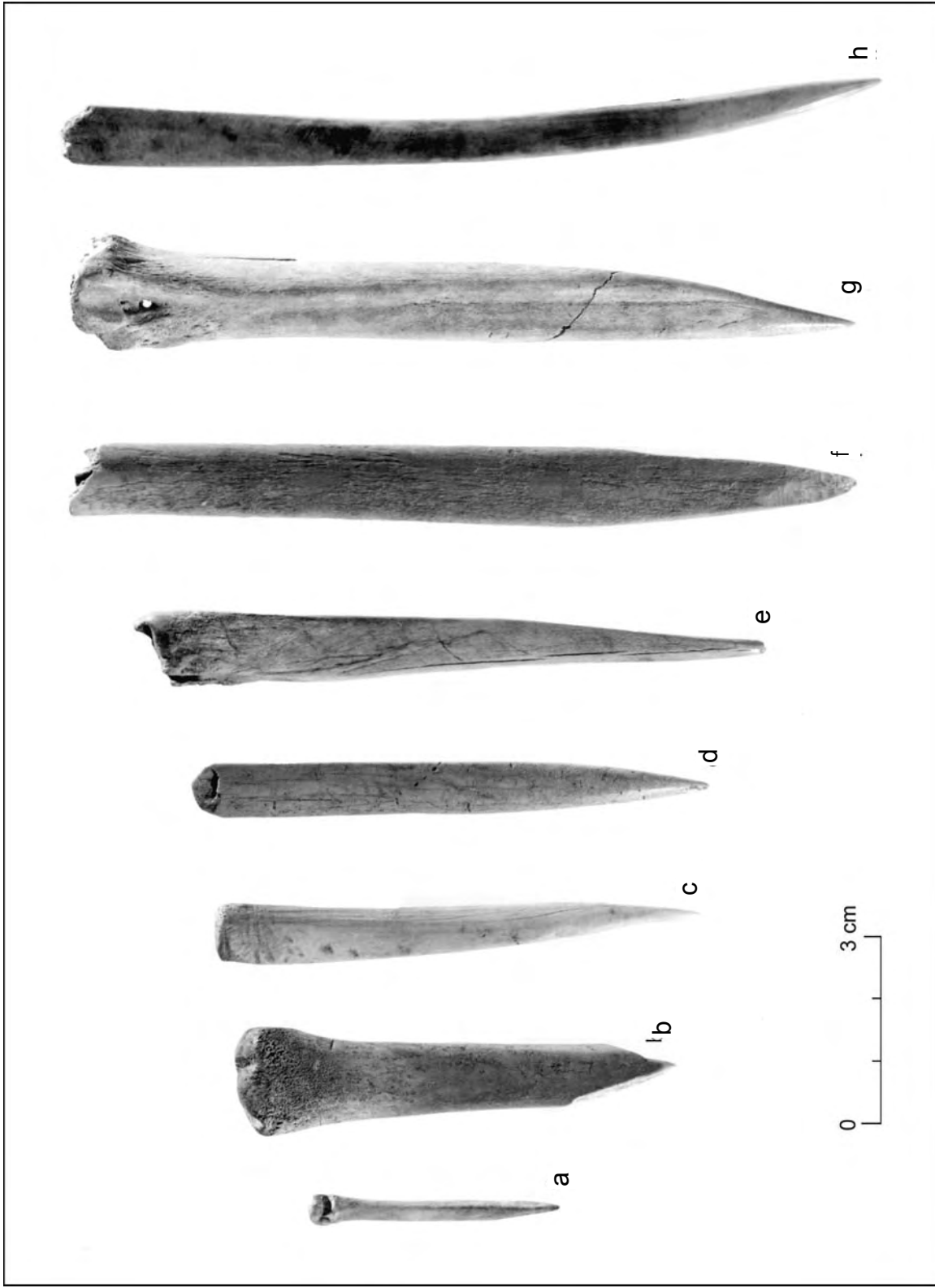


Figure 4.74. Awls from LA 39968; (a-b) head intact, (c) head reduced and ground, (d) head removed and end shaped, (e) head reduced, (f) splinter with tip whittled, (g) head split, (h) head removed.

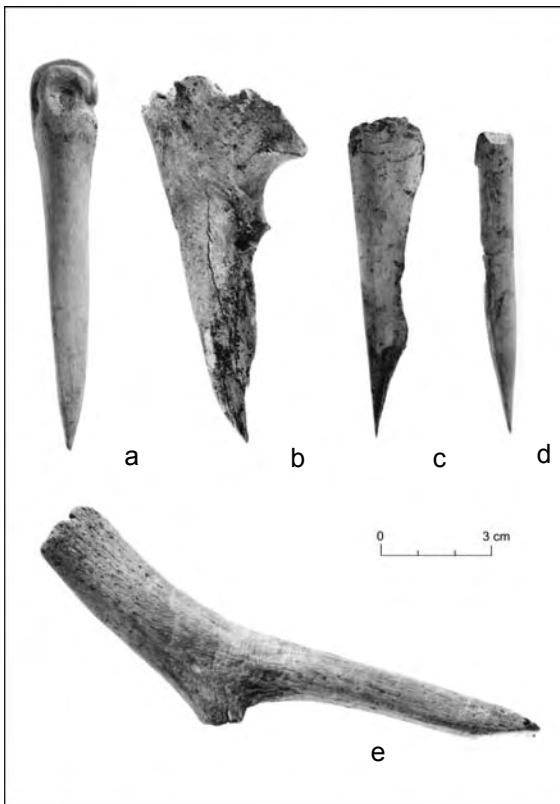


Figure 4.75. Awls and antler tool from LA 39969; (a) head split, (b) head intact, (c) head reduced, (d) head reduced and shaped, (e) antler tine with polish on ends.

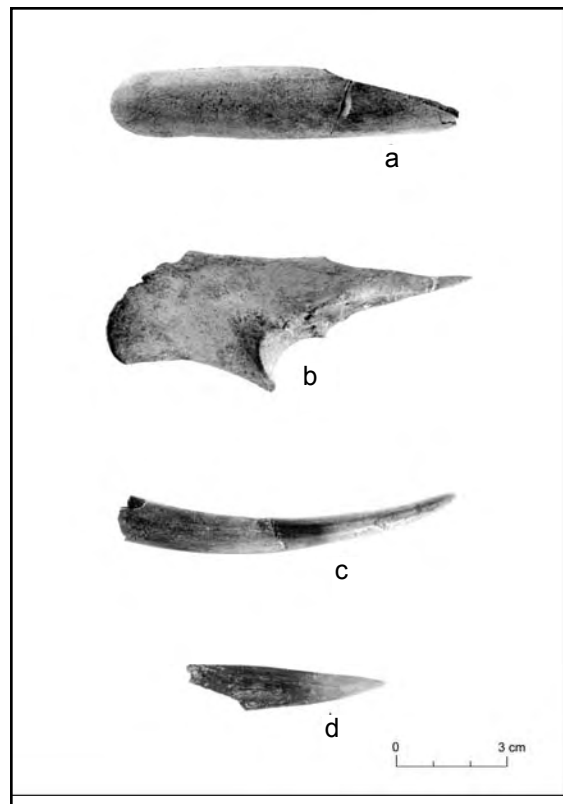


Figure 4.77. Awls and end scraper from LA 70196; (a) end scraper, (b) awl with head intact, (c) antler tine with ground tip, burned, (d) splinter awl, burned.

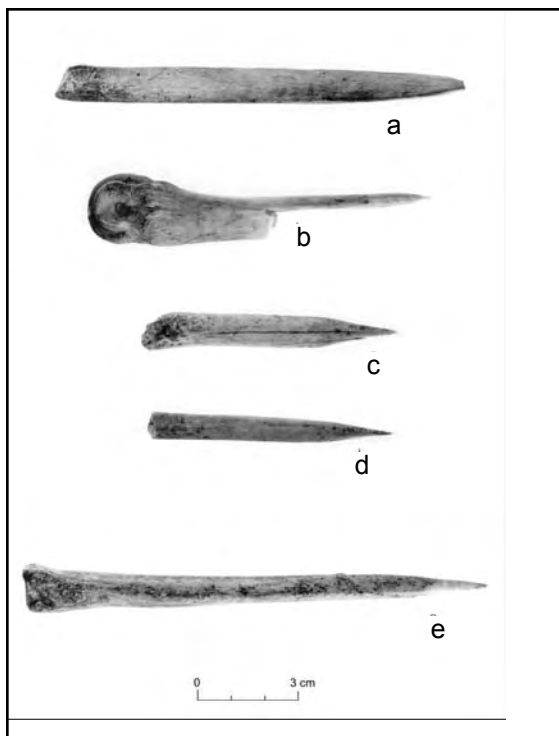


Figure 4.76. Awls from LA 45507, (a) head removed, (b) head split, (c) head reduced, (d) head removed; (e) awl from LA 70185 with head reduced.

use, and it contained 61.5 percent of the bone tools. An additional indeterminate piece was recovered from a trash pit and two tool fragments from a child burial. The spatulate is fragmented but has the beginning of the characteristic flattened end. The awls on the site also suggest hide working.

LA 70185

LA 70185 is a Tularosa phase roomblock with a bone tool assemblage of five artifacts, including three awls and a preform (Fig. 4.76). All were formed from large mammal bones. Sixty percent of the tools are from the fill of the rooms. Hide working is implied.

LA 70196

An assemblage of 13 bone tool artifacts was found on this San Francisco phase pithouse site. Awls constitute 38.4 percent of the assemblage, along with a single preform and a scraper (Fig. 4.77). The end scraper is formed from a split large mammal bone with the end rounded and flattened. Wear appears on

Table 4.93. Bone Tools by Faunal Species

Species	LA 39972	LA 70196	LA 45507	LA 39969	LA 70185	LA 39968	LA 3279	LA 37917	TOTAL	PCT
Small mammal		1				1	1		3	1.9
Medium mammal				3			17		20	12.4
Large mammal	1	6	11	4	3	1	41	1	70	43.6
Indeter. mammal		2		1		3	8		14	8.7
Artiodactyl		1	2	2	1	5	5		17	10.6
Deer		3	3	2	1	6	16		31	19.2
Antelope							1		1	.6
Canid							1		1	.6
Jackrabbit							1		1	.6
Pocket gopher							1		1	.6
Turkey							2		2	1.2
Total	1	13	16	12	5	19	94	1	161	100.0

one end of the cut side. The usual function of such tools is the scraping of hides. The pithouse contained 91.6 percent of the bone tools, of which 76.9 percent are from large mammals. Hide working seems to have been part of the activities carried out at the site.

DISCUSSION

Faunal Species Used

When the bone tools from the Luna project are tabulated by faunal species (Table 4.93), sites are seen to be remarkably similar in their use of specific fauna. Large mammals are the overwhelming choice for bone tool production, a mean of 74.0 percent for all sites. Small mammals account for 3.1 percent, medium mammals 13.0 percent, birds 1.2 percent, and indeterminates 8.7 percent. Besides the occasional use of small and medium-sized mammals, the species selection is rather narrow. Deer and indeterminate artiodactyls are the preferred large mammals. Only at the Late Pueblo site of LA 3279 are other faunal species employed as material for bone tools: canid, jackrabbit, pocket gopher, and turkey. As stated earlier, their use only at LA 3279 is somewhat unusual, and may be related to resource depletion of large mammals.

Luna Valley sites have a higher percentage of large game bone use than Pine Lawn Valley sites, except for LA 3279 (Table 4.94). It has been suggested that the Pine Lawn Valley was experiencing

resource depletion by the Pueblo period, about A.D. 1000, and the generally lower dependency on large game material in this valley may reflect that depletion. By the end of the Pueblo period in the Mogollon Highlands, LA 3279, in the Luna Valley, may also have suffered from a reduction of resources.

Table 4.94. Large Mammal Tools by Area

Pine Lawn Valley		Luna Valley	
LA 70196 = 77.0 percent		LA 45507 = 100.0 percent	
LA 39969 = 66.7 percent		LA 70185 = 100.0 percent	
LA 39968 = 77.9 percent		LA 3279 = 67.0 percent	

Provenience

Placement of bone tools within individual sites was examined to help assess the function of specific locations on the sites (Table 4.95). The majority of tools at all sites was recovered from within rooms, or from features within structures, a mean of 83.2 percent. However, only 4.3 percent of this total is from floor contexts. All others are from structural fill, suggesting that bone tools were originally on roof tops that later collapsed or burned and fell into room fill, or they were tossed into the fill as trash items. Burning of roofs is evident at LA 70196, two structures at LA 45507, LA 39968, and some rooms at LA 3279. Bone tools are infrequently found outside of rooms, in trash deposits, in features such as

Table 4.95. Proveniences of Bone Tools

Provenience	LA 39972	LA 70196	LA 45507	LA 39969	LA 70185	LA 39968	LA 3279	LA 37917	Total	Percent
General fill	1	1	3	2	2	5	5	1	20	12.4
Trash			1				2		3	1.9
Fill of room		10	14	9	3	14	77		127	78.9
Floor		1					6		7	4.3
Outside hearth				1					1	.6
Burial			2				1		3	1.9
Total	1	12	20	12	5	19	91	1	161	100.0

hearths, or with burials. Most were found in general fill.

Several interesting observations can be made about bone tool proveniences at several sites. At LA 3279, the Late Pueblo roomblock, most tools are within rooms (91.2 percent): habitation rooms contain 43.0 percent, storerooms 20.9 percent, and the great kiva 36.0 percent. The number of artifacts in all types of structural units is between 1 and 31 per unit. The storerooms yielded a mean of 9.0 tools, while habitation rooms produced a mean of 5.2 per room. However, one habitation room (with the most interior floor features, evidence of ground stone use, and storage pits) produced the highest count of bone tools, 20.9 percent of the site total. This could be fortuitous; however, the largest and most complex room at LA 39969, with possible communal activities, also yielded 70.0 percent of all bone tools on the site, as did Pit Structure 12 at LA 45507, Luna Village, the largest, most architecturally complex, and probably most communally oriented room, with 61.5 percent of all tools out of five structures. The sample is actually too small to make significant comparisons, but there could be a correlation between large, high activity (possibly communal) rooms at a site and the use of bone tools. Could we, therefore, along with other characteristics, identify possible communal rooms as those with the highest

percentage of bone tools? Since awls are the vast majority of tool types recovered on the Luna project, does hide working (such as in clothing manufacture) therefore become an activity performed mostly in specialized communal areas?

CONCLUSIONS

Possible trends in the varying functions of awls of different lengths and tip thicknesses, selection of faunal species for tool use, the association of bone tools with specialized activity rooms, and the possible identification of Athabaskan bone awls need to be subjected to further comparisons among a wide variety of sites. In general, bone tool use in the Mogollon Highlands changes little through time. Selection of faunal species is universally that of large mammals. Only one Late Pueblo site adds minor other faunal variants, and awl manufacture maintains a consistent variety of types and thicknesses through time. A drop in large mammal bone is noted at LA 3279, one of the last sites occupied in the Mogollon Highlands (about A.D. 1300). This decline may be a sign of resource depletion and comparative data from other Late Pueblo period sites seems to confirm this.

FAUNAL ASSEMBLAGES OF THE MOGOLLON HIGHLANDS

Yvonne R. Oakes

The research design for the Luna Project calls for an evaluation of the role of agriculture in the subsistence system of prehistoric Mogollon peoples. To arrive at a determination of dependency upon agricultural products, it is necessary to examine the exploitation of faunal resources as opposed to domesticates and wild plant foods. Does faunal dependency change or lessen through time? Does species utilization vary through time also?

The Mogollon Highlands are considered an excellent habitat for economic wildlife. As part of an upland environmental zone, large-sized game animals are prevalent here as well as preferred plant foods. For species such as deer and elk as well as small animals such as rabbits, the piñon/juniper zone is the richest of all. Thickets and low trees provide good browse and cover, and the open meadow areas allow for sufficient grazing lands. Therefore, it is expected that faunal resources would have provided a dependable source of sustenance for Mogollon peoples and that only increasing populations and the ensuing competition for those resources, climatic degradation, dwindling resources, or more intensive agriculture would have led to a decrease in faunal utilization. This chapter examines the role of faunal species in the various Mogollon economic systems.

METHODOLOGY

All faunal material collected on the Luna Project was analyzed by provenience and level within proveniences. All bones were dry brushed and occasionally washed if needed and given a specific lot number. Analysis data were entered into a computer-based SPSS program. Variables recorded during analysis included taxon, number of individuals recorded for each taxon within a specific provenience, general element, element portion, estimated age, articulation, body part and side, completeness, portions of fragmented pieces present, environmental alteration, animal alteration, the presence of burning and its location, processing indications and location, type of human modification, length, width, and thickness.

Identification of species was performed with the

OAS comparative collection. Unidentified bones were further compared with collections at the Museum of Southwestern Biology at the University of New Mexico. All taxa were identified to the lowest level possible. If specimens were unidentifiable, gross taxonomic categories were used. The minimum number of individuals (MNI) was not determined for this assemblage by the faunal analyst, but a count of specimens (NISP) was.

SPECIES FOUND AT THE PROJECT

All species recovered from the Luna Project are indigenous to the Mogollon Highlands, an upland zone of mountains, foothills, canyons, and narrow valleys. A wide variety of animal types appear at 20 of the 25 sites examined. A total of 11,794 faunal remains were found (Table 4.96). Absent from the assemblage (and assumed not to have been utilized as food) are grizzly bear, mountain lion, javelina, and beaver, known to have been present in the area in prehistoric times. The largest identifiable category of fauna is artiodactyl (Table 4.97).

Miscellaneous Taxa

Forty percent of all fauna collected on the Luna Project are miscellaneous species. These include fauna that are only identifiable by size or are of unknown type, therefore Table 4.98 includes only small, medium, and indeterminate mammals. Large mammals are usually considered to be artiodactyls and are counted as such (Akins 1998a:336). Small mammals are generally lagomorphs or rodents, but a distinction cannot be made. Therefore, these two classes of mammals are undoubtedly much greater in number than the species counts indicate. Of interest is the overall lack of predominance of any of the three classifications, except at individual sites.

Artiodactyls

In comparison to sites in other areas of southwestern New Mexico, there are a large percentage (35.2 percent) of artiodactyls present at the Luna sites (Table

4.97). However, percentages of artiodactyls at the more substantial sites range from 11.6 to 63.0 percent. Percentages available for other sites in the region include LA 5407, which contained 22.1 percent of artiodactyl bone (Akins 1998b:451), which the author considers to be low. Wind Mountain, at a lower elevation and in a less mesic environment, had 19.4 percent (Olsen and Olsen 1996). In an even more xeric location, the Ormand site contained 58.9 percent of artiodactyls (Akins 1998a:337), but the Galaz Ruin had only 4.8 percent (Anyon and LeBlanc 1984:216). Deer, in particular, are known to prefer highland environments, especially piñon/juniper zones. However, the discrepancies in percentages are apparently not related solely to environmental conditions. Shaffer and Schick (1995:128) suggest that other contributing factors may lead to variations in artiodactyl frequencies such as resource depletion of an area, human population size, and prey preference.

