

AN ABSTRACT OF THE THESIS OF

Sally A. Bird-Gauvin for the degree of Master of Arts in Interdisciplinary Studies in
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Abstract approved: _____

Barbara J. Roth

The purpose of this research was to see if there were technological differences in ground stone manufacturing and use from a single site that had been occupied for over 600 years, A.D. 550 – A. D. 1150, and had multiple occupations that evolved over time (Late Pithouse Phases, Georgetown, San Francisco, and Three Circle through the Classic Mimbres Period). An assessment of the ground stone assemblage was made based on a technological approach to analyzing ground stone. A general artifact code system listing attributes common in ground stone artifacts was created to use as a guide during the analysis phase. The information gathered from the examination of the ground stone assemblage was placed into a database for analysis.

The site had been heavily vandalized prior to excavation and the data showed that 30.4 percent of the recovered ground stone artifacts came from this disturbed fill. Due to the disturbed context, there was not enough data recovered from undisturbed fill in the Late Pithouse units to make any substantial statements about technological change. However, an examination of the tool types within the different occupations indicates that tool types were similar from the earliest occupations, Georgetown (A.D. 550 – 650) to the latest, Classic Mimbres Pueblo (A.D. 1000 – 1150).

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**Analysis of the Mimbres Ground Stone Assemblage, Lake Roberts Vista Site
(LA 71877), Gila National Forest, Lake Roberts, New Mexico**

by

Sally Bird-Gauvin

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submitted to

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Analysis of the Mimbres Ground Stone Assemblage, Lake Roberts Vista Site (LA 71877), Gila National Forest, Lake Roberts, New Mexico

Chapter 1: Introduction

This thesis is an analysis of the ground stone artifacts recovered at the Lake Roberts Vista Site (LA 71877 site) during field school excavations conducted in 1992, 1994, and 1995. Lake Roberts Vista site is a small Classic Mimbres masonry pueblo site with a Late Pithouse component located adjacent to Lake Roberts in the Gila National Forest of southwestern New Mexico. It is located in the middle portion of Sapillo Valley near the headwaters of Sapillo Creek. The site consists of approximately 10-15 pueblo rooms that are built above and around the Late Pithouse component.

The Lake Roberts Vista site was excavated in a cooperative agreement between Western New Mexico Museum (WNMM), the Gila National Forest (GNF), and Oregon State University (OSU). The site had been vandalized prior to the 1992 excavation and was selected for study in order to gather any remaining information from the vandalized site, to explore the possibility of an earlier Pithouse period occupation, and to determine its potential as a possible interpretative site within the Gila National Forest (see Figure 1).

The site was occupied during the Late Pithouse period, A.D. 550 to A.D. 1000 through the Classic Mimbres phase, A.D. 1000 to A.D. 1150 (Bettison and Roth 1995). During this time the Lake Roberts occupants went through various stages of development from semi-sedentism to an agriculturally based sedentism. At the Lake Roberts Vista site the occupation intensity apparently increased from the Pithouse through the Classic period. The site was first occupied during the Georgetown phase (A.D. 550 – 650), with continued occupation through the late pithouse period. A Classic Mimbres pueblo component was built afterward on top of the pithouse component.

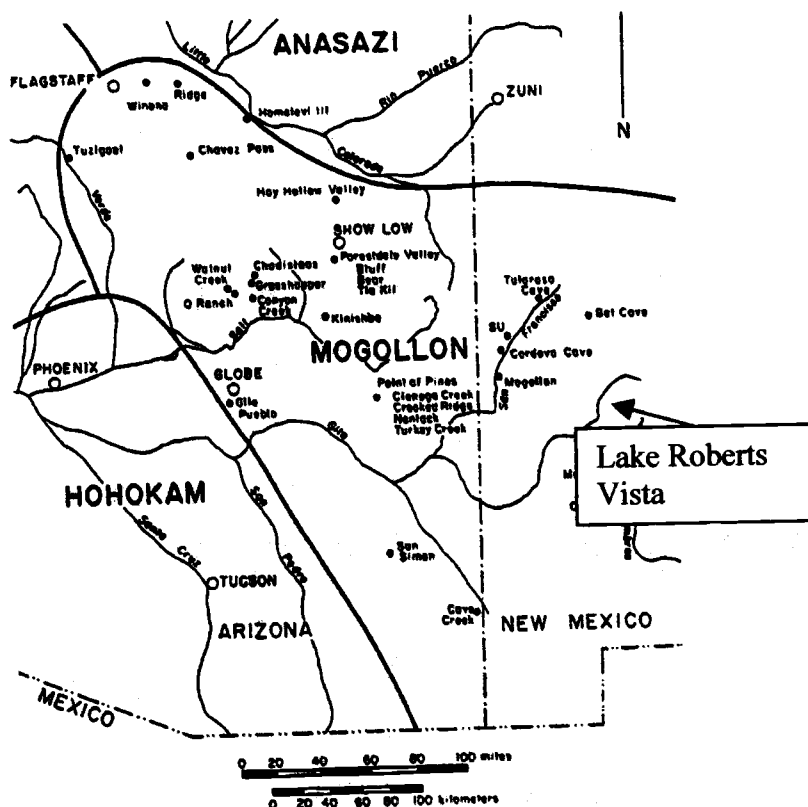


Figure 1 – Site Location map

Through data recovered from the site, Roth (1997) was able to infer that there was a slight population increase during the Late Pithouse period, and the occupants were becoming more sedentary. Pithouse 4, a San Francisco phase pithouse, was repeatedly used, as is evident from the three separate floors that were recovered. Large internal storage pits were located within the structure suggesting that the occupants were using the structure seasonally with the intent to return (Stokes and Roth 1999). It was not possible to estimate the Three Circle phase occupation size due to the presence of the Classic Mimbres pueblo on top of the pithouse component, however, an apparent large communal structure was constructed during the same time frame suggesting an increase in sedentism and growing social complexity (Stokes and Roth 1999).

Ground stone tools are thought to have been part of the daily activities of prehistoric cultures. The use of manos and metates as food preparation tools is well documented throughout the Southwest (Diehl 1996, Mauldin 1993, Schlanger 1991), as well as the manufactured ground stone axes and mauls found in numerous archaeological sites (Haury 1936, Lekson 1992). Several of these ground stone tools have been found within adobe walls as part of the structure and in roasting pits, implying that the tool was recycled by another or later cultural group or its original user once its original use was exhausted. The manufacturing of ground stone tools and the changes that they may have gone through over time can help our understanding of how the Lake Roberts Vista site groups adapted over time.

The ground stone recovered at Lake Roberts Vista was analyzed using a technological approach (Adams 1996), which combines a typological description of the artifact and an analysis of how the artifact was used, reused, redesigned or recycled. The purpose of the technological approach is to move beyond a form-function classification of ground stone artifacts by looking at each stone tool's attributes macroscopically and microscopically. Ultimately, using this approach, along with ethnographic analogy, and the current literature on experimental archaeology to analyze the ground stone assemblage, it is possible to trace the "life history" of the artifact(s) (Adams 1994, 1995, 1997; Schiffer 1987, 1996; Schlanger 1991), and more efficiently look at how grinding technologies developed.

This thesis will aid ground stone research by understanding how ground stone tools were reused, redesigned or recycled within the confines of a Late Pithouse Village and a small Classic Mimbres Pueblo in the Sapillo Valley of Southwestern New Mexico. It also looks at how ground stone use changed over time in response to changes in

sedentism and agricultural dependence. As well, this thesis will attempt to answer the following questions:

- What tool types are found within the Pithouse and pueblo occupations?
- What kinds of food processing tools are present in each occupation phase?
- What other ground stone implements were recovered from the site and what was their possible function?
- Are there any technological differences between the Late Pithouse and Classic Mimbres occupations?

The purpose of this study is not only to address the function these tools may have had for the Mimbres people, but also to aid archaeologists as a tool in future studies of ground stone within the Sapillo Valley of New Mexico.

Chapter 2 will discuss briefly the background of the site and the Mimbres people. Chapter 3 describes the methods used in the analysis of the Lake Roberts Vista collection. The artifact distribution and a detailed description of the artifact types are discussed in Chapter 4. A synthesis of archaeological context and interpretations of prehistoric behavior at Lake Roberts Vista will be presented in Chapter 5.

All of the measurements, observations, and interpretations for each artifact have been recorded in a computerized database that will be made available to the Western New Mexico Museum, where the collection is archived. Within appendices (A and B) are the attributes used to analyze the Lake Roberts Vista ground stone collection and the general artifact form that lists each artifact's attributes broken down by the year it was collected and the unit it was recovered in.

Chapter 2: Overview of Mimbres Prehistory

This chapter provides a general overview of the Mimbres sequence from A.D. 200 to 1150, beginning with the Early Pithouse Period and continuing through the Classic Mimbres Phase.

Early Pithouse Period

Beginning at approximately in A.D. 200 and continuing through to A.D. 500 (the Cumbres Phase), the Mimbres people began living in small pithouse villages. Information regarding this phase is scarce, however, it is known that the occupants lived in thatched structures that were round or bean-shaped subterranean pithouses with lateral entryways. Villages were set on top of high knolls, mesas, ridges, or other isolated locations above major river valleys. Villages were generally set between two ecozones, the uplands and the valley floor, which permitted an easy access to food supplies yielded from both ecozones (Lekson 1992).

It is hypothesized that groups maintained a seasonal mobility exploiting the surrounding ecozones (Binford 1980; Lekson 1992). Subsistence was primarily on wild game such as elk, antelope, mule deer, rabbit, as well as plant foods (agave, prickly pear, yucca, wild walnut, mesquite, and pinon nuts). There has been some evidence that maize may have been a supplement to the diet due to the presence of maize cobs at some Early Pithouse sites, however, there is a lack of evidence for agricultural intensification (e.g., storage pits, agricultural features, etc.) (Bettison and Roth 1995).

Late Pithouse Period

The Late Pithouse Period begins at approximately A.D. 550 and continues to A.D. 1000. This period is divided into three phases (Georgetown, San Francisco, and Three Circle) based on Haury's (1936) work at the Harris Site and Mogollon Village. The phase distinctions were established due to the differences in pithouse architecture, ceramics, and artifact assemblages found at the sites.

During this period the Mimbres continued to live in subterranean pithouse structures maintaining limited seasonal mobility exploiting their surrounding landscape. Sites were moved from the top of knolls to the first bench above the flood plain and into side drainages (Anyon and LeBlanc 1984). There were some significant changes to the structures and diet, suggesting cultural development over time.

During the Georgetown phase, (A.D. 550 – 650), the Mimbres appear to have lived similarly to that of the Early Pithouse phase. They continued to live in small subterranean structures that changed slightly from round to D-shaped. Ceremonial structures or large pithouses often had a large earthen lobe adjacent to the entryway (Anyon and LeBlanc 1980). The Mimbres created a red-slipped pottery, which was added to the brown earthenware made by early pithouse groups.

During the San Francisco phase (A.D. 650 – 750) the subterranean structures changed again to a more rectangular shape with slightly rounded sides and a lateral entrance. Site location changed to the first bench above the flood plains and in side drainages (Anyon and LeBlanc 1984). This phase was the first to introduce painted pottery, Mogollon Red-on-Brown. Communal structures were similar to those in the early phases; however, they became more formal suggesting more ceremonial use than domestic activity (Anyon and LeBlanc 1980). During this phase burials with smashed

pottery were placed under the floor of abandoned pithouses for the first time. Groups continued to hunt and gather plant foods, however, there appears to have been an increase in maize dependence.

The Three Circle Phase (A.D. 750-1000) saw increasing changes in pottery styles, burial practices, and diet (Lekson 1992). Pithouses were still rectangular, but they were larger and the interior was often lined with masonry walls. Seen for the first time are slab-lined hearths inside of the pithouses. Water control features, such as diversion dams are found during this phase, suggesting an even greater reliance on agricultural practices (Hemington 1979). Burials were placed underneath the floors of occupied pithouses and the associated pottery bowls were punctured at the bottom, "killed", a small hole (approximately 2 centimeters in diameter) is punched out of the bottom of the vessel (Lekson 2002), versus being smashed as in the San Francisco Phase.

Three Circle phase pottery became more elaborate, with painted geometric and curvilinear designs. Three Circle Red-on-White, A.D. 730-770, was the first time that bowls were slipped with a white kaolin clay slip. A.D. 750 saw the first of the Mimbres Black-on-White series, Boldface Black-on-White (Style I). This is distinguished by bold geometric designs, generally containing curvilinear wavy lines that go all the way to the rim. By A.D. 880 Transitional Black-on-White (Style II) pottery was being produced (Fewkes 1993). Increased evidence of trade is also found. Turquoise and chrysocolla from the Burro Mountains and glycymeris shell from the Gulf of California are some of the materials that have been recovered from these sites (Anyon and LeBlanc 1980).

The communal structures were generally large and rectangular in shape, with cobble masonry interior walls. Structure size varied and appears to have been

dependent on the size of the community (Anyon and LeBlanc 1980). The interior contained benches and foot drums, along with sipapus and exotic items.

Classic Mimbres Period

The Classic Mimbres period began in about A.D. 1000 and ended between A.D. 1130 and A.D. 1150 (Lekson 1992, 2002). During this period, the Mimbres began to shift from occupying subterranean structures to above ground structures. There is a limited amount of data available for the transitional phase between the pithouse to the pueblo phases. It appears that many larger Three Circle phase pithouses are located under most of the Classic Mimbres single-story masonry pueblos (Anyon and LeBlanc 1984). The pueblos were not architecturally planned communities, but grew by additions (Shafer and Taylor 1986). Rooms were added on to core sets of rooms when necessary. Pueblos were constructed with adobe and local river cobbles. Surface rooms occur in groups called roomblocks. Communal structures appear to go out in favor of open-air plazas, where community functions and daily activities took place.

Roofs were used for daily activities, as in modern Zuni and Taos communities. These activities included domestic behaviors such as grinding maize and tanning hides. Entrance to the living area was through the roof, which was covered by a thin tabular slab called a door slab. The pueblos generally consisted of two rooms a large living area and a smaller storage room, which were connected by a small door. Floors were slab-paved and covered with a thick adobe.

Agriculture intensified during the Classic Mimbres period. Canal irrigation along the major drainages appeared, along with a larger number of water control features (Herrington 1979; Lekson 2002). Evidence within sites (maize, beans, and squash) suggests that the Mimbres were relying heavily on agricultural products for their daily

diet. Smaller game such as rabbits and mule deer were also seen more readily at Classic Mimbres sites, and this may be a result of more time spent in a single location due to farming activities.

During this time the Classic Mimbres produced Black-on-White pottery similar to the earlier Style II. Burials were subfloor inhumations, of occupied or unoccupied room floors in a flexed position facing the wall next to where they had been placed (Anyon and LeBlanc 1984; Shafer and Taylor 1986). The practice of placing a single pottery, inverted "killed" bowl over the head of the deceased was still being practiced (Lekson 2002).

Trading increased from the Gulf of California, with glycymeris shell, spondylous, conus, and other shell being traded in. From the Valley of Mexico scarlet and military macaws are seen. Olivella shell from the Gulf of Mexico is seen, as is pottery from the Anasazi and other branches of the Mogollon.

Between A.D. 1130 and A.D. 1150 Classic Mimbres Black-on-White pottery was no longer being made and cobble masonry pueblos were no longer built. Several theories have been presented as to account for the end of the Classic Mimbres society. One theory suggests that they exhausted their resources due to maximizing their population capacity within the region (Minnis 1985). A second theory suggests that they became a part of the Casa Grandes culture and changed their pottery style, house form, and location (Lekson 1992).

The Lake Roberts Vista Site

The Lake Roberts Vista site consists of approximately 10-15 pueblo rooms that are built above and around a Late Pithouse component. The site was occupied from the

Georgetown Phase (A.D. 550) to approximately the end of the Classic Mimbres Period (A.D. 1150). It is located in the southwest corner of New Mexico within the Sapillo Valley above Sapillo Creek, a tributary to the Mimbres River Valley. The site is located on a large knoll at an elevation of 6,180 feet above sea level. The on-site and surrounding vegetation is open pinon-juniper woodland with a variety of short grasses.

The site was excavated over three field seasons (1992, 1994, and 1995) by Cynthia Bettison of the Western New Mexico University Museum and Barbara Roth of Oregon State University. The site had been vandalized over the years from surface collectors and pothunters; evidence was noted due to a number of looted depressions throughout the site.

The field investigations revealed that the site had been heavily damaged through pothunting activities. The three field season's surface remains and excavations revealed that the site consisted of a Classic Mimbres Phase cobble masonry pueblo component and a Late Pithouse component (Roth 1997) (Figure 2). Within the pithouse component Roth (1997) was able to determine that the site spanned the Late Pithouse phases. Houses dating to the Georgetown, San Francisco, and Three Circle phase were excavated. The data suggests that occupation changes occurred over time. These changes are possibly linked to increased sedentism, agricultural intensification, and to social changes (Roth 1997).

Flotation samples from the site indicated that one recorded Georgetown phase pithouse yielded maize and the common bean (Diehl 1997). This suggests that the Georgetown phase occupants began farming when the site was initially occupied. Roth (1997) postulates that groups moved into the area to hunt, gather pinon, and farm the bottomlands near Sapillo Creek.

Two houses from the site (Pithouse 2 and 4) date to the San Francisco phase (A.D. 650-750). Pithouse 2 was found beneath a large pueblo roomblock that was heavily vandalized. Two units revealed small portions of the house, allowing for little information to be gathered from it. A large metate and ceramics were recovered within the floor fill. Pithouse 4 had three distinct floors that suggest three separate occupations or reuse by the same household returning to the site regularly (Roth 1997). In the floatation samples collected from all three floors maize was present. Samples from the lowest floor also contained beans, squash, pinyon, and purslane, suggesting a mixed subsistence strategy of wild and cultivated foods (Roth 1997; Diehl 1997).

Five pithouse depressions were surface collected in close proximity to Pithouse 4. Based on the ceramics that were collected they may be contemporaneous with the San Francisco phase.

