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The Black Mountain Phase Occupation at Old Town: an Examination of Social and Technological Organization in the Mimbres Valley of Southwestern New Mexico, ca. A.D 1150 - 1300

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The Black Mountain Phase Occupation at the Old Town Ruin: an Examination of Social and Technological Organization in the Mimbres Valley of Southwestern New Mexico, ca. A.D. 1150 - 1300

by

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

August 2014

Dedication

To all my family and friends who have helped along the way and especially my grandmothers, Minerva Chad and Clara Brown; my uncles, Harden Taliaferro and Donald Steinmetz; and my aunt, Julia Jones, who passed while I was in the process of completing this selfish document.

Acknowledgements

As is the case with any long-term research agenda, the research contained in this dissertation could not have been possible without the help of many individuals and institutions. First among these is Darrell Creel, who never wavered in offering support of my plans, however absurd they may have been. His breadth of knowledge of all things related to archaeology never ceases to amaze and inspire me to become more astute.

Nearly everyone at the University of Texas at Austin contributed in some way to the completion of this dissertation. Darrell Creel, Sam Wilson, and Maria Franklin were probably forced to deal with more headaches on my account than each probably thought possible. I can only imagine that my actions placed them, and other members of the Graduate Studies Committee, in rather precarious positions throughout the course of my studies. I cannot express my gratitude in words for being allowed to finish the work contained in this dissertation. Similarly, Thomas Hester and Harry Shafer agreed to jump on my committee at the last minute. Their help in the final push of this dissertation is greatly appreciated.

I would also like to thank Dr. Michelle Hegmon and Dr. Michael Bever both of whom were originally on my committee. I was somewhat forced to drop these committee members due primarily to scheduling conflicts. However, both of these researchers contributed to this final product in some way and their help in my progress cannot be overstated.

Members of my cohort helped me get through the rough patches while pursuing this advanced degree. I will always look back fondly at the times spent in various Austin watering holes with everyone in the Anthropology Department (you know who you are).

I also appreciate the help of my friends at the University of Oklahoma. Elizabeth Toney, Beau Schriever, Nick Beale, Sarah Hamby, Tom Gruber, Janna Gruber, Mike Searcy, Pat Gilman, and Paul Minnis made it tolerable for a UT boy to be in Okie-land.

There were many other researcher and institutions that aided in my research. Much of this research would not have been possible without the help of Jeff Speakman at the Center for Applied Isotope Studies at the University of Georgia. He selflessly took a week of his time to aid in my NAA group determinations despite trying to finish his Ph.D. Similarly, the bulk chemical compositional analyses of my Playas samples could not have been possible without the help of Michael Glascock and Jeff Ferguson at the Missouri University Research Reactor. Tom Holcomb and the BLM, Las Cruces District, have been instrumental in allowing me to conduct excavations at Old Town and have also shown considerable patience in waiting for me to finish my final report. It's coming, I promise! Roger Anyon and Steven LeBlanc provided information pertaining to the excavations conducted at Walsh and Montoya as well as other revalent information obtained from the Mimbres Foundation's survey endeavors. They graciously allowed me to reproduce the plan maps of Walsh and Montoya (Chapter 5). Finally, Steve Shackley, at the Geoarchaeologial X-Ray Fluorescence Laboratory has put up with my badgering over Mimbres Mogollon obsidian samples' source determinations. His assistance in clarifying many aspects of these obsidian samples has been instrumental in furthering my analyses of their patterning.

Every archaeologist I've had the pleasure of collaborating with in the Mimbres area has also contributed to this research. I'd like to thank Elizabeth Toney, Darrell Creel, Beau Schriever, Barb Roth, Roger Anyon, Steven LeBlanc, Steve Lekson, Pat Gilman, Steve Swanson, Aaron Woods, Leon Lorentzen, Michelle Hegmon, Karen Gust Schollmeyer, Jacob Sedig, Deb Huntley, Matt Peeples, Sean Dolan, Tom Gruber, Katy

Putsavage, the Grant County Archaeological Society, and the 2006 and 2007 volunteers and UT field crew for making conducting research in the region enjoyable. This has truly been one of the greatest groups of people one could imagine working with.

Since I've been working at the Gila National Forest, numerous individuals have also aided in me being able to complete my degree. In no particular order these include Elizabeth Toney, Bob Schiowitz, Wendy Sutton, Jeanne Schofer, Russ Ward, Gabe Partido, Art Telles, John Pierson, Janice Stevenson, Pat Morrison, Monte Topmiller, Mike Natharius, Chris Adams, Ann Baca, Colleen Nicholas and countless other people. Everyone has shown considerable patience in putting up with my hectic schedule and has made working for the Federal Government a blast.

Most importantly I'd like to thank my family for their constant support in all of my endeavors. None of this could have been possible without all of you. Mom, Dad, Steve, and Elizabeth, it's finally over! Thank you all so very much for your help. Hopefully now we can all get together like a family again. I love you all.

The Black Mountain Phase Occupation at the Old Town Ruin: an Examination of Social and Technological Organization in the Mimbres Valley of Southwestern New Mexico, ca. A.D. 1150 - 1300

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The University of Texas at Austin, 2014

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The Black Mountain phase of the Mimbres Mogollon cultural tradition, dating from around A.D. 1150 through A.D. 1300, is perhaps the most poorly understood time period of the entire Mimbres sequence. During that time, people inhabiting the Mimbres Valley of southwestern New Mexico adopted new ceramic sequences, ceased producing Black-on-white pottery, adopted new architectural styles, and possibly changed mortuary patterns. These changes have been interpreted in a multitude of ways that can be reduced to models of continuity and discontinuity. Unfortunately, these models and interpretations rest on a very limited set of data that comes largely from three moderately tested Black Mountain phase sites in the Mimbres Valley proper: Montoya, Old Town, and Walsh. Thus, arguments for or against either model based on the presence of absence of particular traits are necessarily limited by the modest data from these three sites.

It was in this context of opposing interpretations that other aspects of the life ways of Black Mountain phase peoples were analyzed. Specifically, I look at the ways lithic and ceramic technologies were organized to assess if the changes that occurred during the

Black Mountain phase also represent changes in the ways social systems were organized. I believe that while certain aspects of material culture such as shifts in ceramic or architectural style are easily changed whereas the social mechanisms responsible for their production are more resistant.

The results of these analyses demonstrate that there are more similarities than differences with respect to the manner in which technologies were organized during the time periods traditionally accepted as representing “Mimbres” manifestations and the Black Mountain phase. Thus, the social mechanisms dictating the processes of production, distribution, transmission, and reproduction appear to be similar from the Pithouse periods through the Black Mountain phase.

This research adds to the growing body of evidence that suggests continuity between the Classic period inhabitants of the Mimbres area and later Black Mountain phase peoples.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

For some time, the Black Mountain phase in the Mimbres area has represented one of the more enigmatic cultural manifestations in the Southwest. The Black Mountain phase dates from around A.D. 1150 through A.D. 1300 and was initially differentiated from the preceding Classic period (ca. A.D. 1000-1150) by the appearance of new ceramic traditions; the cessation of Mimbres Black-on-white pottery production; new architectural styles that incorporate the use of coursed adobe; an apparent change in mortuary patterns where individuals are increasingly interred as secondary cremations; and changing settlement patterns. Subsequent interpretations of these patterns have resulted in two main interpretations regarding the relationship between the Classic period and Black Mountain phase inhabitants of the area. On one side of the spectrum are researchers who see a substantial disconnect between the inhabitants of the Mimbres area during these time periods. These researchers argue that the Mimbres Mogollon cultural sequence ends with the end of the Classic period. Conversely, there are some researchers who see a considerable amount of similarity between patterns present during the Black Mountain phase and those present during earlier time periods. These researchers argue that there is continuity between peoples living during the Classic period and those inhabiting the Mimbres area during the Black Mountain phase.

Indeed, much of the literature mentioning this time period in the Mimbres area has struggled with interpreting how the cultural manifestations witnessed during the Black Mountain phase correspond to local and regional developments. This time period, from about A.D. 1150 through A.D. 1300, represents one of major cultural transformations across the larger Southwest. While contemporaneous occupations have seen relatively intense investigation in the Ancestral Pueblo and Hohokam areas (e.g. Abbot 2003; Crown and Judge 1991; Doyel et al. 2000; Kohler 2004; Kohler et al. 2012; Lekson 2006), mid-12th century occupations in southwestern New Mexico and southeastern Arizona have seen relatively scant investigation. Perhaps the best documented of these investigations are those that have been conducted as part of the

Eastern Mimbres Archaeological Project (Hegmon and Nelson 1994; Nelson 1999; Nelson and Hegmon 1993). However, as Hegmon and others (1999) demonstrate, the occurrences taking place in this section of the larger Mogollon culture area may not mirror those of the surrounding region. Thus, while the Eastern Mimbres Archaeological Project increased our knowledge of cultural processes occurring along the eastern slopes of the Black Range, these processes and their underlying theories cannot easily be extended to other areas.

Addressing the relationship between Black Mountain phase peoples and groups inhabiting the Mimbres area during preceding periods served as one of the key agendas of my research. While there has been a growing amount of research suggesting continuity between Classic period and Black Mountain phase peoples, much of this research relies on the presence or absence of specific traits between time periods as a basis of support (Creel 1999; Hegmon et al. 1999). This research has demonstrated that certain characteristics originally believed to have originated during the Black Mountain phase were actually present earlier in the Mimbres cultural tradition (e.g. coursed adobe architecture, circular clay-lined hearths, secondary cremations, distinct ceramic traditions, etc.). However, these same data have been used to argue for discontinuity between Classic period and Black Mountain phase inhabitants of the Mimbres area (Shafer 1999). It was for these reasons that I decided to focus on social aspects of Mimbres culture and how these differed through time. I believe that while the outward expression of material culture is easily susceptible to change under certain circumstances, the mechanisms responsible for this outward expression (i.e. social and technological organization) are less so. It was my intention to use these investigations to further the recent research endeavors that have focused on the social aspects of the prehistoric inhabitants of the Mimbres area (see papers in Powell-Marti and Gilman 2006 as well as Roth 2010a).

To date, the only excavated Black Mountain phase site in the Mimbres valley that has been reported in any amount of detail is the Old Town ruin (Creel 1999, 2006). Preliminary efforts were taken to report the work the Mimbres Foundation conducted at the Black Mountain phase Walsh and Montoya sites (LeBlanc 1976, 1977; Ravesloot

1979). However, no formal report of these investigations has been prepared. Because of this, our understanding of the daily lives of individuals during this time period is perhaps the most limited of all those in the Mimbres Mogollon cultural sequence.

It was under these circumstances that the Black Mountain phase component at Old Town was targeted for investigation beyond the modest efforts in the 1990s. From July through August of 2006 and June through July of 2007 test excavations were conducted by the University of Texas at Austin in Area C (the Black Mountain phase area) at the Old Town site (LA 1113) in Luna County, New Mexico. The objectives of these excavations were to (1) further explore the nature of the Black Mountain phase inhabitants at the site, (2) gain insights into the daily lives of the Black Mountain phase peoples within the Mimbres area, (3) explore the organization of household practices during the Black Mountain phase, and (4) contribute to the discourse surrounding the potential abandonment of the Mimbres area and collapse of the Mimbres Regional System during this time period.

Data obtained from these studies could then be compared to data obtained from the numerous excavated earlier pithouse and pueblo period structures in the Mimbres area. This was done in order to compare the patterns observed in Black Mountain phase material culture to patterns present in proceeding time periods. I believed that this was one of the more fruitful ways to investigate the alleged abandonment of the area during the Black Mountain phase. Any archaeologist knows that material culture waxes and wanes in popularity as time progresses and that a multitude of social processes can account for observed patterns in the archaeological record. However, the processes responsible for the production of these material items are less resistant to change and are instilled in the traditions handed down in communities of practice. Thus, if archaeologists wanted to identify the abandonment of an area, their primary focus should not be on the appearance of new types of material items during a specific time period, it should instead be centered on how the practices responsible for these new items' occurrence were organized.

In the following pages I attempt to delve into the original research agenda outlined above. This research can be broken down into two parts. The first part, encompassing Chapters 2 through 6 serve as background to the research that I conducted. The second part, encompassing Chapters 7 through 12, presents the data used to address the apparent abandonment of the Mimbres area during the Black Mountain phase.

Chapter 2 is aimed at providing a theoretical background for my research. While I was first interested in issues concerning the abandonment of the Mimbres area during the Black Mountain phase, my research design changed, over the course of the years, to focus more on how technologies were organized during the Black Mountain phase. Understanding this aspect of social life necessitated, in my mind, an understanding of how households and communities were organized as well. This was primarily the result of two realizations. The first of these was the fact that all changes in social systems are negotiated at smaller analytical levels. It is the actions undertaken by individuals as collectives that influence how the larger social system is structured. However, individuals take on many roles in their social life. These include members of households and all the social roles engendered in their relationships, as well as members of various communities. All of these relationships act upon the individual and condition their actions. Thus, when looking at how technologies are organized, we need to understand the other social influences that allow technological organization to take its form.

The second realization dictating my current theoretical approach concerned the fact that the manner in which technologies are organized is often informed by the manner in which communities of practice are organized as well. In these social constructs individuals are taught not only the specific skills necessary to participate in the group's communal undertakings, but are also instilled with a more general set of rules that dictate their behaviors and mannerisms. It is through an intricate process of "legitimate peripheral participation" that communities not only substantiate and perpetuate their own existence but also by necessity instill their members with a sense of identity in the larger social world.

With this in mind, it makes sense that if a new social group occupied an essentially abandoned area, as some propose the Mimbres valley was by the end of the Classic period, then the manners in which communities of practice were organized would essentially change as well. This is due to the fact that the actions undertaken by these collectives inform the identity of their practitioners. If a new ethnic group occupied an abandoned valley one would expect there to be marked differences in the manner in which communities of practice organized their productive processes.

Chapter 3 serves as an introduction to the environmental setting in which the inhabitants of Old Town were enmeshed. Overviews of the local physiography, soils, climate, vegetation, and fauna are presented. To the extent possible, temporal shifts in these phenomena are also presented with attention given to conditions present during the site's Black Mountain phase occupation. While these data give the reader a sense of the local conditions surrounding portions of the Mimbres valley, certain analyses were conducted based on comments I received from various attempts to obtain funding to conduct my research. Specifically, many reviewers noted that the use of identified chemical compositional groups might reflect local geological variations and not, as I proposed, reflect conscious decisions of groups to target specific geological deposits through time. Unfortunately, available data pertaining to the correlation of sourced clay raw material specimens with particular geologic formations is insufficient to allow me to adequately address this issue.

Chapter 4 presents a brief overview of the culture history of the area. The general cultural patterns for the Mimbres area have been dealt with in sufficient detail elsewhere, so only an overview of temporal trends is offered. These general trends are presented and augmented with more current research that has taken place since their original formulation.

In Chapter 5, I present a more detailed overview of work concerning the Black Mountain phase and other contemporaneous cultural manifestations in the southern Southwest that have influenced how the Black Mountain phase has been interpreted. A brief history of the research culminating in our current understanding of the Black

Mountain phase is presented and what little research has been conducted at Black Mountain phase sites is also discussed. The chapter concludes with a discussion of the schism that at one time divided interpretations of the Black Mountain phase and the conditions that influenced these interpretations.

Chapter 6 provides a detailed discussion of the Black Mountain phase architectural remains that have been excavated at Old Town (LA 1113). Each individual room and room/suite is discussed, as are other features that may have been used during the site's Black Mountain phase occupation. These data are then compared to features present in other time periods to see if there were shifts in the manners in which space was organized through time. The results of these analyses indicate that while some features are unique to the Black Mountain phase (e.g. raised box hearths) other types of features common to the Black Mountain phase appear earlier in the Mimbres sequence (e.g. circular clay-lined hearths, coursed adobe architecture, etc.). Similarly, analyses confirm the Mimbres Foundation's assertion that room size increases through time. However, these data also demonstrate that the size of room-suites does not vary significantly through time. This indicates that the culturally defined space needed for a coresidential unit remained fairly constant from the Classic period through the Black Mountain phase.

In Chapter 7, I present a general discussion of lithic technology and follow this with a comparative analysis of lithic debitage recovered from excavated (and reported) archaeological sites in the Mimbres area. As one can imagine, the comparability of these datasets rests on different analysts recording similar information for excavated assemblages. Unfortunately, the amount of comparable data across excavated assemblages is limited. Thus, only raw material variability and cortical variation present on flakes is analyzed in a comparative fashion across assemblages. Because the datasets used in this analysis encompass all of the periods/phases in the Mimbres chronological sequence, they provide insight into changes in procurement patterns and reduction strategies through time.

The results of these analyses indicate that raw material procurement patterns and reduction strategies varied through time, between contemporaneous sites, and between contemporaneous rooms within sites. While much of the variability in the datasets is likely a result of the raw material variability present in the natural environment, there are some patterns worth noting. These results show that the people inhabiting the area during the Cliff/Salado phase preferred fine-grained chalcedony to all other materials while the inhabitants of earlier time periods tended to procure coarse-grained materials (e.g. andesite/basalt and rhyolite) over other more fine-grained materials that were likely less available as time progressed. This observation is based on the proportional increase in flakes struck from andesite/basalt cores from the Late Pithouse period through to the Classic period as well as a proportional decrease in flakes struck from chalcedony cores during this same time span.

I then shift my attention to the intra-site variability present within assemblages recovered from excavated rooms in the Black Mountain phase component at Old Town. These analyses indicate that there is substantial variability within the lithic assemblages recovered from excavated rooms. I suggest that this variability is the result of a continuation of practices present during the preceding periods and results from a local adaptation of lithic technology that was organized at the household level. This adaptation focused on the production of a maintainable generalized tool kit that allowed individuals to efficiently exploit the local resources that were predictable in both time and space.

In Chapter 8, I focus my attention on the formal chipped stone tool assemblages recovered from excavations at Old Town as well as patterns present in the sourced obsidian assemblage. These data point to a different level of organization in the procurement of raw materials used in the manufacture of projectile points. It is shown that the majority of the area's projectile point assemblage is manufactured from materials that are not available locally. This pattern increases where it reaches its peak during the Classic period. However, the same networks utilized during earlier periods are also utilized during the Black Mountain phase. Because the diversity of obsidian source groups utilized in the production of projectile points decreases through time, I believe that obsidian procurement was something that was organized at a level above that of the household and could represent a phenomenon that was organized at the regional level.

Again, the available data suggests that there is a considerable amount of continuity between the Black Mountain phase and earlier periods with respect to the manner in which the procurement of obsidian projectile points is organized.

In Chapter 9, I present a brief outline of the operational sequence associated with ceramic technology and follow this with a discussion of the organization of ceramic production. I characterize the production of ceramics during the Late Pithouse and Classic periods using available data. This analysis later serves as the point of comparison for my analysis of Playas ceramic production (Chapter 10). Until recently, discussions of how Mimbres pottery production was organized have relied on somewhat limited data and conclusions were often drawn with consideration of only one line of evidence. Recent synthesis of the extant INAA dataset for the region allows for a more thorough analysis of how pottery production was organized during the Pithouse and Classic periods in the Mimbres area (Speakman 2013). I use Costin's (1991) organization of production parameters to analyze this dataset. These analyses suggest that there were two methods of organizing production during the Pithouse and Classic periods. Specifically, initial analyses using Speakman's compositional groups demonstrate that the production those compositional groups composed primarily of plainwares and early-decorated ceramics (e.g. Mogollon Red-on-brown and Three Circle Red-on-white) was organized differently from the production of Mimbres Black-on-white Style III ceramics. My analyses suggest that the production of plainwares and early-decorated ceramics was organized as household specialization where production was aimed at meeting local demands. Conversely, the production of Mimbres Black-on-white ceramics became increasingly organized at the community level through time. With Mimbres Black-on-white ceramics, production was aimed at meeting regional demands by some production groups and was aimed at meeting local demands with others.

I follow this discussion with an analysis of ceramics recovered from assemblages associated with rooms excavated in the Black Mountain phase component at Old Town. These analyses demonstrate that there is considerable variability between assemblages recovered from roof and floor contexts associated with these rooms. I interpret this variability as resulting from both social and temporal causes. Using these data, I suggest that distribution/consumption practices were organized at the household level and reflect the negotiation of social relations by individual households. I also suggest that these patterns were fairly resistant to change throughout the Black Mountain phase.

In chapter 10, I discuss the efforts taken to refine the Playas INAA dataset. To facilitate these efforts 102 new samples were submitted from excavated rooms/room-suites at Montoya, Old Town, and Walsh. A total of 11 compositional groups were established in these analyses, some of which correspond to the compositional groups established by Speakman (2013) in his analysis of the Mimbres INAA dataset. The results of these analyses demonstrate that there were multiple areas of production for Playas ceramics, many of which were located in the Mimbres valley. Ceramics originating from these production zones were somewhat widely distributed but most appear to be locally consumed. I suggest that this pattern represents the organization of production at the household level. Current evidence indicates that the organization of production for one compositional group, Playas Red 2, was organized at the community level. I interpret this as a response to existing practices associated with the manner in which production was organized for ceramics belonging to the El Paso brownware (or polychrome) series.

While considerable variability was present between sites with respect to the proportion of ceramics originating from different Playas production zones, less variability is present between individual excavated Black Mountain phase structures. I interpret this pattern as resulting from household practices associated with the construction and maintenance of distinct social relations.

In Chapter 11, I present a brief discussion of mortuary patterns present at Black Mountain phase sites that have been excavated in the Mimbres area. These data are slightly augmented by the recovery of two flexed inhumations and one cremation from more recent testing endeavors at Old Town. These data were compared with sites throughout the larger Mimbres area. The general patterns that emerge from these analyses are similar to those already noted by other researchers. In general, secondary cremation burials increase through time, though they are always more prevalent in areas surrounding the Gila River. While the proportion of cremations increases through time, inhumations are fairly common at Black Mountain phase sites in the Mimbres area.

Finally, in Chapter 12, I present a summary of my research and concluding thoughts. I end this chapter with a discussion of additional research needed to investigate patterns outlined in the preceding chapters.

Chapter 2: Theoretical Background: Agency, Practice, Communities, and Households

As mentioned in Chapter 1, the main purpose of my research is to examine the possible abandonment, or substantial depopulation, and immigration of new groups into the Mimbres area during the Black Mountain Phase. Numerous researchers have explored this topic (e.g. Creel 1999b; Hegmon et al. 1999; Nelson 1999; Shafer 1999a) and their interpretations of the available data are presented in more detail in Chapter 5 of my dissertation. Suffice it say however, is that the vast majority of the interpretations of these data sets has rested on the presence or absence of particular traits, or artifact classes, to examine the problem (see Chapter 1 and Chapter 5). Often, the same datasets are used to argue opposite interpretations. I felt it would be useful to approach the topic from a different perspective and focus instead on the processes associated with the production and distribution of the physical traits and artifact classes that differentiate the Black Mountain phase from other earlier periods of the Mimbres cultural sequence. In the pages that follow, I lay out the theoretical string that guided how I approached these datasets. I first lay out the ground work for what has come to be known as agency theory in the archaeological literature. Because I'm interested in the processes that allow specific ways of doing things to be transmitted generationally, I believe that this approach provides the means of accomplishing my desired ends. This approach stipulates that social structures (the rules and resources drawn upon by individuals in performing actions) are reproduced through the agency of individuals and groups. Some of these social structures reflect our archaeological constructs of households and communities. In many middle range societies, these larger social groupings (e.g. households and communities) serve as the primary base from which new members are socialized and knowledge is transferred across generations (Netting 1993).

The main theoretical orientation which informs the current research follows the rubric of what has come to be termed "practice theory" or "agency theory" (Bourdieu 1977, Cowgill 2000, Dobres 2000, Dobres and Robb 2000, Dornan 2002, Giddens 1984, Johnson 1989, Ortner 1984, Pauketat 2001, Robb 2010, Skibo and Schiffer 2009). The general approach within archaeological research began with early attempts to “people the past” (e.g. Gero 1991; Tringham 1991). There have been various interpretations as to the pedigree/genealogy of the modern usage of agency theory though time, as the modern usage of “agency” and/or “practice” theory demonstrates, two trends are apparent in the literature (Bourdieu 1977, Cowgill 2000, Dobres 2000, Dobres and Robb 2000, Dornan 2002, Giddens 1984, Johnson 1989, Ortner 1984, Pauketat 2001, Robb 2010, Skibo and Schiffer 2009). These two trends are effectively discerned by the nature of an individual’s conscious rationalization of their actions. To a certain level the different approaches either assume that an individual is either full cognizant of the circumstances surrounding their behavior or they merely act in a routine, habitual manner and rarely question why they perform actions in a particular manner. These differences will be drawn out in the following section though at a vulgar level they are primarily responses to who is deemed to be the progenitor of the theoretical approach, namely Karl Marx, Emile Durkheim, and/or Max Weber. The different strains of the approaches are often intermingled but in a general sense, depending on who is seen as the father of the approach, have very different perspectives on the nature of agency/practice and the nature of social change.

The basic tenets of both approaches are the recognition that human action and social structure are co-determinous. Thus, human action (agency) is both influenced by and an influencing aspect of a given historically situated social structure and vice versa. Where the greatest divergence in agency/practice-based approaches exists is in how different approaches situate agents in relation to the rationality of their actions. As stated above these differences are primarily based on which social theorist is used as the seed or kernel of an individual researcher’s approach.

Perhaps one of the most cited quotes used by agency/practice theory practitioners comes from The Eighteenth Brumaire of Louis Bonaparte by Karl Marx. In this work Marx states that “men make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly found, given and transmitted from the past” (Marx in Tucker 1978:595). This one passage reflects many of the central tenets of modern agency/practice theory. First and foremost among these is the notion that individuals are responsible for dictating the social structures present in a given historical period. Second, these given social structures that are being influenced by current actions were actually in existence prior to the arrival of the individual currently performing them. Finally, it shows that individual action is somewhat constrained by the existence of these social structures. All of these different factors were integral to Marx's critique of Capitalism and his notion of historical materialism.

Marx was extremely concerned with aspects of consciousness or the "conceptions, thoughts, ideas" and by extension, the actions, of individuals (Marx in Tucker 1978:149). According to Marx, man's consciousness, or when they "begin to distinguish themselves from animals," arises "as soon as they begin to produce their means of subsistence" (Marx in Tucker 1978:150). This production arises by necessity because of an "increase in population" and how this population is physically organized (Marx in Tucker 1978:150). Accordingly, within this population, the interaction amongst individuals will take a certain form. The "primordial" form for Marx was the family. The social relations inherent in familial organization structure first a basic division of labor, and second future social relations that correspond with "productive forces" which cause "further development in the division of labor" (Marx in Tucker 1978:150). It is within this ever-emerging system that man becomes subjugated and determined by the conditions of social production and social organization. Or, as Marx states:

> the social structure…is continually evolving out of the life process of definite individuals, but of individuals, not as they may appear in their own or other people's imagination, but as they really are; i.e., as they operate, produce materially, and hence work under definite material limits, presuppositions and conditions independent of their will (Marx in Tucker 1978:154).

As will be discussed below, this construction of social structure as something "continually evolving" out of the preconditioned actions of individuals lies at the heart of later conceptions dealing with the "duality of structure" (sensu Giddens 1984:25-28).

For Marx, an individual's actions were usually guided by an overarching ideology that masked the relations of production from individual social groups. Within each division of history, based off relations to the means of production, there exists a dominant ideology that was constructed by a social group (i.e. socio-economic class) and this ideology justifies its position and thus the societal division of labor within its time. Marx notes:

> The class which has the means of material production at its disposal has control at the same time over the means of mental production, so that thereby, generally speaking, the ideas of those who lack the means of mental production are subject to it. The ruling ideas are nothing more than the ideal expression of the dominant material relationships, the dominant material relationship grasped as ideas; hence of the relationships which make the one class the ruling one, therefore, the ideas of its dominance (Marx in Tucker 1978:172-173).

The all-invasive power of this "false consciousness" resonates throughout the totality of the social system, so much so that all actions and ideas become seen as "the only rational, universally valid ones" (Marx in Tucker 1978:174). This ideology is often skewed to mask the social relations of production. As the process of primitive accumulation continues into the capitalistic mode of production, this masking of the social relations of production evolves such that the commodities or goods produced by individuals are no longer seen as encapsulating the relations of production but are instead viewed solely on their exchange value (Marx 1990:873-876).

Specifically, Emile Durkheim first brought interest in individual action into the emerging discipline of sociology. While the majority of his work was centered on how social institutions emerged to maintain the social cohesion of a group, he was concerned within how individual action was shaped and subjugated by the institutions that inform a group's collective conscience. Durkheim's primary units of analysis were "social facts," which he described as "ways of acting, thinking, and feeling" which were "external to the individual and endowed with a power of coercion" (Durkheim 1938:3). These social facts act as a means to control individual action through coercion but this coercive power is also subject to resistance if negative sanctions are enacted upon specific shared individual actions that transgress those dictated by the collective conscience (Giddens 1972:123-140). Thus, for Durkheim, social facts represented the social structures and cultural norms of behaviors that existed outside the individual and were capable of policing individuals' actions through the fact that they represented shared collective dispositions. While Durkheim was more concerned with collective social behavior, he did recognize that the individual "private manifestations" of social phenomena were indeed influenced or controlled by the shared collective construction of the social fact which individuals are socialized to conform to. These private manifestations of behavior serve to reproduce the shared collective model (Durkheim 1938:6-46).

While both Marx and Durkheim were both primarily concerned with individuals as members of a larger social group, Max Weber was, to a certain extent, more concerned with individual action. A key concept of Weber's analysis is his notion of "verstehen" which translates literally as "to understand." Weber believed that sociology was a science that attempts to understand social action in order to explain its causes and effects (Weber 1948: 88). Actions are defined as any human behavior to which a performer attaches a subjective meaning. Actions become social when the subjective meaning ascribed to an individual's behavior compensates for, and is "oriented" by, the "behavior of others" (Weber 1948:88). Thus, an individual's actions are constrained when they become social actions because they are not only somewhat dictated by the actions of others but they also become opened to public scrutiny. For Weber, individual freedom became more restricted as the levels of bureaucracy increased within a social system. In this scenario individuals become more compartmentalized and the choices open to individuals become more restricted as individuals become actors of specific social roles (e.g. class, status, and party roles) (Weber in Gerth and Mills 1946:180-195).

Accordingly, Weber believed that individual action was somewhat constrained by the constellation of institutions which dictate appropriate behaviors in specified social settings. Weber states:

> The line between meaningful action and merely reactive behavior to which no subjective meaning is attached, cannot be sharply drawn empirically. A

> considerable part of all sociologically relevant behavior, especially purely traditional behavior, is marginally between the two. In the case of many psychophysical processes, meaningful, i.e. subjectively understandable, action is not to be found at all; in others it is discernible only to the expert psychologist (Weber 1948:91).

Because of this limited understanding of behavior on the part of the performer, Weber grounded his analysis of individual action on abstractions that he called "ideal types" or "pure types" (Weber 1948:89). Weber states that:

> The theoretical concepts of sociology are ideal types not only from the objective point of view, but also in their application to subjective processes. In the great majority of cases actual action goes on in a state of inarticulate half-consciousness or actual unconsciousness of its subjective meaning. The actor is more likely to 'be aware' of it in a vague sense than he is to 'know' what he is doing or be explicitly self-conscious about it. In most cases his action is governed by impulse of habit. Only occasionally and, in the uniform action of large numbers often only in the case of a few individuals, is the subjective meaning of the action, whether rational or irrational, brought clearly into consciousness. The ideal type of meaningful action where the meaning is fully conscious and explicit is a marginal case (Weber 1948:111-112).

Thus, Weber somewhat sees the subjective meaning of individual action as something which resides outside the realm of consciousness. This becomes increasingly so as the levels of bureaucracy increase within a social system

All of the social theorists mentioned above believed that social action was constrained by overarching social structures/institutions that dictated how humans were to behave in given situations. In Marx's case as soon as men began to produce their means of subsistence and families began to organize the means of production, social structures begin to develop which guide an individual's actions. For Durkheim, social facts (ways of acting, thinking, and feeling) were conditioned by the collective conscious of the social group and this collective conscious was in turn shaped by the institutions present in the social system. Finally, Weber believed that individual action was constrained by the institutions present in society and the pressure exerted by these institutions upon social action increases as societies become more segmented. For all of these theorists, individuals were somewhat blind to the forces being exerted upon their actions by the social institutions that their actions reinforced. All believed that individuals were socialized to accept certain ways of acting and a system of surveillance and punishment insured that they behaved in the manner dictated by the overarching social structure.