The majority of identifiable artiodactyl are deer (both white-tailed and mule deer), which are prevalent in the area today. As late as 1885, near the WS Ranch, Navajo scouts killed 84 deer in just a few days, saving the skins and intestines, and making jerky of the meat (French 1990:88,98). Antelope, bighorn sheep, bison, and elk are much less common in the faunal assemblages (Table 4.99), but all are still found in the area today. They occur mostly in the San Agustin Plains, northeast of the study area. Antelope have also been recovered at two early Mogollon sites bordering the plains, Bat Cave and Tularosa Cave. Their remains were present at nine (36.0 percent) of the Luna Project sites. Bighorn sheep were found at five of the sites, elk at four, and bison at three. Bighorn sheep have also been recovered at the SU site (Martin and Rinaldo 1947:288), Bat Cave (Dick 1965:64), Tularosa Cave (Heller 1976:14), and the Gallo Mountain sites (Akins 1998b:259). Elk would have been prevalent in prehistoric times but do not appear to have been a major prey species. All of the sites with bison bone are in the Luna Valley, suggesting possible major procurement areas in the grasslands to the north toward Red Hill or to the northwest in nearby eastern Arizona. Amick (1996:12) suggests they may have also been on the San Agustin Plains in Paleoindian times. Bison have also been found at Tularosa Cave (Hough 1914:5), LA 5407 in the Gallo Mountains (Heller 1976:60), Bear Ruin near Showlow, Arizona (Haury 1941:15), Mogollon Village (Haury 1936b:6), and in the Pine Lawn Valley at Turkey Foot Ridge (Martin and Rinaldo 1950b:350), the Sawmill site, and Higgins Flat (Berman 1979:51,

67). Thus, most artiodactyls show fairly general spatial patterning within the Mogollon Highlands. Antelope, bison, and bighorn sheep procurement would have involved slightly more travel than deer and elk; however, antelope and bison are herd animals, and more of them can be obtained at one time with little increase in cost.

Rabbits

Rabbits are the second most common animal recovered in the faunal assemblages (8.6 percent, compared to 35.2 percent for artiodactyls), indicating their probable use as dietary items. Both cottontail and jackrabbits are represented. Cottontail bones exceed those of jackrabbits (63.4 percent and 32.9 percent, respectively; Table 4.100), almost 2:1. At no site with more than 15 rabbit bones do jackrabbits outnumber cottontails. Szuter (1989) notes that agricultural field clearing creates a better environment for jackrabbits, who tolerate open spaces better. She suggests that jackrabbits should predominate at later Pueblo sites dependent on agriculture. Interestingly, this is definitely not the case at the Luna Project sites, which could indicate that fields were not close to sites, or that there were no large plots of agricultural land.

Birds

Ten varieties of bird species constitute 8.3 percent of the faunal assemblage from the Luna sites (Table 4.101), including two that are water-seeking ducks and mallards. Numbers for individual species are generally low, suggesting that use of birds such as Mexican jays, quail, and hawk was not subsistence oriented. Ceremonial use of ravens, hawks, and other birds cannot be ruled out, however (Clark 1998:34, 35). The majority of the bird population is composed of turkey, which was recovered at seven (or 35.0 percent) of the project sites. Wild turkey are not uncommon in the Mogollon Highlands today, particularly in the Oak Springs/Dry Leggett area, and their use prehistorically as a food source is well documented. However, our analysis can only confirm a few instances of probable food use.

It has long been thought that nondomestication of wild turkeys is a characteristic of the prehistoric Mogollon Highlands (Reed 1956:12; Bluhm 1957); however, there are hints that there actually may have been some domestication. At Tularosa Cave, desiccated eggs, turkey droppings, and presence of corn and beans in the stomach contents of turkeys (Heller

1976) suggest some degree of domestication. Berman (1979:39) believes a portion of the cave also may have been used as turkey pens. Large quantities of turkey dung were also found at LA 4989, a late Tularosa phase site in the Gallo Mountains (Kayser 1972:12). The keeping of turkeys has been documented at late Mogollon pueblos in nearby eastern Arizona. The earliest turkey remains in the region are from Tularosa Cave and are thought to date between 300 and 150 B.C. (Heller 1976:61). However, finds seem to be more prevalent in Pueblo period sites than in Pithouse period ones. Pithouse sites with turkey remains include Luna Village (this report), Turkey Foot Ridge (Martin and Rinaldo 1950b:350), the SU site, the Promontory site (Linskey 1975:257), Mogollon Village (Haury 1936b:1), and Fence Corner (this report). It is known that later in time, the Western Apache kept turkeys and traded them to Zuni Pueblo as they got older (Ferg and Kessel 1987:86).

Rodents

Rodent populations on the Luna sites were fairly small. The two largest sites (LA 3279 and LA 45507) had the highest frequencies. The majority of rodents were prairie dog, pocket gopher, or woodrat, accounting for 78.0 percent of all rodents recovered (Table 4.102). All taxa may have been considered edible by prehistoric peoples in the Mogollon Highlands, particularly prairie dogs (Bailey 1971:124,125). Prairie dogs were probably not a primary choice as food items, but were eaten when other populations were exhausted or running low. However, Basso (1971:97) reports that Apache youth often hunted pack rats. They would catch them and put the animals directly into a fire and burn off all the hair. The rats were then skinned and roasted or boiled. However, many rodents from the Luna Project sites may represent nondietary animals inhabiting site areas.

Carnivores

Carnivores make up only 1.3 percent of the Luna faunal assemblage, 66.8 percent of them dog, wolf, or coyote (Table 4.103). No domestication of canids is evident at the sites, such as large amounts of gnawing on discarded bones. Although prevalent in the Mogollon Highlands, carnivores were not common food items, but they may have been hunted for specific ornamental or ceremonial parts, such as the claws of bears. More often, carnivores were killed

because they were life-threatening or a menace to a community. Most carnivore remains were from the large, late Tularosa phase pueblo of LA 3279 (Hough site); however, 77.8 percent of all raccoons were recovered from LA 45507, a Late Pithouse village. Their number suggests purposeful killing, but for what purpose is unknown.

Amphibian/Reptiles

Only 49 elements were recovered, representing three species: frog/toad, snake, and turtle (Table 4.104). The snakes and frog/toads all probably occurred on the sites as postdepositional deposits; however, turtles may have been food items, and their shells are often integral parts of ceremonial gear.

Fish

Fish are the least common faunal material, constituting .1 percent of the total assemblage (Table 4.105). Suckers and catfish were the only two types of fish recovered. Suckers were mostly (83.3 percent) from LA 3259, a Late Pueblo site on the banks of the San Francisco River. The two elements of catfish were from LA 39969, an early Reserve phase site on the SU Canyon drainage, which leads into the San Francisco River at a distance of 6.4 km. The eating of fish is not common among Indian groups; however, fishing is frequently depicted on bowls from the Mimbres area to the south. The Apache, on the other hand, seem to have had a definite taboo against eating fish (Basso 1971:31; Kessel 1971:150).

DISTRIBUTION OF SPECIES BY SITE

LA 3279

This Late Pueblo period site, with 5,462 pieces of bone, accounts for 46.3 percent of all fauna recovered from the project (Table 4.106). Of most interest, however, are the differences in floor and thermal assemblages between the numerous rooms, which are listed by broad species category and described below (Table 4.107). Most room floors are lacking the low-frequency species of carnivores, amphibians, and fish. The 474 identifiable taxa recovered from the floor contexts at the site break down as shown in Table 4.108.

Artiodactyls (or large mammals) appear to be the single most common faunal type found on the floors of LA 3279. However, when combining small mammals with rabbits and rodents, this category

outnumbers large mammals by 49.1 percent to 32.5 percent. When looking at thermal features, the difference is even greater: 41.0 percent small mammals are found within hearths compared to 21.9 percent large mammals. Yet, for the site as a whole, large mammals do outnumber smaller ones by 34.2 percent to 29.6 percent, a difference, however, of less than 5 percent. The majority of the large animal remains were found within the upper fill of the great kiva. When considering floor and hearth assemblages, large animals seem to be used less for food than small mammals. Room 10 had the highest percentage of large mammals at 61.0 percent, above the single standard deviation expected. This is a small room thought to have been used originally for storage but later converted to living quarters. It contained a hearth, which also had high numbers of large mammal bone. Somewhat unusual taxa found on other floors include three bighorn sheep, two ducks, a badger, and a high number of turkey bones. In Room 9, different species include two muskrat, a crow, a turtle, and a canid.

Medium-sized mammals within the great kiva are higher in number than statistically expected (20 percent). They were also the most frequently found faunal type within the excavated hearths. Mammals of this size include fox, badger, dog, wolf, coyote, badger, and bobcat, all found at the site. However, this category may also include smaller artiodactyls such as the young or immature. The consumption of medium-sized mammals is perhaps an indication of the lack of availability of larger mammals and/or the use of less preferred species as food items. The reason for their higher frequency within the great kiva is unknown.

There is a large percentage of rodents in Room 5, probably post-depositional because the room had been excavated prior to OAS work and contained looser fill. Identifiable rodents within room hearths or ash pits on the site are minimal and include a vole, prairie dog, pocket gopher, woodrat, and squirrel. However, thermal features also contained five canids, a red fox, red-tailed hawk, and a frog/toad. The canids, fox, squirrel, and prairie dog were all calcined, indicating they were not postdepositional occurrences.

Hearths and other thermal features within rooms, such as ash pits, contained 256 identifiable faunal remains. The contents of these hearths suggest that all sizes of fauna were being consumed (Table 4.109). While only 8.2 percent of the remains are identified as rabbit, many of the unidentified small mammals may also be of this taxa, increasing

their number to a dominant position. Of interest is the fact that only 2.7 percent of the bird bones (and/or turkey) displayed burning, indicating that these also were not postdepositional occurrences.

In summary, occupants of LA 3279 subsisted on a wide variety of fauna; however, small and medium-sized mammals seem to have been the most utilized, followed closely by artiodactyls. Turkey remains are prevalent in the fill of rooms and on floors, but only a small percent (.4-2.7) were recovered from hearths. This could suggest that turkeys were being kept alive, but there were no signs of turkey pens within the rooms excavated by OAS. The large variety of seldom-used fauna found as calcined specimens (rodents, birds, and canids) in hearths indicates these species were also being consumed. The presence of these somewhat less preferred taxa may suggest subsistence stress was occurring at the site because these are not considered primary food items.

Within the great kiva, there are no outstanding additions or lack of particular species. Two canid bones, both burned, were recovered from the hearth (along with other species) and one each from the two footdrums. Within the footdrums were also deer, rabbit, turkey, and Mexican jay bones, along with several burrowing rodent species. The burial pit containing an elderly male yielded several large and medium-sized mammals and rabbit, bird, and red-tailed hawk remains. The association of the hawk with a person thought to have had some degree of prominence in the community may have ceremonial significance.

LA 3563

The pit structure at LA 3563 dates to the Three Circle phase, ca. A.D. 900-1000, and was initially dug by Paul Martin in 1949. He also dug an adjacent Reserve phase roomblock, filling the pit structure with uncurated items from the roomblock. It was not possible during OAS excavations to separate the fauna by occupation period. Table 4.110 gives faunal species recovered from the pit structure but does not separate them by phase.

LA 37917

Only four pieces of mid-to-large-sized mammal bones were recovered from the site, which may date to the Archaic period. One is a deer fragment. All were burned and found together in a charcoal-stained area on the south side of the site.

LA 39968

Fauna from the different cultural features at this Tularosa phase site are given in Table 4.111. However, the only unit with substantial numbers of fauna is the pit structure. Roof fall was easily detectable during excavation, and comparative faunal data from roof fall, floor, and hearth are given in Table 4.112.

The roof fall contained 2 canids and 14 king snakes, not found in the rest of the site assemblage. The large number of one type of snake suggests a nest, but how all died at once is unknown. Small mammals are the predominant type of fauna in roof fall, as in the other areas of the pit structure. A variety of rodents was recovered from the pit structure floor, including 1 pocket gopher, 15 woodrats (9 individuals), 2 prairie dogs, and 1 kangaroo rat. Their presence in the hearth suggests they were subsistence-related. An unusual number of frog/toads were found on the floor (N = 20) and one in the hearth. Because of the one in the thermal feature, it may be that frog/toads were food items. Of the 32 faunal bones from the hearth, there were two gray fox, one frog/toad, seven kangaroo rat, 1 woodrat, and one prairie dog, none of which are usually considered food staples.

The variety of rodents and medium-sized mammals recovered from the floor and hearth of the pit structure suggests that a wide mix of animal food was being consumed. The artiodactyl percentages for all levels within the pit structure are extremely low in comparison to other sites and indicate low reliance on larger mammals. Subsistence stress may be occurring at the site during its occupation.

LA 39969

For the size of LA 39969, with three rooms and outside work areas, the faunal remains are few in number (Table 4.113). A comparison between the rooms seems most warranted when looking at faunal utilization. The faunal assemblage is quite different from the nearby, but somewhat later, site of LA 39968. LA 39969 dates to the Early Reserve phase and displays no shortage of artiodactyls, heavy use of rodent species, or utilization of less desirable animal food. Two catfish bones were recovered from Room 3, and while fish are not often found at northern Mogollon sites, their presence is not a surprise here because the San Francisco River flows a short distance away. Room 2 contained only a small amount of bone, whereas Rooms 1 and 3 had an

almost equal distribution of species. Both rooms are very high in artiodactyl representation, suggesting processing of these large mammals (including deer, pronghorn, and bighorn sheep) or short-term storage. However, turkey and fish appear only in Room 3. Subsistence stress is not indicated in the existing percentages.

LA 39972

The site is multicomponent with a limited number of fauna recovered from the surface scatter (Table 4.114). The trash pit is related to a Reserve phase occupation of the site, and general fill is mixed with Early Pithouse period material. Turkeys and birds (probably turkeys) dominate the assemblage with also a fair number of rabbits and small mammals. Artiodactyl remains were not found in the trash pit. The assemblage is too small to determine subsistence patterns for the Reserve phase and too mixed to determine what fauna are associated with the earlier pithouse occupation.

LA 39975

While 100 pieces of faunal bone were recovered from this Early Pithouse period site, few were from within the pit structures or pits (Table 4.115). Large mammals dominate the entire assemblage (63.0 percent). This amount is expected if the premise holds true that early Mogollon settlers were primarily hunter/gatherers utilizing domestic crops only as supplemental to their subsistence regime.

LA 43766

This is a mixed-component site with an Archaic roasting pit overlain by fill from an eroded Pueblo roomblock upstream. Fortunately, the two can be separated (Table 4.116). Because the Pueblo material is secondarily deposited, it is difficult to assess except to note that artiodactyls dominate (57.4) percent. Use of small mammals, such as rabbits, is minimal. The Archaic roasting pit contained only one deer fragment and six rabbit or small mammal bones. The site is a short-term campsite, and the fauna represented would be locally available to a group on the move.

LA 43786

Only 22 pieces of bone were found on the outside surface of this Three Circle site. All are artiodactyls

(including deer and antelope). Too few remains were found to suggest subsistence patterns.

LA 45507

The five pit structures at this Three Circle village site provide a good opportunity for intrasite comparisons. Table 4.117 presents a listing of all fauna found on the site. Table 4.118 gives comparative data from pit structures. Room 12 is divided into two columns because of a later occupation in the upper fill of the structure.

All structures fall within expected percentages for the site, with a few minor exceptions. Pit Structure 1 has a high percentage of rodents, which may be a result of its shallow depth (less burrowing involved). Room 9 has an extremely low count because only a small portion of the room was intact prior to excavation. Room 12 has an unusually high number of faunal bones because a later, temporary Pueblo occupation utilized the upper portion of the pit structure. Therefore, only the count for roof fall and floor of Room 12 was used in statistically comparing the rooms, not the upper level. It has been suggested elsewhere that Room 12 was perhaps ceremonial in nature because of its large size, surrounding bench, and complex ventilation system. However, no rare or unusual faunal remains were present in this room (or any other at the site). The most uncommon remains were ten prairie falcons, a hawk, bighorn sheep, and a Mexican jay in Room 12. The large number of birds may indicate selection for ceremonial purposes (Clark 1998:34-35). Artiodactyls appear in high percentages in the rooms, but if rabbits, small mammals, and rodents are consolidated, then small, secondary economic food sources surpass artiodactyls. Pit Structure 13 has slightly higher percentages of rabbit and bird, indicating, again, a balanced diet of large and small mammals. An evenly mixed diet of large and small mammals is suggested for the site, signaling some degree of subsistence stress.

The upper level of Pit Structure 12 contains a more diverse array of fauna, including the only turkeys and frog/toads on the site. The absence of identifiable turkey on the rest of the site is surprising and suggests they probably were not food items. This upper level also has the lowest artiodactyl percentage of all site units.

A burial pit overlying Pit Structure 12 contained seven faunal remains: one deer, one cottontail, one woodrat, two kangaroo rats, one rodent, and one unidentified. Only the deer bone can be assumed to

be purposefully placed within the pit.

A large fire pit outside of Pit Structure 12 contained 356 bones: 88 small mammal (24.7 percent), 81 medium mammal (22.8 percent), 5 rodent (1.4 percent), 3 rabbit (.8 percent), 175 artiodactyl (49.2 percent), and 4 bird (1.1 percent). It is thought to date to the same time period as the upper fill of Room 12 (post-A.D. 1000).

LA 45508

Only 13 faunal remains were recovered from the site. Ten of these were from Pit Structure 1, dating to the Georgetown phase (Table 4.119). Seventy percent of these were large mammals or artiodactyls. On the floor were a pocket gopher, prairie dog, and a medium-sized mammal. These are probably intrusive, because no hearth or indication of food processing was evident within the pit structure.

LA 70185

At this small Pueblo roomblock, there were surprisingly few faunal remains. The lack of pottery and tools on the floors suggests the roomblock was cleaned out at abandonment, hence also the paucity of bone (Table 4.120). There are more than twice as many small mammals, rodents, and rabbits present as artiodactyls (58.9 percent and 27.2 percent, respectively). If these percentages are correct and smaller animals were used as food items, then subsistence stress may have occurred. However, the small assemblage size makes this speculative.

LA 70188

This Archaic site is somewhat unique in that it contained one pit structure and several associated pits. Fauna was recovered from all of these features and are shown in Table 4.121. A comparison between the various pits is given in Table 4.122. The faunal assemblage is heavily weighted toward artiodactyls at a mean of 74.4 percent within the various pits. It is interesting that no rodents were present on the entire site. While artiodactyls are high and rabbits and small mammals low within the pits, the units are not quite alike in their assemblages. The pit structure has medium-sized mammals, a carnivore, and a bird. It is low in small mammals and artiodactyls. Pit 2 has the only occurrence of rabbits, while Pit 3 has the largest number of small mammals, which may be rabbits. Differential use of space (i.e., pits) may be implied. In general, though, it is apparent that large

mammals make up the large majority of site fauna, an indication of heavy reliance on large game by the occupants of this short-term Archaic base camp. The low number of rabbits and small mammals, together with the lack of rodents, suggests only incidental use of small-sized animals.

LA 70196

The site contained one pit structure dating to the San Francisco phase. However, numerous fauna were found within the pithouse (Table 4.123). The roof had burned and collapsed into the structure, creating a division between roof fall, floor fill, and floor (Table 4.124). The fill above roof fall in the upper levels of the pithouse contained most of the rodents, suggesting nonutilization by site occupants. The floor fill was slightly above one standard deviation for artiodactyls, indicating their probable use in processing or for consumption. The roof fall had few faunal remains, so the fact that this level was statistically higher in medium-sized mammals and birds probably is not meaningful.

In general, it appears that the site population relied heavily on artiodactyls as a source of food and, to a moderate degree, turkey also. Rodent and rabbit counts indicate minimum use as dietary resources. Subsistence stress cannot be substantiated for this site.

LA 70201

Because the site is redeposited with eroded materials from three different pithouse phases (Georgetown, San Francisco, and Three Circle) at Turkey Foot Ridge, not much can be said about the ten faunal bones recovered from excavations (Table 4.125). Most of the bone is from large mammals or artiodactyls (70 percent).