At Lake Roberts Vista three pithouses were recovered that appear to date to the Three Circle phase (A.D. 750-1000). Roth (1997) suggests that although the sample size is small, several changes in adaptation were occurring during this phase. Pithouse 3 was remodeled into a subterranean Classic Mimbres pueblo Room 5; however, it is dated to the Three Circle phase based on its shape and ceramics recovered from the blocked entryway. Pithouse 5 appears to have the most formal architecture; but it was swept clean when abandoned and later filled with Classic Mimbres trash. A large communal structure dating to as early as the Three Circle phase, was excavated. After abandonment the communal structure was filled with approximately one meter of Classic Mimbres period trash (Roth 1997). Vandalism also occurred within the communal structure destroying the floor at the south end. Although radiocarbon dates and ceramics recovered from a floor pit indicate that this structure dates to the Three Circle

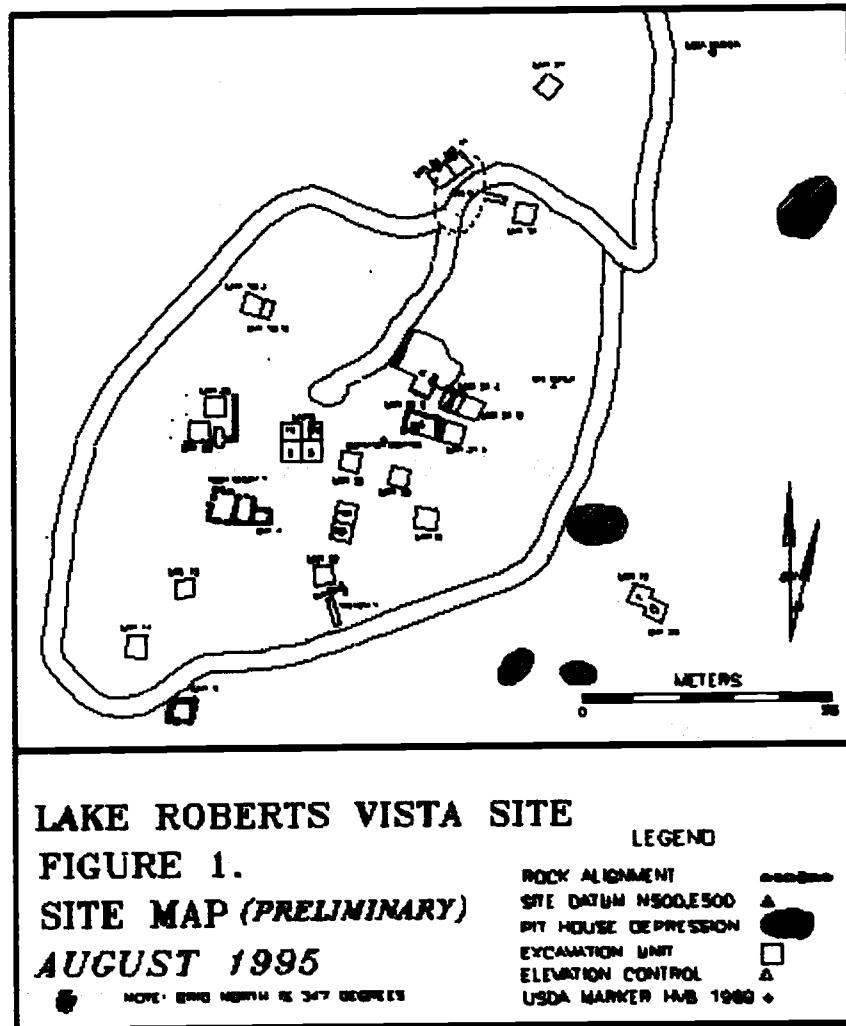


Figure 2. Lake Roberts Vista Preliminary Site Map - 1995

phase, Classic period ceramics were recovered within the floor fill of the structure, and it may have been used into the Classic period.

In addition to the modified Pithouse 3, one intact Classic Mimbres room (Room 3), one partially looted Classic Mimbres room (Room 1), and two heavily looted Classic Mimbres rooms (Rooms 2 and 4) were excavated. The rooms were cobbled-walled and had plastered floors. Room 3 was small and may represent a storage room, while Room 1 was most likely a habitation room. The remodeled Pithouse 3 (Room 5) had a ventilator, deflector, and slab-lined hearth most likely representing a ceremonial

structure that was used after the large communal structure was abandoned. Portions of a plaza between Roomblocks 1 and 2 were also excavated.

In conclusion, Roth and Bettison established, through their research, that the Lake Roberts Vista site was occupied for over a 500-year time frame beginning with the Georgetown phase and ending with the Classic Mimbres Pueblo period. It appears that the site was initially occupied for seasonal farming and large game hunting and groups became more sedentary over time (Roth 1997). Social complexity appears to have increased over time in correlation with increased agricultural intensification.

Chapter 3: Methods

During the three field seasons at Lake Roberts Vista, 468 possible ground stone artifacts were recovered. Each potential artifact was analyzed by using a technological approach, developed by Jenny Adams (Adams, 1988, 1989, 1993a, 1993b, 1995, 1996). Adams developed a manual that lays out a systematic approach to identifying and analyzing ground stone and its attributes through macroscopic and microscopic observations. These include experimentation, an analysis of the ethnographic record, and a review of the archaeological record.

Technological Overview

The ground stone attributes reviewed by the technological approach include the tool's manufacturing, design, and use wear patterns. To identify these specific functions, an understanding of the motor habits that created the attributes needs to be obtained. Motor habits are the movements or strokes required to operate specific tools (Adams 1996). Specifically, impact fractures, wear facets, and abrasive scratches on the tool surface(s) provide information on the tool use.

Macroscopic Observations

Macroscopic observations help determine motor habits of, possibly, both the manufacturer and the user of the tool (Adams 1996). These habits include strategically shaping stone through pecking and grinding motions to create usable tools and distinct use wear patterns (abrasive scratches), which show a direction of use, such as a reciprocal back and forth motion or a crushing motion. For example with a flat-to-

concave mano, if finger grips were pecked into the side of the tool, the sides would be uniformly flat on one or both sides. The used surface area also has a unique shape to it. It is generally slightly convex in the middle and bows up at the ends allowing for the tool to work inside of a flat-to-concaved shaped metate. The concaving and convexing is usually an indication of use over time, not the manufacturing process. If the mano had been heavily used the tool would show facets along the outer edges of the used surface, suggesting the use was extensive and that the outer edges were not resharpened. What makes understanding motor habits important is that it helps to identify how the stone was used.

Microscopic Observations

Microscopic observations help to explore the stone's surface topography to accurately determine the type of observable use-wear damage. Microscopically an unaltered surface will be identifiable due to a lack of use-wear damage and exhibits uniformity throughout the stone. Use-wear is the evidence that allows us to understand how the tool was altered through use (Adams 1996). Adams (1996) suggests that the four critical mechanisms helpful in identifying and understanding the formations of specific damage patterns are: adhesive wear, abrasive wear, surface fatigue, and tribochemical wear (combination of mechanical and chemical interaction). The importance of using microscopic observations is that we cannot see macroscopically the structural integrity of the stone. Each stone has granular elevations where the topography shows a high and low relief of the granular structure. These elevations are modified by manufacturing and use. Although there are patterns that can be seen macroscopically, the actual granular manipulations through adhesive wear, abrasive

wear, surface fatigue, and tribochemical wear can only be seen through microscopic observations.

In stone that has been altered by humans, the individual grain structure changes shape. "Lithic material has a natural granularity that was exploited by prehistoric tool makers" (Adams 1997:2). These granules are what give the stone texture: coarse, medium-course, fine-course, and none of those tools that are smooth enough to be categorized as having no texture. The coarseness of the lithic can be determined through touch as well as macroscopic observation. The texture of a specific stone may have dictated what kind of tool could be produced from the stone. Through pecking, the toolmaker creates craters on the surface of the tool, which are categorized as high and low relief elevations that have crushed the original matrix of the stone (Adams 1996). A stone on stone reciprocal motion, grinding, shears off the high relief, which can be seen both macroscopically and microscopically, dependent on how much use the tool has had. If the stone is worked on a pliable surface, such as hide, evidence of rounding can be seen microscopically within the high and low relief, which leaves a sheen on the stone may be observed macroscopically.

Maintenance of the tool is also important to note. When a tool, such as an axe, that was designed to cut through hard substances, becomes dull; the user must sharpen the tool by grinding on both sides of the bit, or chopping edge, of the axe. This manipulates the granularity of the tool again, which may indicate that the natural granularity of the lithic may not be as important to the analysis as is the altered surface texture (Adams n.d.). Manipulating the granularity of a tool was important to allow the tool to continue its original function. For example with the axe described above, an enormous amount of time and effort is put into the initial creation. One would need to

select the material, shape the stone into a basic form, possibly through flaking off large unwanted pieces and then there is the task of pecking in the grooves for hafting the tool onto a wooden haft and grinding the bit into a sharp edge for cutting as we do today on a wet-stone for our modern metal axes. Without maintenance the axe would become dull and chipped rendering the tool useless. The manufacturer would then have to start the process over again by selecting another piece of stone of the right granularity, flake it, peck it, and grind it into shape. Countless hours would be wasted on the creation of a new tool where many hours would be saved by simply maintaining the tool that was already created to perform the desired function.

Experimental Archaeology

Experimental archaeology is a means for researchers to use replicas of prehistoric tools to gain a better understanding of the motor habits of the manufacturer and the user of the tool. Within this study, documented experiments by Adams (1989a, 1989b), Pritchard-Parker and Reid (1993), Wright (1993) and O'Brien (1994) as well as experiments conducted by students in a ground stone technology course instructed by Dr. Barbara Roth and Sally Bird at the Oregon State University (OSU) Anthropology Department in 1998 were used during the analysis phase. The stones used by the students were sedimentary rocks from the Willamette Valley of Oregon. These rocks were markedly different from the majority of those recovered at the Lake Roberts Vista site, which consisted primarily of igneous rock. Adams', Pritchard-Parker and Reid's, Wright's and O'Brien's experiments were used on stone recovered in the Southwestern region of the United States, which closely resembling the material type recovered at Lake Roberts Vista. Although the materials used were different from the Oregon stone,

the main focus of the OSU students was to review the motor habits during the manufacturing of the tools. The OSU experiments suggested similar facets of wear found on tools from Lake Roberts Vista. As well, Adams and O'Brien's experiments looked at motor habits from use of the tools.

Ethnography

The ethnographic record provides a compelling link between the laboratory analysis and the archaeological investigation. The archaeologist uses material culture to understand the organization and behavior of the culture being researched (Schiffer 1983), their social interaction (Hodder 1982), and the direct and indirect influences on social change (Schiffer 1983). We can obtain this information from artifacts because of their interaction with human activities and human lifeways. Artifacts give us insight into past lifestyles, therefore, by approaching ground stone analysis as a storyteller and asking specific questions, an inanimate object can tell a story. The questions that can be answered include, but are not limited to: what was its function; did it have a single use or was it a multi-use tool; was it strategically designed, redesigned for a different function, or was it recycled for use by another cultural group? (Adams 1985; 1996).

Historically, the Zuni and the Hopi used their pueblo rooftops for food drying and cooking activities. By the early 1900s the Hopi had a room in each home specifically designated for milling purposes. Generally three to four bins were set up at an angle where a long flat mano was used against a flat metate. This allowed for maximum comfort and efficiency (Woodbury 1979; Kennard 1979). As well, Kennard (1979) mentions the use of stone within the adobe walls. He noted that the Hopi women used discarded grinding tools within the making and up-keep of the adobe structures.

Once these questions have been addressed, the context needs to be examined as well as other materials recovered (Adams n.d.). This brings about more questions concerning seasonal mobility, longevity of the tool and site use, communal or single use, and so forth. In short, these artifacts tell a story, a portion of the life history of the people who used them and subsequently discarded them. When a human who consciously used the stone as a tool first picks it up its life history begins (Adams 1985). The life cycle of the tool ends when it is abandoned. The tool may be picked up by later cultural group(s) and reused for another purpose, thus, telling another story by giving us further clues about the community that used the tool.

A life history approach (Adams 1985; Schiffer 1996) directed towards ground stone along with a technological approach equips the archaeologist to look at a site holistically while examining the artifacts through both a macroscopic and microscopic analysis. The combination of these two approaches allows the researcher to go beyond a typological description such as the form and function of the tool (Adams 1985). In addition, these approaches can potentially give the anthropological community and the public a greater understanding of prehistory and the diversity amongst the Mimbres people by possibly reconstructing behavior through ground stone research.

Technological Development

Ground stone tool kits suggest that the development of manos and metates over time is dependent on advances in technology, which may have followed the intensity of agriculture. Technology seemed to change the shape and size of the tools (Adams 1993). Basin manos (one hand mano) and metates were used when social groups were more mobile. As populations increased their dependency on maize grew, therefore, the

need for larger more efficient tools developed, such as the flat-to-concave mano that was held by both hands and used on a flat metate for greater surface use (Adams 1993).

The technological development of ground stone tool kits, as described by Adams (1993), suggests that the developments of manos and metates over time are dependent on advances in technology, which may have followed the intensity of agriculture. These changes allowed for greater efficiency, such as moving from a basin mano and metate where the user could only use pressure from one hand in a circular motion to a trough metate style where the grinding surface and the mano was longer and more effective.

Diehl (1996) suggests that the dietary importance of maize consumption increased during the San Francisco (A.D. 700 – A.D. 825/850) and continued to increase until it was a well-established practice during the Classic Mimbres Pueblo period (A.D. 1000 – A.D. 1150). Diehl postulates that there may be two main reasons for the increase in maize production during the Mogollon Pithouse phase: 1) the introduction of a new maize variety; *Maiz de ocho* around A.D. 500-700 and 2) an increase in population. He reviewed 1,007 manos from 15 Mogollon Pithouse period sites, excavated in the 1930s through the 1970s, to see if there was a correlation between mano surface use sizes with the increase in population and the introduction of the *Maiz de ocho*. Diehl found that the ground stone tool size did increase and became more formal in design as the agriculture intensity increased, as suggested by Adams (1993). However, he concluded that other activities associated with increased sedentism might have also been a factor in the increase in the mano size as well as the cultural preference. These increased activities and the demand for milling grains and seed into flour may have played a part in producing a tool that was more comfortable to the users muscles and allowing for more grinding efficiency at the same time.

Diehl reviewed Hard (1990) and Mauldin's (1991) mano length studies as a base for his research. Hard and Mauldin both inferred that the length of the manos correlated with the dependence on agriculture. Both Hard and Mauldin reviewed the mean length of the manos not the surface use size, as did Diehl. Mauldin's research was based on a study conducted in Central America, where Hard's study was looking at mano lengths associated with the pithouse to pueblo occupation transition. Hard suggests that his mano length results support the hypothesis that there was an increase in agriculture production between the two occupations periods. This may be due to the increase in population growth between the two occupation periods. It is important to note that Hard's research was conducted in a number of museums across the country looking at manos from the Southwest, Great Basin, California, and Mexico. Each of these collections had been excavated prior to the 1950s and Hard notes that he did not use the museum notes for the artifacts because they were incomplete. Therefore, his study of mean length in correlation to an increase in agriculture lacks contextual information about each of the artifacts reviewed.

Morris (1990) reviewed two sites, Ventana Cave (1950) and Bat Cave (1965). He reviewed one-hand manos wear patterns from the two sites. Morris notes that Haury (1950) suggests that the grinding stroke began with a left side pressure applied to the forward edge of the mano, the end stroke would then trail back towards the user who would apply equal pressure to the right side of the tool resulting in asymmetrical use-wear patter. However, what if the user was left handed, would there be different use-wear patterns? The position of the user was also not taken into consideration. Would there be a difference in use-wear patterns if the grinder were sitting, kneeling, or standing? For example, by the turn of the last century the Hopi used

milling bins, where the metates were placed at an angle, which allowed the user to lean over the metate and apply the maximum amount of force on the downward stroke. Unless the mano was turned over periodically the mano use-wear would not be symmetrical. The upper portion of the tool would become thinner much quicker than the rest of the tool based on the pressure given in the downward stroke.

Morris postulates that the reason for changes in ground stone technology was based on the greater dependency on agriculture, especially maize suggesting that grinding tools are indicators of subsistence strategies in the prehistoric Southwest. However, Adams (1999) argues that tool morphology is related more closely to differing processing strategies rather than food procurement, suggesting that different tool designs were developed to accommodate different functions, such as the flat-to-concave mano and metate design, which was a more efficient tool for processing oily seeds than its basin counter part. Adams (1999) also suggests that with the greater need for grinding maize changes occurred in the tool design to allow for greater comfort, such as handgrips being pecked into the mano sides where its user could grip the tool more efficiently.

Laboratory Methods

The 468 possible ground stone artifacts recovered from the Lake Roberts Vista site were analyzed both macroscopically and microscopically under an Edmond Scientific Stereo Microscope that can scroll from 20-40 power. The stereomicroscope is equipped with a 12-inch vertical pole, a 90-degree angle mount, a 180-degree pivot mount, and an 18-inch horizontal arm length, which allows for the analysis of small and large ground stone artifacts. Adams' baseline experimental literature was used to

compare the use-wear patterns identified during the analysis phase of this study (Adams 1988, 1989, 1993). A macroscopic review of a tool may indicate a function, but by evaluating the tool in a combination of macroscopic analysis and microscopic use-wear analysis, artifacts can be categorized by the use-wear patterns on the tool, thus, identifying how the tool was used (Adams, 1996).

After looking at the attributes on each possible artifact, the artifacts were placed in a category for its primary use, if identifiable. Artifacts collected that showed no evidence of human manipulation were placed in the category of non-artifacts, with the exception of stones that were found in an undisturbed location such as at the bottom of a storage pit or on the floor of a room. These artifacts are listed as unidentified or offering.

Adams' Manual for a Technological Approach to Ground Stone Analysis was used as a guide to establish a format for the analysis of the Lake Roberts Vista site ground stone. Cultural groups may differ in design techniques and Adams' manual was designed for researchers in different regions of the world to adjust for those attributes common to the collections being studied. However, the manufacturing and use-wear patterns are similar. Pecking and grinding leave unique signatures on the stones and by using similar techniques suggested by Adams, a researcher can experiment on local material types and adjust their research accordingly.

There are primary and secondary use categories for each artifact (see Appendix A). The primary use categories for the ground stone artifact types are Handstone, Neatherstone, Composite Tools, Containers, Shaped Items, Abrader, and Architectural. Within each of these categories are sub-categories, such as under the category of Composite Tools the sub-categories are Hoe, Maul, Whorl, and Axe. Once the primary artifact type is established, a sub-type is noted, when applicable. The sub-

type categories are Awl, Axe/Maul, Ball, Bowl, Disk or Whorl, Figurine, Handstone/Mano, Mortar, Neatherstone/Metate/Grinding Slab/Lapstone, Palette, Personal Ornaments, Pestle, Pipe/Tube, Pottery Anvil, Plummet/Medicine Stone, Polishing Stone, Tabular or Flaked Tool, and Cooking Stone. These secondary sub-types also include sub-categories.

In order to establish the artifact type and subtype, a series of questions needs to be answered in regards to the attributes found within the stone artifact. These include the Artifact Condition, (whole, less than half, more than half, conjoined fragments not whole, reconstructed whole, reused fragments or indeterminate), Shape (donut, round, irregular, ovoid, square, rectangular, pebble/cobble and crescent), Texture, which separates vesicular basalt into small, medium, and large vesicles from other material types that are looked at by the grain size, these are fine, medium, and course grain size to very fine grains that appear to have no texture, such as a water-worn pebble used to smooth a piece of pottery (Adams 1997). The remaining attributes are Burn, Manufacturing, Use, Second Use, Number of Used Surfaces, Processing Type, and Measurements.

Adams (1999) argues that tool morphology is related more closely to differing processing strategies rather than food procurement, suggesting that different tool designs were developed to accommodate different functions. Adams (1999) also suggests that with the greater need for grinding maize occurred in the tool design to allow for greater comfort.

Under the attribute category of Burn, the artifact is examined to determine if it was burned from use, after use partial or total, before a second use, before and after use, or heat cracked. Manufacturing attribute could be one or more of the following:

pecked, ground, carved chipped, polished, or incised. It was also noted if the tool was pecked for stability, such as with a large metate, the bottom might be pecked to allow it to lay flat against the floor. Also, a mano may have finger grips on the sides of the tool, which would indicate it was pecked to hold, and an axe may have been ground and pecked for hafting.