These ideas brought out by these three social theorists influenced, and were elaborated, upon in the works of Bourdieu (1977) and Giddens (1984). Central to Bourdieu's conception of practice theory is his construction of "habitus" (1977:78-87). Bourdieu describes habitus as "the durably installed generative principle of regulated improvisations" (Bourdieu 1977:78). A substantial portion of practice theory is packed within this definition. Specifically, Bourdieu is suggesting that individuals are not completely cognizant of why they act in a particular manner (improvisation), that individual action is guided by forces outside of the individual (regulated), and that these forces dictating human behavior are the product of a long history of continual formation (durable). These forces that dictate human behavior are durable in the sense that they exist prior to the existence of the individual performing an action and are at the same time maintained by the action the individual performs. These forces dictating behavior (structures) are external to the individual but through performance and external surveillance to the group established rule become internalized by the individual so that action and performance are, to a certain extent, predetermined or regulated. This group established rule of some form of behavior is structured by the history of institutional development within a social group. So, for a particular action a culturally prescribed method of performance has been dictated by the historical development of the social group as a whole. Thus, actions are structured by the history of the group. However, an individual's actions also serve as to reinforce the social structures that dictate a group's actions. This is accomplished through public scrutiny of an individual's performance. As Bourdieu notes "practices are always liable to incur negative sanctions when the environment with which they are actually confronted is too distant from that to which they are objectively fitted" (Bourdieu 1977:78). It is through every actor's ability to judge an individual's actions that the historically developed structured action is policed and reinforced (Bourdieu 1977:17). Because practices are policed in such a manner they "always tend to reproduce the objective structures of which they are a product" (Bourdieu 1977:72). This process of actors performing actions in a culturally prescribed manner that are judged and policed by the group as a whole to ensure adherence to the rule produce what Bourdieu refers to as "structuring" and/or "structured" structures (Bourdieu 1977). While Bourdieu notes that actions are structured by the historical development of a social group, he believes that individuals, in most circumstances, are not cognizant of the original reason for an action's specific performance. For Bourdieu, habitus resides in the realm of the unconscious, what Bourdieu refers to as "the forgetting of history," and leads individuals to interpret their actions as taken for granted, reasonable, sensible, or the product of tradition (Bourdieu 1977:78-80).

Because all cultural practices are the product of history they are imbued with other culturally charged thoughts and beliefs. As such, actions begin to carry symbolic power and enter into a sign-symbol system where specific actions can signify multiple cultural meanings simultaneously. The constellation of culturally prescribed beliefs, thoughts, and actions that are viewed as "traditional" or "taken for granted," and reside in an individual's unconscious are what Bourdieu calls the doxa (Bourdieu 1977:164). The doxa is the realm of the taken for granted, a realm where the "natural and social worlds appear as self-evident" (Bourdieu 1977:164). However, once individuals begin to question the "naturalness" of this socially constructed world, two contrasting points of view will likely emerge. One of these seeks to uphold the conditions present in doxa while the other challenges these conditions. Bourdieu refers to these contrasting viewpoints as orthodoxy and heterodoxy respectively (Bourdieu 1977:164-171). Bourdieu notes the realm of the taken for granted is usually not scrutinized until "relatively undifferentiated social formations" cease to exist (Bourdieu 1977:164). Once some form of differentiation between social formations emerges, these differences enable individual actors to begin to see more options in their respective performance regimes and this in turn enables the possibility of dissension to particular modes of conduct within a given social group. This is especially so if actions deemed appropriate to particular social groups are arranged in a hierarchical manner where one social group, and thus this group's performance of actions, is granted more prestige or power within the society as a whole. In these scenarios the groups seeking to uphold the structure of the doxa, or the group(s) expressing orthodoxy, have an interest in seeking to keep the established order of the society. Usually, the beliefs, thoughts, and actions inscribed within the doxa are used to legitimize the position of a social group(s) benefitting from the "structured/structuring structures" present in the realm of the taken for granted (Bourdieu 1977:168-171). Once dissension emerges within the larger social group to the social structure that legitimizes the position of the dominating social group, certain symbols utilized by the dissenting group(s) are appropriated by the group benefitting from the structure of the doxa. These antagonistic symbols are in essence transmuted by the dominating social group so that they are less harmful to the social structure and incorporated back into the larger social system so that they appear as if they were always present and thus always part of the doxa. This process of appropriation of dissenting elements allows for the reproduction of the doxa, and thus of the status quo. Though while slightly different, the main structures that are upheld as being commonsense or always present still persist despite an overt confrontation to the rules of social conduct that are imbedded within them.

Perhaps one of the most glaring criticisms of Bourdieu's notion of practice theory is the fact that he views all behaviors as something that originates from outside the individual. Because habitus resides in the unconscious of all actors, social change is not possible unless it is the outcome of an unintended consequence of an actor's practice on the restructuring of the larger social system (Bourdieu 1977; Dornan 2002). While in certain instances all humans are somewhat guided by an unconscious set of rules that dictate behavior, in other instances humans are consciously aware of why they perform actions in a particular manner. This is where Anthony Giddens and his theory of structuration make their greatest divergence from Bourdieu's practice theory.

Giddens notes that the primary objective of structuration theory is the study of "social practices ordered across time and space" (Giddens 1984:2). Central to this study is the notion that humans are knowledgeable agents capable of "monitoring" the behaviors of others and expect to have their behaviors monitored as well. It is this monitoring of behaviors which allows structures, defined as the "rules and resources drawn upon in the production of social action," to be reproduced through both time and space (Giddens 1984:19). This "reflexive monitoring" of actions however depends upon agents who are conscious of social structures present within a given social system. This knowledge, or what Giddens calls "practical consciousness," allows individuals to "go on with the routines of social life" without incurring negative sanctions from those monitoring their activities (Giddens 1979:24, 1984:4). While Giddens recognizes that some, if not most, actions might be conducted in a routine manner and the "practical consciousness" may not be at the forefront of the actor's intentionality while conducting a specific set of actions, he also recognizes that actors would be able to justify their actions when questioned in the reflexive monitoring process (Giddens 1984). Thus, as Giddens notes, "there is no bar between discursive and practical consciousness as there is between the unconscious and discursive consciousness" (Giddens 1984: 4).

These two key concepts, reflexive monitoring and practical consciousness, lie at the heart of Giddens' theory of structuration because these two concepts allow for the continuity of cultural practices across time and space. For Giddens, "agency refers not to the intentions people have in doing things but to their capability of doing those things in the first place" (Giddens 1984:9). Giddens believes that these actions performed by agents are initially motivated by some overall plan. Motivation in this sense refers to one's potential for action. All agents are granted the possibility of performing an action. However, the manner in which that action is performed would be different for different actors (e.g. a chef at a three star restaurant cooking a steak versus a middle-class family cooking steaks on the grill). For the most part the majority of basic daily activities "are not directly motivated" and are spurred on by unconscious motives (Giddens 1984:6). But, certain actions that break from the routine do directly affect actions and the possibility of other actors' actions (e.g. the French Revolution). Once the action is motivated, or an individual given the potential to act, actions come into the realm of practical consciousness and are able to be rationalized. While this rationalization of action does not necessarily equate with discursive consciousness, it does mean that individuals are cognizant of how actions are to be performed and that they are aware their performance will be monitored and scrutinized by others. These three processes (motivation of action, rationalization of action, reflexive monitoring of action) are what Giddens refers to as the "unacknowledged conditions of action" (Giddens 1984:5). In the process of performing actions, unintended consequences can be accrued. These unintended consequences in turn affect the unacknowledged conditions of actions. Giddens notes "unintended consequences are regularly 'distributed' as a by-product of regularized behavior reflexively sustained as such by its participants" and that these unintended consequences can in fact become part of the acknowledged conditions of action if they are repetitively performed (Giddens 1984:14).

Thus, the rules and resources that dictate human behavior are reproduced through individual action and become the guiding principles for the reproduction of the entire social system. Giddens notes that the notion of agency being informed by structures (rules and resources) and structures/social systems being reinforced through individual agency is the key concept of structuration theory, a concept he refers to as the "duality of structure" (Giddens 1984:25-28). Thus, the "structural properties of social systems" are both "the medium and outcome" of an individual's activities (Giddens 1984:25). As should be apparent from the above discussion, these phenomena (structure, system, structuration) are reliant on some notion of time and space. While a structure(s) cannot be isolated to a single time or space as they represent the cumulative effect of past actions and are in constant formation, the social system which is the outcome of structure(s) dictating action can be because the practices/activities performed by agents are situated in time and space (Giddens 1984:25). These "situated activities," or situated practices, are reproduced across time and space and represent the key unit of analysis for analyzing the "structuration of social systems" because they are the "mode in which such systems are produced and reproduced through interaction" (Giddens 1984:25). As actions are situated in a specific context (time and space), so too are actors. They are situated in a specific instance in the historical development of a set of social structures within a social system. Thus, an individual's actions will differ according to the context they find themselves in [e.g. the day, week, month, and/or the year in an individual's lifespan the action is performed; if the behaviors are performed in the presence of competent actors or alone; if the space from which the behavior was structured is too distant to draw upon those rules to perform it within its context of origin (such as eating a meal in a different country)].

Those behaviors that represent the "most deeply embedded structural properties" he refers to as "structural principles," and those which are reproduced across time and space he refers to as "institutions" (Giddens 1984:17). It is through the reproduction of structural principles that clusters of institutions are reproduced across time and space (Giddens 1984:164). These institution clusters form what we see as societies. Thus, some practices, especially those that are institutionalized, become something that is "stretched" across time and space (Giddens 1984:139-144). Once these institutionalized practices are performed, they serve as influencing agents to the historically constructed institutional construct. Thus the notion of reflexive monitoring of practices not only influences the structural properties present within a given social system, it also serves to reproduce the structural properties of that system if these structural properties become structural principles within institutions and are reproduced at greater extents of time-space distanciation.

Giddens realizes that not all actions, and by extension structures, are capable of being equally produced, transmitted, and reproduced. Giddens notes that there are several factors that serve to constrain certain actions (Giddens 1984:174-179). One of these, reflexive monitoring, has previously been discussed. Suffice it to say that reflexive monitoring constrains individual action through the possibility of an individual's action incurring some negative sanction by those who witness the behavior. Aside from constraint through reflexive monitoring, Giddens notes that individuals' behaviors are constrained through both material and structural conditions. Material constraints involve those dealing with both the external physical world as well as those imposed by the limitations of the human body. I find it useful to think of these as technological constraints, constraints that deal with how individuals utilize the material world in an efficient manner. Thus if an individual wished to build a dwelling on the side of the mountain he could not fly the material to the home site with his physical being unless the materials and the technology were available to him. If such technology were not present other methods of building the dwelling in the desired location would need to be developed or used. Structural constraints deal with those limitations to action brought about by the possible choice of options available to an actor in a "given circumstance or type of circumstance" that have been dictated by the pre-existence of an overarching social structure that preceded the individual's existence (Giddens 1984:177). Thus, an individual's actions in a cultural setting have somewhat been predetermined by the historical development of the social structures present within the social system prior to the arrival of that individual. These constraints by no means set up a social system where social structures are unchanging monoliths; this would defeat the whole premise Giddens' theory of structuration. At the same time they constrain action they enable other actions. It is through the continuation of the structuration process that small incremental changes within the set of structural properties actors draw upon become recognizable within the structural principles embedded in institutions.

COMMUNITIES

From an anthropological perspective, community studies became more robust with the insights brought about with Murdock's work (Murdock 1949; Murdock and Wilson 1972; Murdock et al. 1945). This work outlined three main criteria for the identification of communities. For Murdock, a community represented "the maximal number of people who normally reside together in face-to-face interaction" (Murdock et al. 1945 in Murdock and Wilson 1972:255). The second criterion in Murdock's formulation was that this interaction needed to occur on a regular basis. Lastly, Murdock believed that this interaction had a significant impact on the social identity of the interacting groups' members (Murdock and Wilson 1972:255). This notion of community has come to be termed formal or “natural communities” (Isbell 2000, Varien and Potter 2008b). Communities in this sense are deemed “natural” because they were assumed to not only represent a natural level of social organization that resulted from interaction and interdependency of its constituents, but also because they formed the “natural” unit of cross-cultural comparison.

While this construction of the community concept is the most commonly cited in the archaeological literature, it has come under scrutiny during the past decades (Canuto and Yeager 2000; Hegmon 2002; Kolb and Snead 1997; Varien and Potter 2008a). This scrutiny was primarily based on the fact that the notions of community being developed by anthropologists near the middle of the 20th century were as much a construct of participant observation as they were a socio-cultural reality. The “regular face-to-face interactions” being observed by anthropologists at the time were thought to exist because of the “interdependencies of people” (Isbell 2000:245). These interactions that resulted from the differential interdependencies of the population produced shared collective dispositions (e.g. notions of solidarity, shared cultural norms and world views, etc.) that were integral to the growing conception of communities as a functional unit (Isbell 2000). A second and more contemporaneous point of contention to these “natural community” constructs it that they represent ideal types where various complementary agents are subsumed into a compartmentalized homogeneous whole where antagonism between its parts is nonexistent. Thus, factionalism created by the intersection of various social roles (e.g. gender, economic, status, etc.) is not taken into account in these “natural” formulations.

Informal, “imagined,” communities stand in opposition to formal, “natural,” community constructions. The idealized notions of pre-modernist communities characterized by face-to-face interactions, that serve to bound individuals to a common set of social structures, have been replaced by notions of imagined communities whereby common bonds between “community” members are not constructed through daily physical interaction but are rather the result of imagined bonds (Anderson 2006, Bourdieu 1990, Chattergee 2004, Murdock 1949, Murdock and Wilson 1972). These bonds are imagined in the sense that the face-to-face interaction, central to Murdock's formulation of communities, is essentially impossible in certain social situations, namely the advent of modernity (Anderson 2006, Harvey 1990). These imagined networks of interaction allow the individual to compose a community that exists outside of their world of face-to-face interaction and empowers that individual to actively negotiate the norms established by the hegemonic doxa, or act in defiance of these norms.

While Anderson (2006) believed that imagined communities were the result of a specific set of historical circumstances, archaeologists have come to view his construction of "imagined communities" as an applicable concept to other time periods. As Isbell notes, "local groups are never so secluded that their members are isolated from outsiders" (Isbell 2000:249). Similarly, an individual may be a member of numerous communities within a social system simultaneously (i.e. ceremonial sodality, gender group, kinship group, etc.). While certain associations with these communities may be sporadic, often an individual will be acting in manners dictated by multiple community structures simultaneously. In these instances, there is the possibility for the rules dictating behavior as a part of the different communities to contradict the others. Thus, with all of the individuals in a particular social system pulling from a varied set of structures that dictate their behaviors, when archaeologists begin to implement a study of community, they are in fact only studying an instance of that community's formation. Further, when we attempt to initiate this study, it becomes increasingly difficult to isolate the homogeneous "natural" community. In actuality, our efforts are directed towards a specific "imagined" community.

Perhaps the most striking difference between "natural" communities and "imagined" communities lies in the scale of their boundaries. While anthropologists working during the early parts of the 20th century often interpreted the localized village as a community composed of regularly interacting individuals, imagined communities are more often than not envisioned as something that connects multiple individuals across a much larger territory. For Anderson (2006), Nations and the imagined communities brought about by Nationalism; serve as a case in point. These social constructs incorporate multiple natural communities into their confines and, as mentioned above, likely incorporate multiple overlapping and antagonistic social constructs of group affiliation. Anderson notes that such social constructs are imagined in three senses. They are imagined as "limited" in that they have known boundaries; they are imagined as "communities" because regardless of the differentiation of individuals claiming membership to its construction, all feel "deep, horizontal comradeship;" and they are imagined as "sovereign" in the sense that no one individual can claim authority over them (Anderson 2006:7). While Anderson used Nations and Nationalism as case studies for his construct of "imagined communities," these social constructs can exist at smaller scales.

Whether the object of anthropological studies dealing with communities actually focuses on a "natural" or "imagined" form of the social phenomenon could fill a vast library, one thing that lies at the center of all community constructs is learning. Individuals must learn the subtle nuances of community membership and be able to perform the practices of community members in a competent manner to become members themselves. In doing so, they give meaning to their actions as well as inform their own identity as a member of the social construct. Thus, learning takes on a multitude of tasks simultaneously. Learning allows individuals to establish group memberships, to ascribe meaning to their actions through experience, to perform actions in a competent manner, and to become an agent with their own objectives and a sense of self-awareness (Wenger 1998). In doing so, individuals enter into what Wenger (1998) calls a "community of practice." Wenger (1998) notes that communities of practice are informed by collective learning that results from the engagement of multiple individuals on similar enterprises (Wenger 1998:45). This collective pursuit of mutual enterprises results in the formation of practices that link the individuals who share in the collective learning process to a community of practice. Practice in this sense mirrors Giddens notion of structuration in the sense that it includes all things "explicit and tacit" belonging to the communal undertaking (Wenger 1998:47). It includes knowledge about all the "language, tools, images, symbols, well-defined roles, specified criteria, codified procedures, regulations, and contracts" made explicit by the community as well as the taken for granted "conventions, subtle cues, untold rules of thumb, recognizable institutions, specific perceptions, well-tuned sensitivities, embodied understandings, underlying assumptions, and shared world-views" of the group (Wenger 1998:47).

This notion of practice takes on many forms and functions at different levels in different communities. Practice allows individuals to become members of a defined community by allowing them to engage with others to meet a common goal. Both the group comprising the community as well as the larger social system within which the community is enmeshed often structures actions performed by these groups. Wenger (1998) refers to two characteristics of communities of practice that explain this situation: joint enterprises and shared repertoires (1998:73-85). Joint enterprises refer to the fact that no community exists in isolation from lager institutions. Thus communities are always negotiating social relations not only within their ranks but also their relations with other structured structures. Just like these larger social structures, communities of practice are in a state of constant formation/transformation that results from these negotiations. Each has a unique historical development that gives its members a notion of being as well as a shared perception of their actions within the social system. These actions, some of which are performed in their mutual engagement towards a shared desired end, represent Wenger's (1998) notion of a shared repertoire. This shared repertoire represents a set of shared resources drawn upon by community members in their performance. Wenger (1998) notes that these resources drawn upon by community members "includes routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions, or concepts" that result from the historical development of the community (1998:83).

Because of the overlapping nature of identities formed by the both the association of individuals to multiple communities practice as well as the presence of multiple communities of practice within a larger social system, communities of practice are instilled with boundaries that developed from the "discontinuities" present between members of a specific community of practice and nonmembers (Wenger 1998:93-95).

These boundaries represent both tangible (e.g. artifacts, documents, physical features, etc.) and intangible (e.g. conceptions, encoded information, etc.) phenomena that are learned by individuals as they become members of communities. Multiple communities can share these "boundary objects", though each interprets them differently. For instance a fully excavated pueblo will be interpreted differently by various communities of practice (archaeological field technician, soil scientist, biologist, etc.) though each recognizes the excavated area or the archaeological site as a marker delimiting their community's boundary.

These markers "accommodate" various interpretations and actions, and they also serve to delimit the types of activities that can take place within their confines, thus excluding some communities from performing their actions. Take for instance a construction worker who visits Chaco Canyon. While certain aspects of their community of practice allow them to understand and become involved with the Great House architecture present at the various archaeological sites within the National Monument, the boundary imposed from the set of communities claiming it as a marker deny their community of practice to perform some of its actions (e.g. destroy a wall section and install French-doors). Likewise, while communities construct boundaries, multiple communities of practice share similar boundaries. In the case presented above, the construction worker's community of practice allows them to understand some of the boundary markers used by southwestern archaeologists (e.g. architectural knowledge, construction techniques, artifacts used by prehistoric peoples to construct buildings, etc.). Because these similarities exist, they allow other communities of practice to "broker" with other communities outside of theirs and establish connections and relations with these other communities (e.g. a backhoe operator at an archaeological site). As Wenger notes, "brokering is a common feature of the relation of a community of practice with the outside" because they allow individuals "to make new connections across communities of practice" and "introduce elements of one practice into another" (Wenger 1998:105, 109). While the process of "brokering" possibly allows for the introduction of new ways of ascribing meaning to one's actions, it can also lead the individual "brokers," those who establish and maintain relations with outside communities of practice, to become "uprooted" from the contexts within which their actions, and by extension their understanding of the world, were ascribed with meaning.

This "meaning" ascribed onto an individual's actions is something that arises from our "experience of everyday life" and is negotiated by individuals as they interact in a continually evolving social system (Wenger 1998:52). Thus the meaning ascribed to our actions is something that somewhat predetermines our actions but is also the product of such actions. Wenger (1998) notes "living is a constant process of negotiation of meaning" (1998:53). This negotiation involves both participation and reification. Participation means that individuals must take part in the structured actions and interactions of communities in order to derive meaning from their collective actions. An individual's participation in these communities shapes not only their perception of themselves, but also serves to structure the actions undertaken by the community itself. These actions serve to produce that Wenger calls "reification," where an individual's actions, ideas, motives, feelings, and other abstractions are made material and "given the status of objects" (Wenger 1998:59). Like other aspects of human action, reification comes to represent something that is both the progenitor and outcome of action because these objective abstractions come to shape our experience in the world. Wenger suggests that both participation and reification exist as a dualism. While certain aspects of this dualistic relationship resemble aspects of a Hegelian dialectic, the component parts do not exist in opposition to one another. However, the existence of one does necessitate the existence of the other. Reification exists because of an individual's participation in a community of practice, and participation in a community necessitates that the community's practices be reified to differentiate it from other aspects of the larger social system. It is through the dualistic relationship that exists between participation and reification that meaning is constructed and negotiated. It is the interplay of this participation/reification relationship that gives meaning to our actions as members of communities of practice.

HOUSEHOLDS

Most anthropologist generally acknowledge that households represent a common component of social systems either by the bringing together of individuals as structural groups (e.g. family, kinship group) or as functional groups that share particular tasks. Indeed, households are often described as "society's most commonplace and basic socioeconomic unit" and the "next biggest thing on the social map after the individual" (Hammel 1984:40-41; Rathje 1981 in Netting et al. 1984:xiii). These social units were seen as taken-for-granted by early anthropologist, and as Yanagisako (1979) points out, "the terms family and household" were commonly used "without attaching to them rigorous, formal definitions" despite the fact most anthropologists "recognize some sort of distinction between the two" (Yanagisako 1979:162). Often, the two definitions of household are so vague that are seen as representing the same social phenomenon (e.g. families constitute households and vise versa). While anthropologists acknowledge these two social constructs are not necessarily always one in the same, this conflation of the social phenomena is still commonly used with no attempt to discriminate between the two.

Bender (1967) sought to break this combination down into its variant analytical units. He believed that when one sought to investigate households and families, one was examining "three distinct social phenomena: families, co-residential groups, and domestic functions" (1967:495). Households and families were differentiated by Bender (1967) based on fact that families are primarily defined by kinship relations while households were primarily defined by co-residence or spatial propinquity. This distinction was further drawn out by the functional roles performed by these different constructs. The primary function of the family focused on the biological reproduction of the social group while the primary function of the household focused on domestic activities (Bender 1967). Thus, for Bender, the household was conceptualized as a coresidential group that performed domestic functions and the family represented a kinship group. Each of these structural units (families, coresidential groups, and domestic functions) could vary within the same social group depending on multiple factors. Bender's analysis shifted the focus within household studies away from one interested in the morphology of the household unit to a focus on what households do. To Bender (1967), households performed domestic functions that aid the household group in meeting the basic needs of survival and reproduction.

Building on the work of Bender, Wilk and colleagues (Wilk and Netting 1984; Wilk and Rathje 1982) defined households based on the functions these social constructs perform cross-culturally. Wilk and Rathje (1982) have given the most succinct definition of households that is commonly used in archaeological discourse. They define the household as:

> …the level at which social groups articulate directly with economic and ecological processes. Therefore, households are a level at which adaptation can be directly studied. In fact, we can define the household as the most common social component of subsistence, the smallest and most abundant activity group. This household is composed of three elements: (1) social: the demographic unit, including the number and relationships of the members; (2) material: the dwelling, activity areas, and possessions; and (3) behavioral: the activities it performs. This total household is a product of a domestic strategy to meet the productive, distributive, and reproductive need of its members (Wilk and Rathje 1982:618).

Like Bender, Wilk and colleagues (Wilk and Netting 1984; Wilk and Rathje 1982) define the household based on the activities performed by its members. Through their cross-cultural analysis they isolated four "functions" that households typically perform: production, distribution, transmission, and reproduction (Wilk and Netting 1984:5; Wilk and Rathje 1982:621). While Wilk and Netting note that coresidence is also a function typically performed by household groups, Wilk and Rathje (1982) note that coresidence is not a necessary household activity and that members of household do not "necessarily live under a single roof" (1982:621). These functions (production, distribution, transmission, and reproduction) are performed at different scales and allow archaeologists to make inferences into the nature of household structure with regards to the manner in which activities are organized within a particular society.

Production

Wilk and colleagues define production as “human activity that procures resources or increases their value” (Wilk and Netting 1984:6; Wilk and Rathje 1982:622). Variation in the production process generally arises in the scheduling of labor surrounding activities associated with various forms of production. As one can imagine, certain production activities would be scheduled in different way at different times. One only needs to think of the labor demands required by irrigation agriculture to envision scenarios where canal maintenance, planting, and harvesting would be organized differently as well as exclude other activities from being performed. As Wilk and Netting note, scheduling takes into account “the absolute timing (in the yearly cycle) of productive tasks and the sequencing (the order) of the tasks themselves and the individual operations within a task” (Wilk and Netting 1984:7). Wilk and colleagues go on to discern two types of scheduling, linear and simultaneous tasks, which are differentiated by the labor demands of the tasks undertaken as well as the specific knowledge of the individuals performing the tasks regarding the end product’s operational sequence. Thus, linear tasks are envisioned as being “done by a single person performing a sequence of operations” while simultaneous tasks “are performed by a number of people acting at the same time” (Wilk and Rathje 1982:622). These simultaneous task production groups either perform similar tasks at the same time (simple simultaneous tasks) or individuals within the group perform different portions of the operational sequence (complex simultaneous tasks) (Wilk and Rathje 1982:622). Thus, the characteristics of task specific labor demands (e.g. group size, scheduling, knowledge, etc.) determines the scale at which production will be organized.

Barring unforeseen circumstances or natural catastrophes, most production takes place with groups of a culturally specified size until the size of the labor group causes decreases in returns on investment (Wilk and Netting 1984; Wilk and Rathje 1982). Thus, as Wilk and colleagues note, the efficiency of group will be determined by the scale of the economy and task specialization (Wilk and Netting 1984:7; Wilk and Rathje 1982:622-623). The labor pool that is organized to undertake particular tasks increases as tasks become scheduled in a simultaneous manner. This is a result of the fact that larger groups are necessary to complete tasks as the scale of the enterprise increases in complexity. Mechanisms need to be in place that either create the formation of larger task-oriented groups, or allow for the incorporation of additional individuals into the task group as labor demands dictate. In the latter case, mechanisms also need to be present to allow for the reduction in labor force. These concepts refer to the elasticity of the labor pool available within a particular social system (Wilk and Netting 1984:8). If an elastic system is present, the labor pool expands and contracts, shrinks and swells as demand dictates. However, if an elastic system is not present, then the increasing size of the task group either has to be absorbed as larger household groups, or must be extended to perform other tasks.

Distribution

Distribution refers to the processes used by groups in providing products to consumers. Wilk and colleagues (1982, 1984) differentiate between two types of distribution: pooling and exchange (Wilk and Netting 1984; Wilk and Rathje 1982:624). Pooling refers to processes that circulate resources within an individual household or community while exchange denotes processes that circulate materials between these social constructs. These processes vary depending on the manner in which production is organized. If production within the household focuses on creation of a diverse array of products, distribution is usually pooled to ensure that each household member has access to an equal share of these resources. As one can imagine, the distribution of particular resources, or the timing of a resource's availability, will affect how social groups distribute these materials. Generally, the pooling of resources by particular social groups is seen as an effective strategy when resources are seasonally variable or unpredictable (Wilk and Netting 1984:9). Wilk and Netting (1984:10) note that the distribution of resources (e.g. clustered, variable, unpredictable, etc.) also determines whether pooling of resources can be accomplished by relatively small social groups (i.e. households) or must be performed by larger social groupings (i.e. clans, corporate groups, communities, etc.). The pooling of resources is generally undertaken by larger social groupings when resource availability is more variable. This usually allows more individuals to be engaged in the production of a particular resource and allows the group to target multiple resources simultaneously or pool their labor during labor bottleneck events (e.g. planting or harvesting).

Transmission

Transmission, as defined by Wilk and colleagues (Wilk and Netting 1984; Wilk and Rathje 1982), refers to the generational transference of "rights, roles, land, and property" (Wilk and Rathje 1982:627). In their discussion of transmission, Wilk and colleagues primarily focus on issues surrounding access to land. They note that as access to land becomes more restricted, such as the case with increasing population density, that the social grouping responsible for transmission rights becomes more rigidly defined (Wilk and Rathje 1982:627). Thus, when land is plentiful in relation to population needs, transmission is handled by larger social groupings and is based on "group affiliations" (e.g. village residence or descent group membership) (Wilk and Rathje 1982:627). However, as resources become more restricted in relation to population, the social groupings responsible for resource transmission from generation to generation become more narrowly defined and eventually are "reduced to the household or to the individual" (Wilk and Rathje 1982:627). As the resource in question (i.e. land) becomes less available to individuals, larger households can develop as individuals stay in close proximity to those who have transmission rights in hopes of eventually acquiring those rights for themselves.

The mode of resource transference also differs in relation to population pressure. Partible transference, the transmission of land held in common equally to a number of heirs, is usually practiced when the access to the resource is not limited by population pressure (Wilk and Netting 1984:12; Wilk and Rathje 1982:628). Conversely, impartible transference, the transmission of land held in common to only one heir, is usually practiced when access to the resource is restricted by population pressure (Wilk and Netting 1984:12; Wilk and Rathje 1982:628). The process of adopting impartible transference as the primary means of resource transmission potentially leads to many unforeseen outcomes such as the development of socio-political hierarchies and/or the development of a landless class.

Reproduction

Reproduction refers to the "rearing and socializing of children" (Wilk and Rathje 1982:630). Wilk and colleagues initially focused their analysis of reproduction to studies that dealt with the biological reproduction of the household, and noted that larger households were better suited to handle the constant demands of childcare through pooling these demands within the larger group (Wilk and Rathje 1982:630-631). Later, Wilk and colleagues envisioned reproduction as "the mandatory socialization and enculturation of sub-adult humans" and note that "socialization generally necessitates coresidence while simple reproduction obviously does not" (Wilk and Netting 1984:14). As children are brought into the social group, many of the other tasks performed by the household are modified to include time for raising the children and teaching them to become productive members of the household and the larger social system. Despite this recognition that children have to learn how to become members of the household and communities of practice, Wilk and Netting do not fully characterize this condition of reproduction (and arguably transmission as well) and instead return to the task of evaluating fertility rates and how these affect household life cycles. Both of these are sometimes manipulated to achieve a culturally defined household morphology (Wilk and Netting 1984:14-17).

Most researchers interested in household archaeology have adopted some form of the household as described above. Most tend to utilize a definition of the household unit that is more aligned with Bender's (1967) definition, that households are coresidential groups which share domestic functions (e.g. Lowell 1989, 1991; Roth 2010b, 2010c; Seymore 2010; Whittlesey 2010) and others have found the distinction of household functions described by Wilk and colleagues (Wilk and Netting 1984; Wilk and Rathje 1982) as useful ways of shaping their research (e.g. Douglas and Gonlin 2012; Lightfoot

1994; Schriever 2010; Varien 1999, 2012). While transmission and reproduction were handled by Wilk and colleagues (Wilk and Netting 1984; Wilk and Rathje 1982) as separate functions that households perform, I believe that these two phenomena represent intertwined activities that allow for the continuity of social systems. Instead of primarily centering analyses of reproduction on the biological reproduction of species, I view reproduction as the generational transmission of overarching social structures. In this sense, social structure is more aligned with Gidden's notion of structuration and is perceived as the rules and resources drawn upon by individuals in the performance of actions. Varien (1999) somewhat alluded to this notion of household action when he noted that, when referencing the work of Wilk and colleagues, "the term function could be replaced with practice" (Varien 1999:17, emphasis original). While this simple, and somewhat unnoticed, word substitution appears innocent enough, it has drastic implications for how archaeologists interpret the patterned variability left behind by household agents.