LA 75791

Only 13 pieces of faunal bone were recovered from this shallow site, which appears to have been inundated at least once by the overflowing of the nearby Dry Leggett stream. The site is important, however, because Pit Structure 2, which contained seven burned large mammal remains, is believed to date to the Athabaskan period (Table 4.126). From this we can infer the hunting and cooking of large mammals at the site by Athabaskan peoples.

LA 75792

The site is a small Reserve phase roomblock with only an outside ramada area and adjacent surface excavated. Twenty pieces of bone were recovered; however, only three were identifiable and proved to be large mammal. Processing of these fauna may have occurred in the area of the ramada.

LA 78439

This is a multicomponent site with an Archaic roasting pit and several hearths from a short-term campsite of the Late Pueblo period (Table 4.127). The Archaic roasting pit contained 17 fragments of indeterminate mammal. The two Pueblo period hearths yielded three large mammal bones, two of them heavily burned.

LA 89846

Several Archaic roasting pits were buried under cultural fill from a later Pueblo period occupation upslope from the site. Faunal remains were recovered from both roasting pits (Table 4.128). Most remains in both pits were from small mammals and indeterminate species. Only one artiodactyl bone was recovered. All of the small mammal bones were burned. Finding more small than large mammals in the roasting pits is uncharacteristic of Archaic sites. Of course, there could be many logical reasons why, at that particular moment in time, small game was taken, such as the possibility that women were gathering in nearby areas and caught small animals that happened to be present.

LA 89847

This site is the result of cultural materials washing downslope from the hill above the site area. Numerous faunal bone were recovered (Table 4.129). The vast majority (88.0 percent) were from large mammals, including elk and bison. The hilltop site is thought to represent several cultural periods. Therefore, the deposits within the highway right-of-way are likely to be temporally mixed.

TAPHONOMIC PROCESSES

A variety of taphonomic processes can occur on faunal remains, such as weathering, pitting, sun bleach-

ing, checking or exfoliation, and root etching. Very few bones from the Luna faunal assemblage exhibited any of these environmental alterations. This suggests that bone remains were generally well buried at the various sites soon after deposition and not particularly subject to weathering and sun damage. The examples were too few to detect any patterns on the sites. Likewise, nonhuman processes such as rodent or carnivore gnawing and tooth punctures were rare and not a factor in the examination of the faunal assemblage.

FAUNAL RESOURCES AND SUBSISTENCE NEEDS

One research goal for the Luna Project was to evaluate the dependency on agriculture through time within the various subsistence systems of the Mogollon people. One means of determining that dependency is through the study of faunal exploitation and availability. This chapter specifically examines the role of large versus small mammals within the many prehistoric periods or phases associated with the Mogollon Highlands. For assessment purposes, large mammals are those classified as large (no species given) or as artiodactyl, which, in this assemblage, includes mostly deer, but also pronghorn, bighorn sheep, and bison. Small mammals include those identified only as small and also all

rabbits and rodents. These two broad classifications provide a good data base from which to evaluate faunal utilization within the highlands area.

Large mammals, particularly deer, are considered the preferred choice of food for prehistoric groups. Their size allows for the feeding of a number of people at one killing, and the body parts can be used in a variety of ways, such as for bone tools, sinew, pouches, clothing, blankets, and ceremonial accoutrements. However, large animals are not as plentiful in the environment as smaller ones and can become overexploited and therefore depleted fairly easily, thus causing an imbalance in resource availability. If this occurs, the taking of smaller-sized animals for subsistence needs increases out of necessity.

Figure 4.78 is a comparison of the amounts of large versus small fauna through time. Based on percentages of these fauna in the Luna assemblage, there appear to be ample numbers of large game early in the prehistoric sequence in the Archaic period and in the following Pinelawn and Georgetown phases. While small game may also have been plentiful, their presence on sites is minimal, suggesting little exploitation. In general, the percentage of large game at Mogollon sites decreases through time, while small game numbers rise.

However, during the Late Pithouse period (Three Circle phase), the percentage of large game takes a larger drop and is almost virtually matched

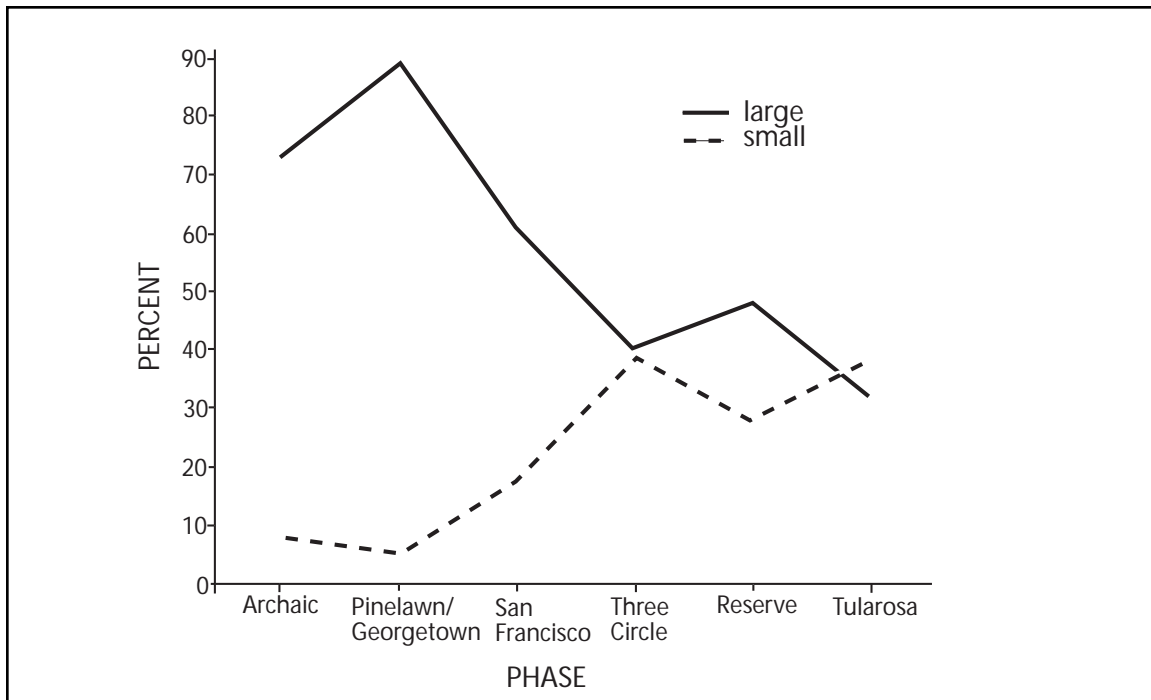


Figure 4.78. Percentage of large and small fauna by phase.

by small game. Large game are obviously not being procured in this phase to the degree they were earlier, presumably because of a lack of availability, which was probably caused by overexploitation. The using of a resource without allowing for natural regeneration of that resource may often be the result of population pressure. In the Three Circle phase, there may simply have been too many mouths to feed at this time, when villages had become quite large and mostly sedentary, settling in specific locales for greater lengths of time. The following Reserve phase is a time of major change in the highlands in which settlements scattered to locations higher in elevation and in underutilized areas. Also, new architectural forms and ceramic types appear at this time. The movement to new locales may well be the result of having to leave the depleted resource bases of the large Three Circle villages. Large game faunal procurement rises again during the Reserve phase as new territories are opened up. However, with the massive aggregation that occurs in the Tularosa phase, large mammal presence on sites drops to an all-time low of 32.4 percent, while small game counts exceed that of large game for the first time in the prehistory of the Mogollon Highlands (Fig. 4.78). These low percentages again may reflect population pressure on faunal resources. The imbalance in availability of large versus small game may indicate longer-term damage to the ecosystem in a time when adequate faunal resources were not available, possibly contributing to the abandonment of the region during this time.

Another measure of resource depression of large game is the artiodactyl index developed by Szuter and Bayham (1989) and tested in the southern Mogollon area by Cannon (1998) and the Luna Project. The index presents a ratio of artiodactyls (or large mammals) in an assemblage to the number of artiodactyls and rabbits (or small game) combined, whereby $\text{artiodactyls} \div (\text{artiodactyls} + \text{rabbits}) = \text{index}$. Cannon (1998:8) notes that a decline in the values of the indices over time in a given area is considered evidence of resource depletion. Other factors that can influence the indices, however, include small sample size, bias in collecting faunal samples, screen size greater than 1/4 inch (or no screen used), and spatial variability in sites (including both location and elevation). Cannon (1998:19) warns of difficulties in comparing sites for temporal variability if spatial variability exists. The Luna Project has corrected for spatial variability by dividing index results into two areas of study, Reserve (including the Pine Lawn Valley) and Luna (Table 4.130).

Resource depression usually occurs in periods

of high population density or when settlements are large and basically permanent (Cannon 1998:7). It is often accompanied by intensification or diversification when groups take a greater variety of resources, including those that offer a lower return for their efforts. The prey choice model of foraging theory likewise states that resources with higher caloric return are preferred, and lower return resources are taken only when higher ones are not available (Stephens and Krebs 1986). Greater emphasis on domesticated plants is another response to faunal depletion (Shaffer and Schick 1995:118). Table 4.130 indicates that there is a decrease in large game abundance over time in both the Reserve and Luna areas (see also Fig. 4.78). In the Reserve area, the drop is dramatic and temporally significant. Large game abundance in this area in the Archaic period and following Pinelawn phase is not surprising, given the postulated low population densities and richness of this environment. From our settlement pattern studies (this report), we know that during the later Reserve phase in the Pine Lawn Valley, sites disperse and shift out of the valley, probably because of the overpopulation and overexploitation of resources. By the ensuing Tularosa phase, very few sites remain in the area. Therefore, it may be for this area specifically that an index of about 0.60 or lower is a sign of resource depression, indicating only a slightly higher reliance on large game compared to small. The taking of small game such as rabbits and birds is relatively inefficient and likely not pursued by choice (Cohen 1985:102). Certainly, by the Tularosa phase, resource depression is highly evident at LA 39968 (Spurgeon Draw), with an index of only 0.14. Settlement pattern studies indicate this is also the time when the Pine Lawn Valley and surrounding area is almost completely abandoned.

In the Luna area, the indices are not quite as clear-cut, and this may be, in large part, due to several small sample sizes. The Archaic period is represented by LA 89846, a temporary campsite containing two roasting pits with few faunal remains. The index of 0.36 for this site tends to indicate a high dependence on food other than large game. This could be true; however, the site is likely not representative of the full spectrum of subsistence activities of site occupants. LA 45508, while low in sample size, seems to generally mimic the pattern found in the Reserve area for the Pinelawn phase, that of high dependence on large game. The low index of 0.32 for the Tularosa phase site of LA 70185 also may relate to small sample size; however, the site was occupied from A.D. 1175 to 1200, when sites were being abandoned in the Reserve area and a

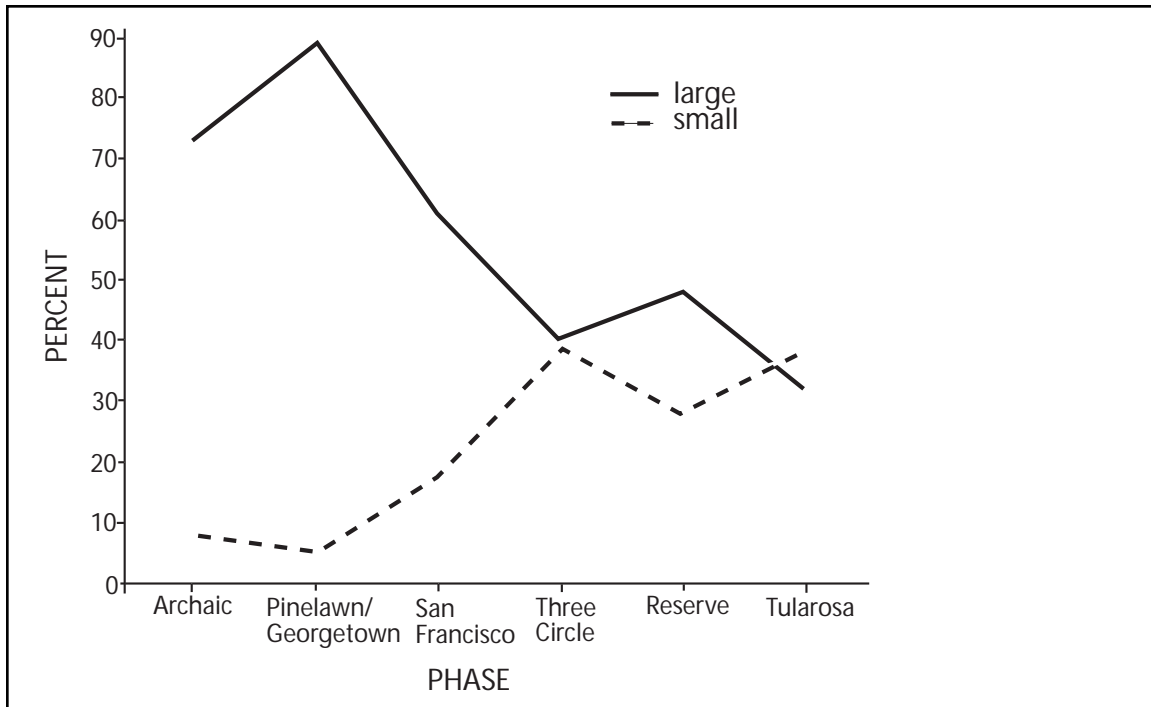


Figure 4.79. Graphic representation of large game index by area.

similar pattern was beginning in the Luna area. Therefore, the index is likely an accurate representation of resource availability on the site. The Hough site, LA 3279, shows a rise over earlier periods in large game abundance around A.D. 1275. This could be the result of a rebound effect, whereby if areas are not overexploited or if populations leave, large game will be replenished. Cannon (1998:29) has documented this upswing after periods of low abundance in the Mimbres area to the south. From the resource depression seen at LA 45507 (Luna Village) to the later rise in large game at LA 3279, the rebound effect may have occurred here also. However, the index at the Hough site is barely above 0.50, and the environment probably could not sustain taking enough small game to balance the fewer large species available to feed the large population at the site. Resource depression, a signal that resources are stressed, is strongly implied for both LA 3279 and LA 45507.

Figure 4.79 demonstrates the decline in large game availability in the two resource areas. Discounting the index for the Archaic site, LA 89846, it is concluded that there is a definite pattern of temporal decline in large game availability in the Mogollon Highlands, possibly contributing to the abandonment of the two areas.

Age of species can provide a measure of how many immature taxa may have been used as food

items. Immature species are not readily available subsistence choices, and their presence in quantities is another indicator of faunal resource stress. Tables 4.131 and 4.132 reveal the same basic pattern (as shown in earlier comparisons) of no evident stress present in the Archaic and Pinelawn/Georgetown periods, when few or no immature species were being utilized. The San Francisco phase does show a slight increase in the occurrence of immature species, particularly young deer. As in the faunal index, the utilization of deer that are slightly out of season, before they are fully mature, may be an indicator of stress. The Three Circle phase site of Luna Village exhibits slightly more use of immature species, again young animals, than does the earlier San Francisco phase. However, the diversity of immature species jumps to almost three times that of the earlier phase: 72.0 percent are small mammals (mostly rodents).

The Reserve phase occupation at LA 39969 yields the highest percentage of immature species, 15.5 percent. However, the sample size is very small and suggests prehistoric clearing out of much of the faunal site debris. The species diversity is very low, only four types, and canids and medium-sized mammals (which could also be canids) make up 84.6 percent of the assemblage. All remains are in or near the outside trash pit and may or may not be related to the occupation of the site. During the Tularosa

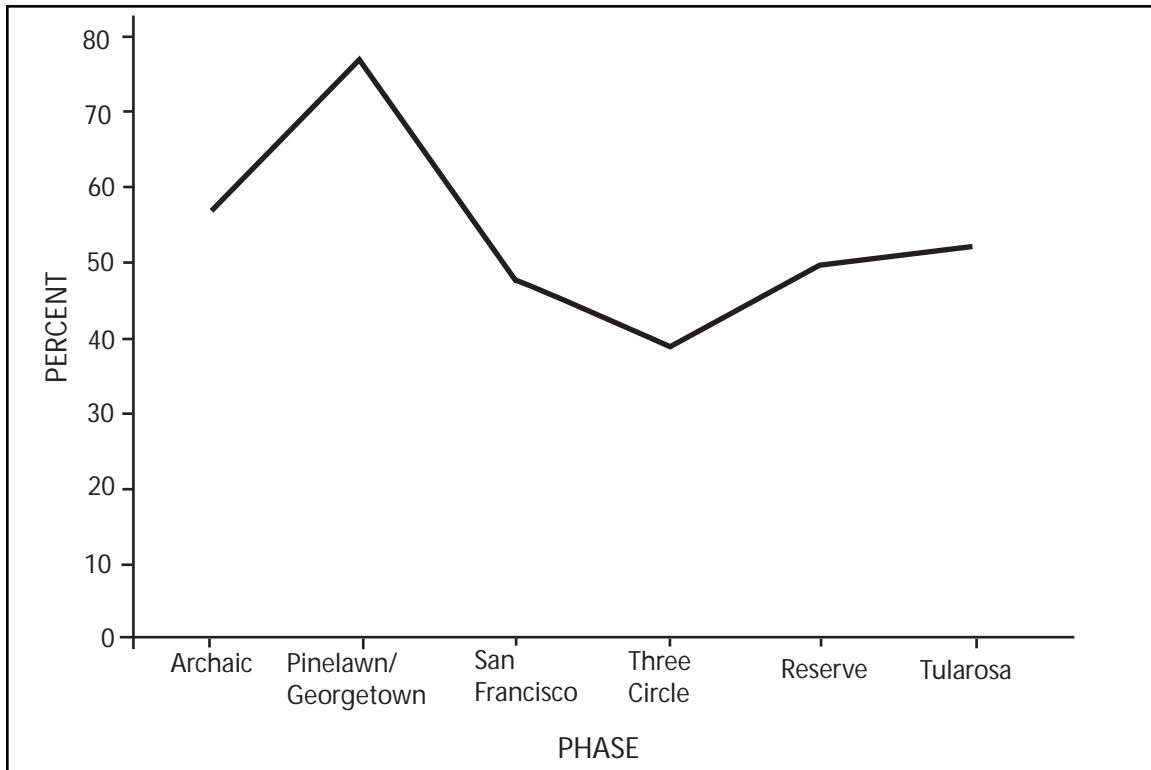


Figure 4.80. Percentage of processed fauna by phase.

phase, the percentage of immature species remains high (6.2 percent). The greatest use of these species is at LA 39968, where a percentage of 11.3 was recorded. The site also has the lowest faunal index of all periods. Diversity among species is high: 13 varieties. Twenty-seven percent of the assemblage is comprised of juveniles, and 69.2 percent of young adults. Small animals account for 68.6 percent of the immature assemblage and large mammals only 10.9 percent. This is also the only site where fetal remains were recovered, 91.3 percent of which were canids. An evaluation of the data, in general, seems to indicate the presence of subsistence stress.

In addition to the number of large fauna decreasing through time, the percentage of potential human processing of Mogollon faunal remains also diminishes. Processing activities that can indicate human involvement include impact breaks, burning, cutting, chopping, sawing, and spiral or snap fractures. Processing of animal bones is generally indicative of preparation for consumption but may also represent use for tools or ceremonial items. Breakage can also result from trampling, weight of soil deposits overlying bones, crushing by carnivores, or injury to an animal (Marshall 1989; Lyman 1994:424).