Use indicates the type of use (single or multiple-use, reused, recycled, redesigned, and unused). A single-use artifact is employed only in the activity for which it was originally designed. A multiple-use and reused artifact was designed for one task, but another portion of the tool was employed in a second activity, such as a mano that has evidence of a battered end, which suggests that it was also used as a pestle. This second-use would not inhibit the original design use. This is considered concomitant secondary use (Adams, 1994:41) under the category of Sequence of Use. Concomitantly used tools may have been used simultaneously or in such a manner as to not destroy the original use, but to broaden the amount of use from one artifact.

Recycled artifacts are tools that were designed for one task, and then used in a separate task, possibly after the original tool was discarded. These artifacts include manos that broke and are then used as an abrader or found in the remains of a pueblo wall. Redesigned artifacts are tools that were designed for a specific task and were altered from either use or deliberately redesigned then used in a separate task making it unfeasible to utilize the tool in its original function. For example, if a mano that was worn thin on one edge making it useless to complete its original task, someone may then flake the thin edge creating a sharper edge for some other use, rather than discard it (see this collection artifact Field Number 3745, Appendix B). These tools are considered Sequential secondary use or tools used in a second task after alteration (Adams 1993,

1994, 1995). The Second-use category pertains to those tools that have more than one use. These tools have two or more surfaces that were used in separate activities, therefore, if applicable, the main function of the tool is listed under its primary tool type with its secondary tool type listed accordingly. Processing Type indicates what the tool was used for, food processing, procurement, a container, or multiple types of processing.

The combination of information gathered during the analysis phase provides a worthy representation of the artifact's life history: its use and manufacturing (Adams n.d.). What remains is the information collected when excavated, including what human activity or behavior (storage, burial, abandonment, etc.) enabled it to be in the context it was in when found. The results of the analysis of the Lake Roberts Vista assemblage are presented in the following chapter.

Chapter 4: Ground Stone Assemblage, Lake Roberts Vista Site

For this study, 468 whole and fragmentary possible ground stone artifacts from the Lake Roberts Vista site were examined. Through a technological analysis of each stone, 26 artifact fragments were conjoined with 17 tools, and 163 were placed under the category of non-artifacts, for a total of 296 whole, fragments, or conjoined artifacts. The non-artifacts are not included in this analysis.

The majority of the assemblage came from 31 excavated units (94.3%, n=279), two percent (n=6) came from three test trenches, and 7.1 percent (n=21) came from 11 surface collected units. The artifacts were sorted into 19 types: handstones, manos, polishing stones, abraders, mortars, palette, lapstones, metates, axe, maul, neatherstones, hoe, shaped stones (natural, grooved, and figurine), pipes, balls, griddles, pulping stones, cooking stones, and offering stones. Once typed, the artifacts, if applicable, were identified by a more detailed description or subtype. If the artifact had more than one use a secondary subtype was also listed.

Artifact Descriptions

Handstones

Handstone tools are hand-held tools without specific attributes that allow them to be considered manos, polishing stones, and pestles (Adams 1996). Thirty-three handstones were recovered from Lake Roberts Vista. Most of the use-wear on the handstones was indeterminate, (63.6%, n=21). Eight (24.2%) were burnt after use; 13 (39.46%) were whole, and 21 (63.6%) were fragmentary. Nine (27.3%) were recovered in Classic Mimbres fill, five (15.5%) were collected from the Three Circle component phase, five (15.5%) from the San Francisco component phase, and two (6.1%) came from the Three Circle component phase.

Manos

Manos are one of two hand-held components of the food processing equipment. The second is a pestle. Manos work concomitantly with metates. Mano and metate subtypes are identified by design variations. Manos are generally small enough to fit comfortably within the hand. There are four main subtypes of a mano: *basin*, *trough*, *flat*, and *flat-to-concave*. A *basin mano* has a convex surface and is worked against the metate in a combination of circular and reciprocal strokes. These manos develop use-wear facets on their edges and ends. *Trough manos* have distinctive abrasive use-wear damage on the ends, where they come into contact with the sides of the metate. A *flat-to-concave mano* has a flat to slightly convex surface and is moved against the metate in a reciprocal back and forth motion. *Flat manos*, have surfaces that are as long as the width of a flat metate, there is no use-wear damage on the ends and they have a flat grinding surface (Adams 1996).

Eighty-nine manos were recovered from Lake Roberts Vista site. Seven (7.9%) were recovered from the Georgetown component, five (5.6 %) of the manos were recovered in San Francisco fill, five (5.6%) were recovered in the Three Circle fill, and 37 (41.6%) were recovered in Classic Mimbres trash fill. The remaining 35 were recovered from vandalized units and surface collections (39.3%). Seventy-one (79.8%) of the recovered manos are *flat-to-concave*, three of which were redesigned into scrapers (FN's 883, 3436, and 3689) (see Figure 3), one was redesigned into a *hoe* (FN 3106), and one was recycled for a secondary use as a *palette*. Nine (10%) manos are flat; FN 2598 was redesigned into a *hoe*. Nine manos (10%) were indeterminate. Five (5.6) manos had a secondary use as a pestle (FN's 604, 3104, 3108, 3223, and 3452). Three manos were recycled by a later group and found within the wall fall of pueblo rooms (3.4%).

The redesigned scrapers and hoes were heavily used tools. The manos were worn out or nearly worn out from their original function making it virtually impossible to continue use as a mano. All five had one edge worn to a thin taper where they became impossible to grip while using a reciprocal back and forth motion.



Figure 3. Flat-to-concave mano redesigned into a one-convex edge tool, scraper. Tool on the left is the top portion, to the right is the mano used surface. The mano was designed with finger grips.

Metates

Metates are the bottom or table stone of the food processing equipment. They are used concomitantly with manos. Metates are heavy, cumbersome tools that are generally not taken when groups are traveling on seasonal rounds or when a site is

abandoned. There are five subtypes of metates: *basin*, *trough*, *open*, *flat*, and *flat-to-concave*. The *basin metates* have intentionally manufactured, elliptical basins worn by a circular and reciprocal mano stroke. *Trough metates* are manufactured by pecking and grinding within a rectangular depression, where the mano fits snugly between the side borders, causing facets on either end of the mano. *Flat metates* are not necessarily shaped, but have relatively naturally flat surfaces where the mano fits the width of the metate. The metate will remain flat as long as the mano is as wide as the metate or wider. *Flat-to-concave metates* are depressed in the center due to a mano that is shorter than the width of the metate (Adams 1996), as the mano curves up at the ends from use so does the metates' sides.

Lake Roberts Vista site yielded 25 metates; all were fragmentary. Fifteen (60%) were *flat-to-concave*; one was a conjoined fragment not whole. There were four *basin metates* (16%), two troughs (8%), and three indeterminate metates (12%). Fifteen (60%) were recovered within the Classic Mimbres fill. Four (16%) were recovered within the pithouse components, one in the Georgetown phase and two in the San Francisco phase, and one heavily fragmented, conjoined not whole, was recovered in a Three Circle component hearth, suggesting a reuse of the tool as a roasting/cooking stone.

There is significant difference between the number of manos (89) recovered from the site and the small representative of metates (25) recovered. It has been speculated that many of the metates may have been collected by residence of the near by town, Silver City, New Mexico. Many of the homes in Silver City have rock walls made from metates and/or have metates decorating their driveways and lawns (personnel communication with Barbara Roth). Therefore, the possibility is great that if the metates were left on the surface or exposed by the vandalized pits that they were picked up for a

specific purpose, thus, the current local community is still practicing recycling of usable tools for their own purposes.

Mortars

Mortars are shaped basins in which substances, (e.g., food, nuts, and paints) are reduced through crushing and grinding actions of a hand-held tool, generally a pestle. Their size and configuration varies greatly. There are small hand-held mortars, *pebble mortars*, with small basin depressions for possibly herbs, spices, and paints. There are bowl size mortars. Some are immobile rocks or rock outcrops, *bedrock mortars*, with deep basins that are pecked and ground into shape with deep basins (Adams 1996). Mortars are used for various tasks, pigment processing, to hold water, and processing food. For food processing a pestle is used in an up and down, crushing, and stirring motion causing abrasions within the mortar and wear facets on the pestle.

Eight mortars were recovered from the site, three *boulder mortars* (37.5%), three *bowls* (37.5%), one *pebble mortar* (12.5%) and one blank (12.5%). Two (25%) mortars were excavated from the Georgetown phase component. The *pebble mortar* and one *bowl* were whole artifacts the remaining mortars are fragmentary. The three *boulder metates* have use-wear indicating that the opposite surfaces were used as a neatherstone.

Pestles

Pestles are hand-held stones used to crush and grind. Use-wear damage includes impact fractures, chips, and abrasions. Pestles are either complex elaborately designed tools or an expediently used tool (Adams 1996). Six *pestles* were recovered from the Lake Roberts Vista site. Five (83.3%) of the *pestles* were the tools' secondary

use from a mano, see *Manos* above. Four of the manos were *flat-to-concave manos*; one was an indeterminate fragment. All five had use-wear damage consistent with pestle use on one or both ends. Both tool activities may have been used concomitantly. The sixth *pestle* was recovered in Unit 20, San Francisco phase Pithouse 4 within Feature F4C, an internal floor pit. The tool was a natural shaped, expediently used tool with little use-wear.

Griddles

Griddles are tabular pieces of stone that were placed over the fire and used to cook various types of foods (tortillas and cakes). They are generally thin slabs that are smoke-blackened or oxidized from use over a fire (Adams 1996). Two griddles were found within the site. One griddle was found within the Classic Mimbres plaza. It was bifacially flaked into a round griddle. The tool had been burnt on one side due to use (see Figure 4). The second griddle was recovered in Georgetown phase Pithouse 1. The Georgetown griddle is very fragmentary, the fragments were conjoined, not whole, the used surface had been ground smooth, and the entire tool is burnt (see Figure 5). This griddle is very thin and made of a tuff material. It is too fragmentary to know its shape, though a partial side was recovered and suggests that the tool may have been square or rectangular in shape. The texture and size is very different to the Classic Mimbres griddle, which is made out of a tabular material and is more than two-times the thickness.



Figure 4. Griddle from Classic Mimbres Plaza. Note the flaking around the tool.



Figure 5. Griddle from Georgetown Phase Pithouse 1, fragmented.

Polishing stones

Polishing stones are handstones that are generally naturally shaped, small, with a smooth texture, similar to a river pebble (Adams 1996). *Polishing stones* are used to alter the texture of another surface, such as a piece of pottery. When heavily used the *polishing stone* has use-wear facets and may take on a sheen. Abrasions from use-wear can be seen microscopically.

Two *polishing stones* were recovered disturbed fill. Both tools are fine textured, to no-texture. One of the tools has two use-wear surfaces.

Abraders

Abraders are handstones that have a rough surface used for shaping surfaces of other items (Adams 1996). Abrader subtypes include *U-shaped grooved abraders*, used for shaping cylindrical objects, *V-shaped grooved abraders*, used for shaping and sharpening awls and needles, and possibly the edges of lithic tools, and *flat abraders*, which are used to shape and sharpen stone tools (axes), personal ornaments, and wooden weaving tools (Woodbury 1954, Adams 1996).

Two abraders were recovered at Lake Roberts Vista site. One fragmented *flat abrader* was recovered in level 2 of Pithouse 3 / Room 5. The second, a *multiple V grooved abrader* was recovered at the surface of Units 4 and 7 from the 1994 field season.

Palettes

Palettes are generally thin, tabular pieces of stone that have been embellished with border decorations and are used for processing pigment. This type of *palette* has

been associated with Hohokam mortuary rituals (Haury 1976). The three *palettes* recovered at Lake Roberts Vista have no embellishments; two are flat stones that have been used to process pigment. One *palette* came from Room 4's second wall fall; a second *palette* came from Unit 15, the fill of Classic Mimbres Plaza number 2. The third was a *flat-to-concave mano* recovered in Unit 1, Level 6, Classic Mimbres trash fill, that was recycled into a *palette*. The *flat-to-concave mano* had been burned prior to use as a *palette*; the used *mano* surface was also the *palette* surface (see Figure 6).

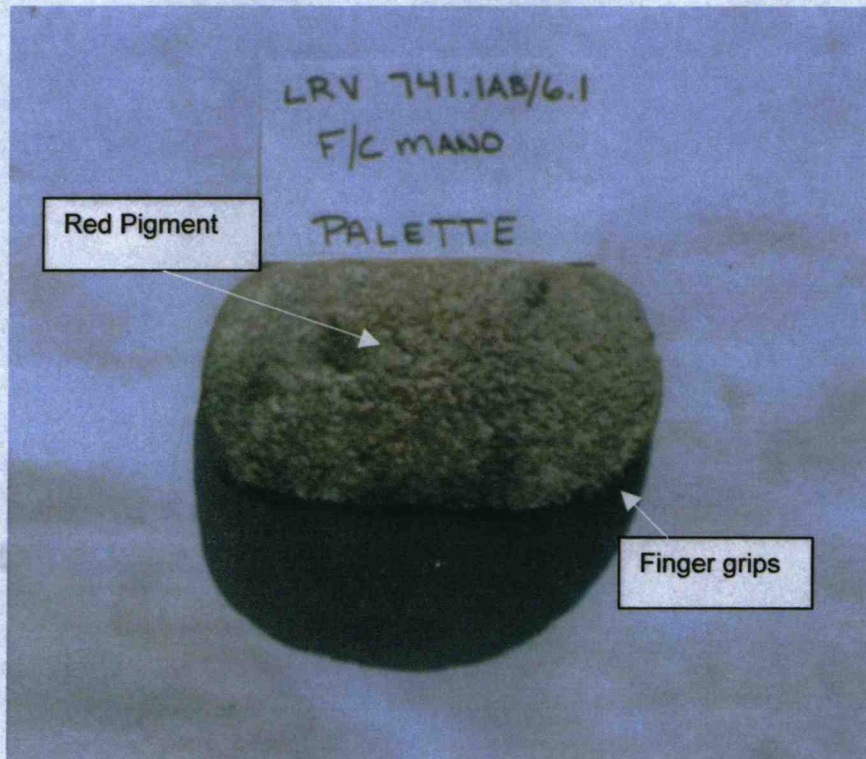


Figure 6. Flat-to-concave mano, reused as a palette. Note pigment on used *mano* surface. *Mano* had been designed with finger grips.

Netherstones

Netherstones are generally large bottom stones or table stones that something is worked against. These include artifacts that do not have specific attributes that would classify them as a metate or grinding slab. Netherstones have been damaged from use, but are generally too large to be held in the hand. They differ from metates in that they are generally not used for food processing nor are they usually formally shaped.

Eleven netherstones were recovered at the site. Six (54.5%) came from the Classic Mimbres trash fill and two (18.2%) from Pithouse 3 Classic Mimbres trash fill. Three (27.3%) were collected from surface finds during the 1992 field season. Use was indeterminate for nine of the netherstones. One was a *flat neatherstone* and one was a *flat-to-concave* neatherstone due to its use-wear.

Lapstones

Lapstones are netherstones that are generally smaller and may sit comfortably in ones lap. They were used to process intermediate substances or shape items. Generally something is worked against the lapstone creating abrasions (Adams 1996). Lapstones can come in a variety of shapes similar to a metate dependent on use.

Nine lapstones were recovered. Four (44.4%) were from the Classic Mimbres fill; two *flat-to-concave* lapstones and two blanks. One *flat-to-concave lapstone* (11.2%) were recovered from Pithouses 3 / Room 5. The remaining four were recovered from Pithouse 4 (44.4%).

Hoe

Hoes are ground stone tools that were used to cultivate the land. They are similar in shape to the modern hoe where one end is tapered, by either being flaked or ground to shape. The other end may be notched for hafting or not if held in the hand.

Three *hoes* were recovered at the site, two of which were redesigned into a *hoe* after the tools original use (*mano*) became exhausted (FN's 2598 and 3106). Seibert (1987) noted that on the Colorado Plateau, many *manos* had been redesigned as *hoes*, with notches for hafting. Within the Four Corners area Woodbury (1957) noticed that *hoes* may or may not be hafted.

The two redesigned *manos* were not notched for hafting. Both *manos* were either a *flat* or *flat-to-concave mano* used in a reciprocal-rocking motion, where one end became very thin due to pressure on the upward stroke. The thin edges were flaked to create a sharper edge. The material types were tuff and small vesicle vesicular basal. Striations from scraping are noticeable microscopically. One of these *hoes* was recovered in Level 3 of the Pithouse 3 entryway; the second was recovered in Test Trench 1 at the north end of Roomblock 2 (see Figure 7). The third *hoe* (FN 3806), recovered in the floor fill of Pithouse 2, was made out of basalt and did not appear to be notched for hafting. The tapered edge had been worn nearly flat from use (see Figure 8).

Maul

Maules are large rocks used to pound something, similar to those used today. *Maules* are distinguishable by the hafting groove and battered ends (Adams 1996). One fragmented $\frac{3}{4}$ inch grooved *maul* was recovered from Unit 16, Classic Mimbres Roomblock 2, disturbed level 2. The *maul* had been heavily burned after the break.



Figure 7. Pithouse 3 Redesigned Flat-to-concave mano into a hoe.

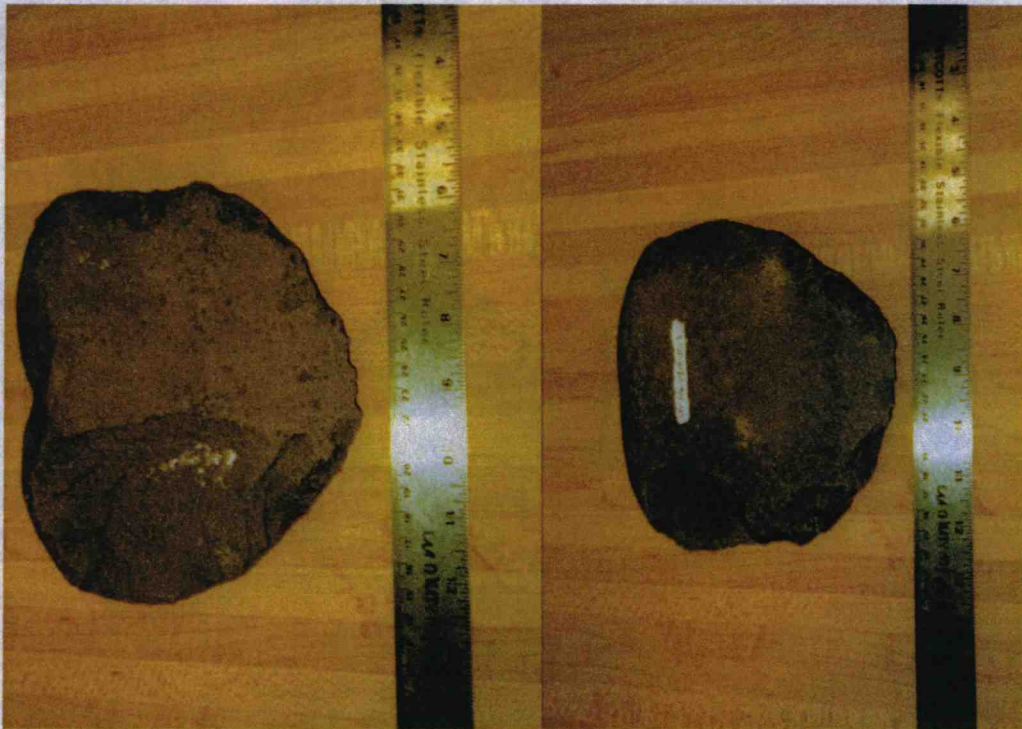


Figure 8. San Francisco Phase Pithouse 2 hand held Hoe.