Based on the above discussion, large households are favored in situations where production focuses on a diverse array of resources. Usually, labor can be pooled and scheduled in a simultaneous manner when the situation dictates (e.g. planting fields, harvesting crops, constructing houses, etc.). When labor is not pooled for the production of a specific resource, these large households experience more leeway in their ability to extend labor into the production of different resources. These resources are pooled within the household for redistribution amongst their ranks. If a surplus of a particular resource is present, these resources can then be exchanged across other social groupings (e.g. other households within a community, or between other households in other communities). By contrast, smaller households are favored in situations where production is similar across all social groups or when specialization of production creates situations where the discrepancy (diversity) between groups/individuals is so great that pooling resources would only benefit a small portion of the household group (Wilk and Rathje 1982:625-626). In the former situation, pooling would not be an effective strategy because there would be little opportunity for reciprocation, in the latter situation, only a portion of the overall group would benefit from the redistribution of pooled resources. This is especially so if production was not diversified beyond the production of the specialized product (Wilk and Rathje 1982:625-626). Thus, while some portion of the group may engage in a more diverse production regime in this scenario, if these resources were pooled for redistribution within the groups, only those individuals engaging in specialized production would benefit from the pooling of the resources obtained by the diversified production group.

Transmission and Reproduction: Redux

While Wilk and colleagues (Wilk and Netting 1984; Wilk and Rathje 1982) defined transmission as the transfer of physical resources between generations and defined reproduction based primarily on the biological sense of the term, many anthropologists and archaeologists have come to see these two processes as interrelated phenomena that influence the overall organization of a given social system. Increasingly, researchers using the concepts outlined by Giddens (1984) in his theory of structuration and by Bourdieu (1977) in his notion of practice theory have begun to view these two processes as integral to the structure of a social system. Specifically, researchers have begun to view individual social practices, or agency, as phenomena which serve to not only reinforce the given structure of a particular social system but are also phenomena which are influenced by the manner in which a particular social system is organized or structured. As such, any given social practice both influences and is influenced by the rules governing social behavior, or, as Giddens states, an actor's activities serves to constitute and reconstitute the structural principles within a social system which allows for the reproduction of structures across time and space (Giddens 1984). Of course no individual is brought into a given social system in a vacuum. Individuals are taught how to negotiate their actions and their associated outcomes through a series of learning frameworks. Within these learning frameworks individuals are acculturated to the proper methods of performance in a given social setting. Thus, transmission of the culturally prescribed ways of doing things becomes the guiding force for both biological and social reproduction.

TECHNOLOGY, OPERATIONAL SEQUENCES, AND LEARNING FRAMEWORKS

Technology has been variously described in the literature perhaps no more famously than in Leslie White's (1959:8) and Lewis Binford's (1962:218) definition of culture as "man's extrasomatic means of adaptation." Implicit in this definition of culture is the notion that things that exist outside the body (i.e. technologies) allow humans to adapt to foreseen and unforeseen conditions. Thus technology represents items that help individuals reach desired ends. While all the theories and research agendas outlined above might seem to be a rather disparate amalgamation of ideas, they all have one guiding underlying principle: people make things. They not only make things, but the manner in which they make things is dictated by a historically situated set of overarching social structures. While the things being made differ for each, all things produced, both materially and ideologically, are the direct result of various technologies.

Technology in this sense mirrors the notion of bodily techniques first outlined by Marcell Mauss (1935 reprinted in 1992). For Mauss, individual human action was seen as something that was conditioned by the social system in which an individual was a member. Thus, the manner in which specific actions were carried out would potentially differ from one society to the next. Mauss notes that for nearly every human action (technique), even something as mundane and taken for granted as eating, there is a "technical education and… there is an apprenticeship" (Mauss 1992:456). This education and apprenticeship teaches individuals the culturally prescribed ways of conducting themselves, or controlling their body, so that their actions meet the established norm. These culturally prescribed ways of conducting oneself rely on the technologies present in a society. Using one of Mauss' examples as a case in point, when one is taught to dig a hole, the technological implement used to facilitate the behavior is not only culturally dependent but also frames the entire practice. If you hand a field-school student a shovel and ask them to excavate a unit, they will generally be able to accomplish the task after some instruction. Hand them a digging stick and a stone-hoe afterwards and ask them to accomplish the same task; you will likely get a different result.

As Mauss notes, "every society has its own habits'" and "every technique…has its own form" (Mauss 1992:457). The members of that society must learn both the habits and technical forms of a given social system. This is what Mauss meant when he states that "there is perhaps no 'natural way' for the adult" and that all of our actions are not "assembled" by ourselves but are rather the result of our education as determined by the whole society to which we belong, and the place in it we occupy (Mauss 1992:460, 462). Every aspect of our daily routine involves some aspect of learning a culturally specified way of conducting ourselves and orchestrating our bodily movements to mirror a specific form. As one can imagine, different forms can exist within a social system. In some instances these forms constitute social makers and act as a type of demarcating symbol for who belongs to a particular group (e.g. socio-economic class, community of practice, etc.).

This view of technology is more in line with the notions of technology put forth by Dobres and Hoffman and others (e.g. Dobres 2000; Dobres and Hoffman 1994, 1999; Lechtman 1977, 1999; Lemonnier 1986, 1992; Pfaffenberger 1988, 1992) which view technology as a "pervasive and powerful complex of mutually reinforcing socio-material practices structured by self- and group-interests, expressions of agency, identity and affiliation, cultural ways of comprehending and acting on the world, practical and esoteric knowledge, symbolic representations, and skill" (Dobres and Hoffman 1999:2). Thus, the form a technology takes can be seen as a social product that results from and reinforces the social structures present in a given social system. This is what Lemonnier (1992) alludes to when he discusses technological choices. In a given social system certain choices are made by groups about how to apply "action upon matter" and groups decide upon the correct choice despite the fact that each choice or option would allow the group to meet their desired ends (Lemonnier 1992:1). These choices are influenced by the "five components of technology" established by Lemonnier (1992:5-6):

1: Matter - the materials upon which a technique acts

2: Energy - the forces that move objects and transform matter
3: Objects - the implements used to act upon matter
4: Gestures - the techniques of the body used in transforming materials into cultural products (operational sequences)
5: Specific knowledge - the end result of all the perceived possibilities and the choices that have shaped a technological action.

Each of these components is influenced by larger cultural processes that are in turn either enabled or constrained by environmental factors. For instance a cultural group could not develop and use the waterwheel as a source of energy if sufficient running water is not present in the local environment.

From a technology perspective, the culturally prescribed ways of doing things are best encapsulated in the concept of operational sequences for a technological system (Dobres 1999; Dobres and Hoffman 1994; Lemonnier 1986, 1992; Leroi-Gourhan 1943, 1945). The operational sequence for lithic and ceramic technologies are described in more detail in following chapters however, each uses the five components of a technology outlined by Lemonnier (1992). In a general sense, both lithic and ceramic technology require the procurement of matter as raw materials and additional tools needed in the manufacture process; the application of energy to transform these materials usually with through the use of additional tools; and knowledge of how to apply matter, energy, and additional objects together to produce a tool to meet the desired end.

As one can imagine, there are culturally prescribed ways of engaging with these different components of technology. For any aspect of a technological system different choices present themselves and the right and/or wrong choices are dictated by the structure of the social system within which the technology is enmeshed. The different culturally prescribed ways of conducting the actions necessary to produce an item that meets the standards of the overarching social system must be transmitted from one individual and must also be learned by another. In order to accomplish this, a set of learning frameworks must be in place that allow for the transmission of knowledge.

LEARNING: BECOMING A MEMBER OF A COMMUNITY AND A HOUSEHOLD

Within the literature there are two main sets of theories that guide our perceptions of how individuals acquire knowledge: cognitive and situational theories of learning (Anderson et al. 1996, 1997; Greeno 1997; Hodkinson et al. 2008). These two sets of theories are "often conflicting," and while attempts have been made to bridge the various gaps present between the two (e.g. Alexander 2007; Greeno and van der Sande 2007; Halldén et al. 2007; Mason 2007; Murphy 2007; Vosniadou 2007), most researchers now view these attempts as an "unnecessary foray or an unachievable feat" primarily because the two approaches focus on different aspects of traditional learning: cognitive/acquisition and situational/participation (Alexander 2007; Hodkinson et al. 2008:30; Minar and Crown 2001:371; Sfard 1998).

The cognitive/acquisition model views learning as a process of "concept development" and examines "the developmental stages in the learning process" (Minar and Crown 2001:371). As Sfard (1998) notes, this model carries with it certain assumptions about the nature of knowledge. It views knowledge as a material concept that has physical properties and is capable of being owned by an individual. Once knowledge is attained as a "commodity," it is capable of being "applied, transferred (to a different context), and shared with others" (Sfard 1998:6). The situational/participation model in contrast views learning as something that is context driven and primarily social in nature. Instead of focusing on specific discrete bundled packages that can be acquired by individuals, adherents of the participation model focus more on learning "activities" where individuals interact in a specific context. As such the learner is "viewed as a person interested in participation in certain kinds of activities rather than in accumulating private possessions" (Sfard 1998:6). While a very vulgar overview of the two concepts has been presented, I wish to focus my attention on further developing the notions associated with the situational/participation model. As will be discussed below, this model is not fully divorced from certain assumptions made by those upholding the cognitive/acquisition model but focuses more on the context in which learning activities are carried out.

In the first decades of the 20th century, studies in learning and development were centering on the relationship between the two parts. Are learning and development independent of one another, mutually dependent, or did they interact (Vygotsky 1978:79-81)? As Vygotsky notes, all of the concepts current to ca. 1930 could be reduced to "three major theoretical positions. The first centers on the assumption that processes of child development are independent of learning. Learning is considered a purely external process that is not actively involved in development. It merely utilizes the achievements of development rather than providing an impetus for modifying its course. The second…is that learning is development. The third…attempts to overcome the extremes of the other two by simply combining them" (Vygotsky 1978:79-81). For Vygotsky these three major theoretical orientations of the time were flawed because in all three learning either lagged behind development or occurred simultaneously making equal strides in progress as individuals matured. Finally, Vygotsky believed that all three failed to take into consideration the context in which learning takes place.

While Vygotsky does not fully problematize the effects of his experimental context on learning, he does note, "human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (Vygotsky 1978:88). Thus learning is dependent on a specific context where individuals learn in a social setting by individuals who are already capable of solving problems in a competent manner that is beyond the level of the individual seeking instruction. This social nature was exemplified in the "zone of proximal development," or "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky 1978:86). Thus the zone of proximal development represents a developmental stage that someone can attain under the guidance of more competent individuals. Once an individual learns to solve specific problems under this tutelage, the information is internalized, and the individual becomes able to conduct similar operations without assistance. Unlike his predecessors, Vygotsky saw learning as something that preceded development.

Individuals need to learn the proper skills necessary to acquire a more sophisticated "actual developmental level" (Vygotsky 1978:85). Vygotsky believed that this was a cyclical process whereby learning constantly creates new actual developmental levels and coinciding zones of proximal development for individuals to continue to develop and mature.

Vygotsky's zone of proximal development is by far the most cited of his theoretical constructs because it "serves to give connectedness to a wide range of Vygotsky's thought" (Bruner 1987:4 in Moll 1990:3). Moll (1990) notes that the zone of proximal development encapsulates three larger aspects of Vygotsky's model: "holistic analysis, mediation, and change" (Moll 1990:5-15). By "holistic analysis," Moll (1990) refers to Vygotsky's preference for studying "whole activities" and not isolated elements or individual skills (Moll 1990:5-9). By mediation, Moll (1990:9-12) refers to Vygotsky's belief that all knowledge was transmitted by a culturally determined set of signs and symbols the competent use of which allows individuals to reach "higher order intellectual activity" (Moll 1990:12). The final larger aspect of Vygotsky's model encapsulated by the zone of proximal development, change, refers to the fact that the overall outcome of learning and development is not only the change in the individual learner from one level of actual development to another higher level, but also the generation of meaning in the actions undertaken by the learner. This meaning is developed through making the learner conscious of the signs, symbols, tools, technologies, etc. used in carrying out a project or solving a problem (Moll 1990:12-15).

As might be discernible from the discussion above, Vygotsky somewhat straddles the divide between the cognitive/acquisition model and the situational/participation model of learning. Vygotsky was definitely interested in individuals as members of groups but his zone of proximal development represents a focus on unique developmental stages in human cognition. Further, as Lave and Wenger (1991: 48-49) note, most interpretations of Vygotsky's zone of proximal development view learning as consisting of only "a small 'aura' of socialness that provides input for the process of internalization viewed as individualistic acquisition of the cultural given" leaving little room for "the place of learning in the broader context of the structure of the social world." Despite this, Vygotsky is often seen as more of a forefather for those upholding the situational/participation model of learning. Proponents of situational learning theory give as much primacy to the context in which learning occurs as they do the subject matter being learned (Anderson et al. 1996). These researchers note that contextualizing learning in this manner allows one to alleviate the discrepancies that present themselves when a student leaves the traditional learning environment and attempts to transfer their knowledge to real world situations.

In a relatively early critical look at situated learning theory, Anderson and colleagues (1996) note that four claims are made by situated learning theory practitioners that do not always hold true. These four claims are not mutually exclusive and rather hint at much larger issues in generalizing learning into discrete models. The first of these claims has been stated previously, and most researchers now acknowledge that learning is constrained or enabled by the context in which it takes place. However, this is dependent on the subject matter being taught. In some circumstances, which are not fully drawn out, the subject matter being taught in one context is not capable of being transferred from the context in which it is learned to a new context.

This is related to the second claim made by situated learning practitioners that "knowledge does not transfer between tasks" (Anderson et al. 1996:6). This claim is based primarily on the contention of the first claim in that if knowledge were context dependent, then it would fail to transfer to different contexts. However, as Anderson and colleagues demonstrate, the amount of transfer from one situation to the next depends on mediation methods (the signs, symbols, and technologies) used during the learning process and those present in the transfer context, as well as where attention is directed during the learning or transfer context (Anderson et al. 1996:7-8).

The third claim leveled by situated learning practitioners upon cognitive/acquisition models is that "training by abstraction is of little use" (Anderson et al. 1996:8). This critique alludes to the points made above in that if the abstractions taught do not match the context in which they're applied then transfer to the new context will not occur (Anderson et al. 1996:8-9). Some adherents of the situated/participation learning models use this critique to argue for apprenticeship training where learning "is directed towards training someone in a set of specialized skills" that often teaches individuals "the 'secrets' of a craft" through hands-on application and generative experiences (Coy 1989:1-3). As Wendrich (2012b:3) states, "the major purposes (of apprenticeship) are the development of dexterity, skill, endurance, memory, consideration, and properness, while gaining knowledge, inspiration, and/or motivation" of skills involved in a community of practice.

The fourth and final critique of cognitive/acquisition models as discussed by Anderson and colleagues (1996) is that "learning should take place in "complex, social situations" (Anderson et al. 1996:9). This critique is related to the others described above in that the likelihood of transfer from one context to the next is increased when the learning context more closely matches the context in which concepts are applied. Regardless of the concepts being taught, individuals must be able to apply their concepts to an ever-changing world where unforeseeable circumstances of application present themselves. It is argued that teaching individuals in a varied set of complex situations allows individuals to better transfer learned skills to new situations as they arise.

Perhaps one of the most pertinent models describing situated learning comes from the work of Lave and Wenger (1991) in their description of situated learning as legitimate peripheral participation in communities of practice. Like all notions of situated learning, Lave and Wenger (1991) view learning as some degree of "participation in social practice" (Lave and Wenger 1991:54). Legitimate peripheral participation represents the means by which communities of practice (described above) are reproduced, in changing form, across time and space. Learning by means of legitimate peripheral participation entails the ways new members are brought into communities of practice, and into the larger social world, through participation in shared collective activities. As new members are first introduced to the manners of behavior, belief systems, social rules, and resources used by particular communities, their overall knowledge of the structuring of these elements place them on the "periphery" of this community. As individuals learn the rules governing behavior associated with the community of practice in question they move from peripheral participation to "full participation" in the community (Lave and Wenger 1991:37). This process entails the learning of all the necessary rules and resources that dictate the behaviors of the community's members.

This movement from peripheral participation to full participation in communities of practice brings with it both continuity and discontinuity of structural principals within the community. This is true for both the composition/morphology of the group as well as the skill sets used by group members. In the former, group morphology changes as individuals move from peripheral participation to full participation in that new peripheral participants are brought into the group and old full participants fall out of the group. In the latter, as new members experiment with the rules and resources utilized by group members, small changes are accrued either intentionally or as unintended consequences of actions by the negotiation of often conflicting socio-political organizations, identities, status-quos, etc. in the performance of behaviors associated with the community. Thus, the process of community reproduction through situated learning by means of legitimate peripheral participation inevitably entails the production of new or reconfigured structural norms within the community. As Lave and Wenger note, "reproductive cycles are productive cycles as well. They leave a historical trace of artifacts…and of social structures, which constitute and reconstitute the practice over time" (Lave and Wenger 1991:58).

The notion of legitimate peripheral participation is used by Lave and Wenger (1991) to offer a theory of learning as something embedded in social activity and could be used to analyze various forms of situated learning. While they initially developed the theory as a means of investigating apprenticeship in cross-cultural settings, they note that the theory could be used to interpret any method of learning cultural practices. Despite this recognition, the notion of legitimate peripheral participation in communities of practice is most commonly used to describe the process of apprenticeship (e.g. Wendrich 2012b). In these scenarios full participants sponsor, in some way, peripheral participants who wish to gain access to the community of practice in question. Sponsorship ranges from informal to formal with the latter emerging in situations where peripheral participants wish to learn a specialized occupation. In these instances, "intentional relations, and even contractual relations with a specific master (i.e. full participant), are common" (Lave and Wenger 1991:92). In these formal apprenticeship situations there is often some agreement as to what skill sets will be transferred to the apprentice, the responsibilities of the master and the apprentice, as well as some recognition as to the length of the apprenticeship (Coy 1989). Sponsorship in either the formal or informal sense is necessary to confer legitimacy onto the community of practice. Legitimacy here refers to a community's "hegemony over resources for learning and alienation from full participants" in the community to members who have not learned the necessary practices (Lave and Wenger 1991:42).

Learning in these situations is often informal with "little observable teaching" and the "practice of the community creates the potential curriculum" (Lave and Wenger 1991:92-93). Full participants often embody the culturally prescribed ways of behaving, and rather than guide individuals with different levels of community membership through a set of exercises aimed at helping members achieve a new level of practice mastery, allow peripheral participants to learn from one another (Lave and Wenger 1991:93). Once individuals enter an apprenticeship system, learning is frequently based in practice and participation. Individuals move from peripheral position though gradually learning "what constitutes the practice of the community" (i.e. "who is involved; what they do; what everyday life is like; how masters talk, walk, work, and generally conduct their lives; how people who are not members of the community of practice interact with it; what other learners are doing; and what learners need to learn to become full participants") (Lave and Wenger 1991:95). Often the first behaviors learned by a peripheral participant are those that are not vitally linked to the product of the community of practice. As Lave and Wenger note, "less intense, less complex, less vital tasks are learned before more central aspects of practice" (Lave and Wenger 1991:96). This allows the newcomer to become more familiar with the overall structure of the community of practice (i.e. the relations among community members, how different communities of practice interact with their community, the rules and resources used by different community members, the signs and symbols used by different communities, etc.). As their time as an apprentice increases, individuals become more fully incorporated into the production system of the community of practice.

During their tenure as apprentices, individuals acquire both "theoretical" knowledge of practices as well as "specific" knowledge of practices based on the ability to perform tasks in specified way (Wallaert-Pêtre 2001). Both of these can exist in the realm of the unconscious though are expressed as tacit knowledge through performance (Polanyi 1966). The amount of time devoted to these aspects of knowledge differs across the learning processes associated with different communities of practice. Apprentices learn how to perform practices in either open or closed systems. Open systems of learning allow individuals to "adapt to unknown situations" and "respond to unstable situations" (Wallaert-Pêtre 2001: 482). These systems are generally the result of "trial-and-error training" and are more flexible with regards to individual innovation or deviance from the rules guiding action (Wallaert-Pêtre 2001: 482, 489). They are thus more accommodating to change from within the group. Closed systems of learning, on the other hand, are limited in their ability to adapt to new circumstances and respond to predictable situations (Wallaert-Pêtre 2001: 482). These systems tend to be fairly ridged and require the unquestioning adherence to the rules dictating an individual's behavior (Wallaert-Pêtre 2001: 489). Within the operational sequence of the item produced by the community of practice some aspects of production may be guided by a closed system of learning while other aspects of production may be guided by open systems of learning.

The purpose of the apprenticeship process is to instill individuals with the proper "dexterity, skill, endurance, memory, consideration, and properness" as held in common by members of a given community of practice (Wendrich 2012b:3). After their time as a legitimate peripheral participant has passed and the individual becomes a full participant in the community, these aspects of behavior are further developed to such an extent that their guidance in the individual operations of some production activities becomes habitual and taken for granted. Through the course of an individual's apprenticeship all aspects of how to conduct oneself within society are shaped and molded. Because individuals are taught how members of their community interact with one another and with other communities, this shapes how different community members interact with the larger social world not just in relation to production activities but also to other individuals in general.

SUMMARY

While the above set of theories may seem a rather odd agglomeration of ideas, they all serve to ground the manner in which I approached my datasets specifically those relating to lithic and ceramic technology. I believe that, like Bourdieu (1977) and Giddens (1984), individual action is guided by overarching social structures. These social structures are in a state of constant formation caused by the interplay of the dialectical relationship between structure and agency. These structures dictate the general rules of proper behavior for any given subset of the population and are institutionalized in some form due to the fact they encode some notion of situational practices associated with a distinct domain of action. For my study, these institutions are encapsulated and made manifest in households, formal communities, and communities of practice.

For the different variables used in my analyses, communities of practice represent those institutions that share a common productive practice which requires the acquisition of specific knowledge by those wishing to become members of the community. In most scenarios, this knowledge is acquired through apprenticeship where new members come under the tutelage of a full member and knowledge is passed down from the full member to the apprentice incrementally. This learning can take place at different scales and can vary across time and space. Thus for certain communities of practice, learning of productive tasks may take place at the household level while at others it may take place at larger levels of analysis (e.g. formal communities and/or regions).

During the apprenticeship period, inductees are taught not only how to conduct the processes associated with the communal practices, but also learn how their community of practice interacts with other communities of practice. This acts as a form of discipline which gives individuals in the community a sense of where they fit in the larger social system and acts as a form of discipline that instills each community member with a notion of identity.

With respect to my larger research agenda, if was an abandonment or substantial depopulation of the Mimbres area during the Black Mountain phase that was followed by a immigration of ethnically distinct peoples, these new groups would bring with them new sets of situated practices associated with distinct communities of practice. In the following chapters I begin to investigate this possibility through analyzing the manner in which different technologies were organized during different time periods.

Chapter 3: Environmental Setting

The climate of the larger Mogollon area is traditionally classified as arid or semiarid. This general designation is based on low annual precipitation and relatively high evapotranspiration of available moisture. Average daily temperatures in the area range from only 30 degrees Fahrenheit in January to upwards of 78 degrees Fahrenheit in July (Figure 2.1) with an average yearly temperature of 53.6 degrees (Gabin and Lesperance 1977). Average monthly precipitation ranges from 0.14 inches in May to upwards of 3.4 inches in July (Figure 2.2) with yearly precipitation ranging from 7.24 inches to 28 inches (mean = 13.18 inches, standard deviation = 3.91 inches) (Gabin and Lesperance 1977). The combination of these two phenomena (temperature and available moisture) influences the area's evapotranspiration.

As shown in Figure 2.3, the potential evapotranspiration, or the evapotranspiration that would result if an area with homogeneous ground cover was irrigated continually, tends to exceed what is produced from the atmosphere for the majority of the year (Maliva and Missimer 2012). Thus, for large portions of the year, the potential for water to be returned to the atmosphere through both evaporation and plant transpiration is greater than that produced from the atmosphere. While these factors influence the classification of the region's environment as arid and/or semiarid, it should be noted that actual evapotranspiration rates rarely reach the potential evapotranspiration levels due to the fact that little moisture is available to be transferred to the atmosphere and local vegetation has adapted to these environmental conditions and begin growth cycles during optimal conditions (Jensen 1968). Despite this, the relationship between potential evapotranspiration and precipitation is often used to measure the need for irrigation practices. With respect to modern agricultural practices, if potential evapotranspiration exceeds actual precipitation then crops are usually irrigated and water management practices are usually implemented (Thornthwaite 1948).

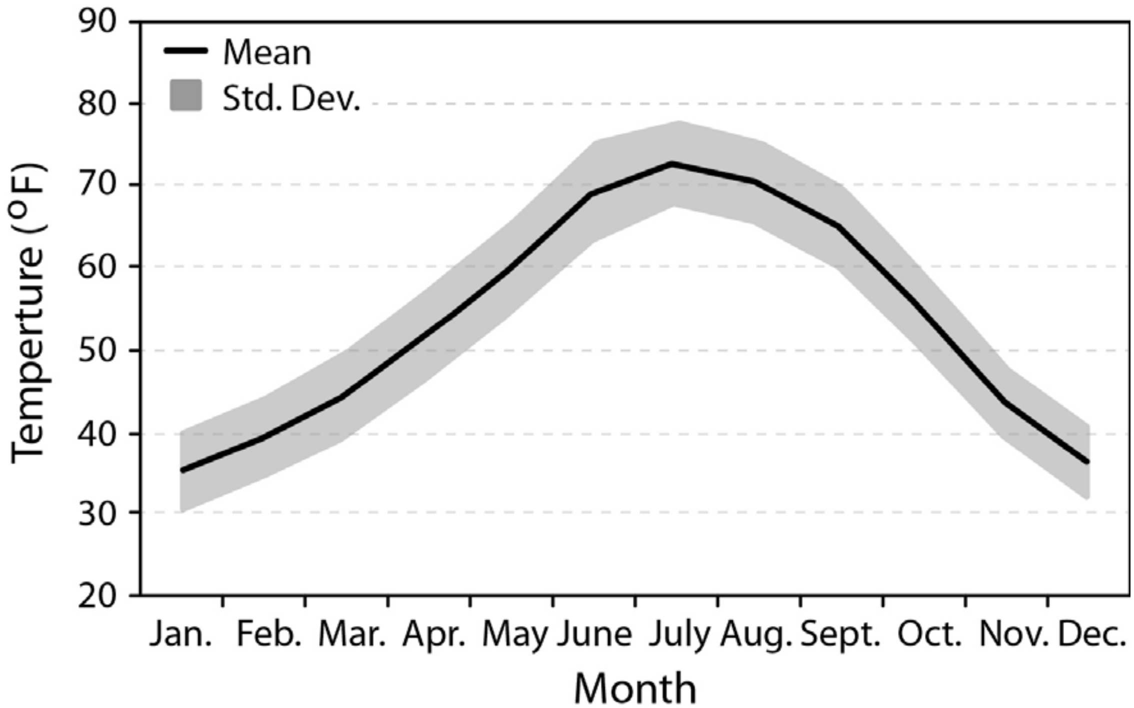

Figure 2.1: Average monthly temperatures for differing weather stations in Catron, Grant, Luna, Sierra, and Socorro counties, New Mexico. Information is based on data obtained from 1850 through 1975. Information taken from Gabin and Lesperance (1977).

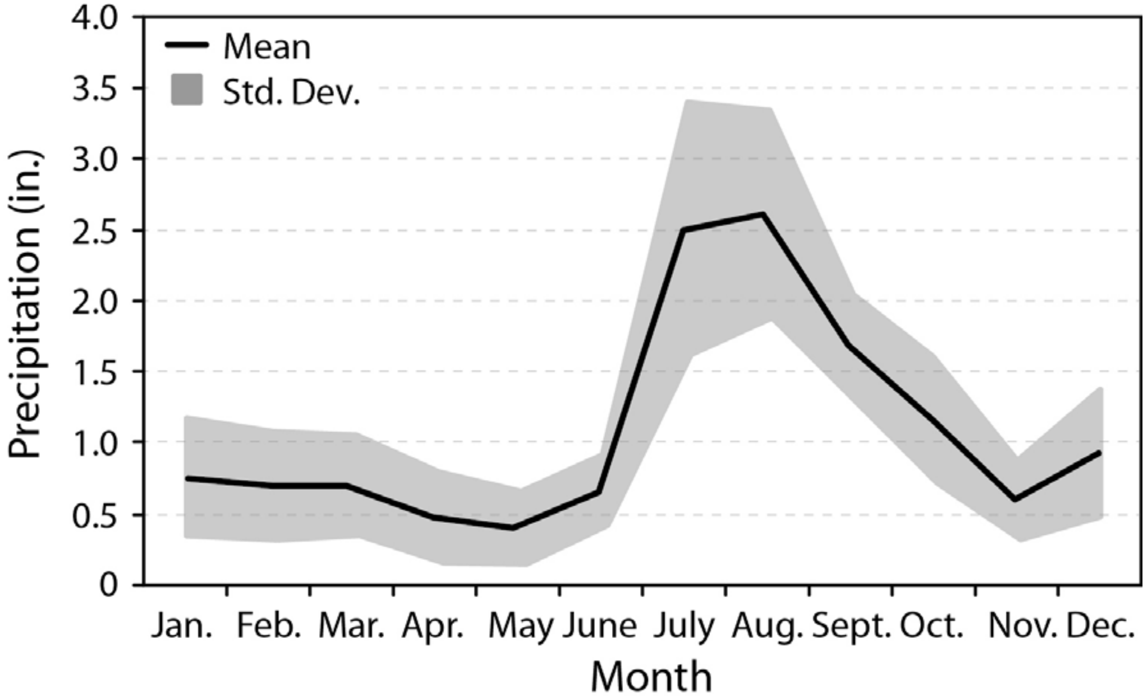

Figure 2.2: Average monthly precipitation for differing weather stations in Catron, Grant, Luna, Sierra, and Socorro counties, New Mexico. Information is based on data obtained from 1850 through 1975. Information taken from Gabin and Lesperance (1977).

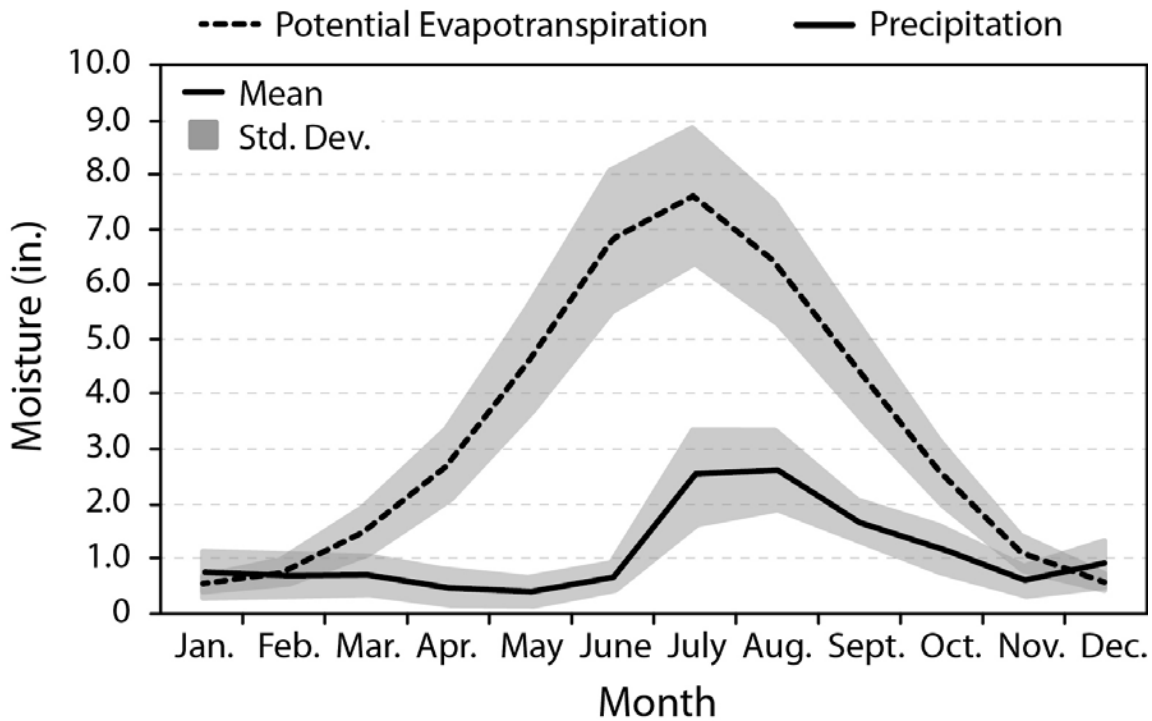

Figure 2.3: Average monthly potential evapotranspiration and average monthly precipitation for differing weather stations in Catron, Grant, Luna, Sierra, and Socorro counties, New Mexico. Information is based on data obtained from 1850 through 1975. Information taken from Gabin and Lesperance (1977).