Figure 4.80 presents the percentages of

processed animal bone, exclusive of burning, by cultural period or phase. Burning is discussed separately because it may be coincidental with other processing, such as breakage or cutting of bones, and inflate the count. It can be seen that much more potential processing of game is recorded for the Archaic and the Pinelawn/Georgetown phases of the Early Pithouse period, matching the high frequency of game at these times. A lack of dependence on agricultural products has been assumed for these early periods, and Figure 4.80 may indicate the greater reliance on faunal resources than in later periods (thus, presumably, more processing). The Three Circle phase displays the lowest percentage of processed fauna and is also the time when availability of game appears to be very low. There seems to be a relationship, which we did not fully explore, between the availability of fauna and the amount of possible processing of faunal remains.

When broken down by faunal categories of large versus small game, processing always occurs less on smaller animals (Fig. 4.81). The Three Circle phase stands out again as having a disproportionate amount of processing of small game. This is also the phase when large game fauna display a drop in availability. The extra effort spent in processing small animals may be another indication of subsis-

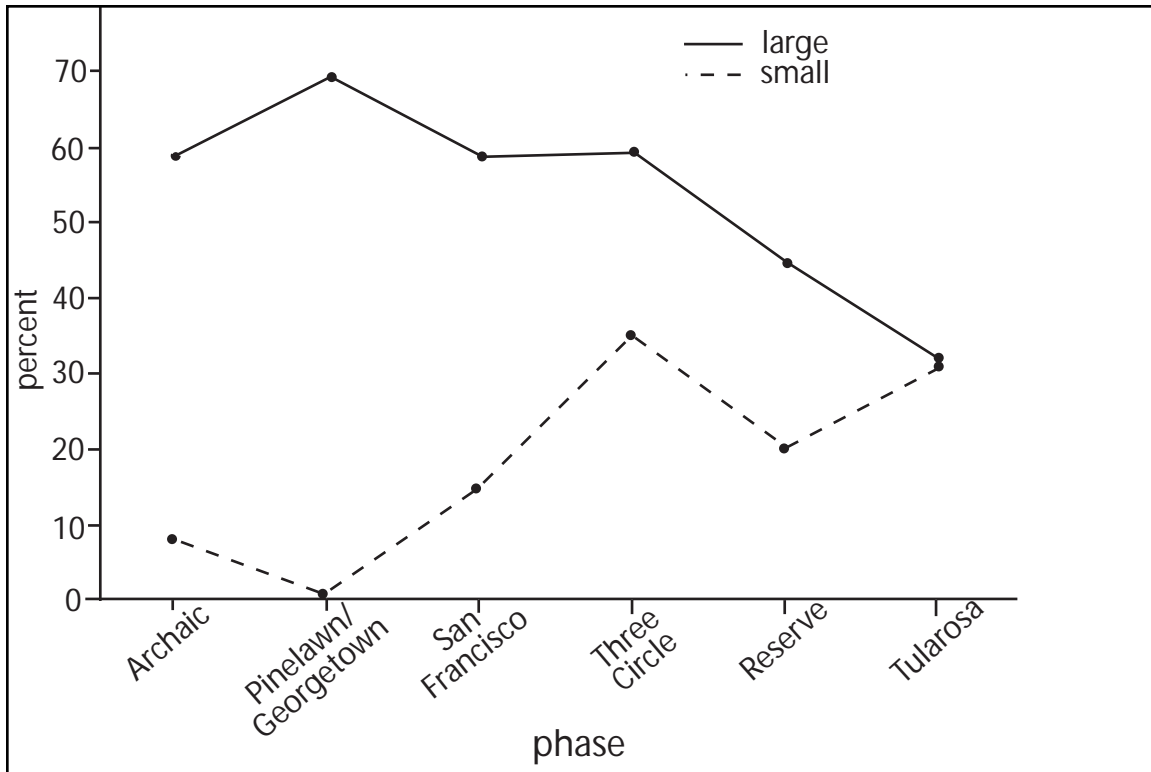


Figure 4.81. Percentages of large and small game processed.

tence stress. Processing of small fauna also rises again during the Tularosa phase, when large fauna are at their lowest. This is another time of postulated stress on subsistence resources.

The varieties of potential processing activities recorded for project sites are listed by faunal type in Table 4.133. The three most common categories of processing are splitting, snapping, and impact fractures (Fig. 4.82). The splitting of bones is the most frequent of the three, and the occurrence does not decrease much through time. However, human causality is difficult to assess, and much splitting of bone may be due to trampling events (Marshall 1989). It is used principally on large mammals, although medium-sized mammal bones are often also split in the Archaic period. In the large-game-depressed Three Circle phase, a fair number of small mammal bones are also split. In the Tularosa phase, prior to abandonment, a large number of bird and/or turkey bones are found split. The snapping of bones usually occurs with both small and large mammals. It does not become noticeable in the record until the San Francisco phase and steadily increases through time. However, in the Tularosa phase, all types of bone are found snapped, such as rabbits, rodents, birds, turkeys, canids, and toad/frogs. Impact fractures are generally related to the taking of large

game, although rabbits, canids, and birds sometimes evidence these breaks also. As large game usage decreases through time, the presence of impact fractures drops considerably.

Burning appears on both processed and non-processed bone, which are tabulated separately. Generally, burned or calcined bone is evidence of human activity. The Luna Project yielded 2,223 pieces of burned bone, comprising 18.8 percent of the total faunal assemblage). Not surprisingly, large mammal bones exhibit the most frequent burning, followed by medium-sized, and then small (Table 4.134; Fig. 4.83). Burned rabbit bones constitute only 3.1 percent of the total assemblage, a very low number. Most rabbit remains were found in an unburned condition. Rodent, canid, and carnivore use is also minimal: 1.3, .2, and .1 percent, respectively. The presence of these seldom-used animals in the Three Circle and Tularosa phases may indicate stress. Rodent bones that were burned include those of prairie dog, pocket gopher, muskrat, squirrel, woodrats, and vole. Carnivores include weasel, badger, and fox.

Animal bone retrieved from hearths, ash pits, and roasting pits (N = 567) are shown in Table 4.135. Some, however, were not burned. The use of these thermally found species for human consump-

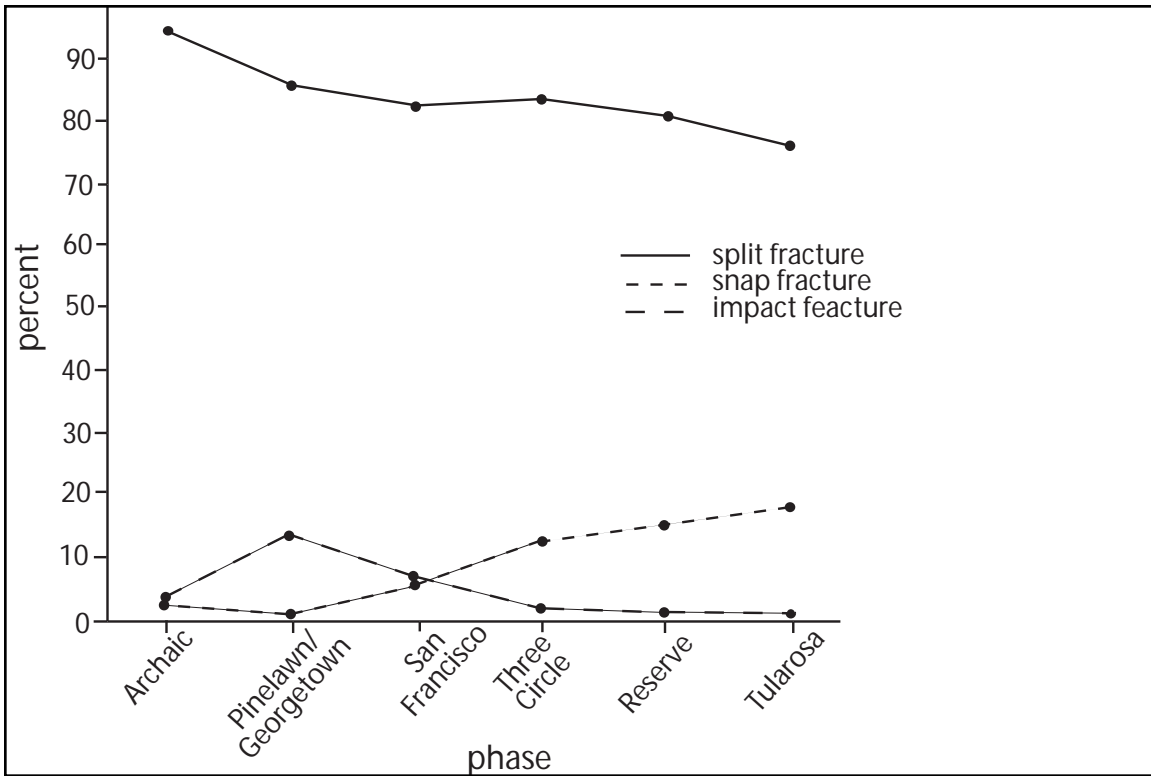


Figure 4.82. Types of processing on Luna fauna.

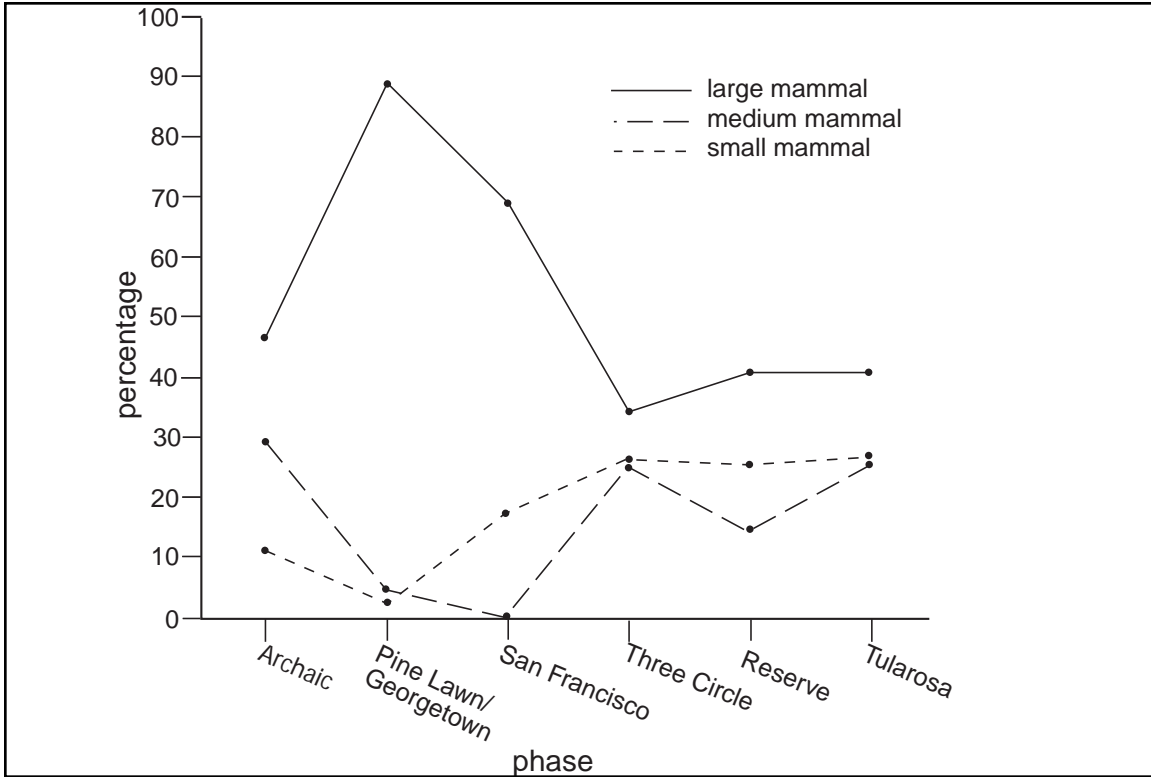


Figure 4.83. Percentages of burned bone by period.

tion is likely, although several taxa are unusual, such as hawk, fox, and frog/toads. Species diversity is at a peak during the Tularosa phase, the last major prehistoric occupation of the Mogollon Highlands. However, faunal bone retrieved from thermal features on earlier sites is at a minimum, and it is difficult to know how much of the displayed diversity was actually present in Tularosa times. While indeterminate, small, and medium mammals are all consistently found in hearths, when small mammals, rabbits, and rodents are combined, the small animal category becomes the largest (33.1 percent), followed by indeterminate. Heavy burning of some bone rendered it unidentifiable. Rodents comprise 3.2 percent of Tularosa thermal bone, and their numbers suggest they were eaten at this time. If looking for signs of subsistence stress in the only adequate hearth assemblage (Tularosa phase), it may be observed in the low number of large mammal bone found in thermal units (15.6 percent), the high percentage of small animals (33.1 percent), including rabbits, and the great species diversity of the assemblage.

CONCLUSIONS

The Importance of Faunal Resources

One goal of this chapter was to provide a determination of the role of hunting in the various Mogollon Highlands subsistence systems. After study of the faunal assemblages, it appears that large game hunting was not only very important throughout all cultural periods in the area, but that it may have driven all subsistence adaptations. Changes through time in resource availability, specifically large game, seem to have been a factor in the type of faunal and possibly plant foods found on sites. Ideal faunal availability would allow for sufficient game to be taken to provide necessary dietary and other subsistence requirements. Rarely are conditions ideal, however. Numerous situations can arise that lower or deplete the resource base, including overexploitation of fauna, human populations becoming too large within a given area, and environmental perturbations. A shift in subsistence strategy to more dependence on agricultural products would increase faunal availability, not lower it.

When resource depletion does occur, one common response is to diversify the resource base. This could be accomplished through movement of a settlement or camp to a new location, dispersing into smaller habitation units, and developing economic

trade networks. It could also be effected through greater reliance on agriculture or wild plant gathering. However, agricultural food is probably never a satisfactory substitute of choice over game animals in the dietary regime (Wills 1988a:36). The pursuit of agriculture is also a costly and risky investment (Lightfoot and Feinman 1982:74; Larson et al. 1996:223). One of the most common methods of diversifying the resource base is to expand the variety of fauna used as food items (Minnis 1985:35). This would include, in particular, the taking of small versus large fauna, those animals that are immature (and thus smaller), and an assortment of less preferred prey species such as many rodents and carnivores. Whatever diversification tactic is used, the goal seems to always be attaining meat and protein even though wild and domesticated plants are available.

Faunal Utilization in the Mogollon Highlands

Faunal analyses tracked the availability and diversity of fauna through time in the Mogollon Highlands. Resource depression can be seen in the temporal decline in availability of large game resources and in the corresponding diversity of fauna taken during periods of overexploitation and overcrowding. The Archaic period of hunting and gathering frequently has been defined by several opposing faunal resource procurement strategies. Most researchers believe that hunting and gathering adaptations involved a broad-spectrum use of plants and animals (Simmons 1989:39; Vierra 1990:62) or that wild plant foods were the most important subsistence items (Bettinger 1980:192; Speth 1990:16). Others believe there was a limited variety of plant and animals or only few major species selected (Price and Brown 1985:3). Still others say that hunting was minimally important to hunters and gatherers and Early Pithouse dwellers (Martin 1943:121; Linsky 1975:266).

Our contention is that hunting of game animals was of great importance, particularly during the Archaic and Early Pithouse periods in the Mogollon Highlands. While archaeologists have uncovered plentiful edible plant remains on Archaic sites throughout the Southwest, campsites and home bases are usually short-term, specialized sites and much more focused on single activities. By deduction, therefore, very few sites are liable to represent the entire range of subsistence adaptations present at that time. Spatial variability, including location and elevation, is also often ignored when assessing the

faunal assemblages of early sites (Cannon 1998). Several comparisons have been made between the Mogollon Highlands and the much more xeric and lower Mimbres and Cochise sites of southern New Mexico and Arizona (Stein 1963; Linsky 1975). However, lower elevations will almost always have less large game and more rabbit species, and therefore assemblage comparisons are not evaluating relative resource abundance but demonstrating what is environmentally available.

In the Mogollon Highlands, the Archaic period is characterized by low population densities, high biomass, and apparently little or no competition for resources. The period has one of the highest faunal indices in prehistory, based on Szuter and Bayham's (1989) artiodactyl measurement. Large game are abundant and are preferred, perhaps more so in the Reserve area than in the Luna region; however, sample sizes for Luna are small. There is no evidence of resource depletion or selection for a diversified subsistence base. In other regions of the Southwest, a broad-spectrum adaptation has been suggested (Simmons 1989; Speth 1990). In the Mimbres Valley and into southern Arizona, the availability of large game is much lower because of less favorable environmental conditions (Shaffer and Schick 1995; Cannon 1998). Thus, the emphasis in these areas seems to be on smaller game and a more diverse selection, out of necessity. Preference of game may not have played a defining role in the species type and frequency of game animals and plant foods obtained by Archaic and later peoples in these more xeric areas. In the Mogollon Highlands, while gathered foods and some domesticated crops are present during the Archaic, dependency upon them is not suggested by the data from the Luna Project sites. The ability to take the desired game of choice in the highlands at this time suggests that groups moved freely over the landscape in pursuit of preferred species, unrestricted by social constraints or territoriality.

In the following Pinelawn and Georgetown phases, the occurrence of large game on sites is even higher, with maximum faunal indices for both the Reserve and Luna areas. Large game apparently remains plentiful, with little other selection even for smaller animals. Linsky (1975:259) notes this same high dependency on large mammals on several sites of this phase. Evidence of agriculture is not uncommon at this time; however, mobility does not seem to be restricted because resource depletion is not apparent, and dependency on large game remains high.

In the San Francisco phase (A.D. 800-900), a change is perceptible in faunal indices and in percentages of large game used compared to the earlier periods. Large game on sites drops from 89.0 percent to 40.5 percent, and the use of small game increases by 10.1 percent. Faunal indices do not fall as much in the Reserve area, from 94.3 percent to 76.8 percent; still high enough, though, to indicate a continuing dependency on large game. The use of other game is heightened by the addition of turkey remains on sites and are perhaps a newly added food for Mogollon peoples. However, it can not be unequivocally determined that the presence of turkey is indicative of a new subsistence item: turkeys may have been kept for ceremonies or feathers. The drops in indices and percentages could, however, suggest a slight decrease in large game abundance, but certainly not near depletion. Pit structures, at this time, have become deeper and more suggestive of at least seasonal occupation, and more than in the past, faunal utilization may be recurring in specific areas near the more permanent sites.

By the Three Circle phase (A.D. 900-1000), there is a strong indication of resource depletion. Populations have tripled, bigger villages have sprung up, and large game dependency shows a significant decline. As much small as large game is being taken (see Fig. 4.78), 40 percent each. A wide diversity of species also appears for the first time, another indication of faunal resource stress. Causes for this subsistence crisis have not been sufficiently examined to warrant explanation at this point. One suggestion offered is that growing populations resided too long in a single place, so that normally abundant resources eventually became depleted. However, the issue is undoubtedly much more complex, involving numerous factors. A result of this crisis seems to be that populations then dispersed into small communities and new environmental niches over a broad area of the Mogollon Highlands. The Reserve area loses a large amount of population, and new villages are founded in the Gallo Mountain area (see settlement pattern study, volume 6). The greatly lowered faunal indices suggest that a drop in availability of large game may be contributing to that large shift and dispersion in population at the end of the Three Circle phase. Great quantities of corn were not found in the extensive excavation at Luna Village, and it may be that agricultural dependency was not strong or important enough to sustain faltering faunal resources.