Axe

Axes are composite tools designed for chopping (Adams 1996) and are hafted with a wooden handle. One fragmented axe was recovered from Unit 25, disturbed communal structure fill. It was impossible to tell what kind of groove or hafting measures were taken, the tool was broken below the groove and along the bit length leaving less than half the bit. The material was fine-grained basalt that had been heavily used. The tool had a small bump approximately half way down the bit from reshaping (see Figure 9).



Figure 9. Disturbed fill – Broken axe bit

Pipes

Pipes are cylindrical or conical-shaped tubes used for smoking tobacco or creating smoke (Woodbury 1954). Three types of pipes were recovered at Lake Roberts Vista; a *cylindrical hole pipe*, *cylindrical-biconical hole pipe*, and a *biconical hole pipe*.

Two pipes came from the Georgetown phase component, the third from the Three Circle phase component. The two cylindrical hole pipes may have held a pipe stem, however, there was no evidence of charcoal inside of either pipe which would indicate that the pipes were used to smoke tobacco. One of the Georgetown pipe holes are large at both ends and would not accommodate a pipe stem; no charcoal was found within the pipe to indicate tobacco use (see Figure 10). Barnett (1973) refers to this style of pipe as cloud blowers, which were used mainly for blowing smoke through.

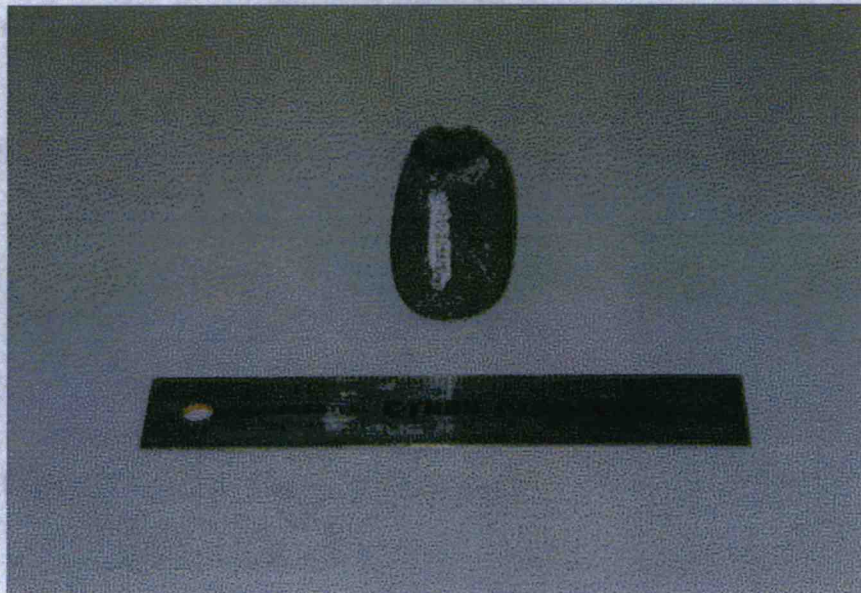


Figure 10. Georgetown Phase Pithouse 1 Pipe or Cloud blower

Shaped stones

Shaped stones are stones that were manipulated or have a specific shape naturally. At Lake Roberts Vista ten artifacts fit into the category of shaped stones. For this study the subcategories used are *painted stone*, *shaped* (artifacts that have been

manipulated into their current shape, subtype unknown), *tube*, and *unidentified shaped items*.

One *painted stone* was recovered in Unit 9, Classic Mimbres trash fill. The stone is a natural egg shaped stone with a flat base. It has pigment (Munsell 10R4/8 Red) painted around the circumference of the stone four times, the base is also painted (see Figure 11).

Nine *shaped* items were recovered. One fragment (less than half), a flat disk with a biconical hole, possible spindle whorl, was recovered in the disturbed level of Pithouse 3's entryway. This artifact is the only ground stone piece that may indicate that one of the occupations was weaving. One *ground to shape* item was recovered in the Three Circle phase Pithouse 5. A *carved* item was recovered in the Classic Mimbres plaza trash along with a *grooved* item. One *grooved / incised shaped* artifact was found on the floor of the communal structure. The remaining four shaped items were too fragmentary to determine shape of any kind, each item microscopically showed abrasions, indicating that they had been manipulated.



Figure 11. Classic Mimbres Trash Fill, Painted Stone. Note the four red lines painted around the upper half of the stone.

Offering stones

Offering stones are stones that were recovered on the floor or within the internal pit of the communal structure. Use is unknown. One *offering stone* was recovered at the bottom of level 8 in Unit 1, internal pit within the Three Circle phase communal structure. The stone was natural with no modifications.

Cooking stones

Three *cooking stones* were recovered during surface collections at Lake Roberts Vista. One handstone was recycled into a *cooking stone* from San Francisco phase Pithouse 2.

Balls

Sixty-four *balls* were recovered from the site. All 64 were naturally shaped. Four were irregularly shaped, three had one flat side, and one has two flat sides. The remaining 56 *balls* were generally spherical in shape. The *balls* were recovered from every unit, material types varied from an iron conglomerate to tuff (see Figure 12). Nearly all of the balls were recovered in trash fill or disturbed units, therefore, their function is unknown, however, balls found elsewhere have been inferred to represent game pieces.



Figure 12. Variety of balls recovered from the Lake Roberts Vista Site

Context Descriptions

The 1992 field season at Lake Roberts Vista yielded 88 ground stone artifacts, the 1994 field season yielded 28 ground stone artifacts and the 1995 field season recovered 179 ground stone artifacts. Thirty-two units were excavated during the three field seasons and ground stone artifacts were collected from 31 of them. During the 1992 and 1994 field seasons, ground stone artifacts were collected in 12 separate surface units. Three test trenches were also excavated during the 1995 field season and ground stone artifacts were collected from all three of them, Test Trench 1, Test Trench 2 and Kiva Trench. The site consists of multiple layers of occupation, Late Pithouse through the Classic Mimbres period. Artifacts were collected in surface units, disturbed (vandalized) fill, Classic Mimbres trash fill, it represents artifacts that may have been left behind by the pueblo occupants, floor fill, roof fall, and wall fall deposits. Wall fall fill are mixed deposits, artifacts recovered from the collapse of the wall or are associated with the wall. Roof fall fill is also mixed deposits, it represents the artifacts they may have been located on the roof at the time of the roof's destruction. Ethnographically the Hopi used their roofs (terraces) as an outdoor living space where household and community

functions were carried out, such as, drying crops and hides, milling corn, and cooking (Kuwawata, Hopi webpage). A brief overview of what was collected within each unit by the year is presented below.

Six surface units (Unit's E, F, G, H, I and K) were collected yielding nine ground stone artifacts (see Table 1).

Table 1. 1992 Units E, F, G, H, I, and K - Classic Mimbres Period

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Handstone	5	Surface	
Flat/Concave Handstones	1	Surface	
Pestle	1	Surface	
Basin Metate	1	Surface	
Cooking stone	1	Surface	

The bulk of the ground stone recovered in 1992 came from the Classic Mimbres phase component, Plaza number 1, and a Three Circle phase communal structure. The communal structure was filled with one-meter of Classic Mimbres trash. The communal structure, Unit 1, yielded 16 ground stone artifacts, from the first meter of Classic Mimbres trash fill. One *flat-to-concave mano* (FN 883) was redesigned into a scraper. Levels 6 and 7 were Three Circle component phase roof fall. Level 8 was the location of Feature 1, F1, where an *offering stone* was recovered on the communal room floor (see Table 2).

Table 2. 1992 Unit #1 – Three Circle Phase Communal Structure

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Neatherstone	1	1	Classic Mimbres Trash Fill
Flat/Concave Mano / Convex edge	1	2	Classic Mimbres Trash Fill
Ball	2	2	Classic Mimbres Trash Fill
Flat/Concave Mano	1	3	Classic Mimbres Trash Fill
Ornament	1	3	Classic Mimbres Trash Fill
Unidentified Shaped Item	1	3	Classic Mimbres Trash Fill
Ball	2	3	Classic Mimbres Trash Fill
Handstone	2	3	Classic Mimbres Trash Fill
Multi edged Tabular Tool	1	4	Classic Mimbres Trash Fill
Mortar	1	6	Roof Fall
Flat/Concave Mano / Palette	1	6	Roof Fall
Handstones	2	6	Roof Fall
Flat/Concave Mano	1	7	Roof Fall
Mano Flat	1	7	Roof Fall
Ball	3	7	Roof Fall
Handstone	1	7	Roof Fall
Offering stone	1	8	Communal Room Floor Pit (F1)

Unit 3 produced the least amount of ground stone artifacts during the 1992 field season, four. The unit was disturbed by vandals and was abandoned after Level 3, disturbed floor fill, yielded four ground stone tools (see Table 3).

Table 3. 1992 Unit #3 – Classic Mimbres Period

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Handstone	1	3	Disturbed floor
Flat/Concave Handstone	1	3	Disturbed floor
Flat/Concave Mano	1	3	Disturbed floor
Lapstone blank	1	3	Disturbed floor

Pueblo Room 1 was identified during the 1992 excavations. Room 1 was excavated in two units, (Units 4 and 7). Unit 4 has been identified as the east edge and

a portion outside of the pueblo room. Unit 7 is identified as Room 1 from Roomblock 2, west end (see Tables 4 and 5).

Table 4. 1992 Unit #4 – Classic Mimbres Period Room 1

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Handstone	1	2	Wall/Roof Fall
Flat/Concave Mano	2	2	Wall/Roof Fall
Flat/Concave Metate	1	2	Wall/Roof Fall
Unidentified Neatherstones	1	2	Wall/Roof Fall
Unidentified Metate	1	2	Wall/Roof Fall
Mortar	1	2	Wall/Roof Fall

Table 5. 1992 Unit #7 – Classic Mimbres Period Room 1

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Mano	3	2	West end, roof fill
Flat/Concave Metate	1	2	West end, roof fill
Lapstone Blank	1	2	West end, roof fill
Unidentified Neatherstone	1	2	West end, roof fill
Flat/Concave Mano	3	3	West end, roof fill
Mano	1	5	

Unit 5, located within the Classic Mimbres Phase plaza yielded three ground stone artifacts. This unit also identified the edge of Georgetown phase Pithouse 1 (see Table 6).

Table 6. 1992 Unit #5 – Classic Mimbres Period Plaza

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Tube	1	2	Plaza
Grooved / Incised	1	2	Plaza
Unidentified Shaped Item	1	2	Plaza

Classic Mimbres Roomblock 2; Room 2 was excavated in one unit, Unit 8, which yielded the largest amount of ground stone artifacts in 1992 for a total of 23. San Francisco phase Pithouse 2 is below the room at level 8. The *handstone* in level 5 was reused as a *cooking stone*; it is heavily burnt from second use (FN 824). The *boulder mortar* in level 6 has use-wear on the bottom surface that indicates the tool was also used as a *metate* (FN 835). The mano recovered from Level 9 is associated with a San Francisco Pithouse component. See Table 7 below for artifact descriptions.

Table 7. 1992 Unit #8 - Classic Mimbres Period Roomblock 2; Room 2

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Mano	1	1	Classic Mimbres Trash fill
Flat/Concave Mano	1	2	Classic Mimbres Trash fill
Balls	3	2	Classic Mimbres Trash fill
Pestle	1	5	Disturbed Roof fill
Flat/Concave Mano	1	5	Disturbed Roof fill
Handstone	1	5	Disturbed Roof fill
Balls	6	5	Disturbed Roof fill
Flat/Concave Mano	4	6	Classic Mimbres Floor fill w/burial
Flat Mano	1	6	Classic Mimbres Floor fill w/burial
Mortar/Boulder	1	6	Classic Mimbres Floor fill w/burial
Mortar/Bowl	1	6	Classic Mimbres Floor fill w/burial
Handstone	1	7	SE Quad Pithouse 2 – Roof fall
Unidentified Mano	1	9	NW Quad Pithouse 2 – Floor fill

Unit 9 is listed as the Classic Mimbres Period Plaza with Georgetown phase Pithouse 1 beneath. Ground stone artifacts are present beginning at level 4. Levels 4 and 5 are trash fill that is either associated with the Classic Mimbres period or Three Circle phase. The Georgetown phase Pithouse 1 is below the plaza, beginning at level 6. The pithouse was burned and filled with trash. A *painted stone* was recovered from level 5, trash fill. The stone is egg shaped with a flat base. The stone has four red

(Munsell 10R 4/8) rings painted around the circumference of the stone, and at the bottom of the base (FN 845). Within the floor fill at level 7 three fragmented mortars were recovered. The two *boulder mortars* had secondary use as a metate (FN 962 and 963) (see Table 8).

The 1994 excavation collections were located in two pueblo rooms, two pithouse units and four surface units. The majority of the ground stone came from the pithouse units during this field season.

Table 8. 1992 Unit #9 – Pithouse 1

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Ball	1	4	Trash fill
Flat/Concave Mano	1	5	Trash fill
Painted Stone	1	5	Trash fill
Handstone	1	5	Trash fill
Flat/Concave Mano	1	6	Georgetown Floor fill
Flat/Concave Mano	1	7	Georgetown Floor fill
Mortar/Bowl	1	7	Georgetown Floor fill
Mortar/Boulder / Metate	2	7	Georgetown Floor fill
Flat/Concave Metate	1	7	Georgetown Floor fill
Handstone	1	7	Georgetown Floor fill

Surface Units D, E, M, and N yielded five artifacts listed in Table 9 below. It should be noted that below Unit M is Roomblock 1. Note that the ground stone collected came from the surface collections only, and is considered the Three Circle phase.

Table 9. 1994 Units D, E, M, and N - Pithouse Phase Surface

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Mano	3	Surface	
Unidentified Handstone	1	Surface	
Unidentified Neatherstone	1	Surface	

Pueblo Room 1 (Units 4 and 7) from 1992 was reopened and the units were combined in 1994, yielding five ground stone artifacts (see Table 10).

Table 10. 1994 Unit #4 and #7 – Classic Mimbres Room 1

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Multiple V Abrader	1	Surface	Classic Mimbres Room #1
Unidentified Handstone	3	Surface	Classic Mimbres Room #1
Unidentified Neatherstone	1	Surface	Classic Mimbres Room #1

The 1995 field season collected the majority of the ground stone artifacts from Lake Roberts Vista yielding 179. Unit 29, a Georgetown phase entryway to Pithouse 1, was recovered under a Classic Mimbres Plaza. The entryway is located to the east of Pithouse 1. Ground stone was recovered in one level, 2 (see Table 11).

Table 11. 1995 Unit #29 - Georgetown Phase - Entryway of Pithouse 1

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Mano	2	2	Entryway fill
Cylindrical, Biconical Hole Pipe	1	2	Entryway fill

Unit 30, a San Francisco phase pithouse, is located under the Classic Mimbres Plaza. Level 1 was pothunted trash fill excavated to approximately 50 centimeters to Level 2, which is disturbed roof fill. Level 3 was floor fill (see Table 12).

Table 12. 1995 Unit #30 - San Francisco Phase - Pithouse 2

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Metate	1	1	Disturbed Trash fill
Trough-Indeterminate Metate	1	1	Disturbed Trash fill
Flat/Concave Metate	1	2	Disturbed Roof fill
Hoe / Hand held	1	3	Floor fill

Three Circle component Pithouse 3 was remodeled into Classic Mimbres period Room 5. The cultural fill (CF) was excavated as a natural level and consisted primarily of Classic Mimbres trash. Level 2 is mixed Pueblo fill, Level 3 is floor fill, and Level 4 is a pueblo room floor, which yielded three ground stone artifacts located within Feature F3A, the hearth. The pithouse entryway was excavated as Unit 11 during the 1994 field season. Within the trash fill of Unit 11 one *flat mano* had been redesigned into a *hoe* (FN 2598). Test Trench 2, TT2, was excavated south of the entryway in 1995. Within TT2, one indeterminate mano was recovered (see Tables 13-15).

Table 13. 1995 Unit TT2 - South of Pithouse 3 Entryway

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Indeterminate Mano	1	1	

The 1994 field season Unit L was a surface unit that was later excavated as Unit 12, trash fill. When the San Francisco Phase (A.D. 650-750) Pithouse 4 was discovered, the unit was excavated as a pithouse feature (Unit 20). Unit 20 was excavated in tandem with Unit 12 during the 1995 field season.

Table 14. 1995 Unit #PH3 - Pithouse #3 Remodeled into Room 5

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Mano	8	CF	Classic Mimbres Trash fill
Flat/Concave Metate	2	CF	Classic Mimbres Trash fill
Flat/Concave Edge Metate	1	CF	Classic Mimbres Trash fill
Metate	1	CF	Classic Mimbres Trash fill
Unidentified Neatherstone	1	CF	Classic Mimbres Trash fill
Flat Neatherstone	3	CF	Classic Mimbres Trash fill
Flat/Concave Lapstone	1	CF	Classic Mimbres Trash fill
Ball	10	CF	Classic Mimbres Trash fill
Flat/Concave Mano	1	2	Pueblo mixed fill
Flat/Concave Metate	1	2	Pueblo mixed fill
Flat Abrader	1	2	Pueblo mixed fill
Flat/Concave Mano	1	3	Floor Fill
Bowl / Mortar	1	F3A	Pueblo Room – hearth
Basin Metate	2	F3A	Pueblo Room – hearth

Table 15. 1994 Unit #11 - Three Circle Phase – Entryway of Pithouse 3

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Handstone	1	Surface	Surface collection
Handstone	1	1	Classic Mimbres Trash fill
Flat/Concave Lapstone	1	1	Classic Mimbres Trash fill
Flat/Concave Mano	1	2	Classic Mimbres Trash fill
Ball	1	2	Classic Mimbres Trash fill
Fragmentary Flat Disk with Biconical hole	1	2	Classic Mimbres Trash fill
Flat/Concave Mano	1	3	Classic Mimbres Trash fill
Flat Mano / Hoe	1	3	Classic Mimbres Trash fill

Unit 12 yielded three separate occupation floors. The surface level and levels 1 and 2 are part of the Classic Mimbres trash. In Level 3 the unit moves into Pithouse 4 and was excavated as a pithouse feature along with Unit 20. The upper floor was capped by roof fall and contained a burial. The third floor contained a hearth, Feature F4D, and three internal storage pits F4A, F4B, and F4C. Feature F4A, yielded a

handstone, F4B yielded a *flat mano*, and F4C yielded a *pestle*. In Unit 12 ground stone was recovered in the lower levels, 4, 5, 6, and 7. Levels 6 and 7 are associated with the pithouse. Unit 20 is located in the southeast corner of the pithouse; ground stone was recovered in three levels, 1, 2, and 3 (see Tables 16 and 17 below).