Since topography and climate are, to some extent, interdependent, when one changes so too does the other. Precipitation within the Mimbres area occurs in a bimodal distribution with cyclonic storms occurring mainly in February and more sporadic, localized events occurring from July through September (Minnis 1985) (Figure 2.2). Archaeologists working in the Mimbres valley traditionally divide the area into two topographic zones. These zones, a desert zone and mountain zone, vary with elevation and support distinct biotic communities. The desert zone is composed of areas with a base elevation of 1200 meters above mean sea level. This zone generally corresponds with the Lower Chihuahuan Vegetation Zone which is characterized by ephemeral stream flow and is dominated by xeric scrubs and stands of grasses (Minnis 1985:78). Stream floodplains in this zone are commonly populated by desert willow, rabbit hackbrush, desert hackberry, mesquite, and cottonwood (Minnis 1985:78). The Upper Chihuahuan Vegetation Zone represents a somewhat transitional zone between the desert and mountain topographic zones. Vegetation within this zone is primarily composed of oak and pinyon/juniper woodlands intermixed with a variety of desert scrubs. The floodplains in this vegetation zone are populated by cottonwood, alder, elder, ash, walnut, and willow in the over-story and ragweed, sunflower, pigweed, grasses, and goosefoot in the understory (Minnis 1985:80). The Transitional Zone, which is present in the elevation band ranging from 2135 to 2750 meters above mean sea level, is similar to the Upper Chihuahuan Vegetation Zone but also contains ponderosa pine in the over-story and the understory is primarily composed of various grasses (Minnis 1985:80-81).

While this characterization of the physical environment in the Mimbres area is for the most part accurate and the one most generally used by researchers, other researchers have seen fit to sub-divide the general categories in order to more fully capture the variability present at smaller analytical levels. In these models, the environment is divided into seven vegetation zones: the Subalpine Forest zone, the Montane Conifer Forest zone, the Great Basin Conifer Woodland zone, the Madrean Evergreen Woodland zone, the Plains Grassland zone, the Semi-desert Grassland zone, and the Chihuahuan Desert Scrub zone (Diehl and LeBlanc 2001:12-17) (Figure 2.4).

The Subalpine Forest zone is located in an elevation band ranging from between 2450 and 3500 meters above mean sea level and receives around 635 to 1000 mm of precipitation annually with a frost free period of approximately 75 days. The species that dominate the upper canopy in this vegetation zone include varieties of alder, aspen, birch, cottonwood, fir, madrone, maple, oak, pine, poplar, spruce, and willow while the understory contains numerous species of edible plants. Various animal populations including bears, mountain sheep, mule deer, and elk inhabit this vegetation zone (Diehl and LeBlanc 2001).

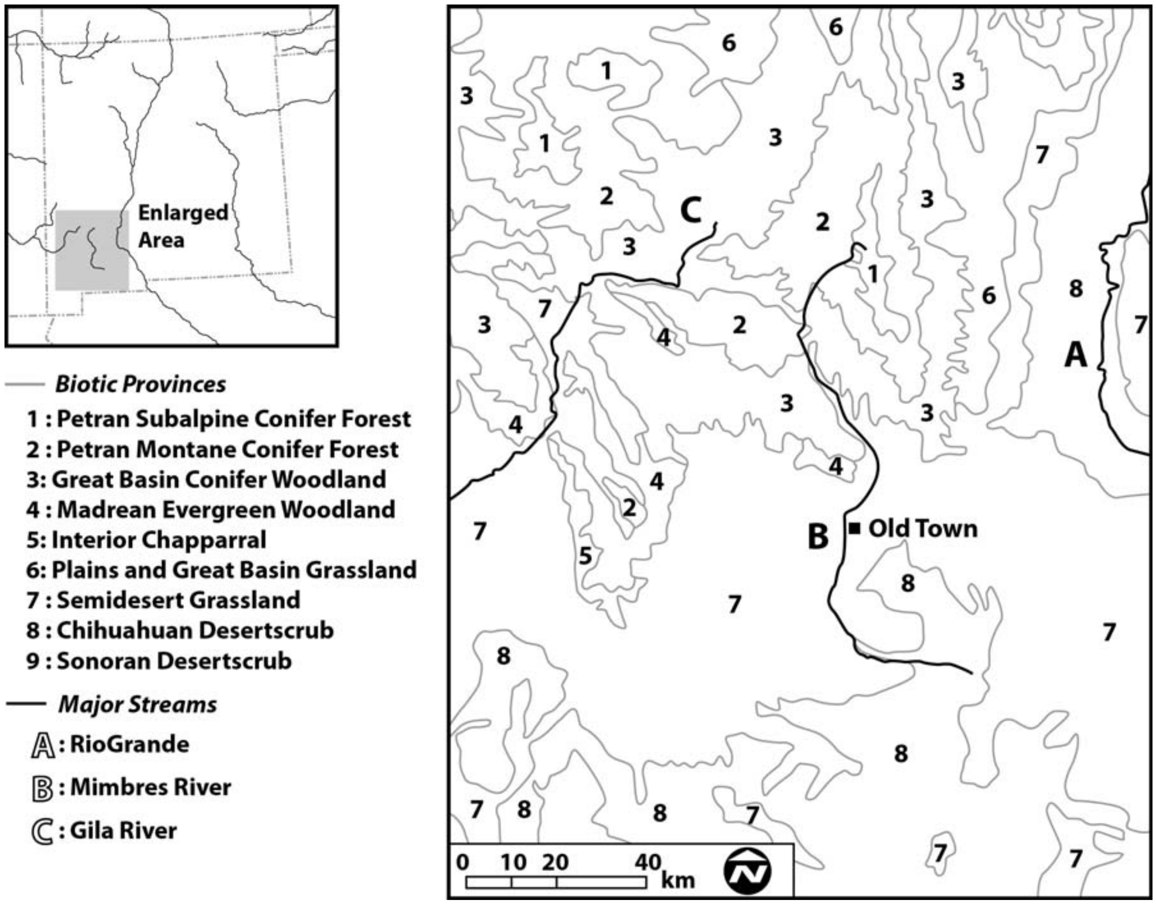

Figure 2.4: Depiction of biotic provinces and major streams surrounding the Mimbres Area. Information taken from Diehl and LeBlanc (2001).

The Montane Conifer Forest vegetation zone is located in an elevation band ranging from between 2300 to 3000 meters above mean sea level and receives more than 500 mm of precipitation annually. The species that dominate the canopy include ponderosa pine, alligator juniper, Gamble oak, and other species of oak while the understory is primarily populated by sumacs, currants, and other edible plants. Numerous animal populations inhabit this vegetation zone including elk, mule deer, white-tail deer, and mountain sheep (Diehl and LeBlanc 2001)

The Great Basin Conifer Woodland vegetation zone, commonly referred to as the pinyon-juniper zone, is located in an elevation band ranging from between 1500 to 2300 meters above mean sea level and receives between 300 to 500 mm of precipitation annually. Ponderosa pine and alligator juniper occur occasionally in this province, though vegetation is dominated by pinyon pine and one-seed juniper with cottonwood occurring along the floodplain of the Mimbres River. There are numerous fruit producing cacti and shrubs in this vegetation zone and all animals present at higher elevations are present in this zone with the exception of mountain sheep (Diehl and LeBlanc 2001).

The Madrean Evergreen Woodland zone is populated by a variety of oaks and pines though one-seed juniper is also occasionally occurs. The understory of this vegetation zone is primarily composed of various cacti and fruit producing shrubs. Numerous animal species populate this biotic province but the larger mammals within the zone are limited to bear and deer (Diehl and LeBlanc 2001).

The Plains Grassland vegetation zone represents the southwestern most extension of the short-grass prairie of the western Great Plains. This physiographic zone receives around 250 to 300 mm of precipitation annually with the majority of this moisture falling between the months of June and August. Mammals that commonly inhabit this vegetation zone include elk, mule deer, pronghorn antelope, and possibly bison (Diehl and LeBlanc 2001).

The Semi-desert Grassland vegetation zone is located in an elevation band ranging from between 1600 to 1800 meters above mean sea level and receives roughly 250 mm of precipitation annually. This province includes the modern grass and shrub infested areas populated by creosote bush, Mormon tea, rabbit brush, mesquite, and salt brush that flourish as a result of overgrazing. Cottonwood, oak, and walnut are also common in more moist areas along the floodplain. The fauna of the area include elk, mule deer, antelope, coyote, jackrabbits, and occasionally mountain lion (Diehl and LeBlanc 2001).

The Chihuahuan Desert Scrub vegetation zone is located in areas below 1600 meters and primarily consists of low rolling hills that receive between 200 and 300 mm of precipitation annually. Cottonwood and oak flourish in areas along this zone's floodplains while various grasses, brush, and cacti populate the areas away from drainages. Antelope, coyote, jackrabbits, javelinas, roadrunners, rodents, and lizards are the primary faunal species encountered in this vegetation zone (Diehl and LeBlanc 2001).

GEOLOGY

Perhaps the best stratigraphic exposure of the geological history of the area surrounding the Old Town ruin is exposed within the Cookes Range which lies roughly 15 kilometers east of the site. The earliest exposures in this area consist of Precambrian era granites and granite gneiss which are intruded upon by later pegmatites and rhyolite dikes (Elston 1957:4). The Bliss Quartzite formation rest unconformably upon these early Precambrian granites and is believed to have been deposited during the Cambrian or early Ordovician Periods. The Bliss Quartzite formation consists of "well-cemented hematitic quartzite, red sandstone, a few beds of glauconitic sandy shale, and, locally, a conglomeratic base" (Elston 1957:6). Rather thick sections of limestone rest conformable upon the Bliss Formation deposits. These limestone deposits consist of an earlier El Paso group and a later Montoya group (Elston 1957). Both attest to the presence of a marine depositional system within the area during the Ordovician Period. This marine depositional system continued to be present throughout the Ordovician Period through to the Pennsylvanian Period (Elston 1957). During this immense time span numerous limestone and shale groups were deposited beginning with the Fusselman limestone group which rest unconformably upon the Montoya group formation. This limestone formation was deposited during the Silurian Period and is nonconformably overlain by the Percha shale formation which was deposited during the Devonian Period. Lake Valley limestone, deposited during the Mississippian Period, and the Pennsylvanian Period Magadelena limestone rest upon the Fusselman limestone deposits (Elston 1957) (Figure 2.5). The Abo-Lobo Red Beds formation rest conformably upon these earlier

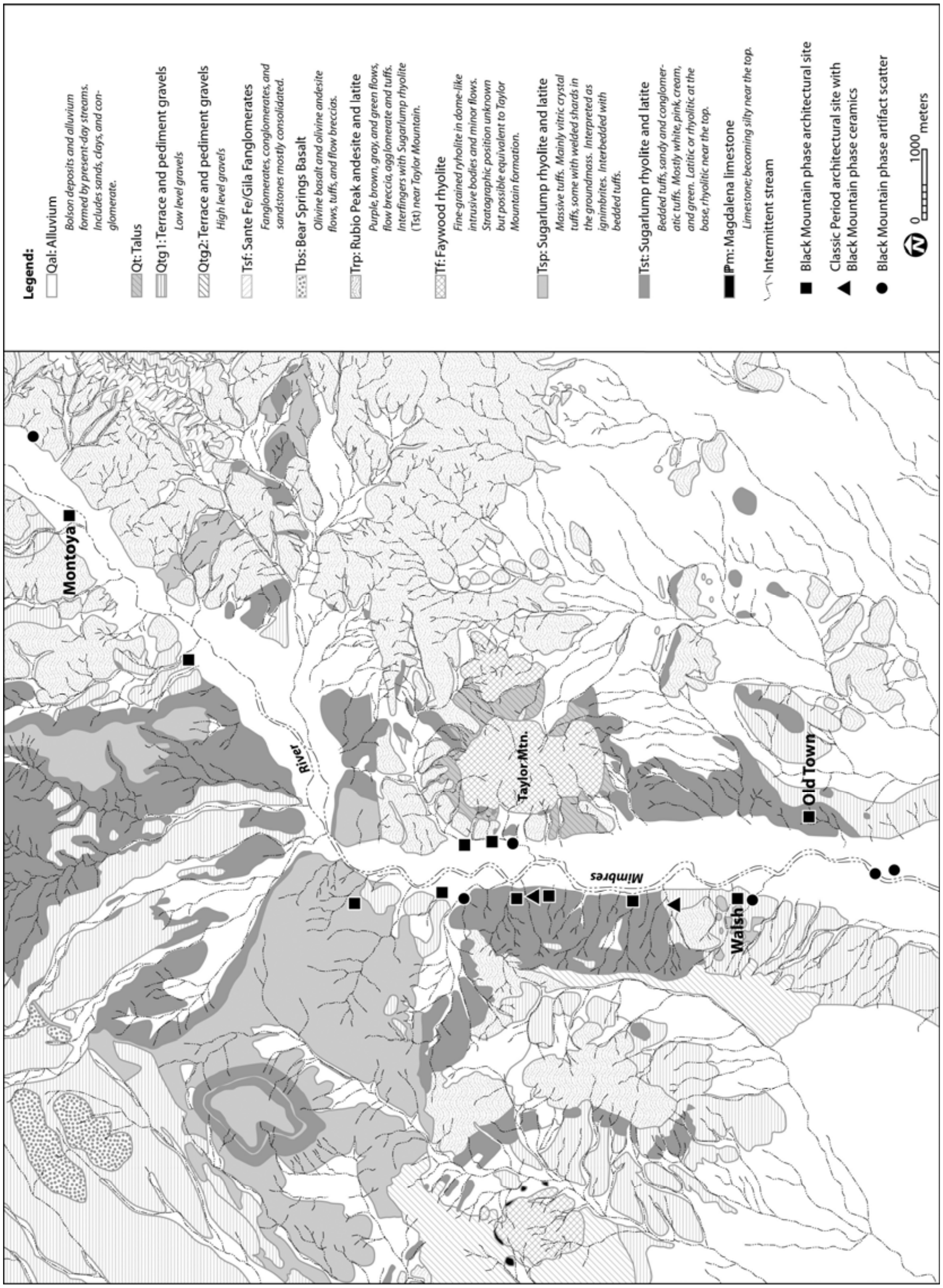

Figure 2.5: Depiction of surface geological formations and recorded archaeological sites with Black Mountain phase characteristics near Old Town.

deposits. These red-bed formations were likely deposited during the late Permian and Triassic Periods and consist of “conglomerates, red shales, and reddish-brown sandstone” (Elston 1957:8). The Sartan-Beartooth quartzite and the later Colorado shale formations rest unconformably upon the earlier Abo-Lobo Red Bed formation and are believed to have been deposited during the Cretaceous Period (Elston 1957).

The Tertiary Period saw the recession of the marine environment present in the area and the emergence of an era of high volcanic activity. Elston (1957) divided this period into an earlier Lower Volcanic Series and a later Upper Volcanic Series. The earlier, Lower Volcanic Series, “was an orogenic calc-alkaline suite, differentiated from a granodioritic magma by fractional crystallization,” while the later, Upper Volcanic Series, “was a calcic suite, possible nonorogenic, and derived from deep-seated basaltic magmas, in part directly or by fractional crystallization, in part by assimilation of silicic rocks, and possibly also by differentiation of a trachytic magma” (Elston 1957:57).

The Lower Volcanic Series consist of the Rubio Peak andesite, Sugarlump rhyolite, Kneeling Nun rhyolite, Mimbres Peak rhyolite, Box Canyon rhyolite, Rustler Canyon basalt, and Caballo Blanco rhyolite formations (Elston 1957:17-31). The Rubio Peak formation consists of andesite and latite flows, tuffs, breccias, conglomerates, and agglomerates (Elston 1957). The color of these deposits range from dark grey or black to purple and brown. Both pyroclastic and flow deposits are equally represented. This deposit rests unconformably upon earlier deposits (i.e. Fusselman limestone and Beartooth quartzite). The Sugarlump rhyolite formation rests both conformably and unconformably upon the Rubio Peak formation. This deposits consists of both rhyolite and latite tuff flows with pyroclastic materials of similar composition often interbedded. These deposits are generally white or green with pink or brown layers present as well. The Kneeling Nun rhyolite formation rests conformably upon the Sugarlump formation and consists of rhyolite beds which have a distinctive grayish-purple color. The Mimbres Peak (Taylor Mountain) formation rests unconformably upon the Kneeling Nun rhyolite formation and is composed of rhyolite flows, pumiceous tuffs, local tuffaceous sandstone, conglomerates, sandy tuffs, and perlite (Elston 1957). These deposits are distinctly stratified and range in color from white or cream to pink. The Box Canyon rhyolite formation rests conformably upon the Mimbres Peak formation and consists of a massive cream to pink colored tuff flow. The Rustler Canyon basalt formation is only exposed locally and consists of a crystalline, vesicular, black rock. Finally, the Caballo Blanco rhyolite formation rests conformably upon the Box Canyon and Rustler Canyon formations. The Caballo Blanco formation consists of a porphyritic rhyolite tuff flow which ranges in color from white or cream to light grey.

The Upper Volcanic Series consists of the Razorback rhyolite, Bear Springs basalt, Swartz rhyolite, and Santa Fe/Gila formations. Each of the eruptions of the Lower Volcanic Series was followed by the period of volcanic stasis that allowed the deposits to be become susceptible to erosion. When these formations eroded the eroded material was redeposited as the Piloncillo formation (Elston 1957:10). This formation mainly consists of sedimentary deposits expressed as "alluvial fans, wind-blown tuffaceous dune sands, tuff, and stream channel sandstone and conglomerates" (Elston 1957:10). Elston (1957) notes that it is easy to differentiate rocks belonging to the Lower Volcanic Series from those belonging to the Upper Volcanic Series based on their color. Specifically, the Lower Volcanic Series rocks tend to be lighter in color when compared to those of the Upper Volcanic Series. The first formation of the Upper Volcanic Series, the Razorback formation, consists of andesite and rhyolite flows which rest unconformable on the Piloncillo formation sediments as well as the latter formations deposited in the Lower Volcanic Series (e.g. Mimbres Peak, Box Canyon, and Caballo Blanco rhyolite formations). Both the andesite and rhyolite flows belonging to the Razorback formation are fine-grained and black to dark grey in color. The andesite occurs as alternating flows and breccias while the rhyolite member of the formation consists of "black fine-grained trachytic, aphanitic, or glassy rock characterized by vitreous luster and perlitic or spherulitic structures" (Elston 1957:32-34). The Bear Springs formation rests unconformably upon the Razorback andesite and rhyolite formations. This formation consists of basalt flows, breccias, agglomerated and conglomerates. This fine-grained basalt is grey to black in color, dense, and holocrystalline (Elston 1957;34-36). The last formation of the Upper Volcanic Series, the Swartz formation, rests unconformably upon the Bear Springs basalt formation. This formation consists of flows, tuffs, and breccias of brown and grey banded rhyolite that are associated with intrusive bodies (i.e. domes and dikes).

When the period of volcanism responsible for the Lower and Upper Volcanic Series ended, the faulting and erosion of these deposits led to the deposition of the Sante Fe/Gila formation. Elston (1957) notes that while his terminology used to describe this formation is taken from researchers working north and east of the Dwyer Quadrangle along the Rio Grande Valley, other researcher working in southeastern Arizona opted to call similar deposits the Gila Conglomerate formation (1957:11). This formation includes all of the consolidated valley fill sediments. These fanglomerate deposits are held together by a siliceous cement. Flows, tuffs, and agglomerates are interbedded with the fanglomerate deposits (Elston 1957:11-13). These deposits are believed to have been deposited around the Plio-Pleistocene transition (ca. 2 mya) (Connell 2004). The Santa Fe formation along the Rio Grande Rift consists of two groups, a Lower Santa Fe Group, and an Upper Santa Fe Group. The Lower Santa Fe group consists of three distinct deposits: fanglomerates and conglomerates resulting from alluvial fill brought into the drainage from the surrounding uplands, shales and siltstones resulting from fluvial and lacustrine deposits, and sandstones derived from eolian deposits (Connell 2004:368). The Upper Santa Fe Group rests unconformably upon the Lower Santa Fe Group and has deposits which are less well consolidated than its Lower Santa Fe counterpart but similar lithofacies are present in both (Connell 2004:372).

SOILS

In most cases the local geology and climatic regimes directly influence the types of soils that can form in an area. In certain instances, human modification of the landscape also has drastic ramifications for soil development either by creating environments conducive to the development of certain soil types (e.g. Glaser 2007) or by depleting soils of specific nutrients through cultural practices (e.g. Sandor et al. 1986a, 1986b, 1986c). While Sandor and colleagues (1986a, 1986b, 1986c) have shown that some of the cultural features present within the larger Mimbres area were used for agricultural purposes and that these uses had ramifications on certain soil properties (e.g. organic carbon and nitrogen depletion, increased compactness, etc.) these features do not characterize the land use strategy of the entirety of the Mimbres area. In most areas of the Mimbres region, the local inhabitants appear to have made use of the surrounding soils in a minimally altered manner where substantial water control features were absent and humans made little intentional effort to manipulate soil characteristics. They thus made use of the locally available soils that had developed insitu from the surrounding geological formations and the larger environmental and climatic regimes.

The majority of the soils within the area surrounding the Old Town ruin belong to the Aridisols, Mollisols, Entisols, and Vertisols soil orders. These soil orders tend to form in arid or semiarid environments where water is only available seasonally and vegetation consists primarily of grasslands or scrublands. With the exception of soils belonging to the Mollisols order, the majority of these soils are only considered to be agriculturally productive when irrigated. These soil orders and their suborders present in the areas surrounding Old Town are described in more detail below.

Aridisols

Aridisols are soils that do not contain enough water or moisture for the growth of most plants. Alongside the relative lack of moisture within this soil order, soil temperature also constitutes a key characteristic of Aridisols. Because of both evaporation of moisture within the soils belonging to this order as a result of high temperatures as well as their lack of moisture, Aridisols contain relatively higher concentrations of salts when compared to other soil orders. Both of these characteristics severely limit land use within areas containing soils belonging to this order. In the absence of mechanisms that aid in the breakdown and transportation (e.g. irrigation) of soluble precipitates, salinity and/or sodicity within these soils accrue rapidly (U.S.D.A. 1999:329; 2010:97). Soil scientists currently recognize seven suborders within the

Aridisols order each of which is differentiated by either temperature regime or the presence of a distinctive horizon usually occurring at around 100 centimeters below ground surface. The seven Aridisols suborders are: Cyrids, Salids, Durids, Gypsids, Argids, Calcids, and Cambids (U.S.D.A. 1999:329-389; 2010:97-122). However, the soil surveys which were conducted around the current study area took place before many of these suborders were classified and described (Neher and Buchanan 1980; Perham et al. 1983). As of 1985, only two suborders were recognized within the Aridisol order: Argids and Orthids.

Argids

Argids are typically classified as Aridisols that have an argillic or a natric horizon. An argillic horizon "contains illuvial layer-lattice clays" which generally form beneath an eluvial horizon though may be exposed on the surface if the degraded rock/wind-blown sediment horizon above erodes away (U.S.D.A. 1985:7). Argillic horizons are thought to take some time to develop (ca. 1000 years) though are believed to develop faster in forested areas. Argillic horizons attest to the stability of the landscape because they form at a relatively slow rate and allow finer textured particles to be preserved. These horizons rely on climates where water is available in a periodic manner to allow clay particles time to deflocculate and migrate from the eluvial horizon into the illuvial argillic horizon (U.S.D.A. 1999).

The Argid suborder of the Aridisol order is broken down into five great groups: Duragrids, Nadurargids, Natrargids, Paleargids, and Haplargids (U.S.D.A. 1985:91). These groups are primarily differentiated by the presence of specific horizons which have developed within the soils. These great groups can be further subdivided into specific soil classes based on soil texture and the moisture and temperature regimes within which they are encountered. For the intents of this study only the Haplargids and Natrargids great groups of the Argids suborder will be discussed as these are the only great groups of the Argids suborder present in the study area (Figure 2.6).

Haplargids

Typic Haplargids contain an argillic horizon which is not saturated with water one meter below the surface for at least 90 consecutive days. These soils are typically fine-textured to a depth of around 50 centimeters below surface and tend to have horizons which are relatively thin (> 15 cm thick). Generally, these soils are fairly well developed, deep, and do not contact lithic bedrock within 50 centimeters of the surface. Typic Haplargids generally have a relatively low organic carbon concentration of less than 0.6 percent within the first 40 centimeters of soil accumulation (U.S.D.A. 1985:93).

Haplargids can be broken down into 20 soil classes that differ from the "typic" Haplargids described above. These 20 different soil classes are: Aquic Haplargids, Arenic Haplargids, Arenic Ustalfic Haplargids, Arenic Ustollic Haplargids, Borollic Haplargids, Borollic Lithic Haplargids, Borollic Vertic Haplargids, Duric Haplargids, Durixerollic Haplargids, Lithic Haplargids, Lithic Ruptic-Entic Xerollic Haplargids, Lithic Ustollic Haplargids, Lithic Xerollic Hpalargids, Ustalfic Haplargids, Ustertic Haplargids, Ustollic Haplargids, Vertic Haplargids, Xeralfic Haplargids, Xerertic Haplargids, and Xerollic Haplargids (U.S.D.A. 1985:93-95). Of these only variants Typic Haplargids, Lithic Haplargids, and Ustollic Haplargids soil classes are found in the current study area.

While the Typic Haplargid soils class is described above, both Lithic Haplargids and Ustollic Haplargids deviate from "Typic" definition in regards to the presence of a lithic contact within 50 centimeters of the surface (Lithic Haplargids) and contain an organic carbon concentration which differs from "Typic" concentrations and are found in warmer, more arid climate regimes (Ustollic Haplargids) (U.S.D.A 1985:92-94).

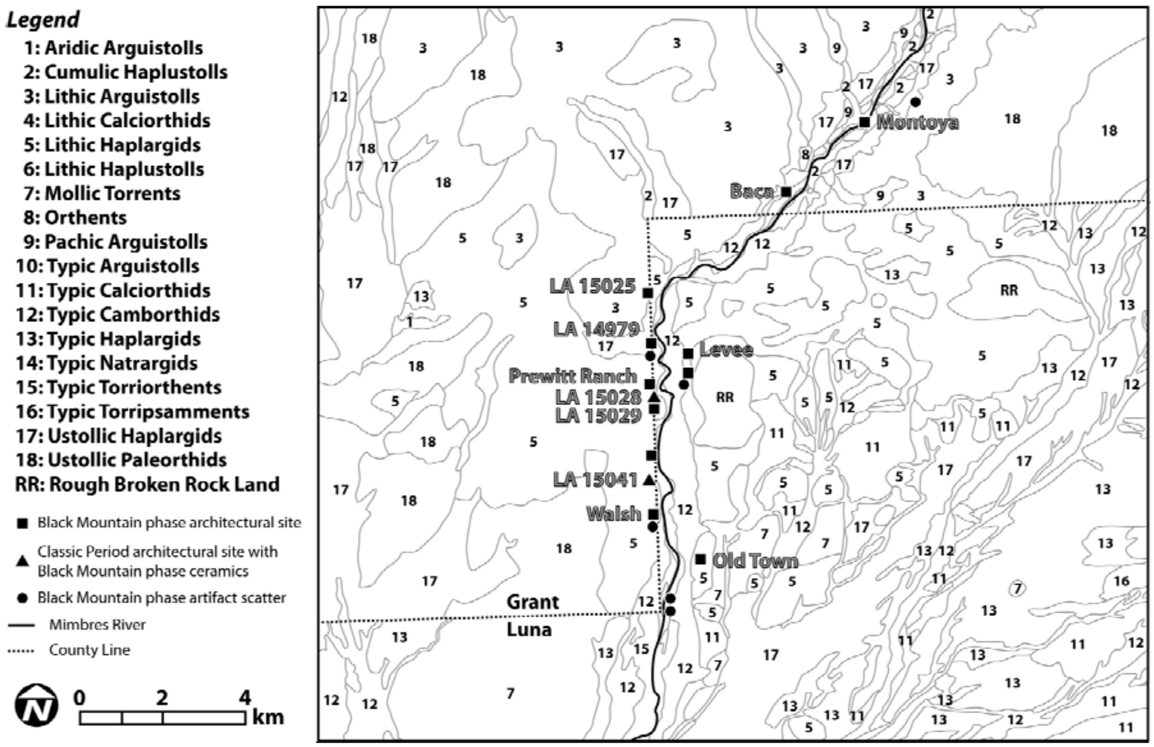

Figure 2.6: Major soil subgroups and recorded archaeological sites with Black Mountain phase characteristics near Old Town.

Natrargids

Typic Natrargids are characterized by the presence of a natric horizon and the absence of a duripan or petrocalcic or petrogypsic horizon within 150 centimeters of the soil surface. Natric horizons are a special type of argillic horizon which contains enough sodium within the soils to aid in the breakdown and dispersion of clay particles and accelerate clay illuviation (U.S.D.A. 1999:44). These soils share many of the characteristics that define Typic Haplargids (e.g. relatively low organic carbon concentrations, fine texture to a depth of 50 centimeters below the surface, bedrock contact exceeds 50 centimeters below the surface) though differ from Typic Haplargids in that they are not saturated with water within one meter from the surface at any point in time. As a result of this lack of saturation, Typic Natrargids often contain small concentrations of carbonates and/or soluble salts. Natrargids tend to be associated with landforms which have a low grade and are believed to have been deposited during the late-Pleistocene or Holocene periods (U.S.D.A. 1999:343).

Natrargids can be broken down into 13 soil classes that differ from the "typic" Natrargids described above. These 13 different soil classes are: Aquic Natrargids, Borollic Natrargids, Borollic Glossic Natrargids, Duric Natrargids, Durixerollic Natrargids, Glossic Ustollic Natrargids, Haplic Natrargids, Haploxerollic Natrargids, Haplustollic Natrargids, Lithic Natrargids, Lithic Xerollic Natrargids, Ustollic Natrargids, and Xerollic Natrargids (U.S.D.A. 1985:96-97). However, only variants of the Typic Natrargids soil class are found in the current study area (Figure 2.6).

Orthids

The Orthids suborder of the Aridisols order is characterized by the presence of salic horizon within 75 centimeters of the surface (U.S.D.A. 1985:99). A salic horizon is characterized by the "accumulation of salts which are more soluble than gypsum in cold water" (U.S.D.A. 1999:49). These salt enriched horizons need to be at least 15 centimeters thick to be classified as salic horizons. Soils belonging to the Orthids suborder also are saturated with water one meter below the ground surface for at least one month out of the year and lack a duripan (an impervious silica-cemented layer) boundary within one meter of the ground surface (U.S.D.A. 1985:99).

The Orthids suborder of the Aridisol order is broken down into six great groups: Salorthids, Paleorthids, Durorthids, Gypsiorthids, Calciorthids, and Camborthids (U.S.D.A. 1985:99). These groups are primarily differentiated by the presence of specific horizons which have developed within the soils. These great groups can be further subdivided into specific soil classes based on soil texture and the moisture and temperature regimes within which they are encountered. For the intents of this study only the Paleorthids, Calciorthids, and Camborthids great groups of the Orthids suborder will be discussed as these are the only great groups of the Orthids suborder present in the study area (Figure 2.6).

Paleorthids

Typic Paleorthids are characterized by the presence of a petrocalcic horizon within one meter of the ground surface (U.S.D.A. 1985:99). A petrocalcic horizon is an illuvial horizon which contains carbonate deposits that act as a cementing agent to soil particles within the horizon (U.S.D.A. 1999:47). These horizons are generally at least 10 centimeters thick though can be only a few centimeters thick if they represent a laminar cap resting directly upon bedrock (U.S.D.A. 1999:48). This petrocalcic horizon is usually located within the first 18 centimeters of soil accumulation within Typic Paleorthids soils. Typic Paleorthids tend to form in fairly warm and arid climate regimes and are believed to represent soils which predate the Holocene period. These soils are not saturated by water to a depth of one meter below ground surface for 90 consecutive days out of the year (U.S.D.A. 1985:105).