During the Reserve phase, sites show a slight increase in faunal percentages, which could suggest

some rejuvenation of faunal resources because of population dispersion into new and smaller habitation sites. However, data from this phase are skimpy, and several sites may have been cleaned out before abandonment, thus presenting a skewed picture of actual faunal remains. Sites do have corn, but many are at new locations and display a bimodality in which half of the sites are situated above 6,800 ft. Therefore, a number of sites may be too high for a reliable or even possible dependency on agriculture. A better determination of corn reliance needs to be undertaken for Reserve phase populations.

As marginal lands became exploited during the Reserve phase and populations continued to dramatically grow, about half of the people shifted to settlements at lower, more arable elevations while aggregating into large communities. In these aggregated villages, faunal percentages drop to an all-time low for large game during any time in the prehistory of the highlands. Also, the utilization of small game surpasses that of large for the only time in prehistory. This decline in numbers is accompanied by a great increase in diversity of faunal species on sites, a strong indication of resource depletion, whereby game choices not usually selected may be

consumed. There are differences also between the Reserve and Luna areas at this time. The Reserve area shows a much larger decline in faunal resources to a low index of only 0.14. It is probably not coincidental that the Reserve area was abandoned earlier than Luna and immediately after A.D. 1200 was almost devoid of sites. After A.D. 1350, the entire Mogollon area is abandoned. Movement to lower elevations along the rivers and stream beds, such as the San Francisco and Tularosa Rivers, accompanied by site aggregation, would seem to have allowed for greater dependency on agriculture than in the earlier Reserve phase, in which sites were small and populations scattered into all types of environmental zones and elevations. But Tularosa phase populations may have simply been too aggregated and food resources not sufficient to maintain stability; thus the area was abandoned. So while there are those who imply that hunting was never a very critical subsistence adaptation (Martin 1943; Linsky 1975; Bettinger 1980), it appears that subsistence systems rose and fell on the availability of faunal resources in specific areas in the Mogollon Highlands.

Table 4.96. Faunal Species Recovered from Project Sites

LA Number	Squirrel	Prairie Dog	Pocket Gopher	Mouse	Rat	Vole	Muskrat	Porcupine	Nutria	Unidentified Rodent	Cottontail	Jackrabbit	Unidentified Rabbit
3279	20	134	60	33	12	1	8	1	1	22	317	145	35
3563											1	1	
37917													
38968	2	61	5	1	46		1			20	205	115	
38969	1	1	2								13	7	
38972		10									3	2	
38975			2										
43766											1	6	1
43786													
45507	6	30	122	31	73					10	91	44	1
45508		1	1										
70185			4				2				9	2	1
70188											1	2	
70196	2	2	1		9					1	4	11	
70201													
75791													
75792													
78439													
87846			3										
87847		1					2				1		
Total	31	240	200	65	140	1	13	1	1	53	646	335	38
Percent	.3	2.0	1.7	.5	1.2	.0	.1	.0	.0	.4	5.5	2.8	.3

Table 4.96. Continued.

LA Number	Wolf/ Dog/ Coon	Fox	Bear	Raccoon	Weasel	Badger	Bobcat	Skunk	Unidentified Carnivore	Deer	Antelope	Elk	Bison
3279	81	7	12	2	1	1	3		1	309	28		4
3663										5	2		
37917										1			
39968	4	4	2		1		2			26	12		
39969	9	1								23	2		
39972													
39975									1				
43766			1							20	1		
43786										20	1		
45507	3	1		10						40	3	1	2
45508													
70185				1						2	1		
70188	1									30		1	
70196										34	3		
70201												2	
75791													
75792													
78439													
87846													
87847	3									3			1
Total	101	13	15	13	2	1	3	2	1	514	53	6	7
Percent	.9	.1	.1	.1	.0	.0	.0	.0	.0	4.4	.4	.0	.0

Table 4.96. Continued.

LA Number	BigHorn Sheep	Bovid	Unidentified Antioctacyl	Duck	Mallard	Hawk	Falcon	Quail	Turkey	Mourning Dove	Mexican Jay	Raven	Crow	Unidentified Bird
3279	7	1	171	4	3	14		9	263		5	2	1	431
3563			8								1			
37917														
39968			49		1			1	5					8
39969	1		10						3					
39972									18					19
39975			3											
43766	11		130											
43786			1											
45507	2	1	48			2	10	11	4	18	13		2	55
45508			1											
70185			2						1					
70188			34											1
70196	3		37						30		5			20
70201			2											1
75791														
75792														
78439														
87846			5											
87847			4											
Total	24	2	505	4	4	16	10	21	324	18	24	2	3	535
Percent	.2	.0	4.3	.0	.0	.1	.1	.2	2.7	.2	.2	.0	.0	4.5

Table 4.96. Continued.

LA Number	BigHorn Sheep	Bovid	Unidentified Antilocapry	Duck	Mallard	Hawk	Falcon	Quail	Turkey	Mourning Dove	Mexican Jay	Raven	Crow	Unidentified Bird
3279	7	1	171	4	3	14		9	263		5	2	1	431
3563			8								1			
37917														
39968			49		1			1	5					8
39969	1		10						3					
39972									18					19
39975			3											
43766	11		130											
43786			1											
45507	2	1	48			2	10	11	4	18	13		2	55
45508			1											
70185			2						1					
70188			34											1
70196	3		37						30		5			20
70201			2											1
75791														
75792														
78439														
87846			5											
87847			4											
Total	24	2	505	4	4	16	10	21	324	18	24	2	3	535
Percent	.2	.0	4.3	.0	.0	.1	.1	.2	2.7	.2	.2	.0	.0	4.5

Table 4.97. Percentage of Faunal Types at Luna Sites

Type	Number	Percent
Miscellaneous	4708	40.0
Artiodactyl	4153	35.2
Rabbit	1019	8.6
Rodent	745	6.3
Carnivore	151	1.3
Amphibian/Reptile	49	.4
Fish	8	.1
Total	11,794	100.0

Table 4.98. Miscellaneous Faunal Types

Type	Number	Percent of Fauna
Small mammal	1746	14.9
Medium mammal	1317	11.1
Unidentified mammal	1645	14.0
Total	4708	40.0

Table 4.99. Artiodactyl Types

Type	Number	Percent of Fauna
Large mammal	3042	73.3
Identified	505	12.9
Deer	514	12.4
Antelope	53	1.3
Bighorn sheep	24	.6
Bison	7	.2
Elk	6	.1
Bovid	2	.0
Total	4153	100.0

Table 4.100. Rabbit Types

Type	Number	Percent
Cottontail	646	63.4
Jackrabbit	335	32.9
Unidentified	38	3.7
Total	1019	100.0
Percent of fauna	8.6	

Table 4.101. Bird Types

Type	Number	Percent
Unidentified	535	55.7
Turkey	324	33.7
Mexican jay	24	2.5
Quail	21	2.2
Mourning dove	18	1.9
Hawk	16	1.7
Falcon	10	1.0
Duck	4	.4
Mallard	4	.4
Crow	3	.3
Raven	2	.2
Total	961	100.0
Percent of fauna	8.3	

Table 4.102. Rodent Types

Type	Number	Percent
Prairie dog	239	32.2
Pocket gopher	200	26.9
Rat	140	18.9
Mouse	65	8.7
Unidentified	53	7.1
Squirrel	31	4.2
Muskrat	13	1.7
Vole	1	.1
Porcupine	1	.1
Nutria	1	.1
Total	744	100.0
Percent of fauna	6.3	

Table 4.103. Carnivore Types

Type	Number	Percent
Wolf/dog/coyote	101	66.8
Bear	15	10.0
Fox	13	8.6
Raccoon	13	8.6
Bobcat	3	2.0
Weasel	2	1.3
Skunk	2	1.3
Badger	1	.7
Unidentified	1	.7
Total	151	100.0
Percent of Fauna	1.3	

Table 4.104. Amphibian and Reptile Types

Type	Number	Percent
Frog/toad	27	55.1
Snake	16	32.6
Turtle	4	8.2
Amphibian	2	4.1
Total	49	100.0
Percent of fauna	0.4	

Table 4.105. Fish Types

Type	Number	Percent
Sucker	6	75.0
Catfish	2	25.0
Total	8	100.0
Percent of fauna	0.1	

Table 4.106. Faunal Remains from Major Interpretive Units, LA 3279

	General Fill		Trash Midden		Room 2		Room 5		Room 6		Room 7		Room 8	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	32	7.4	48	15.7	8	5.2	24	24.2	30	10.8	95	16.2	23	9.9
Small mammal	31	7.2	58	19.0	33	21.3	11	11.1	62	22.3	94	16.0	35	15.0
Medium mammal	98	22.7	61	20.0	23	14.8	19	19.2	46	16.5	126	21.5	35	15.0
Large mammal	94	21.8	34	11.1	29	18.7	4	4.0	15	5.4	42	7.2	44	18.9
Order Rodentia							1	1.0	1	.4	16	2.7		
Family Scuridae (Squirrels)					1	.6								
<i>Ammospermophilus leucurus</i> (White-tailed antelope squirrel)	1	.2												
<i>Cynomys</i> sp. (Prairie dogs)														
<i>Spermophilus</i> sp. (Ground squirrels)														
<i>Spermophilus spilosoma</i> (Spotted ground squirrel)	1	.2												
<i>Spermophilus variegatus</i> (Rocksquirrel)														
<i>Cynomys gurnisoni</i> (Gunnison's prairie dog)	10	2.3	17	5.6	8	5.2	4	4.0	4	1.4	23	3.9	6	2.6
<i>Sciurus alberti</i> (Albert's squirrel)	3	.7	1	.3	2	1.3	1	1.0			1	.2		
<i>Tamiasciurus hudsonicus</i> (Red squirrel)														
<i>Thomomys bottae</i> (Botta's pocket gopher)	6	1.4	1	.3			2	2.0	1	.4	9	1.5	7	3.0
<i>Geomys bursarius</i> (Plains pocket gopher)	1	.2							1	.4	1	.2		
<i>Perognathus flavescens</i> (Silky pocket mouse)														
<i>Peromyscus maniculatus</i> (Deer mouse)											19	3.2	3	1.3
<i>Peromyscus leucopus</i> (White-footed mouse)											6	1.0		
<i>Peromyscus boylii</i> (Brush mouse)											1	.2		
<i>Onychomys leucogaster</i> (Northern grasshopper mouse)											3	.5		

Table 4.106. Continued.

	General Fill		Trash Midden		Room 2		Room 5		Room 6		Room 7		Room 8	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
<i>Nectoma albigula</i> (White-throated woodrat)													1	.4
<i>Nectoma mexicana</i> (Mexican woodrat)									1	.4	2	.3		
<i>Microtus montanus</i> (Montane vole)					1	.6								
<i>Ondatra zibethicus</i> (Muskrat)	2	.5	1	.3									1	.4
Family Muridae (Rats)									2	.7				
<i>Erethizon dorsatum</i> (Porcupine)			1	.3										
<i>Myocastor coypus</i> (Nutria)			1	.3										
Family Leporidae (Rabbits)	1	.2	1	.3									1	.4
<i>Sylvilagus audubonii</i> (Desert cottontail)	24	5.6	22	7.2	10	6.5	1	1.0	28	10.1	43	7.3	15	6.4
<i>Lepus californicus</i> (Black-tailed jackrabbit)	5	1.2	4	1.3	13	8.4	2	2.0	6	2.2	33	5.6	11	4.7
Order Carnivora (Meat eating animals)													1	.4
Family Canidae (Dog, coyote, fox, wolf)					1	.6			25	9.0	1	.2	2	.9
<i>Canis sp.</i> (Dog, coyote, wolf)	2	.5	1	.3							4	.7		
<i>Canis lupus</i> (Gray wolf)														
<i>Vulpes vulpus</i> (Red fox)														
<i>Urocyon cinereargenteus</i> (Gray fox)														
Family Ursidae (Bears)														
<i>Ursus americanus</i> (Black bear)													2	.9
<i>Procyon lotor</i> (Raccoon)														
<i>Mustela ferenata</i> (Long-tailed weasel)									1	.4				
<i>Taxidea taxus</i> (Badger)					1	1.0								

Table 4.106. Continued.

	General Fill		Trash Midden		Room 2		Room 5		Room 6		Room 7		Room 8	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
<i>Lynx rufus</i> (Bobcat)														
Order Artiodactyla (Even-toed hoofed mammals)	15	3.5	6	2.0	2	1.3	4	4.0	12	4.3	9	1.5	8	3.4
<i>Odocoileus</i> sp. (Deer)	23	5.3	4	1.3	4	2.6	3	3.0	4	1.4	26	4.4	9	3.9
<i>Odocoileus hemionus</i> (Mule deer)														
<i>Artioicapra americana</i> (Pronghorn)	5	1.2	1	.3	2	1.3	1	1.0	3	1.1	1	.2	2	.9
Family Bovidae (Bison, cattle, sheep, goat)														
<i>Ovis canadensis</i> (Bighorn sheep)			2	.7					3	1.1				
<i>Bison bison</i> (Bison)														
<i>Bos/Bison</i> (Indeterminate cattle/bison)	1	.2												
Aves (Birds)	53	12.3	27	8.9	10	6.5	18	18.2	16	5.8	14	2.4	10	4.3
Anatinae (Surface-feeding ducks)			1	.3										
<i>Anas platyrhynchos</i> (Mallard)			1	.3							1	.2		
<i>Aix sponsa</i> (Wood duck)														
<i>Mergus mageranser</i> (Common mageranser)													1	.4
Family Accipitridae (Hawks and hammers)														
<i>Buteo jamaicensis</i> (Red-tailed hawk)													2	.9
<i>Buteo lagopus</i> (Rough-legged hawk)													1	.4
<i>Buteo regalis</i> (Ferruginous hawk)														
Family Phasianidae (Quails, partridges, and pheasants)													1	.2
<i>Callipepla squamata</i> (Scaled quail)													1	.2
<i>Lophortyx gambelii</i> (Gambel's quail)														

Table 4.106. Continued.

	General Fill		Trash Midden		Room 2		Room 5		Room 6		Room 7		Room 8	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
<i>Meleagris gallopavo</i> (Turkey)	22	5.1	11	3.6	8	5.2	3	3.0	14	5.0	10	1.7	11	4.7
<i>Progne subis</i> (Purple martin)													1	.4
<i>Aphelocoma ultramarina</i> (Mexican jay)														
<i>Corvus corax</i> (Common raven)														
<i>Corvus brachyrhynchos</i> (Common crow)														
Subfamily Erythrinae (Box and water turtles)														
Order Squamata (Lizards and snakes)	1	.2							1	.4				
Family Colubridae ((Nonvenomous snakes)														
Amphibian									2	.7			1	.4
Order Salienta (Frogs and toads)											2	.3		
Family Catostomidae (Suckers)											2	.3		
Total	431	100	305	100	155	100	99	100	278	100	586	100	233	100

Table 4.106. Continued.

	Room9		Room10		Room11		Room12		Room13		Kiva		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	29	12.3	17	7.3	9	4.3	35	36.5	12	3.3	159	7.1	521	9.5
Small mammal	40	16.9	33	14.2	29	13.9	1	1.0	82	22.5	154	6.9	663	12.1
Medium mammal	32	13.6	40	17.2	29	13.9	12	12.5	30	8.2	212	9.5	763	14.0
Large mammal	27	11.4	69	29.7	53	25.4	26	27.1	95	26.1	817	36.5	1349	24.7
Order Rodentia					1	1.0	1	1.0	1	.3	2	.1	22	.4
Family Sciuridae (Squirrels)													1	.0
<i>Amispermophilus leucurus</i> (White-tailed antelope squirrel)													1	.0
<i>Cynomys</i> sp. (Prairie dogs)											2	.1	2	.0
<i>Spermophilus</i> sp. (Ground squirrels)	2	.8											2	.0
<i>Spermophilus spilosoma</i> (Spotted ground squirrel)													1	.0
<i>Spermophilus variegatus</i> (Rock squirrel)											1	.0	1	.0
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)	11	4.7	6	2.6	3	1.4	1	1.0	9	2.5	30	1.3	132	2.4
<i>Saurus alberti</i> (Albert's squirrel)			2	.9							3	.1	13	.2
<i>Tamiasaurus hudsonicus</i> (Red squirrel)											1	.0	1	.0
<i>Thomomys bottae</i> (Botta's pocket gopher)	6	2.5	1	.4	4	1.9			3	.8	10	.4	50	.9
<i>Geomys bursarius</i> (Plains pocket gopher)	1	.4							4	1.1	2	.1	10	.2
<i>Perognathus flavescens</i> (Silly pocket mouse)	1	.4											1	.0
<i>Peromyscus maniculatus</i> (Deer mouse)													22	.4
<i>Peromyscus leucopus</i> (White-footed mouse)													6	.1
<i>Peromyscus boylii</i> (Brush mouse)													1	.0

Table 4.106. Continued.

	Room 9		Room 10		Room 11		Room 12		Room 13		Kiva		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
<i>Onychomys leucogaster</i> (Northern grasshopper mouse)													3	.1
<i>Nectoma albigula</i> (White-throated woodrat)													1	.0
<i>Nectoma mexicana</i> (Mexican woodrat)	1	.4	2	1.0					3	.1			9	.2
<i>Microtus montanus</i> (Montane vole)													1	.0
<i>Ondatra zibethicus</i> (Muskrat)	2	.8							2	.1			8	.1
Family Muridae (Rats)													2	.0
<i>Erethizon dorsatum</i> (Porcupine)													1	.0
<i>Myocaster coypus</i> (Nutria)													1	.0
Family Leporidae (Rabbits)									32	1.4			35	.6
<i>Sylvilagus audubonii</i> (Desert cottontail)	34	14.4	22	9.5	13	6.2	1	1.0	17	4.7	87	3.9	317	5.8
<i>Lepus californicus</i> (Black-tailed jackrabbit)	8	3.4	6	2.6	12	5.7			9	2.5	36	1.6	145	2.7
Order Carnivora (Meat-eating animals)													1	.0
Family Canidae (Dog, coyote, fox, wolf)							2	2.1	4	1.1	23	1.0	58	1.1
<i>Canis</i> sp. (Dog, coyote, wolf)	1	.4	1	.4					3	.8	9	.4	21	.4
<i>Canis lupus</i> (Gray wolf)											2	.1	2	.0
<i>Vulpes vulpus</i> (Red fox)									1	.3			1	.0
<i>Urocyon cinereoargenteus</i> (Gray fox)									1	.3	5	.2	6	.1
Family Ursidae (Bears)	1	.4	1	.4			2	2.1					4	.1
<i>Ursus americanus</i> (Black bear)							2	2.1			4	.2	8	.1
<i>Procyon lotor</i> (Raccoon)	1	.4									1	.0	2	.0

Table 4.106. Continued.

	Room 9		Room 10		Room 11		Room 12		Room 13		Kiva		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
<i>Mustela ferenata</i> (Long-tailed weasel)													1	.0
<i>Taxidea taxus</i> (Badger)													1	.0
<i>Lynx rufus</i> (Bobcat)									3	.1	3	.1	3	.1
Order Artiodactyla (Even-toed hooved mammals)	4	.17	4	1.7	6	2.9	5	5.2	15	4.1	81	3.6	171	3.1
<i>Odocoileus</i> sp. (Deer)	8	3.4	9	3.9	13	6.2	3	3.1	13	3.6	188	8.4	307	5.6
<i>Odocoileus hemionus</i> (Mule deer)					1	.5	1	1.0					2	.0
<i>Antilocapra americana</i> (Pronghorn)	4	1.7			1	.5			2	.5	6	.3	28	.5
Family Bovidae (Bison, cattle, sheep, goat)											1	.0	1	.0
<i>Ovis canadensis</i> (Bighorn sheep)					2	1.0							7	.1
<i>Bison bison</i> (Bison)											1	.0	1	.0
<i>Bos/Bison</i> (Indeterminate cattle/bison)											2	.1	3	.1
Aves (Birds)	10	4.2	9	3.9	12	5.7			32	8.8	219	9.8	430	7.9
Anatinae (Surface-feeding ducks)													1	.0
<i>Anas platyrhynchos</i> (Mallard)											1	.0	3	.1
<i>Aix sponsa</i> (Wood duck)			1	.4									1	.0
<i>Mergus merganser</i> (Common merganser)											1	.0	2	.0
Family Accipitridae (Hawks and harriers)											2	.1	2	.0
<i>Buteo jamaicensis</i> (Red-tailed hawk)			2	.9							3	.1	8	.1
<i>Buteo lagopus</i> (Rough-legged hawk)											2	.1	3	.1
<i>Buteo regalis</i> (Ferruginous hawk)					1	.5							1	.0

Table 4.106. Continued.