Table 16. 1994 Unit #L/12 – San Francisco Phase Pithouse 4

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Metates	3	Surface	Classic Mimbres Trash fill
Neatherstone	2	Surface	Classic Mimbres Trash fill
Handstone	2	Surface	Classic Mimbres Trash fill
Mano	1	1	Classic Mimbres Trash fill
Lapstone	1	RF	Roof fall
Unidentified Handstone	1	F4A	Interior Pit at Floor #3

Table 17. 1995 Units #12/20 - San Francisco Phase Pithouse 4

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Metate	1	1	Disturbed Trash Fill
Boulder Lapstone	1	1	Disturbed Trash Fill
Ball	1	2	Disturbed Roof Fall
Flat/Concave Mano	3	3	Floor fill between Roof fall and Floor 1
Ball	1	3	Floor fill between Roof fall and Floor 1
Unidentified Shaped Item	1	3	Floor fill between Roof fall and Floor 1
Flat Mano	1	F4B	Storage Pit/Mano @ Floor 3
Pestle	1	F4C	Floor 3
Basin Metate	1	4	Disturbed Trash fill
Flat/Concave Mano	1	5	Disturbed Trash fill
Ball	1	6	Roof fall, Floor 1
Ball	1	7	Floor fill, Floor 1

Unit 17 is a Three Circle Phase (A.D. 750-1000), Pithouse 5. The pithouse was in a formal design and was cleaned before abandonment. The pithouse was not burned, but left open. Level 1 was filled with Classic Mimbres trash fill that had been vandalized

by pothunters. Ground stone was not recovered in level 2, but was recovered in Level 3 floor fill. The *flat mano* (FN 3779) was redesigned with one flaked convex edge (see Table 18). Unit 23, Table 19 below, is a portion of the same pithouse.

Table 18. 1995 Unit #17 - Three Circle Phase Pithouse 5

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Mano	1	1	Disturbed fill
Ball	1	1	Disturbed fill
Handstone	1	1	Disturbed fill
Flat/Concave Mano / 1 Convex edge	1	3	PH Floor Fill
Ball	1	3	PH Floor Fill

Table 19. 1995 Unit #23 – Three Circle Phase Pithouse 5

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Mano	1	1	Classic Mimbres Trash fill
Ball	2	1	Classic Mimbres Trash fill
Unidentified Shaped Item	1	1	Classic Mimbres Trash fill
Polishing Stone	1	2	Disturbed Roof fall
Flat/Concave Mano	2	2	Disturbed Roof fall
Handstone	1	2	Disturbed Roof fall
Mano	2	2	Disturbed Roof fall
Ball	1	2	Disturbed Roof fall
Ball	1	3	Disturbed Roof fall

Unit 31 is an extramural roasting pit located near the entryway of Three Circle phase Pithouse 5. The pit was excavated to 30 centimeters; at the bottom was a fragmentary piece of a trough metate (see Table 20).

Table 20. 1995 Unit #31 - Three Circle Phase, Pithouse 5

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Trough-Indeterminate Metate	1	1	Extramural Roasting Pit

Unit 24B, Pithouse 6, is possibly Three Circle phase. Ground stone was recovered in levels 1 through 3, disturbed Classic Mimbres trash fill and pithouse roof fall and wall fall (see Table 21).

Table 21. 1995 Unit #24B – Three Circle Phase Pithouse 6

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Metate	2	1	Trash fill
Flat/Concave Mano	1	2	Roof fall/Wall fall
Indeterminate Handstone	1	2	Roof fall/Wall fall
Cylindrical Hole Pipe	1	2	Roof fall/Wall fall
Indeterminate Handstone	1	3	Floor fill

Units 25, 28, and Ktr (Kiva Trench) are associated with the Three Circle phase communal room first discovered during the 1992 excavations in Unit 1. The communal room contained Classic Mimbres trash for one meter, which was excavated as a natural level (see Tables 22-24).

Table 22. 1995 Unit #25 - Three Circle Phase Communal Room

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Axe Bit/Broken	1	1	Disturbed
Ball	4	1	Disturbed

Table 23. 1995 Unit #28 – Three Circle Phase Communal Room with Hearth

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Ball	4	1	Classic Mimbres Trash Fill
Ball	1	RF	Roof fall of communal structure
Ball - One Flat Side	1	RF	Roof fall of communal structure

Table 24. 1995 Unit #Ktr – Three Circle Phase Communal Structure

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Ball	1	1	Fill
Ball	1	2	Fill

Unit 18/18B is a disturbed Classic Mimbres Period room within Roomblock 1. Pothunters vandalized the room through level 1, which was excavated as a natural level (see Table 25).

Table 25. 1995 Unit #18/18B - Classic Mimbres Period Roomblock 1

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Lapstone	1	1	Disturbed level
Pebble Polishing Stone	1	1	Disturbed level
Flat/Concave Mano	2	1	Disturbed level
Unidentified Metate	1	1	Disturbed level

Unit 21 and 21A/B are part of Roomblock 1; Room 3. The majority of ground stone recovered within these units were located on top of and mixed into the roof fall, suggesting that the communal area was on the roof. One artifact was recovered in the wall fall, suggesting a reused/recycled tool, two were found in floor fill with one flat-to-

concave mano being redesigned with one bifacially flaked convex edge (FN 3436) (see Table 26).

Table 26. 1995 Unit #21, 21A/B - Classic Mimbres Period Roomblock 1; Room 3

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Ball	1	Surface	Surface
Flat/Concave Mano	1	Surface	Surface
Flat/Concave Mano	3	1	Roof Fall
Neatherstone blank	1	1	Roof Fall
Ball	3	1	Roof Fall
Mano	1	1	Roof Fall
Offering Stone	1	1	Roof Fall
Flat/Concave Mano	2	2	Roof Fall
Mano	1	FF	Floor Fall
Flat Mano	1	Wall	Wall Fall
Flat/Concave Mano / One Convex edge	1	FL	Floor Fall

Unit 26 is part of Pithouse 3, which was remodeled into a pueblo ceremonial room. There was a burial located along the west wall and three metates associated with the ceremonial room. Two metates were recovered in Level 1, trash fill and Level 2, roof fall. One flat-to-concave neatherstone and one indeterminate neatherstone were also recovered in Level 2. Level three is the floor fill of Room 5. Only one metate was recovered in Unit 26, along with four manos (see Table 27).

Unit 16, in Roomblock 2, was heavily disturbed, most likely from vandalism. The unit yielded fourteen ground stone artifacts. This was the only unit that yielded a maul. The maul has a fragmentary $\frac{3}{4}$ groove and is heavily battered and burned (see Table 28).

Table 27. 1995 Unit #26 - Classic Mimbres Period Roomblock 1; Room 5

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Ball	1	1	Classic Trash fill
Pebble Mortar	1	1	Classic Trash fill
Handstone	1	1	Classic Trash fill
Flat/Concave Mano	2	2	Roof fall
Flat/Concave Metate	2	2	Roof fall
Ball - 1 Flat Side	1	2	Roof fall
Polishing Stone	1	2	Roof fall
Neatherstone	2	2	Roof fall
Flat/Concave Metate	1	3	Floor fill
Flat/Concave Mano / One Convex edge	1	3	Floor fill
Flat/Concave Mano	3	3	Floor fill

Table 28. 1995 Unit #16 Classic Mimbres Period Roomblock 2

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Handstone	1	Surface	Disturbed fill
Ball	4	Surface	Disturbed fill
Flat/Concave Handstone	1	Surface	Disturbed fill
Handstone	2	1	Disturbed fill
Flat Mano	1	1	Disturbed fill
Unidentified Neatherstone	1	1	Disturbed fill
Ball	1	1	Disturbed fill
Shaped Item	1	1	Disturbed fill
3/4 Groove Maul	1	2	Disturbed fill
Pebble Polishing Stone	1	2	Disturbed fill

Table 29 lists ground stone artifacts collected from Test Trench 1 (TT1). The trench was filled with trash and helped locate the north end of Roomblock 2 (see Table 30).

Table 29. 1995 Unit #TT1 - Classic Mimbres Period Roomblock 2

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Mano	1	1	North end of Roomblock #2
Flat/Concave Mano	1	1	North end of Roomblock #2
Flat Lapstone	1	1	North end of Roomblock #2

Unit 22 is the south slope of the Classic Mimbres Period Roomblock 2. The ground stone recovered was located within the wall fill (see Table 30).

Table 30. 1995 Unit #22 - Classic Mimbres Period Roomblock 2, South slope

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat/Concave Handstone	1	1	Wall Fall
Blank Neatherstone	1	1	Wall Fall
Handstone	2	1	Wall Fall

Unit 24 is a Classic Mimbres Period room, number 4. One palette was recovered within the second wall fall, level 3, with red (Munsell 10R 4/8) pigment (see Table 31), suggesting Classic period occupants processed pigments.

Table 31. 1995 Unit #24 - Classic Mimbres Period Room 4

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Flat Mano	1	1	Classic Mimbres trash fill
Neatherstone	1	1	Classic Mimbres trash fill
Ball	1	1	Classic Mimbres trash fill
Flat/Concave Mano	3	2	Disturbed trash fill
Flat/Concave Metate	1	2	Disturbed trash fill
Flat Mano / 1 Convex edge	1	2	Disturbed trash fill
Flat/Concave Mano	1	3	Disturbed trash fill
Flat/Concave Lapstone	1	3	Disturbed trash fill
Blank Palette	1	3	Disturbed trash fill

Unit 19 is listed as a Classic Mimbres Period Plaza with Georgetown Phase (A.D. 550-650) Pithouse 1 underneath. Level 1 is the only one clearly defined as part of the plaza. Level 2 is trash fill; levels 3 and 4 are roof fill and floor fill associated with the pithouse. Unit 32 is listed as part of the plaza however, field notes locate it 20 meters east of the defined plaza, and it is also listed as sterile. Both of these units were based off of 1992 excavated Unit 5 (see Tables 32 and 33).

Unit 15 is Classic Mimbres Period Plaza number 2. This plaza is located at the west end of Roomblock 2. Level 1 yielded the ground stone artifacts for this unit. A palette with dark red (Munsell 2.5YR 3/6) pigment was recovered from level 1, fill. A

Table 32. 1995 Unit #19 - Classic Mimbres Period Plaza

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Unidentified Shaped Item	1	1	Plaza
Flat Handstone	1	2	Trash Fill
Ball	1	3	Georgetown Roof Fill
Griddle/Cooking Stone	1	3	Georgetown Roof Fill
Mano	1	3	Georgetown Roof Fill
Handstone	1	3	Georgetown Roof Fill
Biconical Hole Pipe	1	4	Georgetown Floor Fill
Flat/Concave Mano	2	4	Georgetown Floor Fill

Table 33. 1995 Unit #32 - Classic Mimbres Phase Plaza

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Ball	1	2	20 meters East of Unit 5

large tabular material griddle was recovered. The griddle had been broken into three pieces and was conjoined whole. It was flaked bifacially, shaping the tool into a disc.

One side of the griddle was heavily burned were as the other side showed no sign of use. After careful review of all relevant literature available since the early 1900s as well as communications with Jenny Adams, Southwest Ground Stone Researcher, as best as this researcher can tell a griddle like this has not been recorded previously (see Table 34). In comparison, the Georgetown phase griddle is very thin and is made of tuff. The griddle is very fragmented with sections missing. One side of the griddle where all of the pieces were recovered suggests that the tool may have been more square or rectangular in shape. Whereas the Classic Mimbres period griddle was designed round and is much thicker and made from a tabular material.

Table. 34 1995 Unit #15 - Classic Mimbres Period Plaza 2

<i>Artifact type</i>	<i>Amount</i>	<i>Level</i>	<i>Provenience</i>
Palette	1	1	Fill
Ball	2	1	NW corner of unit
Ball	1	1	NW corner of unit
Mortar	1	1	Fill
Griddle/Cooking Stone	1	1	NW corner of unit

Summary

Nineteen artifact types were identified and described. Two-hundred and three (68.6%) ground stone artifacts recovered were used in a single activity. Forty-three (14.5%) were used in multiple tasks (6), reused (23), recycled (4), or redesigned (10). Fifty were indeterminate (16.9%). One-hundred and eighteen (39.9) were whole or conjoined whole. Thirty-seven (12.5%) were natural shaped with no manufacturing. Fourteen (4.7%) were destroyed by fire after use and 40.9 percent were used in food processing activities (n=121). The majority of the foods processing tools, 30.1 percent,

were hand-held, manos (n=89). One-hundred eighty-six were manufactured for use (62.8%).

The Lake Roberts Vista assemblage was excavated from 31 units with 90 (30.4%) artifacts coming from disturbed fill (pothunted) and surface collections. From the Classic Mimbres trash fill, mixed pueblo context (wall fall, and roof fall), and floor fill 155 (52.4%) artifacts were recovered. From the Late Pithouse phase's floor fill, roof fall, and communal room, 51 artifacts (17.2%) were recovered.

Through ethnographic analogies of the Hopi and Zuni Tribes it is known that the roofs of the pueblo peoples were used for daily activities and for social functions. The grinding tools and other artifact types found within the roof fall at the Lake Roberts Vista site suggest that the Mimbres communities had also practiced using the roof as an outside living space, where food grinding activities took place.

The adobe walls of the pueblo structures required rocks to maintain their structure. The wall fill is evidence of recycling of tools either not needed any longer by the current society or scavenged out of earlier residences abandoned homes, trash pits, or collected on the surface.

Much of the trash fill recovered is from the Classic Mimbres occupants who would fill an abandoned pit structure with trash verses removing the trash to an outside location. There was possibly some mixing of trash between the Classic Mimbres occupation and the Three Circle occupation, due to the Classic Mimbres occupants utilizing an already established trash pit from the earlier group.

The following chapter explores in more depth the results of these detailed artifact and unit descriptions.

Chapter 5: Conclusions

The intent of this thesis was to identify the tool types within the Late Pithouse phase and the Classic Mimbres Pueblo period occupations at Lake Roberts Vista site and to identify technological changes between the occupations. This thesis also anticipated identifying how ground stone tools were reused, redesigned and/or recycled within the confines of the site.

The Lake Roberts Vista ground stone assemblage consists of 296 whole, fragmentary, and conjoined artifacts. A total of 206 ground stone artifacts were recovered in provenienced context and will be used to make comparisons between the occupations, as well as suggest social behaviors. After careful examination of the provenience of each ground stone artifact recovered it was concluded that 90 (30.4%) artifacts of the Lake Roberts Vista site ground stone assemblage was recovered within the disturbed context and surface collections and would not be used in making comparisons between the Late Pithouse and Pueblo occupations. The Classic Mimbres trash fill represents those artifacts left behind or thrown away by the pueblo occupants, the wall fall and roof fall fill represents a mixed Pueblo context. A total of 52.4 percent (n=155) of the artifacts came from the Classic Mimbres component. The wall fall contains artifacts that may be classified as reused architectural tools. The Late Pithouse assemblage came from floor fill and features. The Georgetown phase component yielded 16 (5.4%) artifacts, San Francisco Pithouses 2 and 4 yielded 17 (5.7%), and the Three Circle phase Pithouse 5 yielded 19 (6.4%) of the artifacts recovered. Of the 206 ground stone artifacts recovered, 136 (45.9%) were ground stone tools. These tools will be used to compare technological differences between the occupations.

Findings

Five tool types (Handstone, Netherstone, Composite, and Shaped stone) were recovered within the pithouse and pueblo occupations. Within these five tool types, 18 subtypes were identified. Tools are listed by subtype in Table 35.

Table 35. Tools from Pithouse / Pueblo Occupations

	<i>Georgetown</i>	<i>San Francisco</i>	<i>Three Circle</i>	<i>Classic Mimbres Floor fill</i>	<i>Classic Mimbres Roof / Wall Fall</i>	<i>Classic Mimbres Trash fill</i>
<i>Artifact Type</i>						
Handstone	X	X	X		X	X
Flat/Concave Mano	X	X	X	X	X	X
Flat Mano		X	X	X	X	X
Mano	X	X			X	X
Pestle		X				X
Polishing stone					X	
Abrader						X
Netherstone		X			X	X
Mortar			X	X	X	
Boulder Mortar	X				X	X
Bowl	X			X	X	X
Pebble Mortar						X
Metate fragment					X	X
Basin Metate		X		X		
Flat/Concave Metate	X			X	X	X
Trough Metate			X			
Palette				X	X	
Hoe		X				
Griddle	X			X		

All but five of the tools recovered were food processing tools, *polishing stone*, *abrader*, *netherstone*, *palette*, and the *hoe*.

Additional tools recovered from the disturbed fill and surface collections include: *cooking stones, tabular tool, a flat-to-concave edge metate, axe fragment, pebble polishing stone, and a ¾ grooved maul.*

Seven ground stone artifact types other than tools were recovered from Lake Roberts Vista site. Each of the artifacts listed in Table 36 are represented within the provenienced assemblage except for the *tube*. The function of these is not known.

Table 36. Ground Stone Artifacts, Other than Tools

<i>Artifact Type</i>	<i>Possible function</i>
Balls	Games
Grooved & Incised stone	Ornamental / Unknown
Painted stone	Ornamental / Unknown
Cylindrical, Biconical pipe	Blow smoke / Cloud blower
Cylindrical pipe	Blow smoke / Cloud blower
Offering stone	Ceremonial
Tube	Unknown

Seventy-two *Balls* were recovered from the site, 43 were recovered from each occupations provenienced assemblage. The *cylindrical-biconical pipe* and the *biconical pipe* were recovered within the Georgetown Pithouse 1 deposits.

To answer the research question; Are there technological differences between the Late Pithouse and Classic Mimbres occupations? A comparison of the 206 tools collected in floor fill, roof and wall fall fill, and trash fill deposits was attempted (see Table 56).

Thirty-four (16.5%) tools were recovered within the Late Pithouse occupation. The pueblo occupation yielded 91 (44.2%) artifacts of the comparison collection. Based

on the limited number of tools found within the Late Pithouse occupations, the sample size is inadequate to make a comparison of technological differences between the Late Pithouse and the Classic Mimbres occupations. A comparison was also made after removing the wall fall (10.2% (n=21) artifacts from the data set. The wall fall indicates recycling of tools, therefore, if it is removed from the comparison data set the pueblo occupations data changes to 34 percent (n=70). Although this narrows the margin between occupations, the Pueblo sample is more than 50 percent greater than the Pithouse sample, making the sample size too small to make substantial comparisons between tool technology changes over time. Regardless of the small data set, an examination of the tools recovered indicates that there was little to no change in tool types over time. What is more significant is the increase in the number of tools from the Late Pithouse to the Classic Mimbres occupations. For example, 13 *flat-to-concave manos* were recovered in all three Late Pithouse occupations. Within the Classic Mimbres occupation, 30 (minus wall fall) *flat-to-concave manos* were recovered. That is 43.3 percent greater than the earlier occupations. Furthermore, the Classic Mimbres pueblo occupants appear to have had a larger tool collection, *palettes*, *pebble mortars*, *abraders*, and a possible *spindle whorl* were recovered only from the pueblo occupation. However, there is not an increase in metates, which is expected with the increase in *manos*. There is a large increase in the pueblo occupation for netherstones, which may indicate a less formal metate type. However, only one is classified as flat-to-concave, the remaining netherstones are indeterminate. This brings about further questions, could the pueblo inhabitants have taken their large food grinding tools with them when they left and left behind their hand tools? This is highly unlikely; metates are generally large, cumbersome tools for an individual to carry off. What is more likely to have happened is

Table 37. Ground Stone Comparison

	Georgetown	San Francisco	Three Circle	Classic Mimbres Floor fill	Classic Mimbres Roof / Wall Fall	Classic Mimbres Trash fill
<i>Artifact Type</i>						
Handstone	2	2	5		4	5
Flat/Concave Mano	6	3	4 – 2 redesigned	7 – 2 redesigned	15	13
Flat Mano		1	1		1	2 – 1 redesigned
Mano	1	1		2	2	1
Pestle		1				
Polishing stone					1	
Abrader						1
Netherstone				1	7	8
Mortar			1	1	1	
Boulder Mortar	1 – reused					1
Bowl	1			1		1
Pebble Mortar						1
Metate fragment					1	1
Basin Metate				1		
Flat/Concave Metate				1	4	5
Trough Metate			1			
Palette				1		
Hoe		1				
Griddle	1			1		

that the occupants of Lake Roberts Vista site either broke up these tools upon abandoning the site, they processed their food away from the main communal area, or perhaps vandals located a number of the metates and carted them off the site. Therefore, the question remains, was there an increase in food processing within the site and if so, where is the evidence?