Paleorthids can be broken down into four soil classes that differ from the "Typic" Paleorthids described above. These four different soil classes are: Aquic Paleorthids, Ustochreptic Paleorthids, Ustollic Paleorthids, and Xerollic Paleorthids (U.S.D.A. 1985:105). Of these, only Ustollic Paleorthids are found in the current study area. Ustollic Paleorthids contain an organic carbon concentration which differs from "Typic" concentrations and are found in warmer, more arid climate regimes (U.S.D.A. 1985:105).

Calciorthids

Typic Calciorthids soils are characterized by the presence of a calcic horizon within one meter of the ground surface (U.S.D.A. 1985:99). A calcic horizon is an illuvial horizon that has calcium carbonate concentrations. Calcic horizons differ from petrocalcic horizons used to differentiate Paleorthids soils by the fact that carbonate deposits within calcic horizons are not sufficient enough to cement soil particles. Usually, carbonate deposits within calcic horizons form in large voids present within the soils and do not penetrate all voids within the horizon (U.S.D.A. 1999:34-35). These soils are not saturated by water to a depth of one meter below ground surface for 90 consecutive days out of the year and tend to be fairly deep and well developed. Generally, lithic contact within these soils is deeper than 50 centimeters below the surface.

Calciorthids can be broken down into 12 soil classes that differ from the "Typic" Calciorthids soils described above. These 12 different soil classes are: Aquic Calciorthids, Aquic Duric Calciorthids, Argic Calciorthids, Borollic Calciorthids, Borollic Lithic Calciorthids, Durixerollic Calciorthids, Lithic Calciorthids, Lithic Ustollic Calciorthids, Lithic Xerollic Calciorthids, Ustochreptic Calciorthids, Ustollic Calciorthids, and Xerollic Calciorthids. Of these 12 classes, only Typic Calciorthids and Lithic Calciorthids are present within the current study area. Lithic Calciorthids differ from the "Typic" definition above by the presence of a lithic contact within the first 50 centimeters of soil accumulation.

Camborthids

Typic Camborthids are characterized by the presence of a cambic horizon. Cambic horizons form as a result of "physical alterations, chemical transformations, or removals" that transfer soils (U.S.D.A. 1999:35). These processes usually result in the alteration of primary minerals within the soil though some "weatherable minerals (e.g. clay minerals and alterable minerals that yield bases or iron to the soil solution) are present in most cambic horizons" (U.S.D.A. 1999:37). Generally, the cambic horizon represents a B horizon (subsoil) that forms below an epipedon and are at least 15 centimeters thick. However, cambic horizons can be present as a surface expression if the upper stratums have been truncated (U.S.D.A. 1999:35-36). Aside from the presence of a cambic horizon the only other diagnostic feature of Typic Camborthids soils is the absence of an anthropic epipedon, an enriched surface layer which resulted from human activity (e.g. elevated carbon, calcium and phosphorus concentrations resulting from waste disposal and irrigation practices) (U.S.D.A. 1999:22). Like many other soil groups within the study area, these soils are not saturated by water to a depth of one meter below ground surface for 90 consecutive days out of the year and tend to be fairly deep and well developed. Generally, lithic contact within these soils is deeper than 50 centimeters below the surface.

Camborthids can be broken down into 19 soil classes which differ from the "Typic" Camborthids soils described above. These 19 soil classes are: Anthropic

Camborthids, Aquic Camborthids, Aquic Duric Camborthids, Borollic Camborthids, Borollic Lithic Camborthids, Borollic Vertic Camborthids, Duric Camborthids, Durixerollic Camborthids, Durixerollic Lithic Camborthids, Fluventic Camborthids, Lithic Camborthids, Lithic Xerollic Camborthids, Natric Camborthids, Ustertic Camborthids, Ustochreptic Camborthids, Ustollic Camborthids, Vertic Camborthids, Xerertic Camborthids, and Xerollic Camborthids (U.S.D.A. 1985:102-103). However, only variants of the Typic Camborthids soils are found in the study area (Figure 2.6).

Mollisols

Mollisols are typically dark colored soils which tend to form in grasslands within semiarid regions. Soils belonging to this order are generally found at higher latitudes and within various temperature and moisture regimes. These soils are generally associated with late-Pleistocene or Holocene deposits. The key characteristic of this soil order is a fairly well developed A horizon that contains high organic carbon concentrations resulting from the continual addition of carbon to the soils from vegetation growth. These enriched horizons are known as mollic epipedons which generally have a soft, granular structure and a relatively high base saturation (U.S.D.A. 1999:23, 555; 2010:7, 197). Soil scientists currently recognize seven suborders within the Mollisols order each of which is differentiated by either temperature regime or the presence of a distinctive horizon usually occurring at around 100 centimeters below ground surface. The seven Mollisols suborders are: Albolls, Aquolls, Rendolls, Xerolls, Borolls, Ustolls, and Udolls (U.S.D.A. 1985:169-201, 1999:555-654, 2010:197-240). However, only soils belonging to the Ustolls suborder of the Mollisols order are found in the study area (Figure 2.6).

Ustolls

Soils belonging to the Ustolls suborder of the Mollisols soil order are Mollisols soils which are located in either an ustic or aridic moisture regime (U.S.D.A. 1985:280, 1999: 560). Ustolls soils are well drained and have a mollic epipedon (U.S.D.A. 1999:601). These soils tend to have either a gypsic or calcic horizon within 1.5 meters of the ground surface or within 50 centimeters below the base of a cambic or an argillic horizon (U.S.D.A. 1985:170). While argillic, cambic, and calcic horizons are described above, gypsic horizons are described as illuvial horizons with somewhat high concentrations of secondary gypsum deposits (U.S.D.A. 1999:42).

The Ustalls suborder of the Mollisolls order is broken down into seven great groups: Durustolls, Natrustolls, Calciustolls, Paleustolls, Argiustolls, Vermustolls, and Haplustolls (U.S.D.A. 1985:186, 1999:602). These groups are primarily differentiated by the presence of specific horizons which have developed within the soils. These great groups can be further subdivided into specific soil classes based on soil texture and the moisture and temperature regimes within which they are encountered. Of the seven great groups in the Ustolls suborder, only Argiustolls and Haplustolls soils are found in the study area (Figure 2.6).

Argiustolls

Typic Argiustolls are characterized as having an "argillic horizon in or below the mollic epipedon" (U.S.D.A. 1999:602). The mollic epipedon in Argiustolls soils is usually less than 50 centimeters thick with increasing particle texture as depth increases (U.S.D.A. 1985:187). In Argiustolls soils this argillic horizon contains decreasing clay concentrations as depth increases from the horizon's surface. If a natric, petrocalcic, or duripan horizon is present, they are present at least one meter beneath ground surface (U.S.D.A. 1999:602). It us uncommon for there to be a lithic contact in Argiustolls soils until after a depth of 50 centimeters beneath ground surface. Argiustolls are generally indicative of fairly stable soils which were likely deposited in the late-Pleistocene.

Argiustolls can be broken down into 10 soil classes that differ from the Typic Argiustolls described above. These ten soil classes are: Alfic Lithic Argiustolls, Aquic Argiustolls, Aridic Argiustolls, Boralfic Argiustolls, Lithic Argiustolls, Pachic Argiustolls, Torrertic Argiustolls, Udic Argiustolls, Ustalfic Argiustolls, and Vertic Argiustolls (U.S.D.A. 1985:187-188). However, only variants of the Aridic Argiustolls, Lithic Argiustolls, and Pachic Argiustolls soils are found in the study area. These variants of the Argiustolls great group differ from the Typic Argiustolls soil class in either the thickness of their mollic epipedon (Pachic Argiustolls), the presence of a lithic contact within 50 centimeters of the ground surface (Lithic Argiustolls), or are found in a warmer, more arid, climate regimes (Aridic Argiustolls) (U.S.D.A. 1985:187-188).

Haplustolls

Typic Haplustolls are characterized by the presence of a cambic horizon below the mollic epipedon (U.S.D.A.1999:613). This mollic epipedon is usually less than 50 centimeters thick (U.S.D.A. 1985:189) Additionally, Typic Haplustolls lack duripan, natric, petrocalcic, and argillic horizons. It us uncommon for there to be a lithic contact in Haplustolls soils until after a depth of 50 centimeters beneath ground surface.

Haplustolls can be broken down into 20 soils classes which differ from the Typic Haplustolls described above. These 20 soil classes are: Aquic Haplustolls, Aridic Haplustolls, Cumulic Haplustolls, Entic Haplustolls, Fluvaquentic Haplustolls, Fluventic Haplustolls, Lithic Haplustolls, Lithic Ruptic-Entic Haplustolls, Oxic Haplustolls, Pachic Haplustolls, Ruptic-Lithic Haplustolls, Salorthidic Haplustolls, Torrertic Haplustolls, Torrifluventic Haplustolls, Torriorthentic Haplustolls, Torroxic Haplustolls, Udertic Haplustolls, Udic Haplustolls, Udorthentic Haplustolls, and Vertic Haplustolls (U.S.D.A. 1985:191). Of these, only Lithic Haplustolls and Cumulic Haplustolls are present in the study area. Lithic Haplustolls are differentiated from Typic Haplustolls by the presence of a lithic contact within the first 50 centimeters of ground surface while Cumulic Haplustolls differ with regards to the thickness of the mollic epipedon as well as an increased organic carbon concentration (U.S.D.A. 1985:189-191).

Entisols

Entisols are characterized by the absence of pedogenic processes. Specifically, soils belonging to this order “have little evidence of the development of pedogenic horizons” and usually only contain an ochric epipedon which either differs substantially in color, moisture, thickness, or organic carbon concentration to be classified as any of the other seven epipedon classes. This lack of pedogenesis within the soil order is primarily due to the landforms upon which Entisols are deposited. Generally, soils on these landforms are not in place long enough to develop distinct horizons. Entisols are usually found on steep eroding slopes or along flood plains where new materials are deposited at regular intervals. The other key characteristics of soils belonging to the Entisols order is that they are generally derived from mineral parent material. Entisols are known to vary with regards to their moisture content, temperature regime, and age (U.S.D.A. 1999:389; 2010:8, 123). While the Entisols soil order is composed of five suborders: Aquents, Arents, Psamments, Fluvents, and Orthents (U.S.D.A. 1985:107), only soil classes belong to the Psamments and the Orthents suborder are found in the study area (Figure 2.6).

Psamments

Soils belonging to the Psamments suborder of the Entisols soil order are characterized by the presence of a sandy soil texture within all portions of the soil profile strata and less than 35 percent rock fragments (U.S.D.A. 1999:393). Psamments soils generally have a lithic contact before a depth of 25 centimeters below ground surface or has an organic carbon concentration that decreases irregularly as depth increases (U.S.D.A. 1985:107). Because of their sandy particle size, "psamments have a low water-holding capacity," soils belonging to this suborder are susceptible to being transported by aeolian processes (e.g. blowing, drifting) (U.S.D.A. 1999:432).

The Psamments suborder of the Entisols order is broken down into seven great groups: Cryopsamments, Torripsamment, Quartzipamments, Ustipsamments, Tropopsamments, Xeropsamments, and Udipsamments (U.S.D.A. 1985:120-121, 1999:432). These great groups can be further subdivided into specific soil classes based on soil texture and the moisture and temperature regimes within which they are encountered. Of the seven great groups in the Psamments suborder, only soils belonging to the Torripsamments great group are present in the study area (Figure 2.6).

Torripsamments

Typic Torripsamments are Psamments which are located in either an aridic or torric moisture regime (U.S.D.A. 1985:120). Soils within this moisture regime are usually dry in all parts for more than the half the time soils 50 centimeters beneath ground surface are above five degrees Celsius (5^0 C) in temperature (U.S.D.A. 1999:96).

It is uncommon for there to be a lithic contact in Torripsamments soils until after a depth of 50 centimeters beneath ground surface (U.S.D.A. 1985:122).

Torripsamments can be broken down into four soil classes which differ from the Typic Torripsamments described above. These four soil classes are: Durorthidic Xeric Torripsamments, Lithic Torripsamments, Ustic Torripsamments, and Xeric Torripsamments. However, only Typic Torripsamments soils are present in the study area (Figure 2.6).

Orthents

Orthents are described as Entisols soils which are located on recently eroded surfaces (U.S.D.A. 1999:420). This erosional surface could be a result of cultural (e.g. cultivation, mining, etc.) or natural (e.g. extreme fluvial erosion, mass wasting, etc.) transforms. Generally, these surfaces are so eroded that the once overlying soil horizons have been removed or are no longer discernible. Orthents soils tend to be composed of fine-sized particles and have a lithic contact within 100 centimeters of the ground surface.

The Orthents suborder of the Entisols order is composed of six great groups which are differentiated based on soil texture as well as the moisture and temperature regimes within which the soils are located. These great groups are: Cryorthents, Torriorthents, Xerorthents, Troporthents, Udorthents, and Ustorthents (U.S.D.A. 1985:116). Of these six great groups in the Orthents suborder only Torriorthents soils are located in the study area (Figure 2.6).

Torriorthents

Typic Torriorthents are Orthents soils which are located in either an aridic or torric moisture regime (U.S.D.A. 1985:116, 1999:420). These soils are generally located on moderate to steeply sloped landforms where bedrock is usually shallow (>50 cm below ground surface), though can be present along recent alluvial fans where carbon is not present in sufficient quantities to allow the development of additional soil horizons (U.S.D.A. 1999:421).

Torriorthents can be subdivided into 11 soil classes which differ from the Typic Torriorthents described above. These 11 soil classes are: Aquic Torriorthents, Aquic

Durorthidic Torriorthents, Durorthidic Torriorthents, Durorthidic Xeric Torriorthents, Lithic Torriorthents, Lithic Ustic Torriorthents, Lithic Xeric Torriorthents, Usteric Torriorthents, Ustic Torriorthents, Vertic Torriorthents, Xerertic Torriorthents, and Xeric Torriorthents. However, only Typic Torriorthents are found in the current study area (Figure 2.6).

Vertisols

Vertisols are soils with high clay concentrations which sometimes form deep cracks during dry periods. Because of their high clay concentrations the clay particles expand during wet periods and contract during dry periods forming the characteristic mud-cracks associated with this soil order. While moisture and clay content affect this shrink-swell process it also affects the soil density and hardness. During wet periods when the clay particles have swelled, the soil is sticky though during dry periods Vertisols are hard and compact due to the shrinking and realignment of the soil's constituent clay particles. Vertisols are generally present in warmer temperature regimes and range significantly in regards to moisture regimes. While clay concentrations within Vertisols are high, discrete soil horizons do develop in soils belonging to this order. Vertisols generally form on gently sloping landforms.

The Vertisols soil order is composed of four suborders (U.S.D.A. 1985:241). These suborders are primarily differentiated by differing moisture and temperature regimes which affect the duration of mud-crack formation and exposure. For the period of time when soil surveys for the study area were conducted (ca. 1980 and 1983), the four suborders of the Vertisols soil order were: Xererts, Torrerts, Uderts, and Usterts (U.S.D.A. 1985:241). Of these only soils belonging to the Torrerts suborder are present in the study area (Figure 2.6).

Torrerts

Torrerts soils are characterized as a Vertisols soil that has cracks present either throughout the year or cracks which are closed for less than 60 consecutive days (U.S.D.A. 1985:241). These soils are generally found in arid climates and "are commonly by parent materials that tend to weather to smectictic clays, such as basalt" (U.S.D.A. 1999:797).

The Torrerts suborder of the Vertisols soil order consists of one great group, Torrerts, which consists of two sub groups: Mollic Torrerts and Paleustollic Torrerts. The differences between these subgroups and the Typic Torrerts classification lie in either the color of the upper soil horizons or in the structure of the clay particles within the soils. Only Mollic Torrerts are present in the study area (Figure 2.6). This subgroup is characterized by the presence of a darker surface horizon (U.S.D.A. 1985:241).

TEMPORAL CHANGE OF THE PHYSICAL ENVIRONMENT

In general, the major patterns outlined above have remained constant throughout much of the Quarternary period. While we know that certain types of vegetation have encroached upon the area during historic times (e.g. mesquite and creosote in lower elevation areas), the major biotic communities, geological formations, climate regimes, and soils present in the area today were also present throughout much of the area's prehistoric occupation. Barring anthropogenic change, the characteristics outlined above were likely those present during prehistoric time periods.

From an archaeological perspective, this indicates that certain characteristics, such as access to particular raw materials like tool stone and native plant species, were similar to modern conditions when the Mimbres area was occupied prehistorically. Be this as it may, other aspects of the physical environment have likely changed between modern and prehistoric conditions. Specifically, the precipitation values given above represent the average of monthly totals collected from weather stations distributed across a large portion of southwestern and western New Mexico. There are of course, fluctuations in the amount of precipitation that falls at these different weather stations from year to year.

If one analyzes the data collected from a single weather station, it quickly becomes apparent that there are significant variations in these yearly values (Figure 2.7). For example, the greatest fluctuation in annual precipitation based on records obtained from the weather station at the Mimbres Ranger Station is a decrease of roughly 16.5 inches of precipitation between 1978 and 1980.

Determining how modern precipitation values differed prehistorically from modern and historic records is somewhat problematic. Our current understanding of prehistoric rainfall patterns is based on dendro-climatological data obtained from areas east of the Mimbres River valley in the Rio Grande basin (Grissino-Mayer et al. 1997). As shown in Figure 2.8, these data demonstrate that there were substantial yearly fluctuations in estimated annual precipitation. If one compares Figure 2.8 to Figure 2.7 it becomes readily apparent that the data obtained from the weather station at the Mimbres Ranger Station shows that the area on average experiences substantially more precipitation on a yearly basis than that based on the tree-ring reconstructions. Probably the greatest source of discrepancy between the two datasets is the fact that they are derived from data obtained in different physiographic areas. The Rio Grande basin likely experiences less annual precipitation than areas to the west due to the fact that a number of north-south trending mountain ranges separate the two (e.g. the Burro Mountains, Pinos Altos Mountains, Mimbres Mountains, Black Range Mountains, etc.). These mountain ranges create rain shadow effects for areas to the east as moisture primarily derives from systems moving in from the west.

Despite these differences, the dendro-climatological data developed by Grissino-Mayer and colleagues (1997) is commonly used by researchers in the area primarily because it is the only one available with the temporal depth needed to address differing agendas. While the values associated with the amount of precipitation determined for a given year may not be the same as those associated with areas further west, the general pattern associated with precipitation values is likely similar across areas. Thus, while the actual amount of precipitation that fell in the Rio Grande basin and the Mimbres River

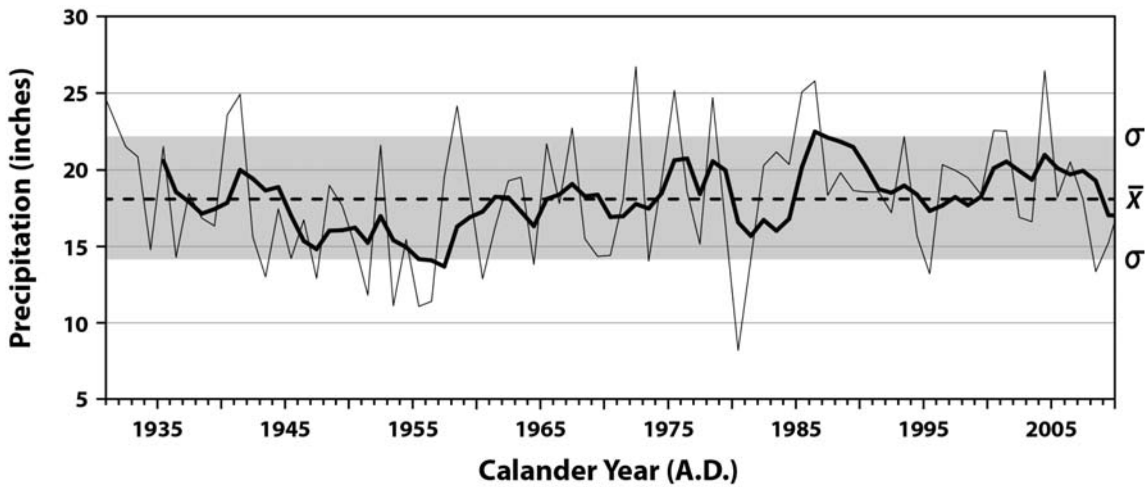

Figure 2.7: Changes in annual precipitation from the for the Mimbres Ranger Station weather station from 1931 – 2010. Information taken from the National Oceanic and Atmospheric Administration National Climatic Data Center (2013). The bold black line represents a 5-year moving average. The dashed black line is the 80-year mean for this area of New Mexico (A.D. 1931-2010) (mean = 18.15 inches) and the shaded areas represent one standard deviation from this mean value (standard deviation = 4.02 inches).

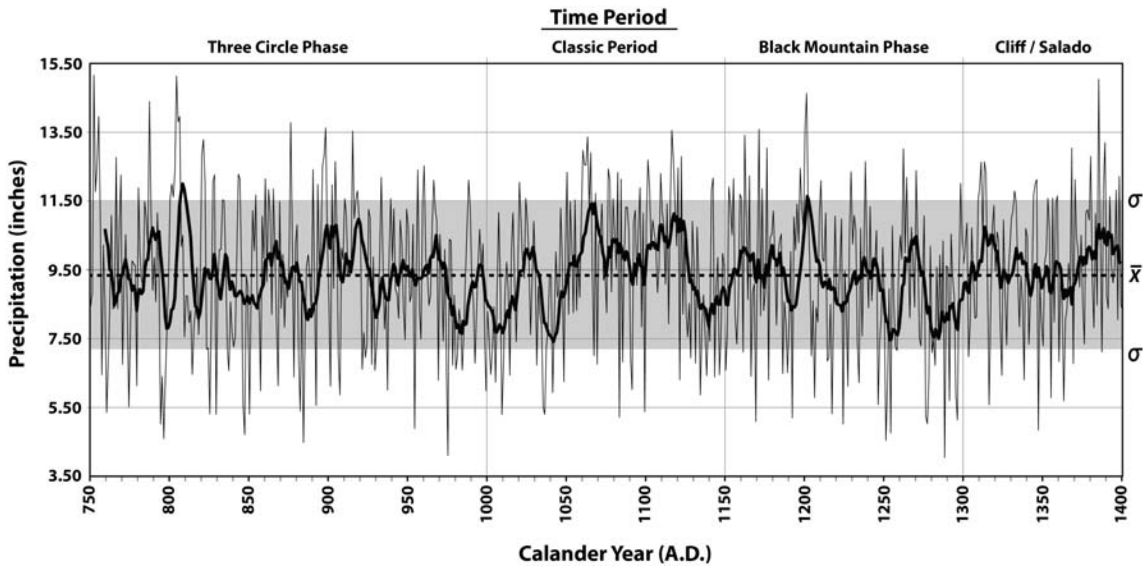

Figure 2.8: Changes in annual precipitation from the Three Circle phase through the Cliff/Salado phase (ca. A.D. 750-1400). Information taken from Grissino-Mayer et al. (1997). The bold black line represents a 10-year moving average. The dashed black line is the 878-year mean for this area of New Mexico (A.D. 622-1500) (mean = 9.34 inches) and the shaded areas represent one standard deviation from this mean value (standard deviation = 2.15 inches).

valley between A.D. 1270 -1300 may differ, it is likely that both areas experienced less than average annual precipitation during this time span.

The only other environmental variable that is likely to have changed through time are the soil types present in the area. As mentioned above, many of the soil types described above require a rather lengthy amount of time to develop, while others, such as Entisols soils, are characterized by their lack of pedogenesis and thus reflect soils that are relatively recent phenomena. Further complicating the soil data is the fact that they are characterized by limited field testing and data not derived from soil testing units are extrapolated from tested plots based on other physiographic data (e.g. slope, aspect, and vegetation cover). The inconsistency of this method of soil designation can somewhat be discerned by the rather abrupt break in soil classifications along the Grant and Luna County line. Somewhat related to this issue is the possibility that prehistoric, historic, and modern land use practices have changed the vegetation communities in particular areas. If these areas were in fact not surveyed, then there is a possibility that these areas differed at one point in time from when the individual soil reports for Grant and Luna Counties were conducted.

I originally hoped to be able to use the soil survey data in conjunction with geospatial information pertaining to clay raw material specimens submitted for neutron activation analysis to analyze if those samples capable of being assigned to some of Speakman's (2013) Mimbres chemical compositional groups patterned out with specific soil types. It readily became apparent that this would be a futile endeavor primarily because of the inconsistency between Counties as well as the fact that the geospatial information associated with some of the clay raw material specimens was not ideal. For instance, some samples were merely given the locational information associated with archaeological sites near where the raw material samples were taken. Thus, there are a number of samples that were said to originate from NAN Ranch, Swarts, and Elk Ridge. Without knowing specifically where these raw materials samples originated, it would impossible to see if they correlated with specific soil types.

Based on the data outlined above the conditions present in much of the larger Mimbres area likely reflect those which were present during prehistoric periods. While we have some conclusive evidence that the prehistoric inhabitants of the Mimbres valley were actively changing their environment through irrigation practices and the clearing of local vegetation due to subsistence practices and population pressure, it remains unknown as to whether these practices changed the modern conditions of the environment (Creel and Adams 1986; Minnis 1985).

Chapter 4: Culture History

The cultural chronology for the Mimbres Mogollon area is traditionally divided into periods and phases. The divisions between periods and phases therein are based on differences in material culture, and for the later part of the prehistoric period of most concern herein, particularly changes in architecture and ceramic assemblages. The following overview is what most would agree to as the likely sequence of events within the Mimbres Valley and is primarily taken from Anyon and colleagues (1981), Lekson (1992, 2006), and Hegmon et al. (1999).

EARLY PITHOUSE PERIOD

The Early Pithouse period dates from A.D. 200 to A.D. 550 and is relatively poorly understood. This is primarily due to the lack of investigation of sites dating to this period. The dates associated with this period are based solely on a few radiocarbon assays which range from A.D. 130 to A.D. 645 (Lekson 1992:66-74). The Early Pithouse period is distinguished from earlier occupations by the introduction of ceramic technology, a notable shift in subsistence strategies, a unique settlement pattern, and the appearance of new architectural characteristics.

The Early Pithouse period is marked by the introduction of Alma Plain brownware pottery and thinly slipped redwares. Like ceramics common to later occupations in the area, Early Pithouse period brownwares are formed using the coil and scrape method and exhibit a variety of surface finishing techniques (e.g. incising, scoring, etc.). These plainware varieties are the first that appear in the sequence and are followed by thinly slipped redware vessels that have come to be called Mogollon Early Red ceramics (Diehl and LeBlanc 2001). These Mogollon Early Red wares are differentiated from their later San Francisco Red counterparts due to their thinner slip and the absence of other surface treatments (e.g. polished surfaces, dimpled exteriors, and scored interiors) (Diehl and LeBlanc 2001:109).

Nearly all excavated sites with an Early Pithouse period component are located on relatively high topographic landforms. This pattern has been interpreted in a variety of ways including the desire to avoid cold air inversion down valleys, the procurement of resources only available at these locations, viewshed, maximizing arable land at lower elevations, the ritual significance of the landform, avoiding flood potential, and safeguarding against the threat of perceived violence (Diehl and LeBlanc 2001; LeBlanc and Whalen 1980). LeBlanc (LeBlanc and Whalen 1980) discredits the majority of these interpretations except for viewshed and safeguarding against violent confrontations. LeBlanc notes that the Pithouse period sites are located on easily defensible locations (LeBlanc and Whalen 1980). While no evidence of violent confrontations has conclusively been found on sites in the Mimbres area, LeBlanc (1999) notes that sites across the Southwest which are contemporaneous to the Early Pithouse period do contain evidence that sporadic episodes of violence were fairly widespread during this time period.

In contrast to the placement of Early Pithouse period sites on high locations for defensive purposes, Diehl (Diehl and LeBlanc 2001) sees their placement at these locations as a response to increase their visibility in an area with low population densities. For Diehl, such locations would have fostered social interaction by allowing groups to easily locate other settlements as they travelled across the landscape.

Lekson (1992, 2006) notes that our common association of Early Pithouse period sites with high, isolated landforms may be incorrect. He shows that Early Pithouse period villages in the Reserve and Eastern Mimbres area are not located in what most would call “defensible positions” but are rather located in low-lying areas along floodplains, a pattern more commonly associated with later occupations. Lekson likewise notes that our conflation of Early Pithouse period components with non-decorated ceramics leads to the possibility that any Early Pithouse period village along the lower terraces of valley floodplains would be misinterpreted as a later occupation type.

Finally, the Early Pithouse period was initially interpreted as marking the transition from a hunting and gathering life-way to one with a greater dependence on agriculture. As noted above, new evidence from the Tucson Basin demonstrates that Late

Archaic people were fairly reliant on cultigens, at least for some portions or the year, and took great strides to improve agricultural productivity of lands surrounding their settlements. It should be noted that the Late Archaic period is poorly documented for the Mimbres area when compared to surrounding areas to the north and west. Be this as it may, research in these areas demonstrates that people were experimenting with horticulture well before the advent of the Early Pithouse period. Research in these areas suggest that Early Pithouse period subsistence economies represent an intensification of those present in preceding periods (Wills 1985, 1996a, 1996b).

To date, only three Early Pithouse period sites have been partially excavated in the Mimbres area: McAnally, Thompson, and Y-Bar (Diehl and LeBlanc 2001; Shafer 2003:23-25). Through these investigations one pithouse was completely excavated and 13 others were partially excavated. At the McAnally site, one of the 12 definable pithouse depressions was completely excavated and three others were tested. At the Thompson site, seven of the estimated 55 pithouse depressions were tested. At Y-Bar, two pitstructures were tested. Three other pithouses are likely present at the site, one of which likely represents the remains of a great kiva (Shafer 2003). The results of these investigations demonstrated that house floor plans of this period vary from circular, to "Bean" shaped, to amorphous in shape though most all have lateral entryways (Diehl and LeBlanc 2001). While villages vary in size, all appear to have at least one larger structure that is believed to have served communal purposes. Early Pithouse period communal structures were generally larger in floor area and possessed lobes on either side of their entryway. Other than their size and their lobed protrusions around the entryway, no other features distinguish communal structures from their domestic counterparts during the Early Pithouse period (Anyon and LeBlanc 1980).

Late Pithouse Period

The Late Pithouse period dates from A.D. 550 to A.D. 1,000 and is subdivided into the Georgetown, San Francisco, and Three Circle phases. While the sample of excavated Early Pithouse period sites is small for the Mimbres area, numerous Late

Pithouse period components have been excavated. The vast majority of these have been the result of work undertaken at later occupations where surface architecture is present, and few solely Late Pithouse period sites have been excavated (though see Haury 1936b, and Roth 2010a). Because the Late Pithouse period has been so intensively investigated in the Mimbres area, only a cursory overview is presented highlighting the key traits of the period (see Anyon and LeBlanc 1984; Cosgrove and Cosgrove 1932; Creel 2006a; Haury 1936b; and Shafer 2003 for detailed discussion of Late Pithouse period remains).

The traditional phase designation used for the Late Pithouse period was first established by Haury (1936b) based on his work at Mogollon Village along the San Francisco River near Alma, New Mexico and Harris Village along the Mimbres River near Mimbres, New Mexico. Prior to this work there had been several typologies of pithouse architecture and corresponding phase designations with little attempts to find correlations between them (e.g. Bradfield 1928, 1929a; Cosgrove and Cosgrove 1932; Nesbitt 1931). Based on his work at Mogollon and Harris Villages, Haury (1936b) differentiated the Georgetown, San Francisco, and Three Circle phases primarily on the basis of changes in architecture and ceramic assemblages.

The Georgetown phase of the Late Pithouse period dates from the end of the Early Pithouse period to around A.D. 700. This phase is marked by the introduction of San Francisco Redware pottery production in the area. Sites are usually located along the first terrace above streams or near springs and house morphology varies from round to "D" shaped. Communal structures of the Georgetown phase retained the overall shape of the Late Pithouse period predecessors but differ significantly in size when compared to their domestic counterparts (Anyon and LeBlanc 1980). These structures were found to be associated with San Francisco Red and different varieties of Alma plain and textured ceramics. It is generally believed that the subsistence practices of Georgetown phase peoples focused on a mixed subsistence base that incorporated cultigens into a hunting and gathering life-way (LeBlanc 1983).