	Room 9		Room 10		Room 11		Room 12		Room 13		Kiva		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Family Phasianidae (Quails, partridges, and pheasants)														
<i>Callipepla squamata</i> (Scaled quail)							1	.0			1	.0	2	.0
<i>Lophortyx gambelii</i> (Gambel's quail)							2	.1			2	.1	2	.0
<i>Meleagris gallopavo</i> (Turkey)	10	4.2	9	3.9	19	9.1	4	4.2	26	7.1	116	5.2	263	4.8
<i>Progne subis</i> (Purple martin)													1	.0
<i>Aphelocoma ultramarina</i> (Mexican jay)											5	.2	5	.1
<i>Corvus corax</i> (Common raven)											2	.1	2	.0
<i>Corvus brachyrhynchos</i> (Common crow)	1	.4											1	.0
Subfamily Emydinae (Box and water turtles)	1	.4									2	.1	4	.1
Order Squamata (Lizards and Snakes)													1	.0
Family Colubridae (Nonvenomous snakes)													1	.0
Amphibian													2	.0
Order Salienta (Frogs and toads)							1	.3			1	.0	4	.1
Family Catostomidae (Suckers)	1	.4									2	.1	5	.1
Total	236	100.0	232	100.0	209	100.0	96	100.0	364	100.0	2238	100.0	5462	100.0

Table 4.107. Faunal Remains, Floors and Thermal Features, LA 3279

Fauna	Room 2		Room 5		Room 6		Room 7		Room 8		Room 9		Room 10		Room 11		Room 13		Kiva		
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
Floors																					
Small mammal	2	14	9	27	24	20	4	18	3	7	3	7	19	21	4	13	5	6	2	5	
Medium mammal	2	14	2	6	12	10	2	9	7	17	7	16	17	17	4	13	9	11	8	20	
Rodent	1	7	7	21	6	5	1	5			10	11					8	10	3	7	
Rabbit	5	36	4	12	49	16	6	27	12	29	24	26	1	3			2	2	3	7	
Carnivore	1	7			1	1													1	2	
Artiodactyl	1	7	9	27	28	23	8	36	9	22	15	17	19	61	2	66	44	54	19	48	
Bird	1	7	1	3	14	12	1	5	5	12	3	3	2	6			8	10	4	10	
Turkey	1	7	1	3	14	12			5	12	2	2	1	3			4	5			
Amphibian					1	1					1	1					1	1			
Total	14		33		119		22		41		90		31		3		81		40		
Hearths																					
Small mammal			11	28	8	29			5	36	20	28	1	25	15	50					
Medium mammal	1	50	21	52	20	71	3	43	2	14	12	17	3	75	7	23	6	43			
Rodent	1	50									1	1									
Rabbit									3	21	6	8			5	17	1	7			
Carnivore																					
Artiodactyl			6	15	3	43	3	21	31	44					3	10	7	50			
Bird			2	5	1	14	1	7	1	1											
Turkey																					
Amphibian																					
Total	2		40		29		7		14		30		4		14		30		14		

Table 4.107. Continued.

Fauna	Room 2		Room 5		Room 6		Room 7		Room 8		Room 9		Room 10		Room 11		Room 13		Kiva		
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
Other Thermal Features																					
Small mammal	2	33	6	75	8	57	3	43													
Medium mammal	1	17					2	29													
Rodent					2	14															
Rabbit	2	23	1	12	1	7															
Carnivore																					
Artiodactyl			1	12	2	14															
Bird	1	17																			
Turkey					1	7															
Amphibian																					
Total	6		8		14		7														

Table 4.108. Species Recovered from Floors, LA 3279

Species	Number	Percent of Assemblage	Percent	
			Mean	Standard Deviation
Small mammal	72	15.2	16.8 ±	6.1
Medium mammal	62	13.0	13.0 ±	4.5
Rodent	37	7.9	7.3 ±	6.4
Rabbit	76	16.0	17.6 ±	12.4
Carnivore	3	.6		
Artiodactyl	154	32.5	32.8 ±	18.2
Bird	39	8.3	7.6 ±	3.6
Turkey	28	5.9	4.9 ±	4.6
Amphibian	3	.3		
Total	474	100.0		

Table 4.109. Species Recovered from Thermal Features, LA 3279

Species	Number	Percent of Assemblage
Small mammal	79	30.9
Medium mammal	88	34.4
Rodent	5	1.9
Rabbit	21	8.2
Artiodactyl	56	21.9
Bird	6	2.3
Turkey	1	.4
Total	256	100.0

Table 4.110. Faunal Remains from Major Interpretive Units, LA 3563

	Pit Structure		Total	
	(N)	(%)	(N)	(%)
Mammal (indeterminate)	6	8.0	6	8.0
Medium mammal	6	8.0	6	8.0
Large mammal	45	60.0	45	60.0
<i>Sylvilagus audubonii</i> (Desert cottontail)	1	1.3	1	1.3
<i>Lepus californicus</i> (Black-tailed jackrabbit)	1	1.3	1	1.3
Order Artiodactyla (Even-toed hooved mammals)	8	10.7	8	10.7
<i>Odocoileus</i> sp. (Deer)	5	6.7	5	6.7
<i>Antilocapra americana</i> (Pronghorn)	2	2.7	2	2.7
<i>Aphelocoma ultramarina</i> (Mexican jay)	1	1.3	1	1.3
Total	75	100.0	75	100.0

Table 4.111. Faunal Remains from Major Interpretive Units, LA 39968

	General Fill		Roasting Pit (Pit 10)		Burial 2		Pit Structure		East Pit		Entryway	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	7	16.3					84	6.8			7	9.0
Small mammal	5	11.6	1	50.0			539	43.3			9	11.5
Medium mammal	3	7.0					41	3.3			1	1.3
Large mammal	8	18.6					55	4.4			10	12.8
Order Rodentia							20	1.6				
<i>Spermophilus variegatus</i> (Rock squirrel)												
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)	1	2.3					60	4.8				
<i>Sciurus alberti</i> (Albert's squirrel)	1	2.3										
Family Geomyidae (Pocket gophers)							1	.1				
<i>Thomomys bottae</i> (Botta's pocket gopher)							4	.32				
<i>Dipodomys ordii</i> (Ord's kangaroo rat)							20	1.6			1	1.3
<i>Peromyscus leucopus</i> (White-footed mouse)							1	.1				
<i>Sigmodon hispidus</i> (Hispid's cotton rat)							1	.1				
<i>Neotoma albigula</i> (White-throated woodrat)							1	.1				
<i>Neotoma mexicana</i> (Mexican woodrat)							22	1.8			1	1.3
<i>Ondatra zibethicus</i> (Muskrat)							1	.1				
<i>Sylvilagus audubonii</i> (Desert cottontail)	2	4.7					176	14.1			27	34.6
<i>Lepus californicus</i> (Black-tailed jackrabbit)					2	50.0	102	8.2			11	14.1

Table 4.111. Continued.

	General Fill		Roasting Pit (Pit 10)		Burial 2		Pit Structure		East Pit		Entryway	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
<i>Canis</i> sp. (Dog, coyote, wolf)	1	2.3					3	.2				
<i>Urocyon cinereoargenteus</i> (Gray fox)							1	.1	2	100.0	1	1.3
Family Ursidae (Bears)							1	.1				
<i>Ursus americanus</i> (Black bear)							1	.1				
Family Mustelidae (Weasels and allies)					1	25.0						
<i>Mephitis</i> sp. (Skunks)							2	.2				
Order Artiodactyla (Even-toed hooved mammals)	6	14.0					37	3.0			6	7.7
<i>Odocoileus</i> sp. (Deer)							3	.2				
<i>Odocoileus hemionus</i> (Mule deer)					1	25.0					3	3.8
<i>Antilocapra americana</i> (Pronghorn)							12	1.0				
Aves (Birds)							7	.6				
<i>Anas platyrhynchos</i> (Mallard)							1	.1				
<i>Lophortyx gambelii</i> (Gambel's quail)											1	1.3
<i>Meleagris gallopavo</i> (Turkey)							4	.3				
Family Turdidae (Thrushes, solitaires and bluebirds)							1	.1				
<i>Larropellis</i> sp. (Kingsnakes)							14	1.1				
Order Salientia (Frogs and toads)							19	1.5				
Family Bufonidae (True toads)							2	.2				
Family Catostomidae (Suckers)			1	50.0								
Total	43	100.0	2	100.0	4	100.0	1244	100.0	2	100.0	78	100.0

Table 4.111. Continued.

	Roomblock 1		Roomblock 2		Total	
	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (in determinate)					98	7.1
Small mammal					554	40.2
Medium mammal					45	3.3
Large mammal					73	5.3
Order Rodentia					20	1.5
<i>Spermophilus variegatus</i> (Rock squirrel)	1	100.0			1	.1
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)					61	4.4
<i>Sciurus alberti</i> (Albert's squirrel)					1	.1
Family Geomyidae (Pocket gophers)					1	.1
<i>Thomomys bottae</i> (Botta's pocket gopher)					4	.3
<i>Dipodomys ordii</i> (Ord's kangaroo rat)					21	1.5
<i>Peromyscus leucopus</i> (White-footed mouse)					1	.1
<i>Sigmodon hispidus</i> (Hispid's cotton rat)					1	.1
<i>Neotoma albigula</i> (White-throated woodrat)					1	.1
<i>Neotoma mexicana</i> (Mexican woodrat)					23	1.7
<i>Ondatra zibethicus</i> (Muskrat)					1	.1
<i>Sylvilagus audubonii</i> (Desert cottontail)					205	14.9
<i>Lepus californicus</i> (Black-tailed jackrabbit)					115	8.4
<i>Canis</i> sp. (Dog, coyote, wolf)					4	.3
<i>Urocyon cinereoargenteus</i> (Gray fox)					4	.3
Family Ursidae (Bears)					1	.1
<i>Ursus americanus</i> (Black bear)					1	.1
Family Mustelidae (Weasels and allies)					1	.1
<i>Mephitis</i> sp. (Skunks)					2	.1
Order Artiodactyla (Even-toed hooved mammals)					49	3.6
<i>Odocoileus</i> sp. (Deer)			1	33.3	4	.3
<i>Odocoileus hemionus</i> (Mule deer)			1	33.3	22	1.6
<i>Antilocapra americana</i> (Pronghorn)					12	.9
Aves (Birds)					7	.5
<i>Anas platyrhynchos</i> (Mallard)					1	.1
<i>Lophortyx gambelii</i> (Gambel's quail)					1	.1
<i>Meleagris gallopavo</i> (Turkey)			1	33.3	5	.4
Family Turdidae (Thrushes, solitaires, and bluebirds)					1	.1
<i>Lampropeltis</i> sp. (Kingsnakes)					14	1.0

Table 4.111. Continued.

	Roomblock 1		Roomblock 2		Total	
	(N)	(%)	(N)	(%)	(N)	(%)
Order Salienta (Frogs and toads)					19	1.4
Family Bufonidae (True Toads)					2	.1
Family Catostomidae (Suckers)					1	.1
Total	1	100.0	3	100.0	1377	100.0

Table 4.112. Fauna from Roof Fall, Floor, and Hearth, LA 39968

Species	Roof Fall		Floor		Hearth	
	Number	Percent	Number	Percent	Number	Percent
Small mammal	69	5.6	59	35.1	8	25.0
Medium mammal	7	5.7	5	3.0	4	12.5
Rodent	7	5.7	30	17.8	9	28.1
Rabbit	19	15.6	45	26.8	9	28.1
Carnivore	-	-	-	-	-	-
Artiodactyl	5	4.1	8	4.7	1	3.1
Bird	1	.8	-	-	-	-
Turkey	-	-	1	.6	-	-
Amphibian/reptile	14	11.5	20	12.0	1	3.1
Total	122	100.0	168	100.0	32	100.0

Table 4.113. Faunal Remains from Major Interpretive Units, LA 39969

	General Fill	Large Pit (F2)	Jacal (F7)	Hearth (F9)	Burial 1	Storage Pit (F13)	Burial 2	Room 1		
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)		
Mammal (indeterminate)							1	50.0	9	16.7
Small mammal	2	8.3	2	20.0	1	33.3			1	100.0
Medium mammal	7	29.2	3	30.0	1	16.7	2	66.7	5	71.4
Large mammal	3	12.5								
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)	1	4.2								
<i>Sciurus alberti</i> (Alberts squirrel)			1	10.0						
<i>Thomomys bottrae</i> (Boitars pocket gopher)			1	16.7						
<i>Sylvilagus audubonii</i> (Desert cottontail)	1	4.2	1	10.0	3	50.0			2	3.7
<i>Lepus californicus</i> (Black-tailed jackrabbit)	2	8.3			1	16.7			1	1.9
<i>Canis</i> sp. (Dog, coyote, wolf)	4	16.7	3	30.0			2	286		
<i>Vulpus vulpus</i> (Red fox)	1	4.2								
Order Artiodactyla (Even- toed hooved mammals)									2	3.7
<i>Odocoileus</i> sp. (Deer)	1	4.2							1	1.9
<i>Odocoileus hemionus</i> (Mule deer)	2	8.3							5	9.3

Table 4.113. Continued.

	General Fill		Large Pit (F2)		Jecal (F7)		Hearth (F9)		Burial 1		Storage Pit (F13)		Burial 2		Room 1		
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	
<i>Artilocapra americana</i> (Pronghorn)																	
<i>Ovis canadensis</i> (Bighorn sheep)																	
<i>Meleagris gallopavo</i> (Turkey)																	
Family Ictaluridae (Calfish)																	
Total	24	100.0	10	100.0	6	100.0	3	100.0	7	100.0	1	100.0	2	100.0	54	100.0	

	Post Collar (Room 1 F4)		Storage Pit (Under Room 1 F4)		Room 2		Room 2 (F1)		Room 3		Pit Under Cobbles (Room 4 F20)		Posthole (Room 3 F30)		Storage Pit (Room 3 F31)		Posthole (Room 3 F33)		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	1	33.3							4	10.0					1	20.0			16	9.6
Small mammal					2	28.6	1	100.0	1	2.5					1	20.0	1	100.0	12	7.32
Medium mammal					2	28.6													22	13.2
Large mammal									6	15.0									42	25.1
<i>Cynomys gurrisoni</i> (Gurmsion's prairie dog)																			1	.6
<i>Sciurus alberti</i> (Alberts squirrel)																			1	.6
<i>Thomomys bottae</i> (Bottas's pocket gopher)					1	14.3													2	1.2
<i>Spizella socialis</i> (Desert cottontail)	1	33.3							4	10.0					1	20.0			13	7.8

Table 4.113. Continued.

	Post Collar (Room 1 F4)		Storage Pit (Under Room 1 F4)		Room 2		Room 2 (F1)		Room 3		Pit Under Cobbles (Room 4 F20)		Posthole (Room 3 F30)		Storage Pit (Room 3 F31)		Posthole (Room 3 F33)		Total			
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)		
<i>Lepus californicus</i> (Black-tailed jackrabbit)	1	100.0	1	14.3												1	20.0			7	4.2	
<i>Canis</i> sp. (Dog, coyote, wolf)																				9	5.4	
<i>Vulpus vulpus</i> (Red fox)									8	20.0										1	.6	
Order Artiodactyla (Even- toed hooved mammals)																				10	6.0	
<i>Odocoileus</i> sp. (Deer)																				2	1.2	
<i>Odocoileus hemionus</i> (Mule deer)	1	33.3	1	14.3					10	25.0	1	100.0				1	20.0			21	12.6	
<i>Antilocapra americana</i> (Pronghorn)									2	5.0										2	1.2	
<i>Ovis canadensis</i> (Bighorn sheep)													1	100.0						1	.6	
<i>Meleagris gallopavo</i> (Turkey)									3	7.5										3	1.8	
Family Ictaluridae (Catfish)									2	5.0										2	1.2	
Total	3	100	1	100	7	100	1	100	40	100	1	100	1	100	1	100	5	100	1	100	167	100

Table 4.114. Faunal Remains from Major Interpretive Units, LA 39972

	General Fill		Trash Pit (F1)		Total	
	(N)	(%)	(N)	(%)	(N)	(%)
Small mammal	3	7.7	9	23.1	12	15.4
Medium mammal	3	7.7			3	3.8
Large mammal	11	28.2			11	14.1
<i>Cynomys</i> sp.	1	2.6			1	1.3
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)	8	20.5	1	2.6	9	11.5
<i>Sylvilagus audubonii</i> (Desert cottontail)	2	5.1	1	2.6	3	3.8
<i>Lepus californicus</i> (Black-tailed jackrabbit)			2	5.1	2	2.6
Aves (Birds)	5	12.8	14	35.9	19	24.4
<i>Meleagris gallopavo</i> (Turkey)	6	15.4	12	30.8	18	23.1
Total	39	100.0	39	100.0	78	100.0

Table 4.115. Faunal Remains from Major Interpretive Units, LA 39975

	General Fill		Pit 1		Pit Structure 1		Pit Structure 2		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	31	37.3	3	100.0					34	34.0
Small mammal	1	1.2							1	1.0
Large mammal	50	60.2			7	58.3	2	100.0	59	59.0
<i>Thomomys bottae</i> (Botta's pocket gopher)					2	16.7			2	2.0
Order Artiodactyla (Even-toed hoofed mammals)					3	25.0			3	3.0
<i>Odocoileus</i> sp. (Deer)	1	1.2							1	1.0
Total	83	100.0	3	100.0	12	100.0	2	100.0	100	100.0

Table 4.116. Faunal Remains from Major Interpretive Units, LA 43766

	General Fill		Hearth 2		Roasting Pit		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	71	23.1	1	20.0			72	22.8
Small mammal	10	3.2			2	66.7	12	3.8
Medium mammal	45	14.6					45	14.2
Large mammal	16	5.2					16	5.1
Family Leporidae (Rabbits)			1	20.0			1	.3
<i>Sylvilagus audubonii</i> (Desert cottontail)	1	.3					1	.3
<i>Lepus californicus</i> (Black-tailed jackrabbit)	3	1.0	3	60.0			6	1.9
Family Ursidae (Bears)	1	.3					1	.3
Order Artiodactyla (Even-toed hooved mammals)	130	42.2					130	41.1
<i>Odocoileus</i> sp. (Deer)	1	.3					1	.3
<i>Odocoileus hemionus</i> (Mule deer)	18	5.8			1	33.3	19	6.0
<i>Antilocapra americana</i> (Pronghorn)	1	.3					1	.3
<i>Ovis canadensis</i> (Bighorn sheep)	11	3.6					11	3.5
Total	308	100.0	5	100.0	3	100.0	316	100.0