Thirty-nine artifacts were reused, recycled and/or redesigned (13.2%). Five recycled / redesigned tools came from in the Late Pithouse and pueblo fill deposits. One was recovered from the Georgetown phase, one from Three Circle phase, and three

from the Classic Mimbres period; two came from the wall fall. The remaining 13 reused, recycled and/or redesigned tools were recovered in disturbed fill. Therefore, the sample size for reused, recycled and/or redesigned tools was inadequate to make any conclusions. However, 11.2 percent ($n=23$) of the reused, recycled, and redesigned tools were recovered within the pueblo occupation fill. Therefore, it can be inferred that the Classic Mimbres pueblo community recycled their tools with a greater frequency than the earlier groups. It should also be noted that the Classic Mimbres period occupants practiced a more sedentary lifestyle. It is also possible that the earlier groups may have taken their hand tools with them during their seasonal rounds to use enroute, allowing for fewer tools remaining on the site.

In comparing this study to Diehl's and Hard's research on mano lengths and the advent of increased agricultural practices it is not seen that an increase in agriculture is a factor in the size and shape of the ground stone artifacts recovered at the Lake Roberts Vista site. The Lake Roberts Vista sample of artifacts are consistent throughout the occupations. The majority of the manos are flat-to-concave or flat manos; the size and shape are similar from the Georgetown component to the Classic Mimbres component. The difference between Lake Roberts Vista site and Diehl's and Hard's site comparisons are the increase in the number of food processing tools.

In review of Adams and O'Brien's experimental archaeology studies on ground stone recovered within the Southwest, it is clear that the ground stone recovered at Lake Roberts Vista site were pecked and ground, the majority of the manos were created with hand grips in the manner in which they were described by Adams (1989a). It has been suggested by Adams (1988, 1993a) that ground stone morphology may have something to do with the individual's comfort during use. This may be the case with the Lake Roberts Vista site manos and may explain why we don't see many technological

differences over time. The occupants may have discovered a tool that was versatile enough to be utilized in a multiple of tasks, redesigned when worn out, and large enough to complete its task in a timely manner, as well as, be portable. Thus, simply put, the occupants may have found a design that worked for them, and there was no reason to change.

Ethnographically, we know that Pueblo societies of the Southwest, Zuni and Hopi ground food with large flat manos on large flat slabs placed in bins to catch the meal for maximum exploitation of the tool. Although, flat manos were recovered within the Lake Roberts Vista site (five in provenienced context), they were not the predominant tool type.

Recommendation

Due to the heavy vandalism the sample size was too small to make any conclusive interpretations about the technological differences between the occupations. That is not to say that these data are not useful to future ground stone research. The questions asked within this thesis, though not fully answered, does not disqualify them for future research questions within the Mimbres region or the Southwest in general. The data compiled in this thesis provides a record, which can be used for future archaeological recovery efforts within the Sapillo Valley and in ground stone research in general.

Also, the Lake Roberts Vista site can be used to educate the public about the harm that vandalizing a site can do to the interpretation of past cultures. By outlining the Archaeological Resources Protection Act (ARPA) and the National Historic Preservation Act (NHPA) the Gila National Forest has an opportunity with the Lake Roberts Vista site to aid in public education.

Bibliography

Adams, Jenny L.

n.d. *The Los Pozos Ground Stone Assemblage*, Draft In authors possession.

1988 *Use-Wear Analyses on Manos and Hide-Processing Stones*. Journal of Field Archaeology Vol. 15, pp. 307-315

1989a *Experimental Replication of the Use of Ground Stone Tools*. The Kiva 54(3):261-271

1989b *Methods of Improving Ground Stone Analysis: Experiments in Mano Wear Patterns*. In *Experiments in Lithic Technology*, edited by D.S. Amick and R.P. Mauldin, Bar International Series 528, Oxford, England

1993a *Towards Understanding the Technological Development of Manos and Metates*. The Kiva Vol. 58, No. 3:331-343

1993b *Mechanisms of Wear on Ground Stone Surfaces*. Pacific Coast Archaeological Society Quarterly. Vol. 29, No. 4.

1994 *The Development of Prehistoric Grinding Technology in the Point of Pines Area, East-Central Arizona*. PhD. Dissertation on file with the University of Arizona, Tuscan

1995 *Life History as a Framework for the Analysis of Ground Stone Artifacts*. Paper Presented at the 60th Annual Meeting of the Society for American Archaeology, Minneapolis, May 1995

1996 *Manual for a Technological Approach to Ground Stone Analysis*. Center for Desert Archaeology, Tucson, Arizona

1999 *Refocusing the Role of Food-Grinding Tools as Correlates for Subsistence Strategies in the U.S. Southwest*. American Antiquity, 66(3):475-498

Anyon, Roger and Steve A. LeBlanc

1980 *The Architectural Evolution of the Mogollon-Mimbres Communal Structures*. The Kiva 45(3):255-277

1984 *The Galaz Ruin*. Maxwell Museum of Anthropology, Albuquerque, New Mexico

Barnett, Franklin

1973 *Dictionary of Prehistoric Indian Artifacts of the American Southwest*. Northland Publishing, Arizona

Bettison, Cynthia A., and Barbara J. Roth

1993 *1995 Season Proposed Archaeological Study of The Lake Roberts Vista Site*. M.S. on file with the Gila National Forest, New Mexico

Binford, L. R.

- 1980 *Willow Smoke and Dog's Tails: Hunter-gatherer Settlement Systems and Archaeological Site Formation*. American Antiquity 45(1):4-20

Brewington, Robbie L., Harry J. Shafer, and Dennis James

- 1994 *Neutron Activation Studies of Mimbres and El Paso Wares: Social Implications of Trace Element Analysis*. Paper presented at the 8th Mogollon Conference, October 21-23, El Paso, Texas

Diehl, Michael W.

- 1995 *The Intensity of Maize Processing and Production in Upland Mogollon Pithouse Villages A.D. 200-1000*. American Antiquity 61(1): 102-115
- 1997 *Preliminary Report on the Macrobotanical Remains from Lake Roberts Vista*. M.S. on file at New Mexico University Museum

Fewkes, J. Walter

- 1993 *The Mimbres Art and Archaeology*. Avanyu Publishing Inc., Albuquerque, New Mexico

Hard, Robert

- 1990 *Agricultural Dependence in the Mountain Mogollon*. In *Perspectives on Southwestern Prehistory*, edited by P.E. Minnis and C.L. Redman, Westview Press, Boulder

Haury, Emil W.

- 1936 *The Mogollon Culture of Southwestern New Mexico*. Medallion Papers, No. 20. Gila Pueblo, Globe.
- 1976 *The Hohokam: Desert Farmers and Craftsmen, Excavations at Snaketown, 1964-1965*. University of Arizona Press, Tucson.

Herrington, Selma LaVerne

- 1979 *Settlement Patterns and Water Control Systems of the Mimbres Classic Phase, Grant County, New Mexico*, University Microfilms 8009870, Ph.D. dissertation, The University of Texas, Austin

Kennard, Edward A.

- 1979 *Hopi Prehistory*. In the Handbook of North American Indians, Southwest Vol. 9, edited by W.C. Sturtevant and A. Ortiz, Smithsonian Institution, Washington

Lekson, Stephen H.

- 1992 *Archaeological Overview of Southwestern New Mexico*. Prepared for New Mexico State Historic Preservation Division, Human Systems Research, Inc., Las Cruces. In authors possession.
- 2002 *Salado Archaeology of the Upper Gila, New Mexico*. Anthropological Papers of the University of Arizona Number 67, University of Arizona Press, Tucson

Mauldin, Raymond

1991 *Agricultural Intensification in the Mogollon Highlands*. In *Mogollon V*, edited by P. H. Beckett, COS Publishing and Research, Las Cruces, New Mexico

1993 *The Relationship Between Ground Stone and Agricultural Intensification in Western New Mexico*. The Kiva Vol. 58, No. 3:317-330

Minnis, Paul E.

1985 *Social Adaptation to Food Stress: A Prehistoric Southwestern Example*. University of Chicago Press, Chicago and London

Morris, Donald H.

1990 *Changes in Groundstone following the Introduction of Maize into the American Southwest*. Journal of Anthropological Research pp.177-194

Nelson, Margaret C. and Heidi Lippmeier

1994 *Grinding-Tool Design as Conditioned by Land-Use Pattern*. American Antiquity 58(2):286-305

O'Brien, Patrick K.

1995 *An Experimental Study of Ground Stone Use-Wear*. MS on file at the Department of Anthropology, University of Arizona, Tucson

Pritchard-Parker, Mari A., and Dawn M. Reid

1993 *Metate Re-roughening: Results of a Hammerstone Replication Study*. Pacific Coast Archaeological Society Quarterly. Vol. 29, No. 4:51-60

Roth, Barbara J.

1997 *The Late Pithouse Period Occupation at the Lake Roberts Vista Site*. Paper presented at the 62nd Annual Meeting of the Society for American Archaeology, April 1997. Nashville, Tennessee

Schiffer, Michael B.

1983 *Toward the Identification of Formation Processes*. American Antiquity, 48(4):675-704

1988 *The Structure of Archaeological Theory*. American Antiquity, 53(3):461-485

1996 *Some Relationships between Behavioral and Evolutionary Archaeology*. American Antiquity, 61(4):643-662

Schlanger, Sarah H.

1991 *On Manos, Metates, and the History of Site Occupations*. American Antiquity 56(3): 460-474

Schneider, Joan S.

1997 *Analysis of Ground Stone Artifacts*. Chapter 5 in *Archaeological Laboratory Methods, An Introduction*. Editors Sutton, Mark Q., and Brooke S. Arkush. Kendall/Hunt Publishing Company, Dubuque, Iowa

Seibert, Sara

- 1987 *An Analysis of the Hoes. The Second Season's Survey of the Homol'ovi Ruins State Park, Northeastern Arizona*, prepared by R. C. Lange, M. T. Stark, L. Fratt, L. C. Young, and S. Seibert, Appendix H. Ms. On file, Arizona State Museum, University of Arizona, Tuscan

Shafer, Harry J. and Anna J. Taylor

- 1986 *Microstylistic Changes in Mimbres Black-on-White Pottery: Examples from the NAN Ruin, Grant County, New Mexico.* Journal of Field Archaeology

Stokes, Robert J., and Barbara J. Roth

- 1998 *Mobility, Sedentism, and Settlement Patterns in Transition: The Late Pithouse Period in the Sapillo Valley, New Mexico.* Journal of Field Archaeology Vol. 26, No. 4

Woodbury, Richard

- 1954 *Prehistoric Stone Implements of Northeastern Arizona.* Papers of the Peabody Museum of American Archaeology and Ethnology No. 34. Harvard University, Cambridge.

- 1979 *Zuni Prehistory.* In the Handbook of North American Indians, Southwest Vol. 9, edited by W.C. Sturtevant and A. Ortiz, Smithsonian Institution, Washington

Wright, Mona K.

- 1992 *Simulated Use of Experimental Maize Grinding Tools from Southwestern Colorado.* The Kiva Vol. 58, No. 3:345-355

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APPENDICES

Appendix A: General Artifact Code

FEATURE/SAMPLE/LAB NUMBER

UNIT

LEVEL

COUNT

ARTIFACT TYPE

HANDSTONES

- | | | |
|--------------------|-------------------|------------------|
| 1. Handstone | 2. Mano | 3. Pestle |
| 4. Polishing Stone | 5. Abrader | 6. Tabular Tool |
| 7. Hammerstone | 8. Pottery Anvil | 9. Pecking Stone |
| 10. Plane | 11. Pulping Stone | 12. Reamer |
| 13. Unidentified | | |

NEATHERSTONES

- | | | |
|-----------------|-------------------|--------------|
| 14. Mortar | 15. Palette | 16. Lapstone |
| 17. Anvil | 18. Grinding Slab | 19. Metate |
| 20. Netherstone | 21. Unidentified | |

COMPOSITE TOOLS

- | | | |
|----------|-----------|---------|
| 22. Hoe | 23. Whorl | 24. Axe |
| 25. Maul | | |

CONTAINERS

- | | | |
|----------|------------|------------|
| 26. Tray | 27. Censer | 28. Vessel |
| 29. Bowl | | |

SHAPED ITEMS

- | | | |
|---------------------|---------------------|-------------------|
| 30. Natural Shape | 31. Ornament | 32. Figurine |
| 33. Shaped | 34. Grooved Stone | 35. Geometric |
| 36. Slab | 37. Pikistone | 38. Awl/Pin |
| 39. Loomblock | 40. Pipe | 41. Ball |
| 42. Medicine Stone | 43. Plummets | 44. Disk |
| 45. Pot Lid | 46. Fergolith/Crush | 47. Roasting Rock |
| 48. Tube | 49. Griddle | 50. Pigment |
| 51. Offering | 52. Architectural | 53. Unidentified |
| 54. Not An Artifact | | |

Appendix A: General Artifact Code (Continued)**ABRADER**

- | | | |
|-----------------------|-----------------------|--------------------|
| 55. Flat | 56. Single V | 57. Single U |
| 58. Multiple V | 59. Multiple U | 60. Both 1V & 1U |
| 61. Flat & Single V | 62. Flat & Single U | 63. Flat & Mult. V |
| 64. Flat & Multiple U | 65. Flat & Both V & U | |

ARCHITECTURAL

- | | | |
|---------------|------------------|--------------------|
| 66. Lintel | 67. Threshold | 68. Building Stone |
| 69. Ring | 70. Hearth Stone | 71. Splash Stone |
| 72. Bin Stone | | |

AWL

- | | | |
|----------------------|------------------|----------|
| 73. Needle (No Head) | 74. Pin (Headed) | 75. Flat |
| 76. Indeterminate | | |

AXE/MAUL

- | | | |
|--------------------------|-------------------|-----------------|
| 77. Blank | 78. Notched | 79. Full Groove |
| 80. Incomplete Groove | 81. 5/8 Groove | 82. 3/4 Groove |
| 83. 3/4 And Wedge Groove | 84. Spiral Groove | 85. Regrooved |
| 86. 3/4 Double Bit | | |

BALL

- | | | |
|---------------|-----------------|------------------|
| 87. Irregular | 88. 1 Flat Side | 89. 2 Flat Sides |
| 90. Spherical | | |

BOWL

- | | | |
|--------------------------|--------------------------|---------------------|
| 91. Plain-Flat Bottom | 92. Plain-Round Bottom | 93. Tray-Plain |
| 94. Effigy-Round Bottom | 95. Shaped-Flat Bottom | 96. Tray-Bifurcate |
| 97. Incised-Flat Bottom | 98. Incised-Round Bottom | 99. Effigy-Flat Btm |
| 100. Shaped-Round Bottom | | |

DISK/WHORL

- | | | |
|-------------------------------|-------------------------------|----------------------------------|
| 101. Flat Disk (Unperforated) | 102. Flat Disk Biconical hole | 103. Concave Disk |
| 104. Flat Disk (Conical Hole) | 105. Flat Donut (Perforated) | 106. Concave Donut |
| 107. Donut (Unperforated) | 108. Biconcave Donut | 109. Ring |
| 110. Donut (Biconical Hole) | 111. Donut (Conical Hole) | 112. Basin Donut
(Incomplete) |

Appendix A: General Artifact Code (Continued)**FIGURINE**

- | | | |
|--------------|------------------|-----------------|
| 113. Natural | 114. Human | 115. Human Part |
| 116. Animal | 117. Animal Part | |

HANDSTONE/MANO

- | | | |
|----------------|----------------------|--------------------|
| 118. Blank | 119. Flat | 120. Flat/Concave |
| 121. Basin | 122. Hide Processing | 123. Pottery Anvil |
| 124. Polishing | 125. Trough | 126. Multiple |
| 127. Other | 128. Indeterminate | |

MORTAR

- | | | |
|--------------------------------------|----------------------------------|----------------------------------|
| 129. Blank | 130. Boulder | 131. Bowl |
| 132. Disk | 133. Pebble | 134. Tray-Plain
(Rectangular) |
| 135. Tray-Bifurcate
(Rectangular) | 136. Shaped
(Anthropomorphic) | 137. Shaped
(Zoomorphic) |

NETHERSTONE/METATE/GRINDING SLAB/LAPSTONE

- | | | |
|-----------------------|---------------------------|--------------------|
| 138. Blank | 139. Flat | 140. Flat/Concave |
| 141. Flat/Concave End | 142. Flat/Concave Edge | 143. Basin |
| 144. Basin-Open | 145. Basin-3/4 | 146. Trough |
| 147. Trough-3/4 | 148. Trough-Indeterminate | 149. Trough-Closed |
| 150. Indeterminate | | |

PALETTE

- | | | |
|----------------------|-----------------|-----------------|
| 151. Blank | 152. Bordered | 153. Unbordered |
| 154. Anthropomorphic | 155. Zoomorphic | |

PERSONAL ORNAMENTS

- | | | |
|-----------------------------|------------------------|--------------------|
| 156. Blank | 157. Button | 158. Geometric |
| 159. Necklace | 160. Plug | 161. Ring-C |
| 162. Ring-finger | 163. Toggle | 164. Whizzer |
| 165. Bracelet-C | 166. Bracelet-ring | 167. Figurine-2-D |
| 168. Figurine-3 Dimensional | 169. Pendant-blank | 170. Pendant-inlay |
| 171. Zoomorphic inlay | 172. Bead-barrel | 173. Bead blank |
| 174. Bead-bilobe/Teardrop | 175. Bead-convex | 176. Bead disk |
| 177. Bead-irregular | 178. Bead-Plano-Convex | 179. Bead-Tube |
| 180. Bead-Zoomorphic | 181. Bead-Biconvex | 182. Bead-Spool |
| 183. Indeterminate | | |

Appendix A: General Artifact Code (Continued)**PESTLE**

- | | | |
|------------------|--------------------|--------------|
| 184. Blank | 185. Natural | 186. Shaped |
| 187. Cylindrical | 188. Pebble | 189. Block |
| 190. Cobble | 191. Triangular | 192. Conical |
| 193. Parabolic | 194. Indeterminate | |