The San Francisco phase of the Late Pithouse period dates form A.D. 700 to around A.D. 825/850 and is marked by the introduction of Mogollon Red-on-brown pottery production in the area. San Francisco phase sites are generally located on the first terrace above rivers, although some settlements were established along tributaries of the Mimbres and Gila Rivers or in the vicinity of springs (Anyon et al. 1981). House floor plans of this phase range from rectangular with rounded edges to trapezoidal in shape. While there are changes in the morphology of domestic pitstructures, communal pitstructures retain their basic shape but continue to grow in size. The diagnostic ceramic types of the San Francisco phase are San Francisco Red and Mogollon Red-on-brown.

The Three Circle Phase of the Late Pithouse period dates from A.D. 825/850 to A.D. 1,000 and is marked by the use of Three Circle Red-on-white, Mimbres Black-on-white Style I, and Mimbres Black-on-white Style II pottery in the area. Three Circle phase pitstructures retain the basic rectangular shape of the preceding San Francisco phase but incorporate crisp, sharp corners into their architectural design. Previously established larger villages continued to be occupied, particularly along the first river terraces, but new communities are established within marginal environments and along side drainages (Anyon et al. 1981; Diehl and LeBlanc 2001; Pyne 2004). During the Three Circle phase, Hohokam materials and influence begin to filter into the material culture of Mimbres peoples. This is evident in the occurrence of shell ornaments, stone palettes, stone bowls, and ceramics with Hohokam design attributes being found at late Three Circle phase sites (Shafer 2003). Some researchers believe that the appearance of these Hohokam-inspired items is due in part to the presence of Mogollon communities in the Gila River Valley living in close proximity to Hohokam groups further downstream. The interactions between these two groups likely led to occurrence of Hohokam-like artifacts in the Mimbres Valley. It is during this time period that black-on-white ceramics begin to be produced in the Mimbres Valley. Mimbres Boldface Black-on-white, or Style I, is diagnostic of the Three Circle phase as are Three Circle Red-on-white and Mimbres Black-on-white Style II (LeBlanc and Whalen 1980).

Aside from these changes in architecture and ceramic assemblages, the other main characteristic of the Late Pithouse period is a shift in settlement patterns. While Early Pithouse period sites tend to be located on higher elevation landforms, Late Pithouse period sites are usually located along the first bench overlooking drainages. If LeBlanc's rationale for the positioning of Early Pithouse villages were correct, then this would indicate that the threat of violence decreased during the Late Archaic period (Diehl and LeBlanc 2001; LeBlanc and Whalen 1980). However, if Diehl's model is correct, then this would suggest that population densities reached a certain threshold whereby the visibility of a community was no longer deemed necessary to facilitate social interaction (Diehl and LeBlanc 2001).

Regardless of the scenario responsible for the changes in settlement location, other patterns present in preceding periods intensify during the Late Pithouse period. It is during this time period that feedback mechanisms involving population increase, increased sedentism, and increased reliance on cultigens become firmly entrenched. As populations grow, so too does the need to feed them. Cultigens provide a predictable source of nourishment and can be relatively easily manipulated to produce greater yields and thrive in different environments. Conversely, having a predictable subsistence base also allows for population growth. Because cultigens are modified by human agency, they often require this intervention to survive. Thus, once groups begin to invest in agricultural production to meet the food demands of the burgeoning population, they will probably need to remain present throughout some portion of the year to ensure that this subsistence base produces. This causes groups to become more sedentary for at least some part of the year. Similarly, as populations grow, it becomes increasing more difficult to remain highly mobile. Throughout the Late Pithouse period agricultural production intensifies. Minnis (1985) demonstrated that, based on the presence of particular types of charcoal and weedy annual seeds within macrobotanical assemblages recovered from sites, that floodplains were being cleared throughout the Late Pithouse period for agricultural use. Once this system is in place, it is easy to see how it could be allowed to perpetuate itself unless other forces act upon it (e.g. environmental conditions, technological revolution, etc.).

This scenario appears to have occurred throughout the course of the Late Pithouse period and into the Classic period. This was in part due to population growth that steadily increased throughout the preceding periods and into the Late Pithouse and Classic periods (Blake et al. 1986). The presence of multiple superimposed structures at nearly every Late Pithouse period site demonstrates that once an area was occupied, groups tended to remain, or return to, the same location for some time. Similarly, data pertaining to the type/species of charcoal and other macrobotanical remains present at Late Pithouse and Classic period sites suggest that local floodplain vegetation was steadily denuded and replaced by invasive r-selectionist species that thrive in disturbed environments (Minnis 1985; Schollmeyer 2005). Minnis (1985) interprets these patterns as resulting from the systematic clearing of floodplain environments associated with agricultural pursuits.

At some point in time, probably during the late Three Circle phase, a new form of social organization likely emerged. It is now known that certain structures during the Three Circle phase were organized as what some call courtyard groups or clusters (Lucas 1996). These courtyard groupings consist of multiple contemporaneous pithouse structures arranged so that their entryways open onto a common area/courtyard and most tend to have a non-domestic pitstructure incorporated amongst their ranks. These groupings have come to be interpreted as corporate groups that are thought to have consisted of a multifamily kin-group (Creel 2006c; Shafer 2006). The emergence of these corporate groups represents another level of social organization that had not existed during preceding periods. Prior to their emergence, village organization consisted of a low level of organization, the individual pithouse social unit, and a higher level of organization, the community as a whole integrated through the large communal facilities (great kivas) present at most pithouse villages. These corporate groups are believed to represent co-residential units that shared domestic and economic practices and could thus be interpreted as households (Shafer 2006; Wilshusen 1989). Shafer (2006) argues that these corporate emerged as a response to the need to share commonly controlled resources, namely the irrigation systems that are hypothesized to have existed in the valleys during the Late Pithouse and Classic periods (Creel and Adams 1986; Herrington 1979; Shafer 2003). The emergence of these irrigation systems and the ensuing emergence of corporate groups are believed to have had drastic ramifications for socio-political organization in the region (Shafer 2006).

CLASSIC PERIOD

The Classic period dates from A.D. 1000 to around A.D. 1150 and is marked by the transition from pithouse architecture to above-ground cobble-walled roomblocks that, in some cases, incorporate kivas. The presence of Mimbres Black-on-white Style III pottery also marks the beginning of this period, and the exchange of this commodity, as well as the exchange of exotic materials, is characteristic of the increased socio-political interactions taking place during this time period. The majority of research taking place in the Mimbres area has been undertaken at Classic period sites

Classic period pueblos range in size from one or two rooms to upwards of 200 arranged in multiple roomblocks (Anyon and LeBlanc 1984). These structures are often built on top of structures from earlier periods, and some evidence suggests the presence of transitional phase structures representing the emergence of pueblo architecture in the region (Shafer 2003; Shafer and Taylor 1986). During this period, the large pueblos grew from a series of core units that usually consisted of fewer than five rooms (LeBlanc 1983; Lekson 2006; Shafer 2003, 2006). Shafer (2003, 2006) interprets these core units as founding families who had access to prime agricultural lands near the village. Some of these core units evolved in place from those areas occupied by the corporate group courtyard clusters of the Three Circle phase (Shafer 2006). The placement of these core units superpositioned above courtyard clusters as well as the presence of family mausoleums beneath their floors suggests a long period of occupation of the same area by multiple generations of related individuals (Shafer 2006).

According to Blake and colleagues (1986), population densities reach their peak during this time period and new areas within secondary drainages and upland parklands become occupied. settlement pattern data suggest that groups were either exploiting a wider range of resources or that prime agricultural lands had been monopolized and forcing some people to settle new areas away from the larger settlements along the main river valleys (Blake et al. 1986; LeBlanc and Whalen 1980; Lekson 2006).

Gilman (1990) was one of the first researchers to systematically investigate the possibility of socio-political differentiation in the Mimbres area. Based on her analysis of mortuary patterns during the Classic period, she concluded that horizontal differentiation was present though vertical differentiation was not. Thus, people likely took on multiple roles in Mimbres society (e.g. potter, farmer, hunter, etc.); but these positions were not granted differential decision-making authority over other portions of the population. Recently, however, this notion has been revisited (Creel 2006c; Creel and Anyon 2003). These new investigations into the potential for socio-political differentiation have demonstrated that not only was there considerably more variability between individuals with regards to mortuary treatment than investigated by Gilman (1990), but that certain communities, and the members therein, likely exhibited more control over esoteric knowledge than previously thought.

In recent studies dealing with time-space systematics, various researchers have noted the necessity to look at developments taking place within different regions rather than placing these regions within the larger historical sequence (Hegmon 2002b; Hegmon et al. 1999; Nelson 1999). The majority of these arguments center on the developments taking place within different parts of what has commonly been referred to as the Mimbres area. Specifically, they center on the events taking place within these different sub-regions at about A.D. 1130, when the "regional unity of the Late Pithouse and Classic periods began to break down" (Hegmon et al. 1999: 143). During this time, continuity within the region collapses, and two distinct traditions develop within the eastern and western Mimbres area.

While the Mimbres foundation noted that material culture common to later occupations was encountered at Classic period sites, they were hesitant to call their appearance representative of distinct chronological indicators (LeBlanc and Whalen 1980). Since their work, other archaeologists have also noted the appearance of post-Classic material culture in Classic contexts deposits. These deposits have come to be termed the Terminal Classic period in the Mimbres area and the Postclassic period in the eastern Mimbres area.

According to Hegmon et. al. (1999), the Terminal Classic period dates from roughly A.D. 1130 through A.D. 1180 and is characterized by the appearance of ceramics traditionally assigned to the Black Mountain phase at Classic period sites in the Mimbres area. More recently, Creel (2006a:214-215) has discussed data suggesting that the Terminal Classic actually began a decade or two earlier than A.D. 1130. The Postclassic period refers to the reoccupation and expansion of Classic period "field-houses" in the eastern Mimbres area from approximately A.D. 1150 though A.D. 1220. In both of these areas, later ceramic types are common though are not as prevalent as Classic Mimbres and Mimbres Corrugated vessels. The main difference between these distinct occupations is the settlement pattern with many of the larger villages in the Mimbres Valley remaining occupied and the dispersal of populations from larger settlements into remodeled field-houses in the eastern Mimbres area.

BLACK MOUNTAIN PHASE

The time period traditionally encompassing what the Mimbres Foundation termed the Black Mountain phase is dealt with in detail in the following chapter. Suffice it to say here that the material culture of this time period differed enough from the preceding periods to warrant initial interpretations of cultural discontinuity between Classic period and Black Mountain phase peoples. This time period is primarily differentiated based on the presence of distinct ceramic assemblages containing El Paso Polychrome, Chupadero Black-on-white, St. John's Polychrome, Playas, and Three River's Red-on-Terracotta ceramics. Additionally, new structures built of coursed adobe emerge at elevations below 6000 feet above mean sea level. These structures are usually located in new locations where Classic period occupations were absent.

CLIFF/SALADO PHASE

The Cliff/Salado phase dates from around A.D. 1300 to 1450 and is characterized by the introduction of Salado Polychrome pottery (e.g. Gila, Tonto, and Pinto

Polychrome) into the Mimbres Valley. This period is also marked by the occurrence of Chihuahuan polychrome and Playas-like redwares. Late El Paso Polychrome and Chupadero Black-on-white ceramics occur at sites during this period and suggest continuity between Black Mountain phase peoples and those occupying Cliff phase settlements. Cliff phase settlements occur at most elevations and are found along the main drainages of the region. Sites of this period generally consist of "compounds" containing "above ground rooms and considerable unroofed space enclosed by a rectilinear wall" (Dean 2000:4). These exhibit either adobe architecture or a combination of cobble-walled and adobe architecture depending on the location of the site. Nelson and LeBlanc (1986) believe that these structures were built by groups of mobile agriculturalists who erected structures rapidly, occupied them for a short period leaving little if any trash or evidence of room remodeling, and then abandoned the site, moving to different areas.

Chapter 5: Background to Research

The history of developments culminating in our recognition of the Black Mountain phase can be traced back to the first decades of the 20th century, but first use of this phase name came with the work that was being conducted by the Mimbres Foundation in their survey of the Mimbres area during the latter years of the 1970s (LeBlanc 1976, 1977). This research noted the presence of a later occupation that evidenced substantial changes from the Mimbres Classic period. These differences included the apparent cessation of Mimbres Black-on-white pottery production and use, the emergence of new ceramic traditions in the area, the emergence of new methods of disposing of the dead, and the emergence of new architectural styles and features within the Mimbres area near the end of the Classic period (ca. A.D. 1000-1150) (Creel 1999b; LeBlanc 1977, 1980a; Shafer 1999a). The new ceramic traditions that entered the area include the apparently immediate appearance of Playas Redware, El Paso Polychrome, St. Johns Polychrome, Chupadero Black-on-white, and Three Rivers Red-on-terracotta vessels at the time that Mimbres Black-on-white ceramics cease to be present in the archaeological record. The main differences in architecture and settlement patterns during the Black Mountain phase include the apparent abandonment of large Classic period villages during the Black Mountain phase and the emergence of new villages in the lower portions of the Mimbres Valley which were constructed of coursed adobe. These coursed adobe structures were then perceived as generally containing rooms which were larger than their Classic period counterparts and incorporated small clay lined circular adobe hearths, raised box-hearths, and a two-post roof support system which differed from the square slab-lined hearths, three post roof support pattern, and cobble masonry rooms of the Classic period (LeBlanc 1977, 1980a). Finally, LeBlanc (1977, 1980a) notes that the presence of cremations at Black Mountain phase sites represents another defining characteristic of the time period.

Initially, LeBlanc thought that the Black Mountain phase occupation of the Mimbres area bore substantial similarity to occurrences taking place in the extreme southwestern portions of New Mexico. Sites in this area had been excavated earlier in the 1930s and 1960s (Kidder et al. 1949; McCluney 1962; Skibo et al. 2002). These sites were determined to represent phenomena assigned to the emerging Animas phase (Gladwin and Gladwin 1934; Kidder et al. 1949). Originally, sites dating to the Animas phase were "believed to have been outposts of the Casas Grandes culture of northern Chihuahua" and were established by populations leaving the Mimbres area "to be absorbed, or even to dominate" the groups inhabiting northern Chihuahua (Gladwin and Gladwin 1934:96; Kidder et al. 1949:144). However, the absence of cultural traits common to sites in northern Chihuahua as well as the presence of unique cultural traits at Animas phase sites led these researchers to conclude that the Animas phase represented a distinct cultural tradition which was loosely affiliated with the large influential site of Casas Grandes in northern Chihuahua (Gladwin and Gladwin 1934; Kidder et al. 1949; McCluney 1962; Skibo et al. 2002).

While the majority of the characteristics used to differentiate the Black Mountain phase from the Classic period were also present at Animas phase sites, there were stark differences between the Black Mountain phase occupations of the Mimbres area and the Animas phase occupation of southwestern New Mexico and southeastern Arizona. Specifically, LeBlanc (1980a) notes that cremations are present at sites in the Mimbres area and that ceramic assemblages, primarily the proportions of Playas ceramics and Ramos Polychrome ceramics, vary considerably at sites in the Mimbres area when compared to sites in the boot-heel of New Mexico (LeBlanc 1980a:293-294). These differences led LeBlanc to term the Animas phase occupation of the Mimbres area the Black Mountain phase (LeBlanc 1977, 1980a).

LeBlanc also believed that the occurrences taking place in the Mimbres area as well as the Animas area could not be considered in isolation to other culture areas that bear similarities to the material culture present in these areas during the mid-to-late 12th century AD. LeBlanc (1980a) notes that similar architectural patterns and material culture was present during the El Paso phase in the Jornada Mogollon area. In this area the pithouse to pueblo transition occurs during the El Paso phase where above ground coursed-adobe structures begin to appear alongside the "circular and subrectangular or square" pithouses of the preceding Dona Ana phase (Miller and Kenmotsu 2004:239). While pithouses are present throughout the majority of the cultural sequence in the Jornada area, "more formally constructed features" begin to emerge around A.D. 1180 (Miller and Kenmotsu 2004:239). These features represent very shallow pitstructures, sometimes referred to as "pit-rooms," that are rectangular in shape, have coursed adobe walls, and are generally not attached to other such structures (i.e. they are non-contiguous) (Ernenwein 2008; Miller and Kenmotsu 2004). These pit-rooms tend to have well prepared floor surfaces, circular collared-hearths, a stepped entry, and a two-post roof support pattern. Shortly after the inhabitants of the Jornada area began constructing these pit-rooms, full surficial architecture appears in the region (ca. A.D. 1200). The pueblo architecture that emerges in the area consists of contiguous rooms arranged in a linear fashion. These pueblo rooms tend to be slightly larger than the transitional pit-rooms and because of the larger surface area tend to incorporate either a three- or four-post roof support pattern (Miller and Kenmotsu 2004). Many of the features found in pit rooms are also found in contiguous pueblo rooms. Adobe or caliche plastered floors and walls are present as are circular collared hearths and stepped entryways. However, raised altars appear in some rooms during this time period (Miller and Kenmotsu 2004: 240). LeBlanc notes that El Paso phase sites tend to contain more El Paso Polychrome and Chupadero Black-on-white ceramics when compared to contemporaneous sites in the Mimbres and Animas areas (LeBlanc 1980a:295).

Thus, the El Paso phase, the Black Mountain phase, and the Animas phase all tend to share certain characteristics in both their architecture as well as their ceramic assemblages. While all three areas make use of coursed adobe architecture, roof-support patterns as well as the internal features of rooms appear to differ in each area. Roof-support patterns in the Jornada area generally consist of a three- or four-post pattern, though a two-post pattern was present during the transition from the Dona Ana phase to the El Paso phase. In the Mimbres area, the typical roof-support pattern of the Black Mountain phase consists of a two-post pattern. Roof-support posts are often absent at Animas phase site, though when they are present, they typically consists of a single central post. Finally, while there are similarities in the internal features present within excavated rooms in each of the three areas (e.g. small circular clay-lined hearths) several differences exist as well. Both stepped entryways and raised platform "alters" appear to be unique to El Paso phase sites. While raised box-hearths are present at both Animas phase sites and Black Mountain phase sites, they appear to be more common in the Animas area.

However, there are subtle differences in other aspects of the material culture present in these areas. While sub-floor burials are common in most areas, cremations tend to occur more frequently in the Mimbres area. It should be noted that the El Paso phase sites do not fit this general pattern. In the Jornada area, burials are uncommon. While a few sub-floor interments have been found at excavated El Paso phase sites, the majority of human remains encountered in the area tend to represent a set of incomplete disarticulated remains found in various contexts (Lowrey 2005; Miller and Graves 2009, 2012).

As more research began to be conducted, subtle differences between subareas of the larger Mimbres region began to emerge. Specifically, research conducted as part of the Eastern Mimbres Archaeological Project began to show a different settlement pattern for sites on the east side of the Black Range when compared to sites in the Mimbres area (Hegmon et al. 1998, 1999; Nelson 1999; Nelson and Hegmon 2001). In these areas, unlike the Black Mountain phase in the Mimbres area, some Classic period structures were reoccupied and expanded upon during the latter Post-Classic period while other Post-Classic period settlements were newly constructed (Hegmon et al. 1999; Nelson 1999). At these Post-Classic period sites (ca. A.D. 1150-1200) (Figure 5.1), Mimbres Black-on-white Style III ceramics are often found in association with Post-Classic period ceramic types (e.g. Playas Redware, El Paso Polychrome, St. Johns Polychrome, Chupadero Black-on-white, and Three Rivers Red-on-terracotta). These data have led some researchers to hypothesize that Mimbres Black-on-white ceramics were still in use and possibly still being produced during the Post-Classic period in the Eastern Mimbres area (Hegmon et al. 1999: 156).

Around the same time archaeologists were beginning work on the Eastern Mimbres Archaeological Project, researchers in the Mimbres area were beginning to question many of the assumptions made by the Mimbres Foundation concerning the Black Mountain phase. Specifically, Creel (1999b) began to note the occurrence of Black Mountain phase traits at Classic period sites. While LeBlanc (1977, 1980a) noted that some Classic period sites, like the Mattocks site, contained relatively small quantities of Black Mountain phase ceramics as well as Black Mountain phase architectural characteristics, efforts to investigate these later occupations of Classic period sites were minimal (Anyon and LeBlanc 1984; LeBlanc 1976:15, 1980a). Creel's research (Creel 1999b; Hegmon et al 1999) demonstrated that many of the characteristics originally attributed to the Black Mountain phase were present at earlier components in the Mimbres area.

Specifically, Black Mountain phase ceramic types are commonly found at Classic period sites. Many of these are killed whole vessels placed with sub-floor burials. Similarly, cremations are found in earlier Mimbres contexts beginning during the Late Three Circle phase and continuing into the Classic period (Creel 1989; Shafer 2003). Also, small circular clay-lined hearths are more common at Classic period sites than originally thought, occurring in very late or terminal Classic rooms. Finally, coursed adobe architecture predates its apparent introduction during the Black Mountain phase by at least a century. Creel (1999b, 2006a) notes that coursed adobe architecture is present during the Three Circle phase at the Old Town Ruin. Despite the presence of these traits at Classic period sites, Creel notes that for the most part these characteristics are only present in later contexts at such sites. Because of this, Creel and others (e.g. Hegmon et al. 1999) postulated that these phenomena be designated as Terminal Classic (ca. A.D. 1130-1180) (Figure 5.1).

Of final interest to this introduction on the inhabitants of southwestern New Mexico during the 12th century are the Reserve (ca. A.D. 1000-1200) and Tularosa phases (ca. A.D. 1200-1400) of the Mogollon Highlands (Figure 5.1). Like the contemporaneous Classic Mimbres to the south, the Reserve phase is marked by the transition to above ground masonry architecture. Reserve phase sites are generally located along valley floodplains or along the edges of mesas and ridges overlooking drainages below (Bluhm 1960). Bluhm (1960) notes that these Reserve phase structures tend to be relatively small and contain less than 12 rooms on average. While Reserve phase sites may be small, they are numerous. Based on the number of Reserve phase sites present in the area researchers believe that population densities reached their peak during this time period (Oakes 1993; Oakes and Zamora 1999). Plain Mogollon Brownware sherds (i.e. Alma Plain) dominate the ceramic assemblages; and during this time period there is a proliferation of smudged and textured wares (e.g. Reserve Corrugated, Reserve Smudged Corrugated, Reserve Indented Corrugated, Reserve Incised Corrugated, Tularosa Patterned Corrugated, Tularosa Fillet Rim, etc.) that complemented the preceding and contemporaneous Alma ceramic types. Likewise, new decorated ceramic types begin to appear in the region and Mimbres Black-on-white pottery wanes in popularity as Reserve Black-on-white pottery increase in popularity (Bluhm 1957, 1960; Martin and Rinaldo 1950; Martin et al. 1949; Oakes and Zamora 1999).

Unlike the Mimbres tradition of the Mogollon culture area, and to a lesser extent areas in the Jornada del Muerto and the Animas area, areas in the northern Mogollon Highlands do not experience a seemingly rapid cultural reorganization. In these areas the Tularosa phase appears to represent a direct trajectory of the preceding Reserve phase. Tularosa phase sites mirror their Reserve phase counterparts in all respects except for size. Tularosa phase sites grow larger in comparison than those present during the Reserve phase with some containing between 30 and 60 rooms. While larger, Tularosa phase sites are less numerous when compared to the settlement pattern present in the Reserve phase. The combination of larger pueblos and less numerous small structures during this time period could reflect the consolidation of populations into fewer

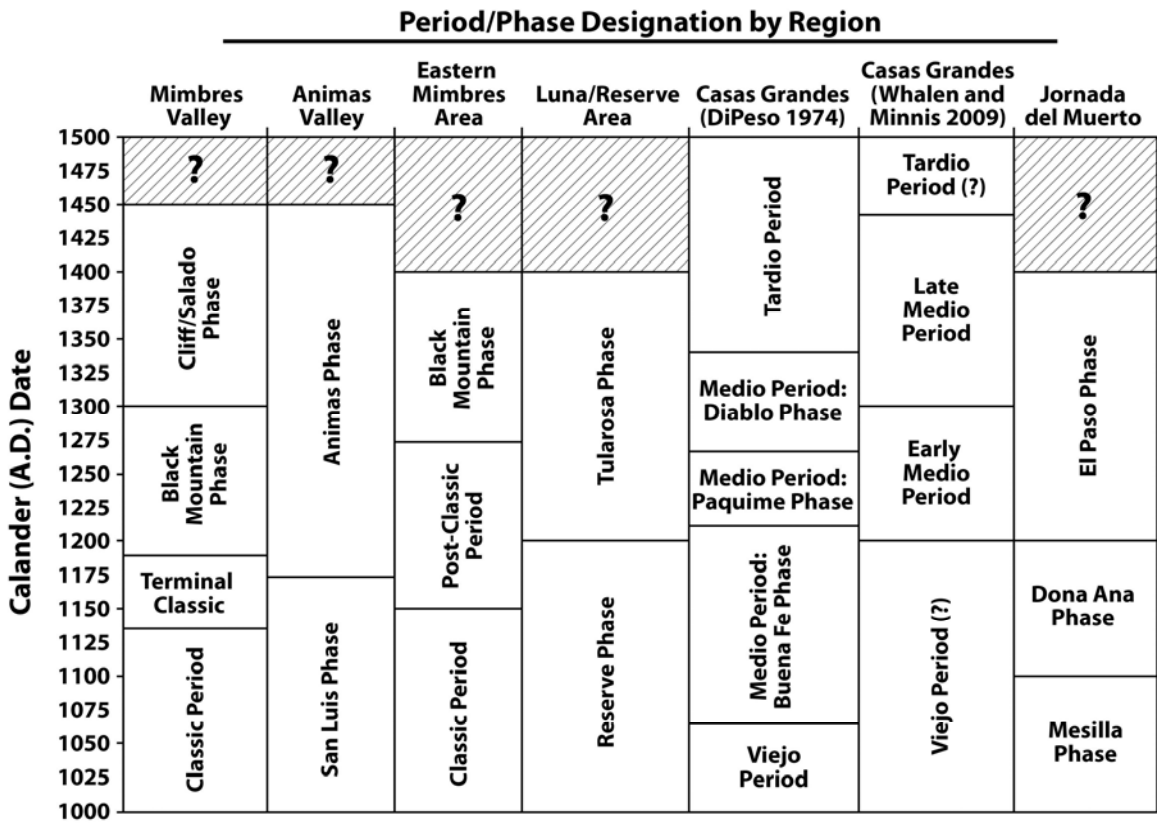

Figure 5.1: Temporal placement of different periods/phases by region. Information taken from Di Peso (1974), Hegmon and colleagues (1999), Lekson (1984, 2006), Miller and Kenmotsu (2004), Skibo and colleagues (2002), and Whalen and Minnis (2009).

settlements. Ceramic assemblages present at Tularosa phase sites mirror those of the preceding Reserve phase though new ceramic types are introduced (e.g. Tularosa Black-on-white, Tularosa White-on-red, and St. John's Polychrome) and gain in popularity (Oakes 1993; Oakes and Zamora 1999). Tested Tularosa phase sites in the area include the East Ridge Ruin (Oakes 1993), Higgens Flat Pueblo (Martin et al. 1957), the Hough Site (Oakes and Zamora 1999), Starkweather Ruin (Nesbitt 1938), Fornholt (Dungan 2012), and 3-Up (Dungan et al. 2012a).

In stark contrast to areas south around the Mimbres River, inhabitants of the northern Mogollon areas continue to construct and use large communal pitstructures throughout the Pithouse periods and into the Pueblo Periods. A few Reserve phase great kivas have been excavated in the Pine Lawn valley (e.g. Sawmill site) though the vast majority of tested great kivas in the northern Mogollon area date to the Tularosa phase (e.g. Fornholt, Higgins Flat, Hough Pueblo, East Ridge, and WS Ranch). These generally tend to be similar to Three Circle phase great kivas in their overall shape as well as the features present within their confines though some are either attached to room blocks or are surrounded by ancillary rooms.

Thus, the research conducted to date on Terminal Classic period, Post-Classic period, Reserve phase, Animas phase, El Paso phase, Black Mountain phase, and Tularosa phase sites (discussed below) suggests that there are similarities and differences between different areas. Specifically, there appear to be differences between the Luna/Reserve areas of the Mogollon Highlands, the Mimbres area, extreme southwestern New Mexico, and the Eastern Mimbres area with regards to the late 12th century manifestations in each of these areas. The Animas phase appears to represent a somewhat distinct cultural tradition though it shares similarities with the Black Mountain phase in the Mimbres arae as well as the El Paso phase in the Jornada del Muerto. While the similarities between these areas likely shows some form of interaction with Casas Grandes in northern Chihuahua, the exact nature of this interaction is currently unknown. Black Mountain phase sites also show considerable similarities to Terminal Classic period settlements and these data suggest that portions of larger Classic period sites continued to be occupied into the Black Mountain phase. The data pertaining to the Eastern Mimbres area suggest that a different adaptation was made in this area when compared to the Mimbres area. Here, some small Classic period farmsteads were reoccupied during the Post-Classic period and other Post-Classic period sites were newly constructed. Often these reoccupied structures were remodeled and expanded to accommodate increased populations. This situation somewhat mirrors the patterns taking place in the Luna/Reserve area of the Mogollon Highlands where no new architectural styles emerged during the Tularosa phase. In these areas, however, we probably see the aggregation of populations into a smaller number of settlements.

What follows is a more in-depth discussion of the Animas phase, Post-Classic period, Terminal Classic period, and Black Mountain phase based on data obtained from excavated sites. The Reserve phase and Tularosa phase are not discussed further primarily because the cultural traits common to these phases are distinctly different from those originally recognized as indicating a late 12th century occupation of the Mimbres area (e.g. adobe architecture, late ceramic types, architectural features, burial patterns, etc.).

EARLY WORK ON 12TH CENTURY SITES IN SOUTHWESTERN NEW MEXICO

The Animas phase represents the first defined cultural sequence that dates to the mid-12th century. Gladwin and Gladwin (1934) first recognized this phase, but it wasn't until the Carnegie Institution and the Peabody Museum carried out excavations at the Pendleton Ruin that substantial data were generated to adequately define the phase's traits (Kidder et al. 1949). The Pendleton Ruin was initially excavated because it was believed to represent a site either settled by, or substantially influenced by, inhabitants of Casas Grandes in northern Chihuahua (Kidder et al. 1949:144). A total of 30 rooms were excavated at the site and 53 other rooms were tested or trenched to define their wall sections. Walls at the site were constructed of coursed adobe that were sometimes placed on smoothed ground surface but were more commonly constructed and placed over footing trenches. While intact wall sections at the site generally rose only one meter above the prehistoric living surface, full height coursed adobe was most likely present when the pueblo was occupied. Once the walls were constructed floors were made of puddled and smoothed adobe and ranged in thickness from four to seven centimeters (Kidder et al. 1949: 128). While little evidence was collected that sheds light on the manner in which roofs were constructed, it is likely that they were constructed in a manner similar to other earlier and contemporary sites in the area. A few fragments of burned adobe with brush/reed impressions were recovered the Pendleton Ruin. Likewise, few postholes were encountered during excavation and those that were evidenced no regular pattern to their placement. These data point to a method of roof construction that utilized posts laid horizontally across wall sections with a layer of brush laid upon them. Adobe was then placed over this organic layer and smoothed flat. Support posts were apparently only placed to aid in supporting portions of the roof that had begun to sag. Only two doorways were encountered during the course of the excavations; and as Kidder et al. (1949) note, more would have been recognized if present because the majority of intact wall sections commonly rose 60 centimeters above prehistoric ground surface (Kidder et al. 1949:128).

Despite the presence of ceramic types common to Casas Grandes, (e.g. Ramos and Babicora Polychromes), other traits common to sites in northern Chihuahua were absent at the Pendleton Ruin (e.g. sub-floor burial, raised box hearths, "deeply scooped" metates, numerous doorways, and regular post hole patterns) (Kidder et al. 1949:144). There were likewise cultural traits present at the Pendleton Ruin that were absent from sites closer to the Casas Grandes heartland (e.g. round collared hearths, cord-marked and Cloverdale Corrugated ceramics, and trough mutates) (Kidder et al. 1949:144) (LeBlanc 1980a:272). Because of these differences, Kidder and colleagues decided that the Pendleton Ruin belonged to the Animas phase that was a "cultural entity distinct from the Ramos phase of Chihuahua" (Kidder et al. 1949:144). However, the possible presence of a platform mound at the site may show stronger ties to Casas Grandes than originally hypothesized (Douglas 2004).