Table 4.117. Faunal Remains from Major Interpretive Units, LA 45507

	General Fill		Trash Pit		Burial 1 (F 14)		Fire Pit		Pit Structure 1		Pit Structure 3		Hearth (Pit Structure 3)		Pit Structure 9	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	7	87.5	1	14.3	49	12.1	25	18.8	1	100.0						
Small mammal					88	21.7	4	12.5	10	7.5						
Medium mammal	6	5.7			80	19.8	2	6.3	9	6.8	3	20.0				
Large mammal	73	69.5			174	43.0	9	28.1	56	42.1	8	53.3				
Order Rodentia			1	14.3							1	6.7				
<i>Spermophilus</i> sp. (Ground squirrels)									1	3.1						
<i>Spermophilus spilosoma</i> (Spotted ground squirrel)																
<i>Cynomys ludovicianus</i> (Black-tailed prairie dogs)																
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)	1	1.0	1	12.5												
<i>Saïurus alberti</i> (Albert's squirrel)																
<i>Thomomys bottae</i> (Boita's pocket gopher)	4	3.8			2	.5	11	34.4	11	8.3	1	6.7				
<i>Pappogeomys castanops</i> (Yellow-faced pocket gopher)																
<i>Dipodomys spectabilis</i> (Banner-tailed kangaroo rat)			2	28.6												
<i>Peromyscus</i> sp. (Mouse)					2	.5										
<i>Peromyscus maniculatus</i> (Deer mouse)																

Table 4.117. Continued

	General Fill	Trash Pit	Burial 1 (F14)	Fire Pit	Pit Structure 1	Pit Structure 3	Heath (Pit Structure 3)	Pit Structure 9
	(N) (%)	(N) (%)	(N) (%)	(N) (%)	(N) (%)	(N) (%)	(N) (%)	(N) (%)
<i>Peromyscus leucopus</i> (White-footed mouse)								
<i>Onychomys leucogaster</i> (Northern grasshopper mouse)								
<i>Sigmodon hispidus</i> (Hispid's cotton rat)								
<i>Neotoma albigula</i> (White-throated woodrat)								
<i>Neotoma mexicana</i> (Mexican woodrat)			1	1	1	6		
Family Leporidae (Rabbits)								
<i>Sylvilagus audubonii</i> (Desert cottontail)	3	2.9	1	14.3	2	1	2	1.5
<i>Lepus californicus</i> (Black-tailed jackrabbit)					1	1		.8
<i>Canis</i> sp. (Dog, coyote, wolf)						1		.8
<i>Urocyon cinereoargenteus</i> (Gray fox)					1			
<i>Procyon lotor</i> (Raccoon)	10	9.5						
Order Artiodactyla (Even-toed hooved mammals)	4	3.8				3		2.3
<i>Cervus canadensis</i> (Wapiti/Elk)					1			3.1
<i>Odocoileus</i> sp. (Deer)	3	2.9	1	14.3	1	1	1	3.1
<i>Antilocapra americana</i> (Pronghorn)								
<i>Bos taurus</i> (Cattle)	1	1.0						
<i>Ovis canadensis</i> (Bighorn sheep)					1			3.1
<i>Bison bison</i> (Bison)								

Table 4.117. Continued.

	General Fill		Trash Pit		Burial 1 (F14)		Fire Pit		Pit Structure 1		Pit Structure 3		Hearth (Pit Structure 3)		Pit Structure 9	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Aves (Birds)			4	1.0	1	3.1	3	2.3								
<i>Podilymbus podiceps</i> (Pied-billed grebe)																
<i>Buteo</i> sp. (Hawks)					1	.8										
<i>Parabuteo unicinctus</i> (Harris' hawk)																
<i>Falco mexicanus</i> (Prairie falcon)																
Family Phasianidae (Quails, pheasants, partridges)																
<i>Colinus virginianus</i> (Bobwhite)																
<i>Callipepla squamata</i> (Scale d quail)																
<i>Lophortyx gambelii</i> (Gambel's quail)																
<i>Meleagris gallopavo</i> (Turkey)																
<i>Zenaidura macroura</i> (Mourning dove)																
Family Corvidae (Jays, magpies, and crows)																
<i>Aphelocoma ulirainina</i> (Mexican jay)																
<i>Corvus brachyrhynchos</i> (Common crow)																
Family Icteridae (Meadowlarks, blackbirds, and orioles)																
Order Salientia (Frogs and toads)																
Family Bufonidae (True toads)																
Total	105	100	8	100	7	100	405	100	32	100	133	100	1	100	15	100

Table 4.117. Continued.

	Pit Structure 12		Vent (Pit Structure 12)		Pit Structure 13		Post Hole 6 (Pit Structure 13)		Hearth (Pit Structure 13)		Burial		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	266	22.6	202	48.7	41	13.5					592	22.7		
Small mammal	139	11.8	110	26.5	37	12.2					388	14.9		
Medium mammal	118	10.0	54	13.0	8	2.6					280	10.7		
Large mammal	282	24.0	30	7.2	75	24.7	2	100.0	2	66.7	712	27.3	1	100.0
Order Rodentia	4	.3	3	.7	1	.3					10	.4		
<i>Spermophilus</i> sp. (Ground squirrels)	3	.3									3	.1		
<i>Spermophilus spilosoma</i> (Spotted ground squirrel)											1	.0		
<i>Cynomys ludovicianus</i> (Black-tailed prairie dogs)	4	.3									4	.2		
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)	15	1.3			9	3.0					26	1.0		
<i>Saiurus alberti</i> (Albert's squirrel)	1	.1			1	.3					2	.1		
<i>Thomomys bottae</i> (Boita's pocket gopher)	51	4.3	9	2.2	31	10.2					120	4.6		
<i>Pappogeomys castaneus</i> (Yellow-faced pocket gopher)	2	.2									2	.1		
<i>Dipodomys spectabilis</i> (Banner-tailed kangaroo rat)	3	.3									5	.2		
<i>Peromyscus</i> sp. (Mouse)											2	.1		
<i>Peromyscus maniculatus</i> (Deer mouse)	26	2.2				3.0					26	1.0		
<i>Peromyscus leucopus</i> (White-footed mouse)			1	.2	1	.3					2	.1		
<i>Onychomys leucogaster</i> (Northern grasshopper mouse)	1	.1									1	.0		
<i>Sigmodon hispidus</i> (Hispid's cotton rat)	5	.4									5	.2		

Table 4.117. Continued.

	Pit Structure 12		Vent (Pit Structure 12)		Pit Structure 13		Post Hole 6 (Pit Structure 13)		Hearth (Pit Structure 13)		Burial		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
<i>Neotoma albigula</i> (White-throated woodrat)	2	.2	1	.2							3	.1		
<i>Neotoma mexicana</i> (Mexican woodrat)	45	3.8	1	.2	5	1.6					60	2.3		
Family Leporidae (Rabbits)											1	.0		
<i>Sylvilagus audubonii</i> (Desert cottontail)	66	5.6	1	.2	16	5.3					91	3.5		
<i>Lepus californicus</i> (Black-tailed jackrabbit)	19	1.6	1	.2	22	7.2					44	1.7		
<i>Canis</i> sp. (Dog, coyote, wolf)	2	.2									3	.1		
<i>Urocyon cinereoargenteus</i> (Gray fox)											1	.0		
<i>Procyon lotor</i> (Raccoon)											10	.4		
Order Artiodactyla (Even-toed hooved mammals)	20	1.7			19	6.3					48	1.8		
<i>Cervus canadensis</i> (Wapiti/elk)											1	.0		
<i>Odocoileus</i> sp. (Deer)	17	1.4	1	.2	15	4.9			1	33.3	40	1.5		
<i>Antilocapra americana</i> (Pronghorn)	2	.2									3	.1		
<i>Bos taurus</i> (Cattle)											1	.0		
<i>Ovis canadensis</i> (Bighorn sheep)	1	.1									2	.1		
<i>Bison bison</i> (Bison)					2	.7					2	.1		
Aves (Birds)	20	1.7	1	.2	6	2.0					35	1.3		
<i>Podilymbus podiceps</i> (Pied-billed grebe)					1	.3					1	.0		
<i>Buteo</i> sp. (Hawks)											1	.0		
<i>Parabuteo unicinctus</i> (Harris' hawk)	1	.1									1	.0		
<i>Falco Mexicanus</i> (Prairie falcon)	10	.8									10	.4		
Family Phasianidae (Quails, pheasants, partridges)											1	.0		

Table 4.117. Continued.

	Pit Structure 12		Vent (Pit Structure 12)		Pit Structure 13		Post Hole 6 (Pit Structure 13)		Hearth (Pit Structure 13)		Burial		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
<i>Colinus virginianus</i> (Bobwhite)	9	.8	4	1.3							13	.5		
<i>Callipepla squamata</i> (Scaled quail)	7	.6	1	.3							1	.0		
<i>Lophortyx gambelii</i> (Gambel's quail)	4	.3									9	.3		
<i>Meleagris gallopavo</i> (Turkey)	18	1.5									4	.2		
<i>Zenaidura macroura</i> (Mourning dove)	1	.1									18	.7		
Family Corvidae (Jays, Magpies, and Crows)	12	1.0	1	.3							1	.0		
<i>Aphelocoma ultramarina</i> (Mexican jay)			1	.3							13	.5		
<i>Corvus brachyrhynchos</i> (Common crow)			1	.3							1	.0		
Family Icteridae (Meadowlarks, Blackbirds and Orioles)			6	2.0							6	.2		
Order Salientia (Frogs and Toads)			1	.3							1	.0		
Family Bufonidae (True Toads)	1	.1									1	.0		
Total	1177	100.0	415	100.0	304	100.0	2	100.0	3	100.0	1	100.0	2608	100.0

Table 4.118. Comparison of Fauna within Pit Structures, LA 45507

Species	Structure 1			Structure 3			Structure 9			Upper Level			Roof Fall/floor			Structure 13			Percent	
	Number	Percent	Mean	Number	Percent	Mean	Number	Percent	Mean	Number	Percent	Mean	Number	Percent	Mean	Number	Percent	Mean	Standard Deviation*	
Small mammal	4	12.5	10	9.4	204	25.7	45	13.9	37	13.8	9.9	5.8								
Med. mammal	2	6.2	9	8.4	147	18.8	27	8.3	8	3.0	7.7	7.6								
Rodent	13	40.6	17	15.9	97	12.4	80	24.8	48	18.0	14.5	8.9								
Rabbit			4	3.7	50	6.4	37	11.5	38	14.1	5.8	6.6								
Artiodactyl	12	37.5	60	56.1	230	29.4	123	38.1	116	43.2	48.3	12.7								
Bird	1	3.1	7	6.5	52	6.6	11	3.4	20	7.5	4.1	2.9								
Turkey					4	.5														
Amphibian					1	.1			1	.4										
Total	32	100.0	107	100.0	785	100.0	323	100.0	268	100.0										

Table 4.119. Faunal Remains from Major Interpretive Units, LA 45508

	General Fill		Pit Structure 1		Total	
	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	1	33.3			1	7.7
Medium mammal	1	33.3	1	10.0	2	15.4
Large mammal	1	33.3	6	60.0	7	53.8
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)			1	10.0	1	7.7
<i>Thomomys bottae</i> (Botta's pocket gopher)			1	10.0	1	7.7
Order Artiodactyla (Even-toed hoofed mammals)			1	10.0	1	7.7
Total	3	100.0	10	100.0	13	100.0

Table 4.120. Faunal Remains from Major Interpretive Units, LA 70185

	General Fill		Room 1		Pot Rest 1		Room 2		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	5	18.5					5		5	10.2
Small mammal	1	3.7			7	43.8	8	43.8	8	16.3
Medium mammal	1	3.7	1	20.0	1	6.3	3	6.3	3	6.1
Large mammal	5	18.5	2	40.0	1	100.0	8	12.5	8	16.3
<i>Thomomys bottae</i> (Botta's pocket gopher)	2	7.4			2	12.5	4		4	8.2
<i>Ondatra zibethicus</i> (Muskrat)	2	7.4					2		2	4.1
Family Leporidae (Rabbits)	1	3.7					1		1	2.0
<i>Sylvilagus audubonii</i> (Desert cottontail)	6	22.2	1	20.0	2	12.5	9		9	18.4
<i>Lepus californicus</i> (Black-tailed jackrabbit)	1	3.7			1	6.3	2		2	4.1
<i>Procyonidae</i> (Raccoon and racoon-like)					1	6.3	1		1	2.0
Order Artiodactyla (Even-toed hoofed mammals)	1	3.7			1	6.3	2		2	4.1
<i>Odocoileus</i> sp. (Deer)	1	3.7			1	6.3	2		2	4.1
<i>Antilocapra americana</i> (Pronghorn)			1	20.0			1		1	2.0
<i>Meleagris gallopavo</i> (Turkey)	1	3.7					1		1	2.0
Total	27	100.0	5	100.0	1	100.0	16	100.0	49	100.0

Table 4.121. Faunal Remains from Major Interpretive Units, LA 70188

	General Fill		Pit 1		Pit 2		Pit 3		Rock File		Stone Circle		Rocks		Pit Structure		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	49	12.9	7	31.8	22	34.9	23	37.1	7	58.3	4	19.0	6	16.7	11	16.7	129	19.5
Small mammal	12	3.1	1	4.5	4	6.3	5	8.1			5	23.8	1	2.8	2	3.0	30	4.5
Medium mammal	67	17.6			6	9.5	1	1.6	4	33.3	1	4.8	5	13.9	24	36.4	108	16.3
Large mammal	216	56.7	8	36.4	21	33.3	24	38.7			11	52.4	21	58.3	25	37.9	326	49.2
<i>Sylvilagus audubonii</i> (Desert cottontail)					1	1.6											1	.2
<i>Lepus californicus</i> (Black-tailed jackrabbit)	1	.3			1	1.6											2	.3
<i>Canis</i> sp. (Dog, coyote, and wolf)															1	1.5	1	.2
Order Artiodactyla (Even-toed hoofed mammals)	16	4.2			8	12.7	4	6.5	1	8.3			3	8.3	2	3.0	34	5.1
<i>Cervus canadensis</i> (Wapiti/elk)	1	.3															1	.2
<i>Odocoileus</i> sp. (Deer)	19	5.0	6	27.3			5	8.1							1	1.5	30	4.5
Aves (Birds)																	1	.2
Total	381	100.0	22	100.0	63	100.0	62	100.0	12	100.0	21	100.0	36	100.0	66	100.0	663	100.0

Table 4.121. Continued.

	Stone Circle		Rocks		Pit Structure		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	4	19.0	6	16.7	11	16.7	129	19.5
Small mammal	5	23.8	1	2.8	2	3.0	30	4.5
Medium mammal	1	4.8	5	13.9	24	36.4	108	16.3
Large mammal	11	52.4	21	58.3	25	37.9	326	49.2
<i>Sylvilagus audubonii</i> (Desert cottontail)							1	.2
<i>Lepus californicus</i> (Black-tailed jackrabbit)							2	.3
<i>Canis</i> sp. (Dogs, coyotes, and wolves)					1	1.5	1	.2
Order Artiodactyla (Even-toed hooved mammals)			3	8.3	2	3.0	34	5.1
<i>Cervus canadensis</i> (Wapiti/elk)							1	.2
<i>Odocoileus</i> sp. (Deer)							30	4.5
Aves					1	1.5	1	.2
Total	21	100.0	36	100.0	66	100.0	663	100.0

Table 4.122. Comparison of Fauna within Pits, LA 70188

Species	Pit Structure		Pit 1		Pit 2		Pit 3		Percent	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	Mean	Std. Dev.
Small mammal	2	3.6	1	6.7	4	9.7	5	12.8	8.2 ±	3.9
Medium mammal	24	43.7			6	14.6	1	2.6	15.2 ±	20.0
Rabbit					2	4.9			1.2 ±	2.4
Carnivore	1	1.8							.4 ±	.9
Artiodactyl	27	49.1	14	93.3	29	70.8	33	84.6	74.4 ±	19.3
Bird	1	1.8							.4 ±	.9
Total	55	100.0	15	100.0	41	100.0	39	100.0		

Table 4.123. Faunal Remains from Major Interpretive Units, LA 70196

	General Fill		Pit Structure		Total	
	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	5	22.7	54	12.2	59	12.7
Small mammal	2	9.1	41	9.3	43	9.3
Medium mammal			27	6.1	27	5.8
Large mammal	9	40.9	163	37.0	172	37.1
Order Rodentia			1	.2	1	.2
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)	1	4.5	1	.2	2	.4
<i>Sciurus alberti</i> (Albert's squirrel)			2	.5	2	.4
<i>Thomomys bottae</i> (Botta's pocket gopher)			1	.2	1	.2
<i>Neotoma mexicana</i> (Mexican woodrat)			9	2.0	9	1.9
<i>Sylvilagus audubonii</i> (Desert cottontail)			4	.9	4	.9
<i>Lepus californicus</i> (Black-tailed jackrabbit)			11	2.5	11	2.4
Order Artiodactyla (Even-toed hoofed mammals)			37	8.4	37	8.0
<i>Odocoileus</i> sp. (Deer)	2	9.1	32	7.3	34	7.3
<i>Antilocapra americana</i> (Pronghorn)			3	.7	3	.6
<i>Ovis canadensis</i> (Bighorn sheep)	1	4.5	2	.5	3	.6
Aves (Birds)	2	9.1	18	4.1	20	4.3
<i>Meleagris gallopavo</i> (Turkey)			30	6.8	30	6.5
<i>Aphelocoma ultramarina</i> (Mexican jay)			5	1.1	5	1.1
Total	22	100.0	441	100.0	463	100.0

Table 4.124. Fauna within Pit Structure Levels, LA 70196

Species	Above Roof Fall		Roof Fall		Floor Fill		Floor		Percent	
	N	%	N	%	N	%	N	%	Mean	Standard Deviation
Small mammal	1	8.3	5	8.8	-	-	35	11.1	7.0	4.8
Medium mammal	2	16.7	2	3.5	-	-	23	7.3	6.9	7.2
Rodent	-	-	1	1.7	-	-	13	4.1	1.4	1.9
Rabbit	-	-	1	1.7	1	25.0	13	4.1	7.7	11.6
Artiodactyl	7	58.3	39	68.4	2	50.0	189	60.3	59.2	7.6
Bird	1	8.3	2	3.5	-	-	20	6.4	4.6	3.6
Turkey	1	8.3	7	12.3	1	25.0	21	6.7	13.1	8.3
Total	12		57		4		314			

Table 4.125. Faunal Remains from Major Interpretive Units, LA 70201

	General Fill		Total	
	(N)	(%)	(N)	(%)
Mammal (indeterminate)	1	10.0	1	10.0
Small mammal	1	10.0	1	10.0
Large mammal	3	30.0	3	30.0
Order Artiodactyla (Even-toed hoofed mammals)	2	20.0	2	20.0
<i>Cervus canadensis</i> (Wapiti/elk)	2	20.0	2	20.0
Aves (Birds)	1	10.0	1	10.0
Total	10	100.0	10	100.0

Table 4.126. Faunal Remains from Major Interpretive Units, LA 75791

	General Fill		Pit Structure 2		Total	
	Nb.	Pct.	No.	Pct.	Nb.	Pct.
Large mammal	6	100.0	7	100.0	13	100.0
Total	6	100.0	7	100.0	13	100.0

Table 4.127. Faunal Remains from Major Interpretive Units, LA 78439

	General Fill		Total	
	(N)	(%)	(N)	(%)
Mammal (indeterminate)	17	85.0	17	85.0
Large mammal	3	15.0	3	15.0
Total	20	100.0	20	100.0