PIPE/TUBE

- | | | |
|-----------------------------|---------------------------------|-------------------|
| 195. Cylindrical Hole | 196. Cylindrical biconical hole | 197. Conical Hole |
| 198. Conical-Biconical Hole | 199. Conical-cylindrical hole | 200. Socketed |
| 201. Biconical Hole | 202. Elbow | |

PLUMMET/MEDICINE STONE

- | | | |
|---------------------------|-------------------------|---------------------|
| 203. Conical | 204. Conical & Groove | 205. Conical & Head |
| 206. Parabolic | 207. Parabolic & Groove | 208. Cylindrical |
| 209. Cylindrical & Groove | 210. Cylindrical & Head | 211. Bilobed |
| 212. Geometric | | |

POLISHING STONE

- | | | |
|---------------------|------------------|-------------|
| 213. Faceted | 214. Floor | 215. Pebble |
| 216. Pebble-Surface | 217. Pebble-Edge | 218. Disk |
| 219. Indeterminate | | |

POTTERY ANVIL

- | | | |
|------------|--------------|--------------|
| 220. Plain | 221. Grooved | 222. Handled |
|------------|--------------|--------------|

TABULAR TOOL

- | | | |
|-------------------------|--------------------------|-----------------------|
| 223. 1 Concave Edge | 224. > 1 Concave Edge | 225. 1 Irregular Edge |
| 226. > 1 Irregular Edge | 227. 1 Convex Edge | 228. >1 Convex Edge |
| 229. 1 Straight Edge | 230. > 1 Straight Edge | 231. Edge & Surface |
| 232. Multiple Edges | 233. Multiple Surfaces | 234. Hafted |
| 235. Notched | 236. Shaped But Not Used | 237. Tool Fragment |
| 238. Unused Material | | |

ARTIFACT CONDITION

- | | | |
|------------------------|------------------------------------|--------|
| 1. Whole | 2. > ½ | 3. < ½ |
| 4. Reconstructed Whole | 5. Conjoined Fragments (Not Whole) | |
| 6. Reused Fragments | | |
| 7. Indeterminate | | |

Appendix A: General Artifact Code (Continued)**SHAPE**

- | | | |
|---------------|-------------------|-----------------|
| 1. Bilobe | 2. Donut | 3. Round |
| 4. Broken | 5. Irregular | 6. Semicircular |
| 7. Conical | 8. Morphic | 9. Slab |
| 10. Crescent | 11. Ovoid | 12. Cylindrical |
| 13. Spherical | 14. Pebble/Cobble | 15. Square |
| 16. Diamond | 17. Rectangular | 18. Triangular |
| 19. Disk | 20. Ring | |

TEXTURE

- | | | |
|----------------------------|-------------------|-------------------|
| 1. Fine | 2. Medium | 3. Coarse |
| 4. No Texture | 5. Fine & Medium | 6. Fine & Coarse |
| 7. Medium & Coarse | 8. Small Vesicles | 9. Large Vesicles |
| 10. Large & Small Vesicles | 11. Conglomerate | |

BURNED

- | | | |
|----------------------|----------------------|-----------------------|
| 1. No | 2. From Use | 3. Before Use |
| 4. After Use Total | 5. After Use Partial | 6. Before & After Use |
| 7. Before Second Use | 8. Heat Cracked | 9. Indeterminate |

MANUFACTURING

- | | | |
|---------------------------------|-------------------------|---------------------|
| 1. Natural | 2. Pecked | 3. Ground |
| 4. Carved | 5. Chipped | 6. Polished |
| 7. Ground & Incised | 8. Ground Perimeter | 9. Ground Edge Only |
| 10. Ground For Stability | 11. Ground Surface Only | 12. Pecked & Grnd |
| 13. Pecked For Stability | 14. Pecked Surface Only | 15. Pecked To Hold |
| 16. Pecked & Ground For Hafting | 17. Pecked Perimeter | 18. Pecked & Polish |
| 19. Pecked & Ground To Hold | 20. Chipped For Hafting | 21. Chipped & Grnd |
| 22. Indeterminate | | |

USE

- | | | |
|-------------|-----------------------------|------------------|
| 1. Single | 2. Multiple Use | 3. Reused |
| 4. Recycled | 5. Redesigned | 6. Offering |
| 7. Unused | 8. Destroyed (Purposefully) | 9. Indeterminate |

SECONDARY USE

See Artifact Type

Appendix A: General Artifact Code (Continued)**NUMBER OF USED SURFACES (Num Surf)**

- | | | |
|------------|-------------------|--------------------|
| 1. 1 | 2. 2 Opposite | 3. 2 Adjacent |
| 4. 3 | 5. 4 | 6. Multi Surface |
| 7. 1 Edge | 8. Multiple Edges | 9. Corner |
| 10. Corner | 11. Indeterminate | 12. Not Applicable |

PROCESSING TYPE

- | | | |
|------------------|-----------------------|--------------|
| 1. Food | 2. Non-Food | 3. Multiple |
| 4. Procurement | 5. Not For Processing | 6. Container |
| 7. Indeterminate | | |

LENGTH**WIDTH****THICKNESS (Thick)****SURFACE POSITION (Surf Pos)**

- | | | |
|---------------------------|---------------------|-----------------|
| 1. Used Surface Down | 2. Used Surface Up | 3. Not Recorded |
| 4. Not Applicable | 5. Broken Side Down | 6. On Edge |
| 7. Used Surface Up & Down | | |

SEQUENCE

- | | | |
|-------------------|------------------|---------|
| 1. Sequential | 2. Concomitant | 3. Both |
| 4. Not Applicable | 5. Indeterminate | |

COMMENTS (Cmts)

- | | |
|--------|-------|
| 1. Yes | |
| | 2. No |

Appendix B: Lake Roberts Vista Database 1992

Date	Feature Number	Unit	Level	Count	Artifact Type	Sub-Type	Cond.	Shape	Texture	Burn	Manuf.	Use	Second	Surface Number	Proc. Type	Length	Width	Thick	Seq.
1992	88	1	1	1	20	150	3	4	1	1	22	1	239	1	1				4
1992	857	1	2	1	41	90	1	3	1	1	2	1	240	1	5	4.8	4.2	3.9	4
1992	857.1	1	2	1	41	90	1	3	1	1	1	1	240	1	5	3.9	3.15	3.05	4
1992	883	1	2	1	2	120	2	17	1	1	12	5	227	2	1		6.6	3.6	1
1992	568	1	3	1	41	90	1	13	1	1	12	1	240	12	5	2.9	2.6	2.6	4
1992	570	1	3	1		156	1	5	4	1	6	10	240	12	5	1.6	1.5	1.1	4
1992	911	1	3	1	1	119	1	3	1	1	2	1	240	1	2	6.0	5.8	4.4	4
1992	912	1	3	1	2	120	3	4	1	1	12	1	240	1	1		11.45	5.45	4
1992	913	1	3	1	1	118	1	15	4	1	1	1	240	1	2	4.8	4.3	1.7	4
1992	919.1	1	3	1	13		3	4	1	1	1	10	240	12	8			2.45	4
1992	922	1	3	1	41	90	1	3	1	1	2	1	240	1	5	5.0	4.5	4.6	4
1992	923	1	3	1	33		3	4	1	1	7		239	11				2.5	4
1992	L21	1	4	1	6	232	7	4	4	1	5	9	239	2	7		65.0	11.0	4
1992	740	1	6	1	14	129	3	4	4	1	14	2	1	2	2			3.4	2
1992	741	1	6	1	2	120	1	17	1	7	12	4	20	2	3	172.5	97.0	27.6	1
1992	743	1	6	1	1	128	3	4	1	5	2	9	239	1	1	10.1		5.8	5
1992	802	1	7	1	41	90	1	13	1	1	1	1	240	12	5	23	21.1	21	4
1992	802.1	1	7	2	41	87	1	13	1	5	3	1	240	12	5	44.8	42.2	38.5	4
1992	803	1	7	1	30	115	1	8	1	1	1	7	240	12	5	42.6	22.2	19.1	4
1992	886	1	7	1	2	120	6	4	7	1	17	3	240	2	1	96.0	163	73.4	2
1992	888	1	7	1	13		1	18	1	1	1	1	240	1	7	54.7	48.6	45.4	4
1992	890	1	7	1	2	119	2	17	10	1	12	1	240	1	1		115.2	68.9	4
1992	993	1	8	1	53		1	5	1	1	1	9	240	11	7	26	22.5	7.6	4
1992	536	3	3	1	1	128	3	4	1	1	2	1	240	1	11			2.4	4
1992	588	3	3	1	16	138	1	17	1	1	1	1	240	1	2	10.5	7.8	3.9	4
1992	589	3	3	1	1	120	3	4	1	1	12	1	240	1	1		8.2	3.0	4
1992	604	3	3	1	2	120	3	17	1	1	12	2	3	2	1		9.25	3.4	2
1992	517	4	2	1	2	120	1	17	8	1	2	1	240	1	1	17.8	8.9	3.8	4
1992	518	4	2	1	19	120	3	4	9	1	2	1	240	1	1			15.4	4
1992	538	4	2	1	2	120	2	17	6	1	12	1	240	1	1		9.1	4.7	4
1992	539	4	2	1	19	150	3	4	5	1	1	1	240	1	1			8.2	4
1992	540	4	2	1	1	118	1	17	4	1	1	1	240	1	7	12.5	7.0	3.7	4
1992	595	4	2	1	21	150	6	4	4	1	2	9	239	2	7			1.9	4
1992	L11.1	4	2	1	13		2	4	1	1	22	9	239	11	7				4

Appendix B: Lake Roberts Vista Database 1992

1992	544	5	1	1	32	116	1	8	6	1	1	9	240	12	5	6.3	5.1	5.0	4
1992	562	5	2	1	53	127	1	12	2	1	1	9	239	11	7	35.0	5.8	3.9	4
1992	593	5	2	1	33		1	15	2	5	4	9	240	1	7	9.9	8.2	5.3	4
1992	621	5	2	1	48		1	12	1										
1992	701	7	2	1	21	150	7	4	1	1	1	1	240	1	7		14.8	6.4	4
1992	708	7	2	1	2	120	1	11	2	1	1	1	240	1	1	10.7	8.0	4.9	4
1992	710	7	2	1	2	120	1	11	8	1	12	3	1	1	3	15.38	10.9	4.1	2
1992	712	7	2	1	16	138	1	15	5	1	1	1	240	1	2	22.9	18.5	8.9	4
1992	714	7	2	1	2	120	1	17	2	1	12	1	240	1	1		6.8	4.6	4
1992	715	7	2	1	19	140	3	4	8	1	2	1	240	1	1			5.5	4
1992	751	7	3	1	2	120	3	17	2	1	17	1	240	2	1		12.5	3	2
1992	752	7	3	1	2	120	2	17	8	1	12	1	240	1	1		9.5	3.7	4
1992	756	7	3	1	2	120	2	1	9	1	12	1	240	1	1		10.3	3.1	4
1992	842	7	5	1	2	128	3	4	2	1	2	1	240	2	1			6.2	4
1992	672	8	1	1	2	120	1	17	5	1	12	1	240	1	1	15.2	10	4	4
1992	686	8	2	1	2	120	1	17	8	1	12	1	240	1	1	20.3	11	6.6	4
1992	LFN204	8	2	1	41	90	1	13	1	1	1	1	239	12	5	3.4	3.3	3.3	4
1992	LFN204.1	8	2	2	41	90	1	13	1	1	1	9	240	12	5	2.1	2	1.8	
1992	772	8	5	1	41	90	1	11	1	1	1	1	239	12	5	9.6	7.6	7.4	4
1992	772.1	8	5	2	41	90	1	13	1	1	1	1	239	12	5	5.2	4.8	4.6	4
1992	772.2	8	5	3	41	90	1	13	1	1	17	9	239	11	5	3.1	3.1	2.8	4
1992	778	8	5	1	2	120	3	4	5	1	12	1	240	1	1		13.4	5	4
1992	784	8	5	1	1	185	1	11	1	1	1	9	240	1	7	17.7	10.7	10.6	4
1992	824	8	5	1	11	128	3	4	5	8	12	3	241	2	3			4.4	2
1992	36	8	6	1	2	120	3	17	1	1	12	1	240	1	1		13.3	3.8	4
1992	823	8	6	1	2	119	2	6	1	1	14	1	240	1	1	10.1		7.1	4
1992	829	8	6	1	2	120	2	17	1	4	12	1	240	1	1		10	7.4	4
1992	835	8	6	1	14	130	3	4	9	1	10	2	19	3	1			8.5	1
1992	837	8	6	1	2	120	1	17	1	1	12	1	240	1	1	22.3	9.3	5.8	4
1992	838	8	6	1	14	131	2	3	1	1	12	1	240	1	2	9.9		7.2	4
1992	830	8	6++	1	2	120	3	4	5	1	12	1	240	1	1		10.9	7.3	4
1992	37	8	7	1	1	118	1	17	5	1	15	7	240	12	8	26	12.3	6.7	4
1992	968	8	9	1	2	128	3	4	9	1	12	1	240	1	1			5.6	4
1992	820	9	4	1	41	90	1	13	1	1	1	9	240	12	8	3.0	2.7	2.3	4
1992	820.1	9	4	2	30	90	1	14	4	1	1	9	240	12	8	3.3	3.2	2.0	4
1992	845	9	5	1	30	31	1	11	1	1	1	10	240	12	5	4.4	3.1	3.0	4

Appendix B: Lake Roberts Vista Database 1992

1992	846	9	5	1	2	120	3	4	1	1	12	1	240	1	1		8.7	2.0	4
1992	LFN31	9	5	1	1	128	1	17	4	1	1	1	240	1	7	6.1	4.3	2.2	4
1992	882	9	6	1	2	120	1	3	1	1	15	1	240	2	1	10.0	9.5	4.6	4
1992	941	9	7	1	1	128	3	4	1	1	22	9	239	11	7		7.4		4
1992	949	9	7	1	14	131	3	4	1	1	12	9	240	1	7				4
1992	953	9	7	1	2	120	1	11	1	5	15	1	240	2	1	9.5	8.2	5.7	4
1992	962	9	7	1	14	130	5	4	9	5	10	5	19	3	1			13.7	1
1992	962.1	9	7	1	19	140	3	4	10	5	2	1	240	1	1			11.7	4
1992	963	9	7	1	14	130	5	4	9	5	10	5	19	3	1				1
1992	77	E	S	1	1	184	1	11	1	1	1	1	240	1	7		5.7	3.5	
1992	30	F	S	1	13	128	3	4	1	1	3	9	239	11	7				4
1992	31	F	S	1	1	128	3	4	8	1	12	1	240	1	1			6.2	
1992	32	F	S	1	2	120	3	4	1	1	12	1	240	1	1			2.9	
1992	51	G	S	1	1	128	3	4	8	4	22	9	239	11	7			3.4	
1992	39	H	S	1	241		5	17	1	2	1	1	240	12	8		5.9	3.2	4
1992	79	I	S	1	1	128	2	17	1	1	1	1	240	1	7		5.2	1.8	4
1992	101	K	S	1	1	128	3	4	8	1	2	1	240	1	1			4.5	4
1992	104	K	S	1	19	143	3	4	8	1	2	1	240	1	1			13.7	4

Appendix C: Lake Roberts Vista Database 1994

Date	Feature Number	Unit	Level	Count	Artifact Type	Sub-Type	Cond.	Shape	Texture	Burn	Manuf.	Use	Second	Surface Number	Proc. Type	Length	Width	Thick	Seq.
1994	742	1	6	1	1		3	11	1	4	22	9	239	2	7		59.5	28.1	2
1994	2010	4 & 7	S	1	20	150	3	4	8	1	10	9	239	1	7			4.1	4
1994	2010.1	4 & 7	S	3	1	128	1	17	8	1	1	1	240	1	1	19.0	9.5	6.2	4
1994	2012	4 & 7	S	1	5	58	1	14	1	1	1	1	240	1	2	5.3	4.1	2.7	4
1994	2532	11	1	1	13	128	3	4	8	1	22	9	239	2	7			4.2	5
1994	2539	11	1	1	16	141	1	17	1	1	1	1	240	1	7	25.5	18.4	8.9	4
1994	2555	11	2	1	2	120	2	11	8	1	15	1	240	1	1		13.8	5.2	4
1994	2559	11	2	1	41	87	1	14	1	1	1	1	240	12	5	2.8	2.5	2.4	4
1994	2580	11	2	1	33	102	3	2	1	1	7	1	239	12	2		4.8	1.4	4
1994	2581	11	3	1	2	120	7	4	1	1	19	1	240	1	1		7.3	4.1	4
1994	2598	11	3	1	2	119	1	17	1	1	15	5	22	3	32	16.2	9.8	2.7	1
1994	2096	11	S	1	1	128	7	4	10	5	22	9	240	2	7			4.5	5
1994	2645	12	1	1	2	128	3	4	1	4	12	1	240	1	1		7.1	2.1	4
1994	3353.1	12	F4A	1	13		1	17	3	2	1	1	240	12	5	22.7	13.8	7.0	4
1994	3134	12	RF	1	16	138	1	5	2	1	1	1	240	1	2	16.9	13.3	7.7	4
1994	66	D	S	1	21	150	3	4	10	1	22	9	239	11	7	9.8	8.4	3.4	4
1994	2128	E	S	1	2	120	3	11	2	1	12	1	240	1	1	9.2	8.8	2.75	4
1994	24	E	S	1	2	120	3	4	2	4	12	1	240	1	1	11.9	5.9	3.3	4
1994	2025	L	S	1	20	150	3	4	10	8	22	1	240	1	7			5.8	4
1994	2029	L	S	1	1	128	3	4	10	1	22	9	239	1	7				4
1994	2037	L	S	1	20	150	3	4	1	8	12	1	240	1	1				4
1994	2042	L	S	1	241		7	5	2	2	1	1	240	12	7			8.8	4
1994	2044	L	S	1	241		1	5	1	2	1	1	240	12	7	8.2	4.1	5.1	4
1994	2046	L	S	1	20	150	3	4	9	4	22	1	240	1	7				4
1994	2048	L	S	1	1	128	3	4	3	4	2	1	240	1	1			4.2	4
1994	2054	L	S	1	19	140	3	4	10	4	22	1	240	1	1			8	4
1994	2059	M	S	1	2	120	2	17	2	1	2	1	240	1	1		9.5	3.8	4
1994	2088	N	S	1	1	128	3	4	8	1	22	9	239	11	7				4