From the time work ceased at the Pendleton Ruin until 1962 very little work was conducted at sites that dated to the mid-to-late 12th century in southwestern New Mexico. While a couple of surveys focused on better defining settlement types and site densities in Chihuahua, Mexico and portions of Hidalgo County, New Mexico, few sites located during these surveys were tested (e.g. Sayles 1936). In 1962, McCluney, an archaeologist from the School of American Research, surveyed and excavated several sites in Hidalgo County, New Mexico (McCluney 1962; Skibo et al. 2002). This area was targeted for investigation "so that the Animas phase could be extended and more information brought to light" (McCluney 1962:vii). The first site to be tested by McCluney was Clanton Draw, a site that was composed of three mounds that represented the remains of three distinct room blocks each of which likely contained upwards of 20 rooms (LeBlanc 1980a:274; McCluney 1962:7-24). Only eight rooms at the site were completely excavated while three others were partially excavated. From these excavations McCluney concluded that roughly 100 individuals occupied the site and, based on the ceramic assemblage recovered from the site, that it was occupied from A.D. 1300-1375 (McCluney 1962:23-24).

All of the rooms excavated at Clanton Draw were constructed from puddled adobe that was "laid in courses fours and fives" (McCluney 1962:11). All excavated wall sections had footing trenches that on average measured 12 centimeters in depth and width. From these footing trenches, walls were built up in roughly one meter increments and allowed to dry before additional courses were set. This pattern was continued until full height (roughly two meters) walls had been constructed. Stones were set along the top of the finished wall sections to serve as supports for the roof, and doorways were cut into the finished wall sections. According to McCluney, the floors were the next architectural feature constructed in the newly forming space, though not all excavated rooms contained formally prepared floors. These were constructed by first applying a thin layer of sand over the clay-pan. This sand was then pounded into place and thin layers of adobe were set in place and allowed to dry. Of the eight rooms excavated at the site only three contained hearths. These were generally circular hearths that were plastered. Roofs were constructed by first placing juniper posts across the wall sections at roughly 30-centimeter intervals. A mat of reeds and brush was then placed across these posts, and a thick layer of adobe was then applied on top of this mat.

Around the same time excavations were being conducted at Clanton Draw, McCluney began testing Box Canyon, a larger village composed of upwards of 350 rooms that were constructed around a central plaza. Based on the ceramic assemblage recovered from the site, McCluney believes that the site was occupied slightly later than Clanton Draw (ca. A.D. 1350-1380) (McCluney 1962:40). McCluney and his team excavated 18 rooms and wall-trenched 39 additional rooms. The construction sequence of rooms was similar to that described for the Clanton Draw site with a few exceptions. When compared to Clanton Draw, walls at Box Canyon tended to be thicker and evidenced better craftsmanship in their construction. Likewise, formal entryways were present at Box Canyon. These consisted of flat stones that rose roughly 15 centimeters above the floor and were set in place by a mixture of gravel and adobe. Also, one raised box hearth was encountered, but the other hearths were the same small circular hearths encountered at Clanton Draw.

In 1962, when the excavations at Clanton Draw and Box Canyon were being conducted, McCluney conducted additional surveys of the surrounding area. During this reconnaissance, the Joyce Well site was located and a decision was made to test the site the following season (McCluney 2002). This decision was based on the similarity of the site to others that had been excavated in the area, the greater frequency of decorated pottery at the site when compared to Box Canyon and Clanton Draw, and the estimated size of the site. Excavations began in the summer of 1963 and by the season's end, 45 of the site's estimated 50 rooms had been excavated (LeBlanc 1980a; Skibo et al. 2002). These estimated 50 rooms comprised one room block that was U shaped and partially enclosed a central plaza area and, based on the site's ceramic assemblage, is believed to have been occupied from A.D.1250 until A.D. 1400 (Skibo et al. 2002). Wall and floor construction was interpreted to be very similar to that at Clanton Draw and Box Canyon. Roofs were generally constructed in the same manner as well, though McCluney notes that long beams were first placed over walls and that these timbers often spanned multiple rooms. These beams were anchored to the wall in an unknown fashion and cross beams were then laid over the primary roof beams. Brush and foliage were then placed over these secondary roof timbers, and adobe was then placed over this vegetation. In most cases a single support post was then erected to add additional support and limit roof sagging (Skibo et al. 2002). Three types of door/entry ways were found within the excavated rooms: T-shaped, rectangular, and circular varieties. Interestingly these either connected adjacent rooms or led to the plaza area. No door/entry ways were found that led from a room to the exterior of the room block (Skibo et al. 2002). The majority of hearths excavated at Joyce Wells were circular adobe lined pits, though three raised box hearths were also encountered (Skibo et al. 2002). The portions of the plaza excavated revealed the presence of a prepared surface, portions of which had been paved with flagstone. While Skibo and colleagues (2002) note that many activities likely took place in this area of the site, no formal features were encountered in their limited testing of this part of the site.

As was the case with many projects that were undertaken prior to the emergence of the New Archaeology in the 1960's analyses of the artifact assemblages recovered from the Pendleton Ruin, Clanton Draw, Box Canyon, and Joyce Wells relied heavily on noting the presence or absence of diagnostic artifact types and associating these types with distinct temporal cultural stages. Generally, analysis of lithic assemblages was restricted to formal tool types. At all of the above mentioned Animas phase sites projectile points, bifaces, scrapers, choppers and cores were encountered. These were found in a variety of contexts and were fashioned from chalcedony, chert, quartz, obsidian, basalt, and rhyolite (Kidder et al. 1949; McCluney 1962; Skibo et al. 2002). Numerous pieces of groundstone were also encountered during the excavation of these sites. The most numerous groundstone artifact type was manos. McCluney notes that at Clanton Draw, Box Canyon, and Joyce Wells that most manos were "elongate-ovid" and bidirectional. Manos of this type generally measured roughly 20 centimeters in length and were mostly fashioned from vesicular basalt, though some were fashioned from sandstone and rhyolite (McCluney 1962; Skibo et al. 2002). Another mano type, what McCluney refers to as "Type 2," was smaller than the "elongate-ovid" variety and was generally worked on one face. These were primarily fashioned from sandstone or rhyolite, though some were manufactured from basalt. The majority of metates found at these sites were through trough metates fashioned from vesicular basalt, though grano-rhyolite through-trough metates were also encountered (McCluney 1962; Skibo et al. 2002). Groundstone axes, palettes, and pendants were also encountered at Animas phase sites as were numerous artifacts of personal adornment (e.g. turquoise, slate, hematite, and shell beads; shell bracelets; etc.). Numerous polishing stones were also encountered at these sites and represent one of the artifact categories that differentiate Clanton Draw, Box Canyon, and Joyce Wells from the Pendleton Ruin. At Clanton Draw, Box Canyon, and Joyce Wells, McCluney notes that some floors appeared to have been polished after the final coat of adobe had been allowed to set. At these sites larger polishing stones were present that McCluney interpreted as floor polishing stones (McCluney1962:16). Likewise, tabular slate tools were also encountered at the sites excavated by McCluney but were absent from the assemblage collected at the Pendleton Ruin (McCluney 1962).

The artifact type that was given the most attention by these early research programs was ceramics. All ceramic types encountered at Pendleton Ruin, Clanton Draw, Box Canyon, and Joyce Wells had been previously described by other archaeologists working in the area with the exception of Cloverdale Corrugated which was first described as a result of the work at Pendleton Ruin (Gladwin and Gladwin 1930; Kidder et al. 1949). Plain utilitarian wares dominate these sites' assemblages accounting for between 67 to 93 percent of all ceramics recovered (LeBlanc 1980a). Other painted and textured ceramics were encountered during the course of these sites' excavation but vary proportionally across sites. These include Cloverdale Corrugated, Playas Redware, Babicora Polychrome, Ramos Polychrome, Chihuahuan Polychromes, El Paso Polychrome, Chupadero Black-on-white, St. Johns Polychrome, Wingate Black-on-red, Tucson Polychrome, and Gila and Tonto Polychromes among others. Based on an analysis of temper, paste, and decoration style for ceramics recovered from Joyce Wells, Skibo and colleagues (2002) postulate that Ramos Polychrome, Ramos Black, and Playas Redwares were manufactured locally while El Paso Polychromes, Chihuahuan Polychromes, Gila Polychrome, and Tucson Polychrome were imported into the region (2002:39-44). Skibo and colleagues (2002) note that other "culinary" ceramic types represented Casas Grandes Obliterated Corrugated, Incised Corrugated, Scored, and Punctated were manufactured locally but that the execution of their surface decoration indicates frequent interaction with the Casas Grandes culture area. As LeBlanc (1980a) notes however, McCluney's temper analysis was non-petrographic, vague, and difficult to replicate (1980a:277-278).

In 1972 the United States Department of Agriculture Forest Service contracted James Fitting to conduct an archaeological survey of lands that were to be part of a land exchange. Upon completion of the survey, Fitting recommended that some sites deserved additional testing and in the spring of 1972 the Forest Service acquiesced and approved a month long "salvage project to be carried out in the area of CF Spring, Willow Creek and at two sites near Burro Springs" (Fitting 1973:4). The first site to be tested was CF Spring, a site that contained three isolated rooms and, based on the presence of a single Mimbres Black-on-white sherd on the site's surface, was thought to represent an undisturbed Classic Mimbres settlement. From June 17 through June 20 of 1972, Fitting and his crew excavated the three structures at CF Spring. Fitting's initial interpretation of the site was soon proven to be wrong and he realized he was excavating a looted "Animas Phase rather than Mimbres Phase site" (Fitting 1973:4). The structures at CF Spring differed markedly from other Animas phase sites excavated by Kidder and colleagues (1949) and McCluney (1962; Skibo et al. 2002). Structures at CF Spring were dug into sterile soil and outlined by rocks. Adobe was then placed against these wall foundations and spread across the excavated area to form a thick "cement-like" floor (Fitting 1973:6). All structures at CF Springs were void of interior features. This lack of interior features and the relative dearth of artifacts at the site led Fitting to initially hypothesize that the site represented a detached storage area for a larger Animas phase site in the area, though no large Animas phase sites were, or are, known of in the vicinity of CF Spring.

A total of 145 ceramic sherds were collected from CF Spring the majority of which were plain brownwares (Fitting 1973). Incised brownware, corrugated brownware, Chupadero Black-on-white, Playas Red Incised, Mimbres Black-on-white Style III, and Wingate Black-on-red sherds were also present at the site. The site contained numerous projectile points and projectile point fragments as well as many pieces of debitage. These data combined with the relative scarcity of cores and ceramics recovered from the excavated portions of the site led Klinger to conclude that the site was a hunting camp that was occupied for a short duration (Klinger in Fitting 1973:29).

THE EL PASO PHASE

The El Paso phase of the Jornada del Muerto and Hueco Bolson was first recognized by Sayles' (1935) Dustbowl survey of Texas, but it was not formally described until Lehmer conducted his research on the Jornada branch of the Mogollon (Lehmer 1948). During the course of his research Lehmer (1948) excavated portions of one site and reported upon the excavation of another that would later come to define his conception of the El Paso phase. The first of these sites, the Bradfield site, was excavated in 1940 and "consisted of a sixteen-room, one story pueblo and an adjacent midden" (Lehmer 1948:39). The pueblo was constructed of coursed adobe and contained 16 contiguous rooms aligned in a linear arrangement. The entire structure measured 25 meters by 95 meters in maximum length and width. Thirteen of the site's 16 rooms were excavated and, based on wall-bond abutment patterns, evidenced multiple construction episodes. Lehmer (1948) believed that room construction sequence began with the construction of wall enclosing a space. These walls varied in thickness across the site from ten to 60 centimeters and were constructed of coursed adobe. These walls were constructed on adobe footing trenches. Lehmer (1948) notes that these footing trenches did not incorporate masonry slabs into their architectural fabric (1948:44). Once the walls were constructed, floors were made of puddled adobe and ranged from five to 15 centimeters in thickness. These floor surfaces were generally laid down upon undisturbed deposits, though in some cases floors were constructed upon fill that was believed to have been placed to level "irregularities in the underlying ground surface" (Lehmer 1948: 44). Roofs were the next architectural element to be constructed. Lehmer (1948) notes that numerous postholes were encountered within the excavated rooms. While some rooms only contained a single primary roof-support post, other rooms contained as many as 17 postholes (Lehmer 1948:44). In general, most rooms excavated at the site either incorporated a two-post of a four-post roof support pattern. No direct evidence of roof construction technique was encountered during the course of Lehmer's excavations at the Bradfield site, though he believed that roofs were constructed by placing timbers across either the walls or the primary support posts with smaller timbers spanning the remaining distances. A layer of brush or grass was then laid over these timbers and a layer of adobe was placed down over these to cap the roof. Hearths were encountered in most of the excavated rooms. These hearths were mostly of the small circular adobe-lined variety (Lehmer 1948:45). Aside from postholes and hearths, the only other internal features present within rooms at the Bradfield site consisted of storage pits and raised entry steps "from 10 to 35 centimeters higher than floor level" (Lehmer 1948:45). No burials were encountered during the course of the site's excavation. While Lehmer (1948) notes that intramural burials are found in the larger Jornada area, he believes that interment at the site likely took place in extramural areas (Lehmer 1948:54). Finally, Lehmer (1948) notes that no rooms contained features reminiscent of kivas found further north, though one room, Room M, was substantially larger than the other rooms present at the Bradfield site. Lehmer postulates that this room likely "served as some sort of communal chamber" for the site's inhabitants (Lehmer 1948:46).

While not excavated by Lehmer, both Alamogordo Site 1 and Alamogordo Site 2 were used to further differentiate and define the El Paso phase of the Jornada Mogollon (Bradfield 1929b; Lehmer 1948; Stubbs 1930). Alamogordo Site 1 consisted of two discrete room blocks. One room block (Alamogordo Site 1, House 1) mirrored the architectural layout of the Bradfield Site. This room block consisted of a 15-room structure arranged in a linear fashion. Directly north was an additional room block containing around three to four rooms. As with the Bradfield site, the walls were constructed of coursed adobe set in foundation trenches. No mention is made of masonry slabs being present in these trenches. Floors were constructed of puddled adobe and most rooms contained either a small circular adobe-lined hearth or an adobe-collared hearth. Roofs were constructed in manner similar to that postulated for the Bradfield site. Roof support patterns again consisted of either a two- or four-post support plan. Alamogordo Site 1, House 1 also contained a larger room placed within the central portions of the main room block. While no kiva-like formal features were present in the room, its larger size suggests a communal function (Lehmer 1948:55).

House 2 of the Alamogordo Site 1 lies just 230 meters southeast of House 1 (Lehmer 1948:55). This room block likely contained upwards of 100 rooms. Unlike the Bradfield site and House 1 at the Alamogordo Site 1, House 2 was not arranged in a linear manner but consisted of a contiguous alignment of surface rooms surrounding a plaza area. A total of 56 rooms were excavated by Bradfield (1929b) and Stubbs (1930). Aside from the overall plan of the room block (i.e. linear vs. plaza oriented) there were few differences in the architectural characteristics present at House 2 of Alamogordo Site 1 when compared to either the Bradfield site or House 1 of Alamogordo Site 1. Of particular interest however was the presence of "stone slabs" occasionally "set in foundation trenches" along wall alignments (Lehmer 1948:56). Aside from these differences walls, floors, and roofs were constructed in a similar manner across sites. Likewise, House 2 at Alamogordo Site 1 contained two rooms (Rooms 21 and 41) that were believed to have served some form of communal function based on their larger than average size and the presence of unusual features in one of the rooms. These unusual features consisted of a semi-circular adobe bin and a large number of postholes in Room 41. Lehmer notes that the overall pattern of the postholes present in this room mirrors the posthole patterns interpreted as loom anchors further north along the Colorado Plateau (Lehmer 1948:57). Finally, there were two "bins" in the corner of Room 20 that were interpreted by Stubbs (1930) as representing "turkey roosts" (Lehmer 1948:57). Each of these bins measured roughly one meter by one meter in maximum length and width and contained small slab-lined doors that opened onto the main room. Two "poles" passed through the walls of these bins roughly 20 centimeters above floor level and were spaced 15 centimeters apart (Lehmer 1948:57).

The final site used by Lehmer (1948) in his definition of the Jornada Branch of the Mogollon was another site initially excavated by Bradfield (1929b) and Stubbs (1930): Alamogordo Site 1, House 1. Like House 2 at Alamogordo Site 1, House 1 at Alamogordo Site 2 was relatively large and contained upwards of 60 rooms arranged around a common plaza area. A total of 22 rooms were excavated at the site. The architectural features encountered during the course of excavations mirrored those present at other sites in the area (e.g. House 1 and House 2 at Alamogordo Site 1 and the Bradfield site).

Lehmer (1948) notes that the ceramic assemblage encountered at the Bradfield site and the Alamogordo sites were composed primarily of El Paso Polychrome ceramics with minor occurrences of Chupadero Black-on-white, Lincoln Black-on-red, Three Rivers Red-on-terracotta, Gila Polychrome, Agua Fria Glaze-on-red, Ramos Polychrome, Babicora Polychrome, Playas Red Incised, Heshotauthla Glaze Polychrome, St. Johns Polychrome, and Mimbres Black-on-white ceramics. Stone palettes, shell and turquoise ornaments, shaft straighteners, axes, mauls, projectile points, and other ground stone tools were commonly found at these sites as well.

The architectural features and artifact assemblages encountered at these three sites led Lehmer (1948) to assign these sites to the El Paso phase as described by Sayles (1935). Sayles described the El Paso phase as occupations that contain “house ruins” arranged as “long tiers of rectilinear rooms” whose ceramic assemblages are dominated by El Paso wares (Sayles 1935:72). Sayles (1935) also notes that sub-floor burials are present at El Paso phase sites, but to date, very few have been found.

Since Lehmer’s initial work, a number of other El Paso phase structures have been partially excavated (e.g. Lowrey 2005; Miller and Graves 2009, 2012). For the most part these pueblos conform to the overall pattern originally described by Lehmer (1948) and Sayles (1935). Most tend to consist of less than 20 contiguous surface rooms arranged in linear fashion. Though other larger plaza oriented pueblos have been identified and intensively surveyed, few have been tested (Miller et al. 2009). Thus, aside from the initial excavations that Bradfield (1929b) and Stubbs (1930) undertook at the Alamogordo Site 1 and Alamogordo Site 2, the majority of our understanding of the El Paso phase comes from survey and excavation of smaller settlements.

THE MIMBRES FOUNDATION AND THE BLACK MOUNTAIN PHASE

During the latter portions of the 1970's Mimbres Foundation archaeologists surveyed 24,745 acres up and down the length of the Mimbres River and along its side drainages (Blake et al. 1986). As a result of this endeavor "more than 400 site components" were located, and 30 sites were tested that spanned the entirety of the Mimbres cultural sequence (Blake et al. 1986:439). Of these, 146 sites contained architectural remains (Blake et al. 1986:451-453). This work allowed previously existing chronological patterns and frameworks to be reevaluated and interpreted. One previously existing/defined cultural sequence stage, the Animas phase, was similar and roughly contemporaneous to a set of sites recorded by Mimbres Foundation archaeologists in their survey of lands and excavation of sites along the Mimbres River. Despite these similarities, Mimbres Foundation archaeologists believed that these contemporaneous sites in the Mimbres area exhibited enough distinctions from the "ill-defined" Animas phase to warrant calling the initial post-Classic occupation of the area the "Black Mountain" phase (LeBlanc 1977, 1980a:279).

While Blake and colleagues (1986) state that 17 Black Mountain phase site were located during the Mimbres Foundation's survey of the Mimbres area, descriptions of sites encountered during the survey as well as data from ceramics collected from sites potentially point to a larger number of such sites within their survey areas (Appendices A and B) (Figure 5.2) (LeBlanc 1979a, 1979b). Based on their data, I infer that 87 definite or probable Terminal Classic period and Black Mountain phase occupations were actually found during the Mimbres Foundation's survey. Of these 87, 51 are sites herein interpreted as being strictly Black Mountain phase occupations. Of these 51, 20 (39%) were sites with architectural remains and 31 (61%) were artifact scatters (Appendices A and B) (LeBlanc 1979a). A total of 12 sites were interpreted as being multi-component with a Black Mountain phase occupation. Of these 12 sites, eight (66%) contained architectural remains while four (33%) represented artifact scatters. Finally, 24 of the 87 sites were noted as containing ceramics commonly associated with the Black Mountain phase but were not interpreted as containing a Black Mountain phase occupation

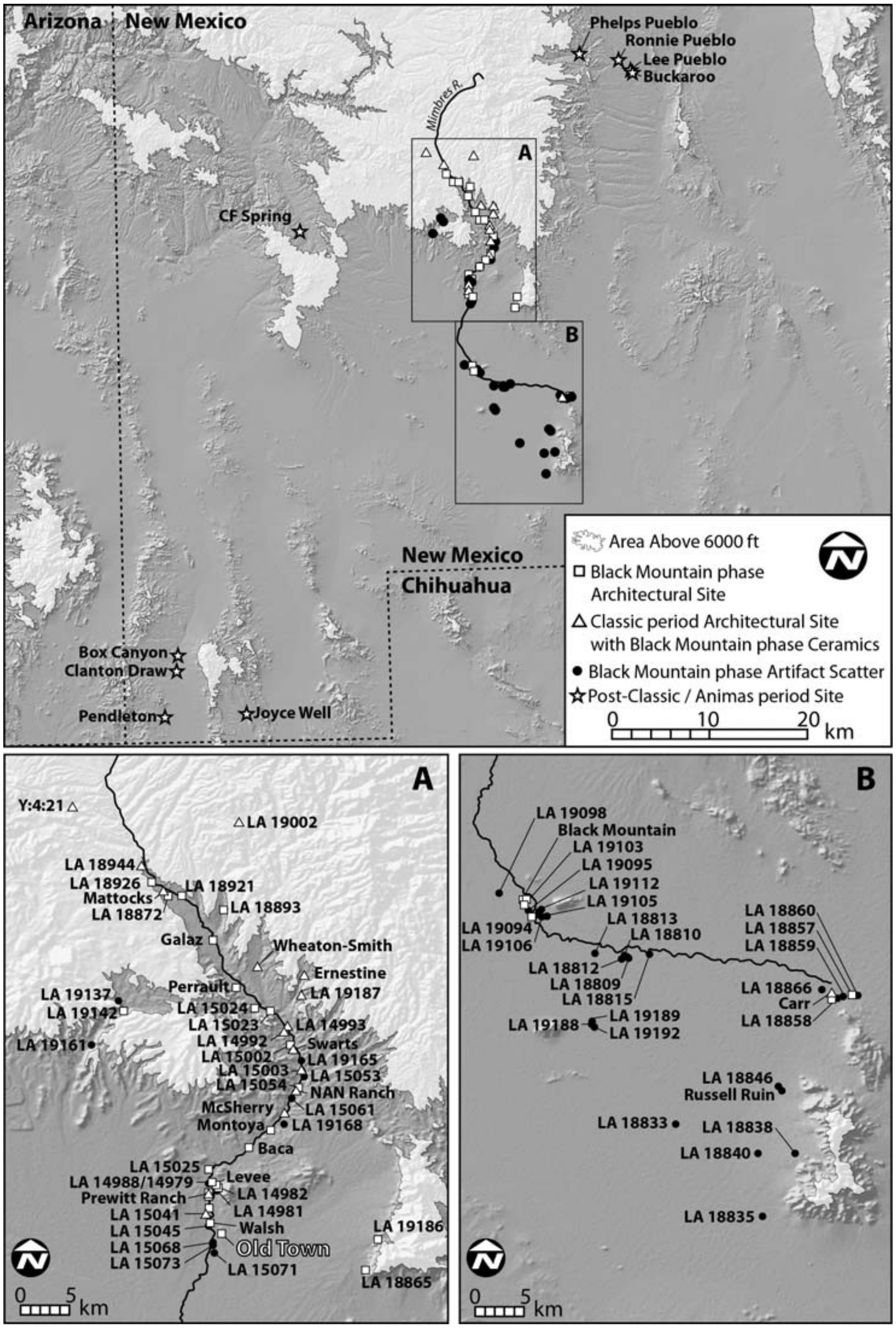

Figure 5.2: Sites identified during the Mimbres Foundation's surveys of the Mimbres area that contain a Black Mountain phase component as well as post-Classic sites discussed in text (see Appendices A and B for descriptions of sites identified as part of the Mimbres Foundation's survey of the Mimbres area).

(LeBlanc 1979a, 1979b). Of these 24, 16 (67%) represented sites with architectural remains, two sites (8%) represented artifact scatters, and six sites (25%) represent an unknown site type. These six sites were present in the ceramic tallies recorded by the Mimbres Foundation (LeBlanc 1979b) but no site descriptions were present in their notes (LeBlanc 1979a). This last category of sites, those containing ceramics commonly associated with the Black Mountain phase but were not interpreted as containing a Black Mountain phase component, likely represent components that we now recognize as Terminal Classic period occupations. Appendices A and B present a brief description of these sites.

The main discrepancy between my totals of Black Mountain phase sites and those presented by Blake and colleagues (1986) in their analyses of Mimbres demographic patterns lies with the fact that I incorporated those sites described by the Mimbres Foundation as “Black Mountain sites” and “Classic Mimbres and Black Mountain sites” (Appendix A)(LeBlanc 1979a). The tallies used by Blake and colleagues (1986) used only those sites described as “Black Mountain pueblos” and “Classic Mimbres and Black Mountain pueblos” (Appendix A) (LeBlanc 1979a). The difference between these two site descriptions lies with the fact that the “Black Mountain pueblo” site description refers to those sites which contain definitive architecture and the “Black Mountain site” description refers to those sites whose architecture is less definable or contained a limited number of definable rooms (usually less than 10).

For the intents of investigating demographic patterns, it makes sense to use only those sites with definitive architecture as opposed to those whose architecture is uncertain or unknown. Similarly, “Classic Mimbres sites” were also excluded from their population estimates. This was likely due to the fact that these small sites were deemed to represent “temporary habitations” which were “seasonally occupied” and were excluded from analysis (Blake et al. 1986:459). It is likely that “Black Mountain sites” were excluded from analyses for similar reasons.

These numbers still possibly underestimate the Black Mountain phase occupation of the Mimbres area. More recent research has demonstrated that most of the larger

Classic period sites experienced some form of Terminal Classic or Black Mountain phase occupation. It is possible that many of the larger settlements north of the Mimbres Foundation's survey contain such occupations but were not systematically inventoried as part of their research endeavors. Similarly, as noted by the Mimbres Foundation (Nelson and LeBlanc 1986), the construction materials commonly used by Black Mountain and Cliff/Salado phase peoples do not preserve as well as cobble masonry used by earlier inhabitants. This problem, in addition to issues of increased erosion resulting from modern and historic land use practices, often obscures these later occupations during inventory endeavors. It is likely that some of the "Black Mountain sherd and lithic scatters" recorded by the Mimbres Foundation actually represented architectural sites whose structural remains were indistinguishable at the time they were encountered.

BLACK MOUNTAIN PHASE SITES TESTED BY THE MIMBRES FOUNDATION

As is indicated by the preceding sections and elsewhere (e.g. Blake et al. 1986), a number of Black Mountain phase sites were located during the Mimbres Foundation's survey of the Mimbres area. However, only two architectural sites were chosen for testing: the Walsh and Montoya sites (Blake et al. 1986; LeBlanc 1977, 1980a; Ravesloot 1979).

The Walsh site (Figure 5.3) contained roughly 120 rooms arranged in multiple room blocks around a common plaza area while the Montoya site contained upwards of 40 rooms organized as a single room block (LeBlanc 1980a, Ravesloot 1979) (Figure 5.4). A total of six Black Mountain phase rooms were excavated at these sites: four at Walsh and two at Montoya. Wall construction at both Walsh and Montoya primarily consisted of coursed adobe that was laid directly on top of a compacted ground surface. No evidence of footing trenches or stone footers were found during the course of the sites' excavation though some wall sections did incorporate masonry into their architectural fabric (LeBlanc 1980a, Ravesloot 1979). Floors were constructed on the same compact surface upon which the walls were. These consisted of layers of adobe that ranged from two to six centimeters in thickness and were laid down after roof

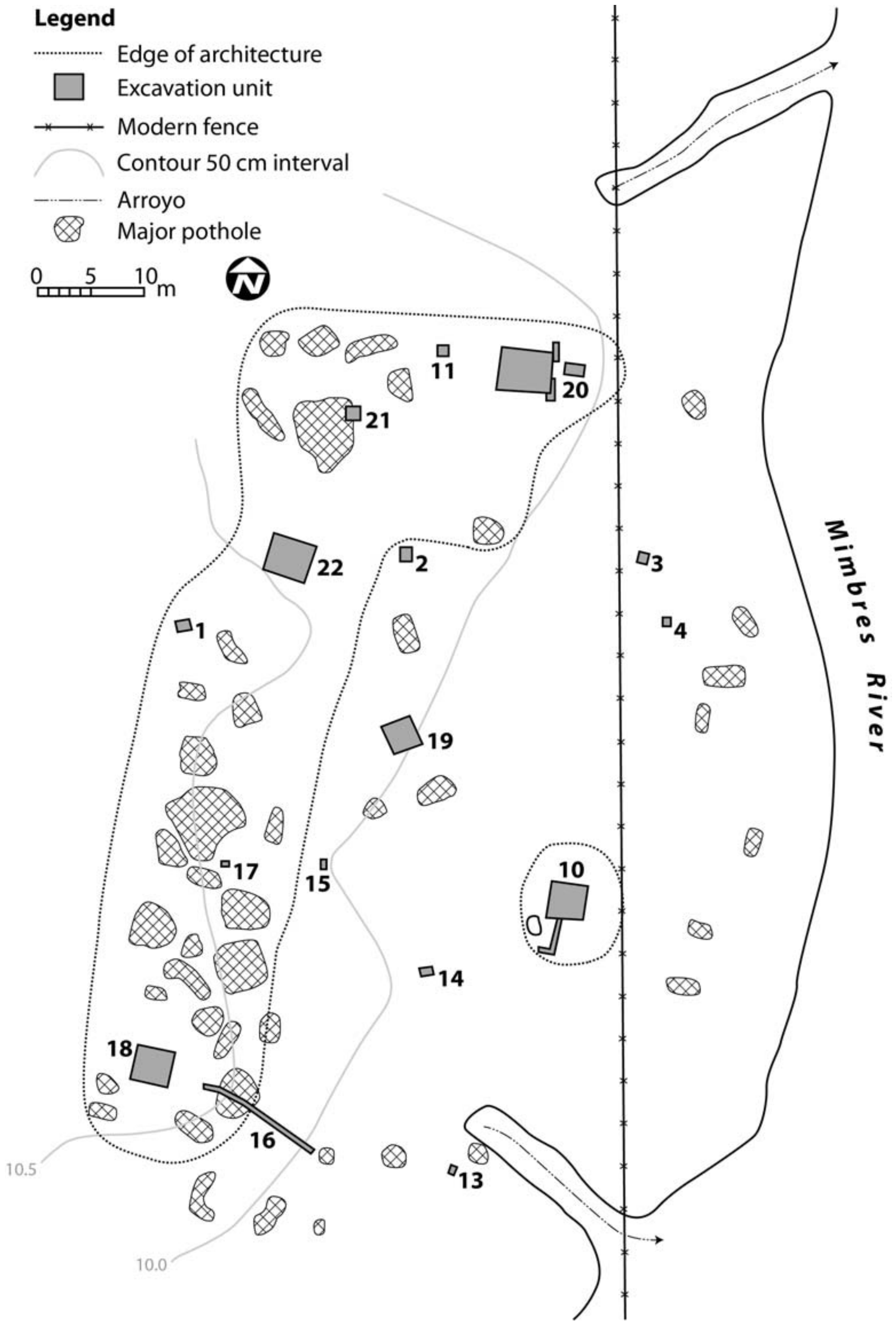

Figure 5.3: Walsh site plan. Map presented courtesy of Roger Anyon and Steven LeBlanc.