Table 4.128. Faunal Remains from Major Interpretive Units, LA 89846

	General Fill		Roasting Pit 1		Roasting Pit 2		Total	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Mammal (indeterminate)	50	69.4	17	73.9			67	66.3
Small mammal			5	21.7	6	100.0	11	10.9
Medium mammal	12	16.7					12	11.9
Large mammal	3	4.2					3	3.0
<i>Geomys bursarius</i> (Plains pocket gopher)	3	4.2					3	3.0
Order Artiodactyla (Even-toed hoofed mammals)	4	5.6	1	4.3			5	5.0
Total	72	100.0	23	100.0	6	100.0	101	100.0

Table 4.129. Faunal Remains from Major Interpretive Units, LA 89847

	General Fill		Total	
	(N)	(%)	(N)	(%)
Mammal (indeterminate)	10	4.3	10	4.3
Medium mammal	11	4.7	11	4.7
Large mammal	195	83.7	195	83.7
<i>Cynomys gunnisoni</i> (Gunnison's prairie dog)	1	.4	1	.4
<i>Ondatra zibethicus</i> (Muskrat)	2	.9	2	.9
<i>Sylvilagus audubonii</i> (Desert cottontail)	1	.4	1	.4
<i>Canis</i> sp. (Dog, coyote, and wolf)	3	1.3	3	1.3
Order Artiodactyla (Even-toed hoofed mammals)	4	1.7	4	1.7
<i>Cervus canadensis</i> (Wapiti/elk)	2	.9	2	.9
<i>Odocoileus</i> sp. (Deer)	3	1.3	3	1.3
<i>Bison bison</i> (Bison)	1	.4	1	.4
Total	233	100.0	233	100.0

Table 4.130. Large versus Small Animal Indices for the Reserve and Luna Areas

Reserve Area					Luna Area			
Period	Site	Small	Large	Index	Site	Small	Large	Index
Archaic	LA43766	21	178	0.89	LA 89846	14	8	0.36
Pinelawn/ Georgetown	LA 70188	33	391	0.92	LA 45508	2	8	0.80
San Francisco	LA 70196	73	249	0.77				
Three Circle					LA 45507	810	809	0.50
Reserve	LA 39969	36	78	0.68				
Tularosa	LA 39968	1010	160	0.14	LA 70185	27	13	0.32
					LA 3279	1453	1869	0.56

Table 4.131. Age of Faunal Species

Age	Archaic		Pinelawn/ Georgetown		San Francisco		Three Circle		Reserve		Tularosa	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Fetal											23	.4
Juvenile									2	1.2	48	.7
Immature	2	.3			3	.7	34	1.3	24	14.4	324	4.7
Young adult	1	.2			8	1.7	34	1.3			30	.4
Mature	660	99.5	113	100.0	452	97.6	2540	97.4	141	84.4	6416	93.8
Total	663	100.0	113	100.0	463	100.0	2608	100.0	167	100.0	6841	100.0

Table 4.132. Immature Faunal Species

Species	Archaic		Pinelawn/ Georgetown		San Francisco		Three Circle		Reserve		Tularosa		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Small mammal							2	3.0			30	7.0	32	6.0
Medium mammal					1	9.1	1	1.5	14	53.9	19	4.4	35	6.6
Large mammal	2	66.7			1	9.1	7	10.3	1	3.8	20	4.7	31	5.8
Indeterminate									1	3.8	19	4.4	20	3.7
Artiodactyl					8	72.7	9	13.2			116	27.3	133	25.0
Rabbit							8	11.7	1	3.8	109	25.6	118	22.2
Rodent					1	9.1	29	42.6	1	3.8	61	14.3	92	17.3
Bird							1	1.5			3	.7	4	.8
Turkey											7	1.6	7	1.3
Canid	1	33.3			11	16.2	8	30.9			41	9.6	61	11.4
Toad/frog											7	1.6	7	1.3
Carnivore											3	.7	3	.6
Total	3	100.0	0	0	11	100.0	68	100.0	26	10.0	425	100.0	533	100.0

Table 4.133. Types of Processing on Faunal Remains

	Archaic										
	LA 43766			LA 70188			LA 89846			Total	
	Split	Snap	Spiral	Split	Snap	Impact	Spiral	Split	Snap	Number	Percent
Small mammal	10	2		26	1			6	1	46	7.6
Medium mammal	45			77				12		134	22.1
Large mammal	106	1	1	227		15	4	3		357	58.9
Indeterminate mammal	22			37				3		62	10.2
Rabbit	2	4								6	1.0
Bird				1						1	.2
Total	185	7	1	386	1	15	4	24	1	606	100.0

	Pineawn/Georgetown										
	LA 39975			LA 45508			LA 70196			Total	
	Split	Snap	Impact	Split	Snap	Percent	Split	Snap	Impact	Count	Percent
Small mammal	1					1.2	25	1		29	13.2
Medium mammal				2		2.3	21	1		22	10.0
Large mammal			12	7		69.8	105	6	15	131	59.8
Indeterminate mammal	23					26.7	15			15	6.9
Rabbit							3			3	1.4
Rodent								1		1	.5
Bird							9	4	1	15	6.8
Turkey							3			3	1.4
Total	65	12	9	9	86	100.0	181	13	16	219	100.0

San Francisco										
LA 70196			Total							
Split	Snap	Impact	Count	Percent						
Small mammal	3		29	13.2						
Medium mammal			22	10.0						
Large mammal	2	3	131	59.8						
Indeterminate mammal			15	6.9						
Rabbit			3	1.4						
Rodent			1	.5						
Bird	1	1	15	6.8						
Turkey			3	1.4						
Total	6	3	219	100.0						

Table 4.133 (continued). Types of Processing on Faunal Remains

	Three Circle										Reserve					
	LA 45507					Total					LA 39969				Total	
	Split	Snap	Impact	Spiral	Cut	Chop	Saw	Count	Percent	Split	Snap	Impact	Chop	Count	Percent	
Small mammal	271	21		1				293	29.2	10	1			11	13.3	
Medium mammal	4				1		1	6	.6	11	1			12	14.5	
Large mammal	550	25	14	7	8	1		608	60.1	32	4	1	1	38	45.8	
Rabbit	14	26	1				41	41	4.0	3	4			7	8.4	
Rodent	4	27	1				32	32	3.2							
Bird	7	23					30	3.0								
Toad/frog		1					1	.1								
Indeterminate mammal										6				6	7.2	
Turkey										3				3	3.6	
Canid										3	3			6	7.2	
Total	850	126	16	8	9	1	1	1011	100.0	68	13	1	1	83	100.0	
Tularosa																
	LA 3279					LA 39968					LA 70188					Total
	Split	Snap	Impact	Spiral	Cut	Chop	Split	Snap	Impact	Split	Snap	Impact	Spiral	Count	Percent	
Small mammal	425	98		3			234	31		6	1		1	799	22.5	
Medium mammal	600	43	1	3			28	3		2				680	19.2	
Large mammal	909	154	31	6	1	1	82	8	5	9				1206	33.8	
Indeter. mammal	117	16					40	2						175	4.9	
Rabbit	55	165	1	3			24	51	1					300	8.4	
Rodent	5	53				1	3	10						72	2.0	
Bird	133	43					2	2						180	5.1	
Turkey	49	75		1				1						126	3.6	
Toad/frog		2												2	.0	
Canid	7	10	1					1						19	.5	
Canivore	1	1												2	.0	
Turtle		1												1	.0	
Total	2301	571	34	16	1	2	413	79	6	17	1	1	1	3562	100.0	

Table 4.134. Burned Bone Types by Period

Bone Type	Archaic		Pinelawn/ Georgetown		San Francisco		Three Circle		Reserve		Tularosa		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Small mammal	24	11.1	1	2.2	10	15.9	227	24.6	7	25.9	178	18.8	447	20.1
Medium mammal	64	29.6	2	4.3			242	26.2	4	14.8	255	27.0	567	25.5
Large mammal	101	46.8	41	89.01	44	69.8	321	34.5	11	40.8	244	25.9	762	34.4
Indeterminate mammal	22	10.2	2	4.3	3	4.8	118	12.7	4	14.8	156	16.5	305	13.7
Rabbit					1	1.5	7	.7			62	6.6	70	3.1
Rodent	1	.5					10	1.2			18	2.0	29	1.3
Bird	4	1.8			5	8.0	1	.1			18	2.0	28	1.3
Turkey									1	3.7	5	.5	6	.3
Canid											5	.5	5	.2
Carnivore							2	.1			1	.1	3	.1
Frog/boad											1	.1	1	.0
Total	216	100.0	46	100.0	63	100.0	928	100.0	27	100.0	943	100.0	2223	100.0

Table 4.135. Animal Bone Retrieved from Thermal Features

	Archaic		Three Circle		Reserve		Tularosa		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Small mammal	15	40.5	1	3.8	2	50.0	106	21.2	124	21.9
Medium mammal	2	5.4	1	3.8	2	50.0	116	23.2	121	21.4
Large mammal	2	5.4	9	34.7			77	15.4	88	15.6
Indeterminate mammal	17	46.0	1	3.8			123	24.6	141	24.9
Cottontail			2	7.7			31	6.2	33	5.8
Blackjack							11	2.2	11	2.0
Canid							5	1.0	5	.9
Bird			9	34.7			7	1.4	16	2.8
Turkey							2	.4	2	.3
Hawk							1	.2	1	.2
Rodent			1	3.8					1	.2
Woodrat							2	.4	2	.3
Kangaroo rat							7	1.4	7	1.2
Prairie dog							2	.4	2	.3
Pocket gopher			2	7.7			2	.4	4	.7
Vole							2	.4	3	.5
Squirrel							1	.2	1	.2
Fox							3	.6	3	.5
Frog/toad							2	.4	2	.3
Total	37	100.0	26	100.0	4	100.0	500	100.0	567	100.0

APPENDIX 4.1. CLAYS COLLECTED DURING THE LUNA PROJECT

CS 1 is from the upper soil horizon exposed on the roadcut near the site on Oaks Springs. This clay lies directly below loose gravel deposits near the surface.

Form. Chunky and easily ground, fairly plastic

Natural Color. Gray-Brown

Refired Color. Yellow-Red, 5YR 6/6

Inclusions. Fine volcanic clastic sand

CS 2 is exposed about 30 cm along Oak Springs drainage. Above the sample are grayish, poorly sorted, redeposited clays and loam layers. Slightly lower are brownish clays. These sediments are mixed with redeposited igneous cobbles, which are rounded to angular in shape.

Form. Chunky, easily ground, highly plastic

Natural Color. Gray-Brown, 5YR 4/6

Refired Color. Yellow-Red, 5YR 6/6

Inclusions. Small angular dull and lithic particles

CS 3 was collected from the upper layers of a stream bank cut. The high organic content of this sample resulted in a dark color.

Form. Chunky, easily ground, not plastic

Natural Color. Dark Brown, 5YR 4/2

Refired Color. Yellow-Red, 5YR 6/4

Inclusions. Small sand grains, occasional angular fragments

CS 4 is a very high-quality clay lens associated with alluvial fans just north of Pueblo Creek Ranch. Samples were collected about 10 cm below the surface. These alluvial fans are along a fairly flat area and are thick with bands of high-quality clay layers. A large amount of clay from this source was collected over time and used in ceramic pottery replication experiments.

Form. Hard and chunky, excellent plasticity

Natural Color. Red-Brown, 5YR 6/4

Refired Color. Yellow-Red, 5YR 6/6

Inclusions. Very fine lustrous and dull angular fragments, occasional fine sand grains

CS 5 is a leached clay near the surface of an alluvial fan fairly close to sample CS 4.

Form. Chunky, fairly easy to grind, very good plasticity

Natural Color. Red-Brown, 5YR 6/3

Refired Color. Yellow-Red, 5YR 6/6

Inclusions. Fine lustrous and dull angular fragments with some sand

CS 6 is from an exposure along a creek just north of Reserve.

Form. Soft and easy to ground, poor plasticity

Natural Color. Gray-Brown, 7.5YR 7/4

Refired Color. Yellow-Red, 5YR 6/6

Inclusions. None

CS 7 is from thick soil layers exposed by a ditch just north of the Reserve dump. It is represented by interspersed layers of conglomerate or gravel-bearing sand, sand, loam, and clay. High-quality clays occur in thin layers throughout a thick exposure of over 6 m.

Form. Breaks in small angular chunks, fairly easy to grind, good plasticity

Natural Color. Gray-Brown, 5YR 6/2

Refired Color. Yellow-Red 5YR 6/6

Inclusions. Fine sand some angular fragments

CS 8 is a soil clay slightly below the surface along a roadcut near the Luna Y Junction to Reserve and Luna.

Form. Breaks in loose chunks, fairly easy to grind, good plasticity.

Natural Color. Gray-Brown, 2.5YR 6/4

Refired Color. Yellow-Red, 5YR 7/6

Inclusions. Fine sand and angular fragments

CS 9 is a weathered tuff along a road exposure just south of Pueblo Creek ranch.

Form. Soft, chunky, not plastic enough to be use as a slip clay, but the light color would have made a good white slip clay; applies well as slip. Most of it flaked off after firing, although better prepared samples may stay on.

Natural Color. White

Refired Color. 10YR 9/4, Buff

Inclusions. Natural occurring mica flakes show through.

CS 10 is exposed by a roadcut north of Buckhorn. It consists of layers of red and greenish white shale. This sample came from the lower levels of this exposure.

Form. Soft, chunky, slightly plastic clay, potential slip

Natural Color. White

Refired Color. NA

Inclusions. NA

CS 11 is from the same roadcut as CS 10 but from lower levels.

Form. Soft, chunky, slightly plastic clay, potential slip

Natural Color. Greenish white

Refired Color. Red, 25YR 7/6

Inclusions. None

CS 12 is a chunky shale and sandstone from the same exposures north of Buckhorn.

Form. Soft, chunky

Natural Color. Greenish white

Refired Color. Red, 25YR 7/6

Inclusions. None

CS 13 is a colluvial clay forming along a pond north of Glenwood.

Form. Soft, chunky, not very plastic

Natural Color. Gray-Brown

Refired Color. Yellow-Red, 5YR 7/6

Inclusions. Sand and crushed rock

CS 14 is redeposited river clay near the Griffin Ranch entrance.

Form. Very chunky, extremely difficult to grind, not very good for pottery making

Natural Color. Gray-Brown, 5YR 6/3

Refired Color. Yellow-Red, 5YR 5/6

Inclusions. Volcanic clastic sand

CS 15 and **CS 16** were collected during two visits and underlie archaeological deposits at the Hough site. These sample was taken about 1.5 m below the surface and exhibited the same characteristics.

Form. Hard, chunky, very plastic

Natural Color. Gray-Brown

Refired Color. Yellow-Red, 5YR 7/6

Inclusions. Crushed rock and sand

CS 17 is a band of pink shale near Quemada. We attempted to process it, but it turned out not to be a possible ceramic source.

CS 18 is a band of pink shale on the road between Reserve and Quemada. It could not be processed into a clay. Inspection of similar sources indicated that clay could have been made from sources in this exposure.

CS 19 is a band of gray shale clay near Lyman, Arizona. These are commonly exposed near the surface along a road.

Form. Soft, very plastic

Natural Color. Gray

Refired Color. Pink, 75YR 8/4

Inclusions. None

CS 20 is a gray weathered deposit north of Pueblo Creek.

Form. Chunky and weathered powder. Mixed with numerous white (calcium flakes deposits, fairly poor working properties).

Natural Color. Gray

Refired Color. Yellow-Red, 5YR 7/6

Inclusions. Sand

CS 21 is a weathered tuff north of Pueblo Creek.

Form. Powdery and weathered, could have been used as a slip clay only.

Natural Color. Gray-Tan

Refired Color. Buff, 10YR 9/2

Inclusions. Mica flakes

CS 22 is a weathered tuff north of Pueblo Creek.

Form. Powdery, weathered

Natural Color. Gray-Tan

Refired Color. Buff, 10YR 9/2

Inclusions. None (mica flakes)

CS 23 was omitted from the study.

CS 24 is from tuff in a road exposure north of Pueblo Creek.

Form. Chunky tuff

Natural Color. White speckled

Refired Color. Not able to process

Inclusions. None

CS 25 is from a road exposure of tuff north of Pueblo Creek.

Form. Chunky tuff

Natural Color. White speckled

Refired Color. Buff, 10YR 9/2

Inclusions. Mica

CS 26 is from an upper soil horizon exposed in a ditch in a soil profile near Luna.

Form. Chunky, weathered, fairly plastic

Natural Color. Gray-Brown

Refired Color. Red, 2.5YR 7/6

Inclusions. Volcanic clastic sand and small angular white fragments

CS 27 is from an outcrop in Apache Creek National Forest east of Luna.

Form. Chunky clay, plastic

Natural Color. Reddish purple, white speckles, extremely high iron content, very plastic

Refired Color. Red, 10R 5/6

Inclusions. White tuff

CS 27 is from a localized road exposure of high-iron clay in Apache Creek National Forest east of Luna.

Form. Thin localized layer of high-iron clay, very plastic

Natural Color. Reddish purple, white speckles, extremely high in iron content, plastic

Refired Color. Red, 10R 5/6

Inclusions. White tuff

CS 29 is a tuff layer in Apache Creek National Forest east of Luna.

Form. Chunky, slip clay only

Natural Color. Speckled pink

Refired Color. Could not be processed into slip

Inclusions. NA

CS 30 includes samples collected from a major shale exposure south of Fence Lake. This and similar

exposures represent possible sources of Anasazi pottery produced in the southern Colorado Plateau.

Form. Chunky shale. Exposures very deep and extremely common. Shale weathered to various degrees. When processed into a clay, it is very plastic.

Natural Color. Dark gray to brown.

Refired Color. Pink to Red, 7.5YR 8/4, 5YR 7/6

Inclusions. None

CS 32 is from a sterile clay deposit at LA 39972.

Form. Hard and chunky

Natural Color. Red-Brown

Refired Color. 2.5YR 7/6

Inclusions. Tuff

CS 33 is exposed along the side of a road near LA 3279 (the Hough site).

Form. Hard and chunky

CS 34 is present in lenses in the noncultural layers at LA 3279.

CS 35 is from 75 cm below ground level at LA 3279.

APPENDIX 4.2. ARCHAEOLOGICAL CLAY SAMPLES

LA 45507, FS 1667

Form. Soft, chunky, possible slip clay

Natural Color. White

Inclusions. None

LA 45507, FS 2257

Form. Small, soft, chunky, fairly plastic

Natural Color. Greenish brown

Refired Color. 5YR 7/6

Inclusions. Small angular igneous and sand fragments

LA 70185, FS 143

Form. Fairly hard but easily processed, good plasticity

Natural Color. Dark gray brown

Refired Color. 5YR 7/6

Inclusions. Mostly sand derived from volcanic clastic sandstone

LA 70189, FS 12

Form. Dried to a fairly hard form but easily processed. Excellent plasticity.

Natural Color. Gray-Brown

Refired Color. 5YR 6/6, Yellow-Red

Inclusions. Angular igneous and sand fragments

LA 70189, FS 13

Form. Dried to a fairly hard form but easily processed. Excellent plasticity.

Natural Color. Gray-Brown

Refired Color. 5YR 6/6

Inclusions. Angular igneous and sand fragments

LA 70189, FS 14

Form. Dried to a fairly hard form but easily processed. Excellent plasticity.

Natural Color. 5YR 6/6

Refired Color. Gray-Brown

Inclusions. Angular igneous and sand fragments

LA 78439, FS 5

Form. Dried to fairly hard form but easily processed, extremely plastic.

Natural Color. Gray-Brown

Refired Color. 2.5YR 5/4

Inclusions. Large white igneous fragments