Appendix D: Lake Roberts Vista Database 1995

Date	Feature Number	Unit	Level	Count	Artifact Type	Sub-Type	Cond.	Shape	Texture	Burn	Manuf.	Use	Second	Surface Number	Proc. Type	Length	Width	Thick	Seq.
1995	3104	1	S	1	2	120	1	17	8	1	12	2	3	4	1	18.2	9.8	3.4	4
1995	3028	12	4	1	19	143	2	17	1	1	10	1	240	1	1		31.2	11.5	4
1995	3048	12	5	1	2	120	2	17	8	1	12	1	240	1	1		9.8	4.1	4
1995	3153	12	8	1	41	90	1	13	1	1	3	1	240	12	5	2.4	2.4	2.4	4
1995	3312	12	7	1	41	89	1	13	1	1	3	1	240	12	5	3.3	3.1	2.8	4
1995	3008	15	1	3	49	241	4	3	1	2	Flaked	1	240	1	1	29.7	28.6	1.8	4
1995	3010	15	1	1	15	151	1	5	1	1	1	1	240	1	2	12.0	9.8	4.7	4
1995	3013	15	1	1	41	90	1	13	1	1	1	1	240	12	5	10.6	10.6	10.4	4
1995	3014	15	1	1	41	90	1	13	1	1	1	1	240	12	5	10.6	10.6	10.6	4
1995	3016	15	1	1	13	118	1	17	1	1	1	9	239	11	7	24.4	11.0	7.5	4
1995	3000	16	1	1	21	150	3	4	10	1	22	9	239	11	7			10.3	4
1995	3037	16	1	1	53														
1995	L677	16	1	1	41	90	3	13	1	1	1	1	240	12	5	4.5	4.2		4
1995	3075	16	2	1	25	82	2	11	2	1	16	1	240	2	2	11.9	8.5	8.2	2
1995	L1341	16	2	1	4	216	1	14	1	1	1	1	240	2	2	10.2	5.6	2.7	4
1995	3126	17	1	1	2	120	3	17	8	1	15	1	240	1	1		7.1	4.1	4
1995	3130	17	1	1	41	90	1	13	1	1	1	1	240	12	5	2.7	2.7	2.6	4
1995	3130.1	17	1	1	1	1	1	1	1	1	1	1	1	1	1	3.3	3.1	3.0	1
1995	3276	17	3	1	2	120	5	17	2	8	15	3	47	1	3		11.1	5.1	2
1995	L604	17	3	1	41	90	1	13	1	1	1	1	240	12	5	1.1	1.0	1.0	4
1995	3086	18	1	1	16	140	1	5	2	1	1	1	240	1	2	26.0	15.8	5.7	4
1995	3090	18	1	1	4	216	1	6	4	1	1	1	240	1	2	2.4	2.3	1.2	4
1995	3389	18	1	1	19	150	3	4	9	1	10	1	240	1	1			15.5	4
1995	3230	18B	1	1	2	120	1	17	8	1	12	1	240	1	1	19.5	8.5	5.0	4
1995	3231	18B	1	1	2	120	2	17	1	1	12	1	240	1	1	21.0	9.4	5.2	4
1995	3210	19	2	1	1	119	2	4	1	1	1	1	240	1	2		4.9	2.8	4
1995	3280	19	3	1	49	241	1	5	2	8	3	1	240	1	1	33.6	32.6	3.6	4
1995	3281	19	3	1	2	128	3	4	1	4	12	1	240	1	1			4.3	4
1995	3281.1	19	3	1	1	128	3	4	5	1	15	1	240	1	7			4.4	4
1995	3284	19	3	1	41	88	1	13	1	1	3	1	240	12	5	3.5	3.4	3.2	4
1995	3285	19	3	1	30		1	3	4	1	1	10	240	12	8	2.8	2.6	1.9	4
1995	3286	19	4	1	40	201	1	7	1	4	7	1	240	12	5	5.0	3.3	3.2	4
1995	3287	19	4	1	2	120	1	11	2	5	12	1	240	1	1	16.3	8.8	5.5	4
1995	3377	19	4	1	2	120	7	4	2	1	12	1	240	1	1		13.0	4.4	4

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1995	3207	19	CF	1	33		1	14	1	1	4	9	240	12	5	5.7	3.9	2.4	4
1995	3183	20	1	2	16	130	4	17	1	1	1	1	240	1	2	37.4	12.5	8.9	4
1995	3189	20	1	1	19	140	3	4	9	1	10	1	240	1	1			12.6	4
1995	3206	20	2	1	41	90	1	13	1	1	3	1	240	12	5	4.1	4.0	3.8	4
1995	3217	20	3	1	2	120	2	17	1	5	17	1	240	2	1		11.7	3.4	4
1995	3409	20	3	1	41	90	2	13	1	1	1	1	240	12	5	3.8	3.4		4
1995	3413	20	3	1	2	120	1	11	2	1	15	1	240	1	1	15.9	9.5	4.9	4
1995	3413.1	20	3	1	2	120	1	2	8	1	12	1	240	1	1	17.2	14.6	4.6	4
1995	3808	20	3	1	53		1	14	1	1	2	9	239	5	7	3.6	3.4	2.5	4
1995	3576	20	F4B	4	2	119	5	17	1	1	14	1	240	1	1		14.4	5.6	4
1995	3581	20	F4C	1	7	185	1	11	1	1	1	1	240	1	2	11.1	8.9	6.5	4
1995	3220	21	1	1	2	120	1	13	2	1	12	1	240	1	1	17.4	13.2	3.9	4
1995	3229	21	1	1	20	138	3	4	9	1	1	1	240	1	7		26.9	6.2	4
1995	3450	21	1	1	51														
1995	3465	21	1	1	41	90	1	13	1	1	1	9	240	12	8	2.1	2.1	1.5	4
1995	3548	21	2	1	2	120	3	4	8	1	12	1	240	1	1			4.4	4
1995	SN1796	21	2	1	2	120	1	17	8	5	12	1	240	1	1	18.3	9.9	3.6	4
1995	3219	21	S	1	41	87	1	13	1	1	1	1	240	12	8	1.9	1.6	1.4	4
1995	3223	21	S	1	2	120	1	17	2	1	12	2	3	3	1	15.1	10.0	3.4	2
1995	3551	21A	1	1	2	120	1	17	8	1	12	1	240	1	1	18.2	11.1	4.0	4
1995	3443	21B	1	1	41	90	1	13	1	1	3	1	240	12	8	3.2	3.1	3.0	4
1995	3452	21B	1	1	2	120	1	17	8	1	12	2	3	2	1	18.4	9.0	2.9	2
1995	3456	21B	1	1	2	128	3	4	2	1	15	4	1	1	1	8.4	11.7	4.5	1
1995	3469	21B	1	1	41	90	1	113	4	1	1	1	240	12	8	2.2	2.0	1.9	4
1995	3440	21B	FF	1	2	128	3	4	8	1	3	1	239	1	1		11.6	4.0	4
1995	3436	21B	FL	1	2	120	1	10	1	1	12	4	227	2	1	14.0	7.5	2.2	1
1995	3437	21B	Wall	1	2	119	1	3	3	1	1	1	240	1	1	8.7	6.5	5.0	4
1995	3426	22	1	1	2	120	3	17	8	1	12	1	240	1	1		8.1	4.5	4
1995	3433	22	1	1		127	1	13	5	1	22	9	239	11	7	5.3	5.0	4.3	4
1995	3435	22	1	1	13		1	12	2	1	3	9	239	11	7	11.3	5.8	5.2	4
1995	L657	22	1	1	20	138	1	17	2	1	1	1	240	1	7	3.4	14.4	6.5	4
1995	3194	23	1	1	2	120	3	4	2	1	12	1	240	1	1			3.1	4
1995	3196	23	1	1	53	41	2	13	2	1	1	9	239	12	5	7		6.6	4
1995	3198	23	1	1	41		1	13	1	1	1	9	239	12	5	3.3	3.2	3.1	4
1995	3198.1	23	1	1	41		1	13	2	1	1	9	239	12	5	3.4	3.4	3.1	4
1995	3251	23	2	1	1	128	2	4	2	1	1	1	240	1	7	7.2	5.4	2.2	4

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1995	3251.2/5	23	2	2	2	128	5	4	6	4	2	1	240	1	1			4.9	4
1995	3251.6	23	2	1	2	120	3	17	9	1	12	1	240	1	1		10.4	4.3	2
1995	3254.1	23	2	1	1	124	1	15	4	1	1	1	240	2	3	10.6	8.5	2.8	2
1995	3255	23	2	1	41		1	13	2	1	1	9	239	12	5	2.5	2.3	2.1	4
1995	S1659	23	2	1	2	120	2	17	10	4	12	1	240	1	1		11.7	3.9	4
1995	3340	23	3	1	41		1	11	2	1	1	9	239	12	5	3.2	2.5	2.3	4
1995	3539	24	1	1	41	90	1	13	1	1	1	1	240	12	8	10.3	10.2	10.1	4
1995	L641	24	1	1	2	119	2	3	8	4	15	1	240	1	1		14.4	4.7	4
1995	LFN685	24	1	1	20	150	3	4	2	1	12	1	240	1	7			13.4	4
1995	3592	24	2	1	2	119	6	12	1	1	2	4	227	2	3	14.4	7.8	2.2	4
1995	3594	24	2	1	2	120	2	11	8	1	12	1	240	1	1		6.6	3.0	4
1995	3597	24	2	1	2	120	1	11	1	1	12	1	240	1	1	14.5	6.8	2.5	2
1995	3637	24	2	1	19	140	3	4	10	5	10	1	240	1	1			9.1	4
1995	SN1799	24	2	1	2	120	1	17	9	1	12	1	240	1	1	17.2	9.7	3.1	4
1995	3628	24	3	1	15	151	1	15	3	1	1	1	240	1	2	18.2	17.9	6.8	4
1995	3634	24	3	1	16	140	1	17	2	1	1	1	240	1	7	15.6	12.4	5.3	4
1995	3635	24	3	1	2	120	1	17	9	1	15	1	240	1	1	17.6	10.7	4.0	4
1995	3685	24B	1	2	19	140	3	4	9	1	22	1	240	1	1				4
1995	3685.1	24B	1	2	19	140	3	17	7	1	22	1	240	1	1			8.7	4
1995	3736	24B	2	1	40	195	3	4	4	2	22		240	12	5			3.2	4
1995	3741	24B	2	1	1	128	3	4	1	5	22	9	239	1	7			2.8	4
1995	3745	24B	2	1	2	120	2	17	1	1	2	4	230	2	3		13.9	7.6	4
1995	3803.3	24B	3	1	1	128	3	4	2	1	2	9	239	1	7			6.3	4
1995	3803.4	24B	3	1	30	115	1	12	2	1	1	9	239	12	8	4.2	2.3	1.9	4
1995	3500	25	1	1	24	76	3	4	1	1	12	1	240	1	4				4
1995	3506	25	1	1	41		1	14	1	1	1					3.9	3.6	3.5	4
1995	3506.1	25	1	1	41		2	4	1	1	1					3.0	2.9		4
1995	3506.2	25	1	1	41		1	5	1	1	1					4.0	3.9	3.5	4
1995	3506.3	25	1	1	41		1	5	1	1	1					3.8	3.8	3.1	4
1995	3516	26	1	1	14	133	1	2	5	1	2	1	240	2	7	6.7	6.5	3.8	2
1995	3522	26	1	1	41	90	1	13	2	1	1	9	239	12	5	6.8	6.7	5.7	4
1995	3531	26	1	1	1	128	3	4	8	5	22	9	239	11	7			6.0	4
1995	3603	26	2	1	1	124	1	11	1	1	1	1	240	6	2	4.9	3.4	2.2	4
1995	3607	26	2	1	2	120	3	11	2	5	2	1	240	2	1		7.8	3.6	1
1995	3608	26	2	1	41	88	1	10	3	1	1	9	239	12	5	6.2	6.2	3.3	4
1995	3614	26	2	1	2	120	2	11	2	5	2	1	240	1	1			4.8	4

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1995	3621	28	2	1	20	140	2	17	10	1	1	1	240	1	1		30.7	9.7	4
1995	3630	26	2	2	20	150	5	4	10	1	22	9	239	11	7			14.2	4
1995	3630.1	26	2	1	19	150	3	4	10	1	10	1	240	1	1			13.1	4
1995	3703	26	2	1	19	140	3	17	10	1	2	1	240	1	1		31.3	7.7	4
1995	3688	26	3	1	19	140	3	17	9	1	2	1	240	1	1			11.4	4
1995	3689	26	3	1	2	120	1	11	2	1	12	5	227	3	1	17.6	8.3	3.5	1
1995	3695	26	3	1	2	120	3	11	8	8	2	1	240	1	1		12.2	5.0	4
1995	3700	26	3	1	2	120	2	3	8	1	1	1	240	1	1	10.5	8.0	4.5	4
1995	3701	26	3	1	2	120	2	17	2	1	2	1	240	1	1		11.1	4.6	4
1995	3689	28	1	1	41	90	1	13	2	1	1	1	240	12	5	1.9	1.9	1.85	4
1995	3689.1	28	1	2	41	90	1	11	2	1	1	1	240	12	5	2.7	2.6	2.2	4
1995	3689.2	28	1	1	41	87	1	3	2	1	1	1	240	12	5	3.6	3.3	3.3	4
1995	3710	28	RF	1	41	87	1	13	2	1	1	1	240	12	5	4.0	3.9	3.5	4
1995	3710.1	28	RF	1	41	88	1	6	2	1	1	1	240	12	5	5.1	4.9	3.5	4
1995	3653	29	2	1	40	196	1	12	2	1	3	1	240	10	5				4
1995	3661	29	2	2	2	120	4	17	2	4	14	1	240	1	1	23.0	11.4	4.3	4
1995	3751	30	1	1	19	148	3	4	10	1	10	1	240	1	1			7.8	4
1995	3752	30	1	1	19	140	3	4	10	1	2	1	240	1	1				4
1995	3816	30	2	6	19	140	5	17	1	1	2	1	240	1	1		31.5	12.8	4
1995	3806	30	3	1	22	1	1	11	2	1	12	1	240	1	4	16.8	12.5	2.1	4
1995	3809	30	3	1	30	116	1	5	4	1	4	10	240	12	5	1.6	1.5	1.1	4
1995	3725	31	1	1	19	148	3	4	10	1	12	1	240	1	1				4
1995	3791	32	2	1	41	90	1	5	1	1	1	9	239	11	5	1.0	0.7	0.6	4
1995	L667	KTr	1	1	41	90	1	3	4	1	1	9	239	11	5	2.1	2.0	1.5	4
1995	3767	KTr	2	1	41	88	1	13	2	1	1	1	239	11	5	3.1	3.1	2.4	4
1995	3716	PH3	2	1	2	120	2	17	5	1	12	1	240	1	1		8.8	3.5	4
1995	3718	PH3	2	1	5	55	5	15	4	1	1	1	240	2	2	2.2	1.6	0.8	4
1995	3719	PH3	2	1	13	128	3	4	2	1	22	9	239	11	7			5.8	4
1995	3054	PH3	CF	1	2	120	1	17	8	1	12	1	240	1	1	19.9	10.8	3.5	4
1995	3055	PH3	CF	1	21	138	7	9	4	1	1	9	239	11	7	21.1	11.7	3.8	5
1995	3064	PH3	CF	4	2	120	5	17	1	8	12	4	47	1	1		9.2	3.0	1
1995	3065	PH3	CF	1	2	120	3	11	8	1	15	1	240	1	1			5.2	4
1995	3068	PH3	CF	1	20	150	3	5	1	1	14	1	240	1	7		41.5	10.8	4
1995	3291	PH3	CF	1	41		1	13	4	1	1					2.6	2.25	1.8	4
1995	3291.1	PH3	CF	1	41	90	1	13	4	1	1	1	240	12	5	2.2	2.1	1.9	4
1995	3302	PH3	CF	2	20	139	5	4	2	1	17	1	240	1	7			3.6	4

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1995	3319	PH3	CF	1	16	140	1	17	4	1	1	1	240	1	2	25.5	17.1	5.0	4
1995	3324	PH3	CF	1	41		1	13	4	1	1	1				1.2	1.1	1.0	4
1995	3324.1	PH3	CF	1	41	90	1	13	4	1	1	1	240	12	5	1.5	1.2	1.2	4
1995	3324.3	PH3	CF	1	41	87	1	5	4	1	1	1	240	12	5	2.8	2.4	2.3	4
1995	3324.4	PH3	CF	1	41	90	1	13	4	1	1	1	240	12	5	3.7	3.5	3.3	4
1995	3324.5	PH3	CF	1	41	90	1	13	4	1	1	1	240	12	5	3.1	3.1	3.0	4
1995	3344	PH3	CF	1	41	90	1	13	1	1	1	1	240	12	5	3.0	2.9	2.8	4
1995	3346	PH3	CF	1	2	120	3	4	1	1	17	1	240	1	1		12.0	4.9	4
1995	3350	PH3	CF	1	19	142	3	4	5	5	2	1	240	1	1			4.2	4
1995	3360	PH3	CF	1	19	140	3	4	9	1	10	1	240	1	1			18.0	4
1995	3366	PH3	CF	1	2	120	2	17	7	1	19	1	240	1	1	19.2	11.7	5.4	4
1995	3495	PH3	CF	1	41	90	1	13	4	1	1	1	240	12	5	2.9	2.5	2.4	4
1995	3702	PH3	CF	1	19	140	3	4	10	1	10	1	240	1	1			8.9	4
1995	3713	PH3	CF	1	19	140	3	17	9	5	10	1	240	1	1			16.1	4
1995	3361	PH3	F3A	1	14	131	1	5	2	1	2	1	240	1	7	21.9	18.1	6.1	4
1995	3362	PH3	F3A	1	19	143	3	4	1	1	10	1	240	1	1			8.5	4
1995	3363	PH3	F3A	1	19	143	3	4	5	1	10	1	240	1	1			10.2	4
1995	3642	PH3	FF	1	41	1	1	13	4	1						3.1	2.9	2.3	4
1995	3643	PH3	FF	1	2	120	2	17	4	1	15	1	240	1	1		10.4	2.7	4
1995	3797	PH5	1	1	41	90	1	13	1	1	1	1	240	12	5	3.9	3.5		4
1995	3797.1	PH5	1	1	41	90	1	13	1	1	1	1	240	12	5	4.0	4.0	3.9	4
1995	3797.2	PH5	1	1	41	90	1	14	1	1	1	1	240	12	5	4.1	3.5	3.1	4
1995	3798	PH5	1	1	33		1	16	1	1	3	9	239	1	5	4.7	1.8	0.6	4
1995	3799	PH5	Fill	1	2	119	3	17	2	5	12	5	227	4	3		7.9	2.8	1
1995	3108	TR2	1	1	2	128	1	17	2	5	12	3	3	2	3	19.4	8.7	4.3	1
1995	3106	TT1	0-20	2	2	120	4	11	2	5	14	5	22	3	3	17.3	15.6	3.6	1
1995	3110	TT1	0-20cm	1	2	128	2	11	6	1	2	1	240	1	1		12.0	6.4	4
1995	3164	TT1	1	1	16	139	1	11	2	3	1	1	240	1	2	23.4	10.5	9.0	4
1995	LFN407	16	S	1	41	90	1	13	1	1	1	1	240	12	5	3.7	3.6	3.3	4
1995	2616	16	1	1	1	128	1	17	8	1	1	1	240	1	7	8.7	8.0	5.1	4
1995	2623	16	1	1	13	128	1	15	1	5	1	9	239	11	7	9.6	9.6	3.1	4
1995	2723	16	1	1	2	119	3	4	1	1	15	1	240	1	1			2.1	4
1995	2502	16	S	1	41	90	2	13	1	1	1	1	240	12	5	2.7	2.7		4
1995	2502.1	16	S	1	41	90	1	13	1	1	1	1	240	12	5	2.1	2.0	1.6	4
1995	2502.2	16	S	1	41	90	1	13	1	1	1	1	240	12	5	2.8	2.7	2.3	4
1995	2504	16	S	1	1	128	2	4	4	1	1	9	240	2	7		5.8	2.3	4
1995	2624	16	S	1	1	120	1	17	10	1	1	1	240	1	1	20.0	11.8	6.0	4