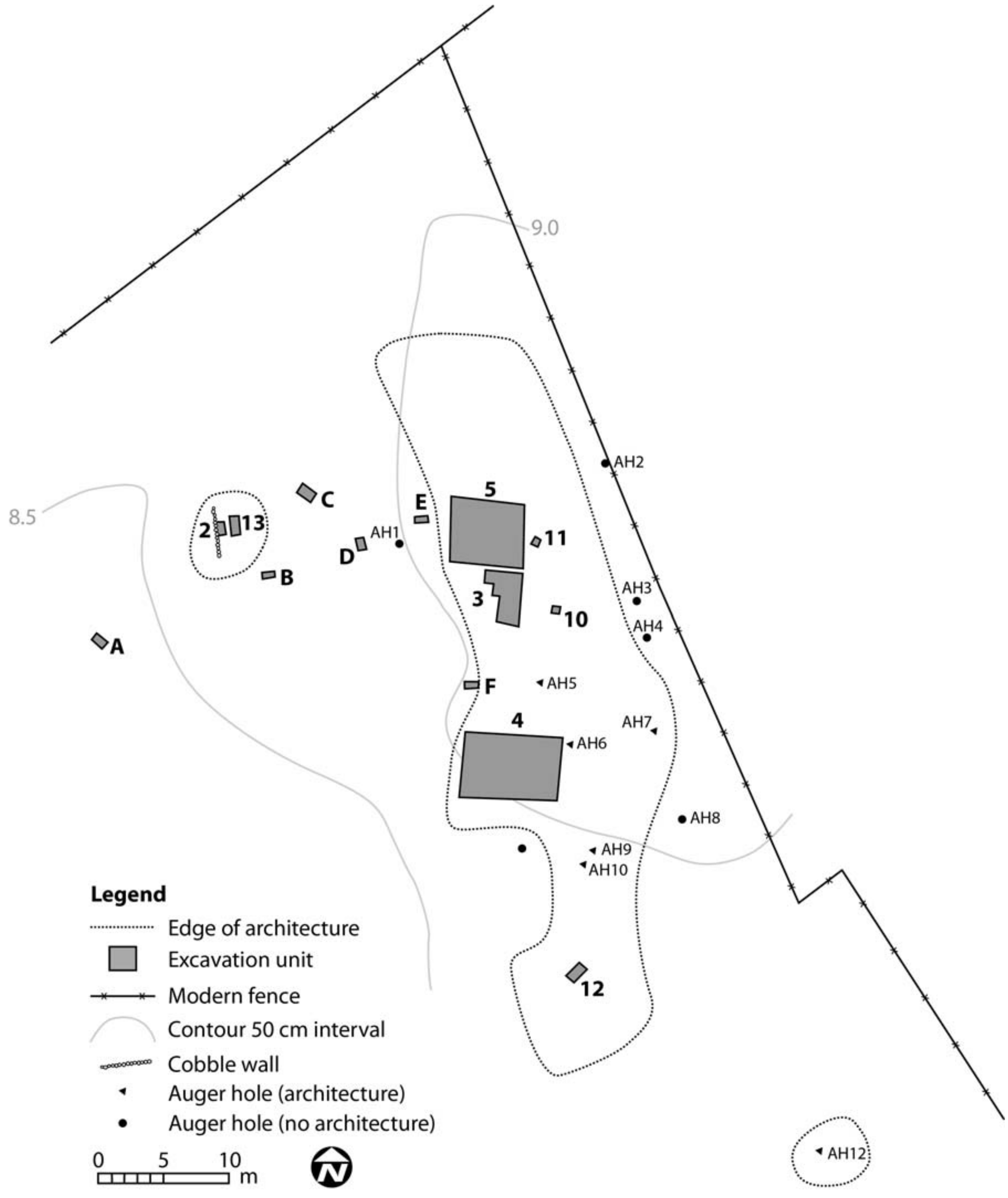

Figure 5.4: Montoya site plan. Map presented courtesy of Roger Anyon and Steven LeBlanc.

support postholes had been excavated (Ravesloot 1979:27). Some rooms contained evidence of multiple occupations and room refurbishing episodes. These rooms often contained multiple prepared adobe surfaces separated by a layer of fill. There was no over-arching pattern to roof construction. Some rooms contained roof support posts while others did not. Those that did contain roof support posts utilized either a single center post or a two-post plan. A main roof support beam was laid across the walls and central axis and smaller secondary beams were then laid across the room. A mat of branches and brush was then laid upon these beams and was capped by an adobe layer that ranged in thickness from five to 10 centimeters. Hearths were generally of the shallow adobe-lined basin variety though one raised box hearth was excavated at the Walsh site. Some of these hearths had been plastered over and were not in use during the final occupation of the room's space (Ravesloot 1979:28).

To date, no formal report of the excavations conducted at Walsh and Montoya has been prepared, though one is in preparation (Roger Anyon 2014 personal communication, Steven LeBlanc 2014 personal communication). The most common discussion of cultural materials recovered from these sites has centered on their ceramic assemblages. The suite of types associated with Animas phase sites further south are also present at Black Mountain phase sites, though their proportions differ between the areas. The higher frequency of Ramos Polychrome at Animas phase sites coupled with the higher frequency of Playas Red and Chupadero Black-on-white ceramics at sites in the Mimbres area is one of the primary characteristics that serve to differentiate the Animas phase from the Black Mountain phase (LeBlanc 1980a, Ravesloot 1979). Likewise, the practice of disposing of the dead by means of cremation was a common practice in the Mimbres area when compared to the Animas region. Of the 23 burials excavated at both Walsh and Montoya, only four (ca. 17 percent) were cremations (Ravesloot 1979). The vast majority of the individuals interred at these sites represented either flexed or semi-flexed inhumations and all but one were encountered beneath the floors of Black Mountain phase structures. Of these 19 inhumations, six were interred with Black Mountain phase pottery types placed over their skull and half of these were “killed” in a manner typical of the preceding Mimbres Classic period (Ravesloot 1979).

Prior to the work at the Walsh and Montoya sites, Mimbres Foundation archaeologists began excavation at the Galaz Ruin (Anyon and LeBlanc 1984). The Southwest Museum of Los Angeles and the University of Minnesota had previously excavated portions of the site and in 1975 the site had been leased to commercial looters who were excavating the site with heavy machinery. The Foundation obtained clearance to conduct excavations at the site at the end of their 1975 season but by this time the majority of the surface architecture had been destroyed (Anyon and LeBlanc 1984). Because of this, the majority of the Mimbres Foundation’s work at the site focused on site’s Late Pithouse period occupation. Despite this, Mimbres Foundation archaeologists were able to reconstruct cultural patterns of periods proceeding the Late Pithouse period due to the fact that pithouse depressions were used as dumps by later inhabitants and by reviewing the notes and collections obtained by the work conducted by the Southwest Museum of Los Angeles and the University of Minnesota (Anyon and LeBlanc 1984).

Of particular interest here, the Galaz site was found to contain a Post-Classic period/Black Mountain phase occupation. As interpreted at that time, evidence of this Black Mountain phase occupation presented itself in two ways at the Galaz ruin: through the interment of individuals in rooms constructed during the Classic period with Post-Classic period ceramics and through the construction of a Post-Classic period pueblo over the remains of a Classic period occupation (Anyon and LeBlanc 1984). The former was evidenced by the presence of individuals interred with Post-Classic period ceramics. Anyon and LeBlanc note that rooms 83, 97, 108, 109, 117, 122, and 124 in the west room cluster contained sub-floor burials with Post-Classic period ceramics as did rooms SWM-4, SWM-5, 41, 44, 72, 98, and 99 in the north room cluster (Anyon and LeBlanc 1984:143). Anyon and LeBlanc (1984) note that similar patterns are present at other large Classic period sites in the Mimbres area. Specifically, both Mattocks and Swarts contained individuals who were interred with Post-Classic period ceramic vessels (Anyon and LeBlanc 1984:143). These data suggest that portions of these room blocks were still occupied during the Terminal Classic and Post-Classic periods.

The Post-Classic period/Black Mountain phase pueblo at Galaz contained 23 rooms arranged in four room blocks. These four room blocks were roughly arranged in "U-shaped" pattern and could have enclosed a plaza area, though no evidence of a prepared surface was found between the northern room blocks and the west and south room blocks (Anyon and LeBlanc 1984:143-147). Individual rooms within the room blocks were constructed in a fairly consistent manner. Walls were constructed of puddled and coursed adobe and, like the Walsh and Montoya ruins, lacked footing trenches. All walls did however have thin masonry slabs set upright into them (Anyon and LeBlanc 1984:145). These slabs formed a continuous masonry veneer along the lower portions of the walls. Floors were constructed of smoothed puddled adobe that in some cases was laid above the cobble-walled masonry of the site's Classic period occupation. No discernible data concerning the construction of roofs could be ascertained from the records collected by the University of Minnesota. However, Anyon and LeBlanc believe that some rooms could have incorporated a four-post pattern roof support system (Anyon and LeBlanc 1984:146).

THE EASTERN MIMBRES ARCHAEOLOGICAL PROJECT

In 1993 Michelle Hegmon and Margaret Nelson began work on the Eastern Mimbres Archaeological Project (EMAP). This project focused on addressing issues surrounding the socio-ecological shifts associated with the Post-Classic period (ca. A.D. 1150 – early 1200s) occupation of areas east of the Black Range in southwestern New Mexico (Hegmon and Nelson 1994; Hegmon et al. 1998, 1999; Nelson 1999; Nelson and Hegmon 1993, 1995). Numerous side drainages of the Rio Grande were surveyed as part of the work conducted by EMAP archaeologists, and a number of sites located by these efforts were chosen for testing. Among those were the Buckaroo site, Lee Pueblo, Ronnie Pueblo, and Phelps Pueblo. These sites were chosen because they contained ceramic types that were produced before and after the A.D. 1150 abandonment date established by Mimbres Foundation archaeologists (Anyon and LeBlanc 1984; LeBlanc 1980a, 1983).

Nelson (1999) notes that sites in the Eastern Mimbres area show considerable variability in architecture. Generally, sites in the area were constructed of cobble-walled masonry. Based on excavation data, these walls were, for the most part, full height (ca. two meters), though their thickness and the amount of cobbles incorporated into their architectural fabric varied at the inter- and intra-site level. Floors were usually constructed from puddled adobe that was smoothed after it had been laid. Again, floors varied both within and between sites in relation to their thickness, slope, and evidence for remodeling (Nelson 1999). As best as can be ascertained roofs were constructed in a manner similar to other sites mentioned above with secondary posts laid perpendicular across wall segments, a layer of reeds or some other form of matting laid over the secondary posts, and puddled and smoothed adobe set over this material. Nelson (1999) notes that, like the Post-Classic occupation at Galaz, no overarching primary roof support pattern was noticed at the inter- and intra-site levels.

The Buckaroo site consists of the remains of an 11 to 12 room pueblo, two to three pit-structures, and an associated artifact scatter. Architectural data, ceramic data, as well as radiocarbon and obsidian hydration dates indicate that the site was multicomponent and was occupied from the late 10th century through to the 14th century (Nelson 1999). Five surface rooms and three pit-structures were tested at the site. The earliest surface structure at the site consisted of a three-walled masonry room. The decorated ceramic assemblage from this portion of the site was composed solely of Mimbres Black-on-white Style III ceramics, indicating that the structure was constructed and in use sometime between A.D. 1010 though A.D. 1130 (Nelson 1999; Shafer and Brewington 1995). Likewise, radiocarbon dates obtained from the lower floor of the room placed the dates of occupation from the late 10th century to the early 11th century (Nelson 1999:76), again indicating a Classic period occupation. No north wall was present during the initial occupation of the room and the architectural space enclosed by the wall sections opened onto an activity area to the north (Nelson 1999). At some point in time this room was remodeled. The west and east walls were extended north and a north wall was constructed to fully enclose the space. At the time this room was remodeled, an additional room was constructed directly to the north. Wall sections of the new and remodeled rooms were similar to those of the less substantial Classic period room and consisted of masonry cobbles set in adobe. A new floor was laid down over the previous occupation in the remodeled room and the floor in the newly constructed room was laid down upon bedrock. The roof in both rooms was supported by a single central roof support post, though at some point the site inhabitants added an additional roof support post in the northwest corner of the newly constructed room. Additional rooms were added to the room block as the site continued to be occupied. Radiocarbon assays obtained from site's living surfaces date from the late 13th century to the early 14th century (Nelson 1999:76). These dates, coupled with ceramic data, indicate a later Post-Classic occupation of the site (Nelson 1999).

Lee Pueblo consists of four room blocks, four isolated masonry rooms, at least five pithouse depressions, and an associated artifact scatter (Nelson 1999). The largest of the room blocks contained upwards of seven rooms of which three were tested. Based on a limited number of absolute dates obtained from charcoal and obsidian, the site appears to have been occupied from the 7th century through the early 15th century. Nelson (1999) notes that the site's architecture was more reminiscent of that present during the Classic period in both room size and wall construction techniques (Nelson 1999:93). Based on the absence of organic architectural materials, severely weathered floors, and the disturbed nature of postholes present within the tested rooms, it is believed that the rooms of Lee Pueblo were disassembled prior to the abandonment of the site. Likewise, the relative dearth of artifacts recovered from the tested rooms suggests that many of the personal belongings of the site's inhabitants were removed before the site was abandoned (Nelson 1999:93-95).

Ronnie Pueblo consists of a small room block, an isolated surface structure, and an associated artifact scatter. The room block likely contained upwards of six rooms of which two were tested (Nelson 1999). The amount of masonry cobbles present at the site was less than that encountered at other sites in the area and suggests that cobbles were not incorporated into the entirety of the architectural fabric, though the mounding at the site points to the presence of "substantial construction" (Nelson 1999:70). Ceramic data coupled with radiocarbon assays indicate that the pueblo could have been occupied from as early as the 9th century through the 13th century. Construction most likely began during the early Classic period and the site was occupied into the early 11th century (Nelson 1999:96). The two rooms tested at the site were contiguous and represent some of the largest tested in the study area averaging more than 20 square meters in interior surface area (Nelson 1999:96). Rooms at Ronnie Pueblo appear to have been constructed by placing coursed adobe upon the local bedrock. Cobble masonry was then set in the adobe courses that were plastered over and made flush with floor level (Nelson 1999). Roofs were constructed by placing secondary posts across wall sections. These posts were then covered by reed/stick matting that was capped by a thick layer of smoothed adobe. Roof support posts were then placed to help stabilize the roof and prevent it from collapsing. Both of the tested rooms had been burned, though one was only partially burned. Based on the absence of organic material and the scarcity of artifacts associated with living surfaces, the partially burned room appears to have been disassembled near the time the site was abandoned. The other completely burned room, however, was not disassembled nor cleared of personal belongings. This room provided the majority of the samples used in dating the site and points to the continued occupation of the site from the Classic period through the Post-Classic period (Nelson 1999).

Phelps Pueblo consists of two room blocks and an associated artifact scatter. The larger room block contained at least six rooms and the smaller room block consisted of two rooms. Based on the amount of masonry rubble associated with the larger room block it is believed that the structure contained full height masonry walls. The smaller room block contained less masonry in its architectural fabric. Ceramic data coupled with absolute dates indicate that the site was occupied from the 11th century through the 13th century (Nelson 1999:78, 97-98).

Three rooms were tested at the site; one in the smaller room block and two in the larger room block. Two of the tested rooms contained evidence of early occupations during the Classic period. The room in the smaller room block began as a tri-walled structure that incorporated upright masonry slabs along the base of the wall segments. The upper portions of the wall alignments were most likely constructed of jacal (Nelson 1999:105). The floor of this early structure was constructed of smoothed adobe that was set upon fill directly above the local bedrock. Based on the presence of three small postholes in this early floor, it is believed that the area enclosed by the three walls was roofed. No west wall was present in the early structure, and while no testing was conducted west of the room, it is likely that the early structure opened up onto an extramural activity area (Nelson 1999). The other room that contained evidence of a Classic period occupation was in the larger room-block. This early structure's walls were constructed in a manner similar to other sites in the area, with masonry cobbles set in adobe. Likewise, the roof appears to have been constructed in a manner similar to other sites in the area. Both of these two rooms were later remodeled. In the smaller room block, the room was remodeled by adding a west wall to the room and adding additional internal features. In the larger room block, the room was remodeled by replastering the floor and by adding additional internal features. All of the tested rooms appeared to have burned and the presence of substantial floor assemblages associated with activity area in the tested rooms suggests that the site was gradually abandoned through time (Nelson 1999).

THE SCHISM

As can be ascertained from the above discussion, the Black Mountain phase exhibits a number of characteristics that appear to represent a rather stark juxtaposition when compared to the preceding periods. Because of the initially stark differences encountered by the Mimbres Foundation in their testing of the Black Mountain phase sites of Walsh and Montoya when compared to those encountered in their testing of Classic period sites, LeBlanc (1980a) postulated that the Black Mountain phase was more closely aligned with the “Casas Grandes cultural system” (LeBlanc 1977:13, 1980a:284). Initially, LeBlanc interpreted these differences as representing the “marked” impact of Casas Grandes on “surrounding areas” (LeBlanc 1977:21; 1989). However, data pertaining to burial practices led LeBlanc to hypothesize that the Black Mountain phase population consisted of “an agglomeration of previously unrelated peoples” with flexed burials representing the “continuation of the Mimbres tradition” and cremations representing influence “from outside the Mimbres area” (LeBlanc 1977:16).

These data, coupled with data pertaining to settlement patterns, suggest that there was a fairly substantial population shift from the Mimbres area to areas around the Deming Plain and further south. Here, Black Mountain phase settlements larger than the 40 to 50 room structures common in the Mimbres area are present. LeBlanc (1977, 1980a) argues that portions of the Mimbres area were abandoned and that some of the resident populations migrated south. At the same time groups from the south migrated north. Both groups established settlements constructed primarily of coursed adobe and cohabitated these settlements simultaneously.

Other lines of evidence seem to corroborate this scenario. The population estimates established by Blake and colleagues (1986) point to a substantial decrease in population during the Black Mountain phase when compared to the Classic period. Based on the data used in their analysis (Figure 5.5), the population of the Mimbres area decreased from roughly 5000 inhabitants during the height of the Classic period to roughly 1100 during the height of the Black Mountain phase (Blake et al. 1986:459-461). Areas alongside drainages appear to have been abandoned as were mesa tops and mountain park areas (Figure 5.6). Portions of these abandoning populations likely “re-concentrated into the main valley…particularly toward the south end of the valley” (Blake et al. 1986:461). It should be noted however that the population estimates established by Blake and colleagues (1986) for the Black Mountain phase in the Mimbres area took only 17 sites into consideration. Further, these estimates do not take into consideration the occupation of portions of the larger Classic period settlements during

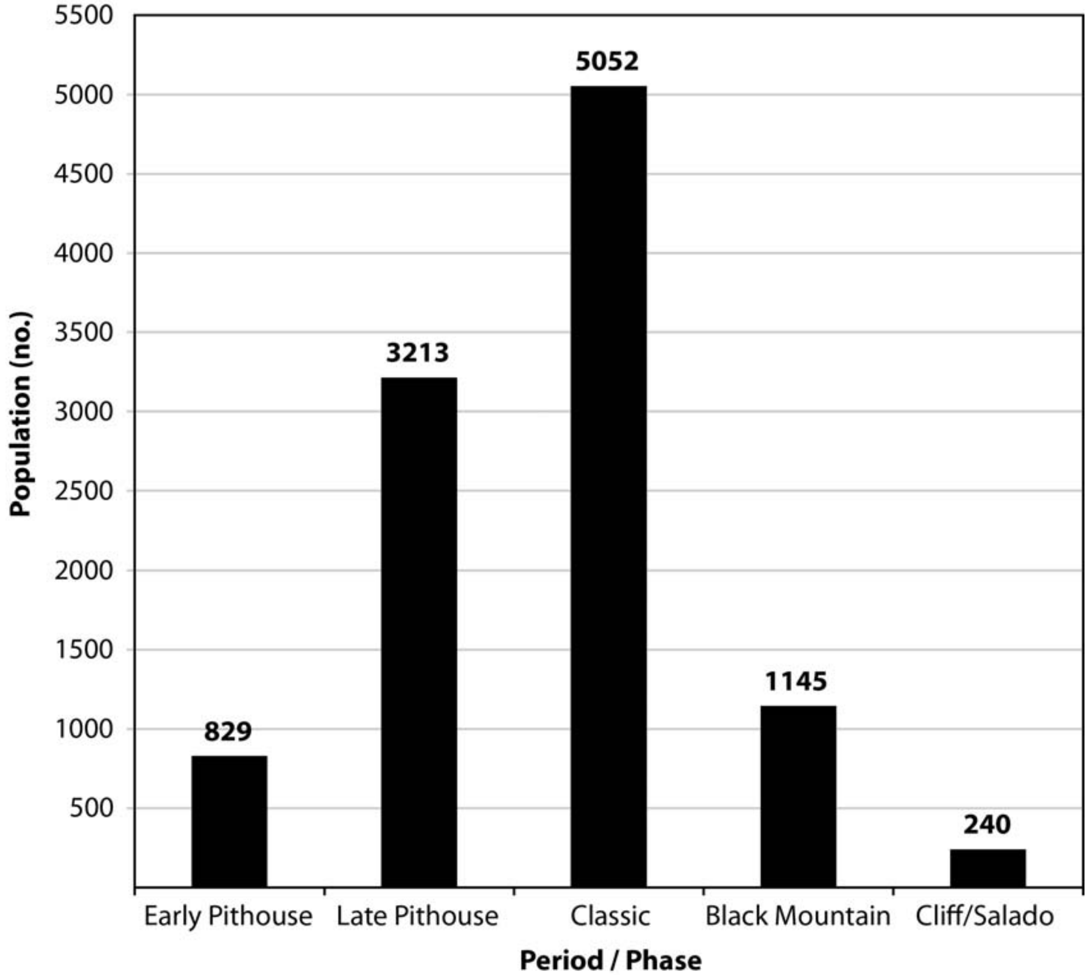

Figure 5.5: Maximum population estimates for each specified time period established by Blake et al. (1986).

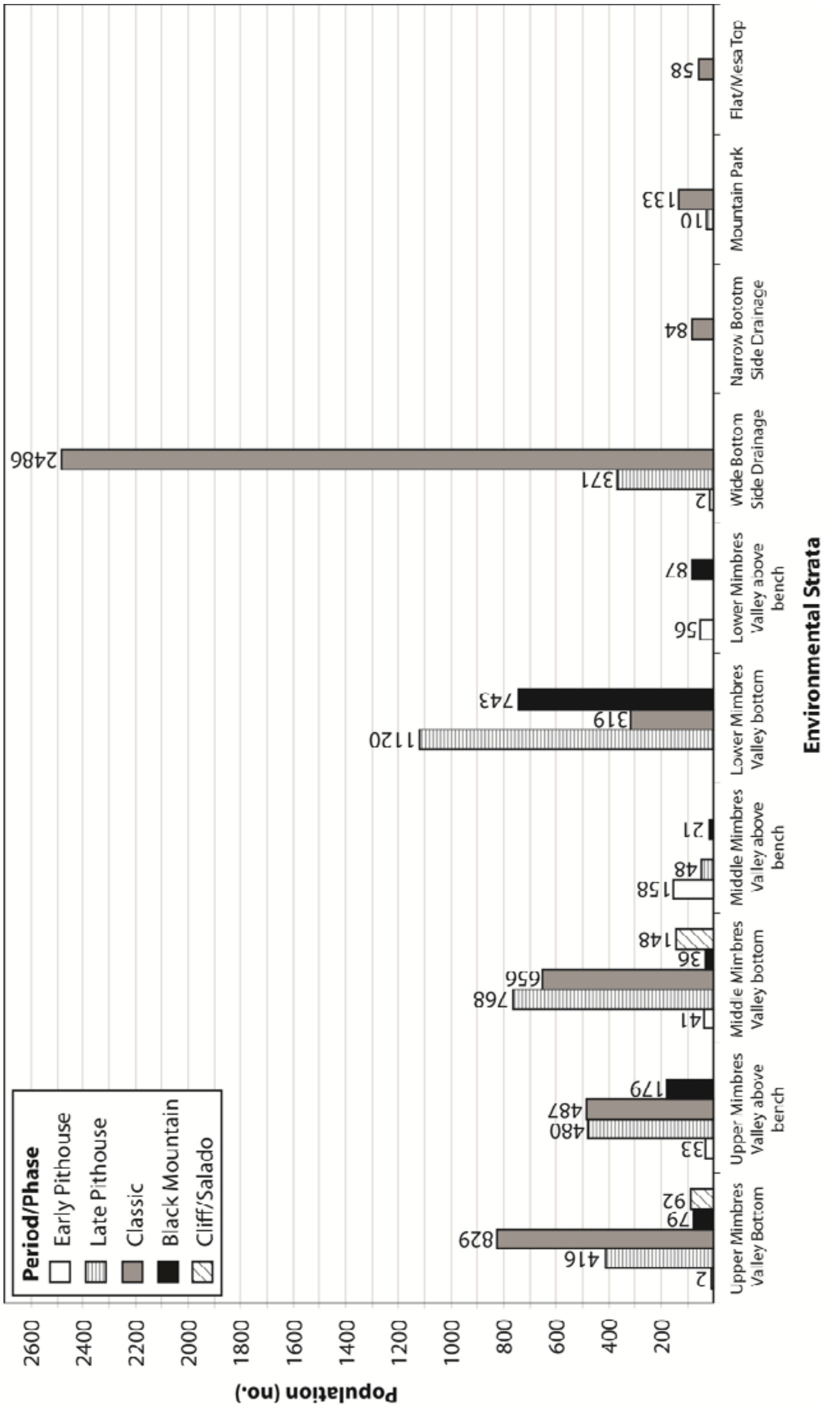

Figure 5.6: Maximum population estimates for each time period by environmental strata.
Data taken from Blake et al. (1986).

the Terminal Classic period or during the Black Mountain phase. Thus, these population estimates likely underrepresent the actual number of people living in the Mimbres area during the time period ranging from A.D. 1130-1180.

While these earlier works explicitly state that only some portions of the Mimbres area were abandoned and that resident populations migrated to the southern portions of the Mimbres area, somehow individual researchers focused on the "abandonment" aspect of LeBlanc's original formulation of the area's depopulation sometime around A.D. 1130-1180. Only a year after LeBlanc and Whalen's (1980) southwestern New Mexico synthesis, Anyon and colleagues (1981) state, "with the end of the Classic Mimbres period, the long Mogollon-Mimbres sequence also terminates. The Classic Mimbres pueblos were virtually abandoned, and there was a substantial depopulation of the region" (Anyon et al. 1981:220). Thus while the Mimbres Foundation's earlier interpretative beginnings mentioned the substantial depopulation of the Mimbres area, it did not explicitly state that the "Mogollon-Mimbres sequence" terminated at the same time. This seemingly innocent additional statement has drastic ramifications for not only how we interpret the Black Mountain phase peoples, but also carries implications for how we interpret the Classic period.

Since the Mimbres Foundation's work in the Mimbres area, there have been two main hypotheses that guide our understanding of the Black Mountain phase. One of these models argues that there is a discontinuity between the Black Mountain phase and the rest of the Mimbres Mogollon cultural tradition (ca. A.D. 200-1150). On the other side of the spectrum are those who see continuity between the inhabitants of the Classic period and inhabitants of Black Mountain phase sites. Proponents of both sides of the spectrum use the same architectural and artifact data to argue their case. These arguments generally use the presence or absence of these characteristics during particular time periods to support their positions. Thus, proponents of continuity hypothesis state that the characteristics used to differentiate the Black Mountain phase from the Classic period were actually present in earlier Mimbres occupations (Creel 1999b; Hegmon et al.

1999). Conversely, proponents of the discontinuity hypothesis believe that the presence of these characteristics marks the end of the Mimbres tradition.

As is the case with any dichotomy, other scenarios that lie in the confines of the Aristotelean Golden Mean also exist. Shafer's (1999a, 1999b, 2006) interpretations of the Classic period abandonment somewhat straddles this elusive middle ground. In his interpretations of the events culminating in our recognition of the Black Mountain phase, Shafer (1999a, 1999b, 2006) believes that the Mimbres area was largely abandoned for a period of approximately 50 years sometime around A.D. 1150. Around A.D. 1200 related groups returned to the area, occupied it for a short period, and then dispersed. While the available chronometric data do not allow us to substantiate this interpretation, other researchers have postulated that Black Mountain and Cliff/Salado phase settlement patterns are more indicative of shorter term occupations characterized by increased mobility much as proposed by Shafer (Nelson and LeBlanc 1986; Nelson and Anyon 1996; Shafer 1999a, 1999b, 2003, 2006).

There are generally two mechanisms that are deemed integral to these discontinuity arguments: the rise of Casas Grandes and environmental conditions. The push mechanisms most proponents of the discontinuity hypothesis favor are decreasingly favorable environmental conditions. Researchers have argued that the changes taking place between the Classic period and the Black Mountain phase also correspond with "diminishing rainfall" and overall unpredictable environmental patterns (Shafer 1999b:104). As Creel (1996, 2006b) and others (Grissino-Mayer et al. 1997) have shown, there was a rather noticeable decrease in annual precipitation during the beginning of the Terminal Classic period (ca. A.D. 1130) (Figures 5.7 and 5.8). In general, average annual precipitation during the entirety of the Terminal Classic period and Black Mountain phase was less than that of the preceding Classic period. While these data seem to indicate a rather substantial decline in precipitation values from the Classic period through the Black Mountain phase, it should be noted that there are no significant

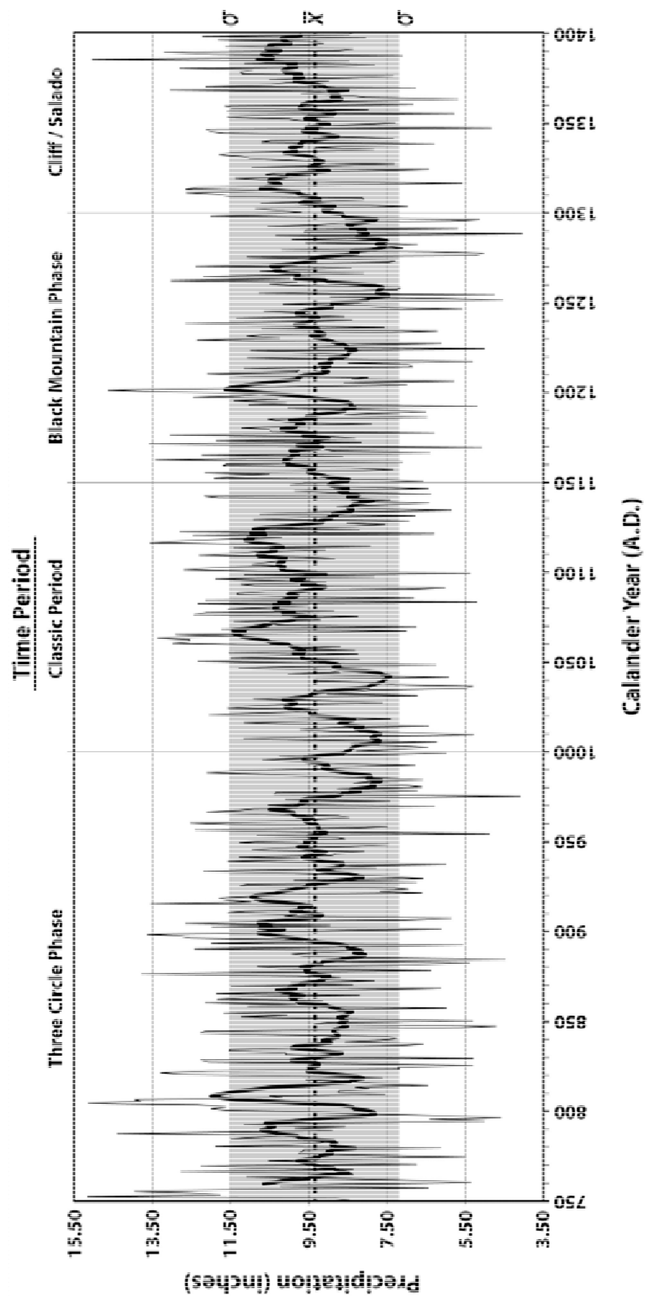

Figure 5.7: Changes in annual precipitation from the Three Circle phase through the Cliff/Salado phase (ca. A.D. 750-1400). Information taken from Grissino-Mayer et al. (1997). The bold black line represents a 10-year moving average. The dashed black line is the 878-year mean for this area of New Mexico (A.D. 622-1500) (mean = 9.34 inches) and the shaded areas represent one standard deviation from this mean value (standard deviation = 2.15 inches).

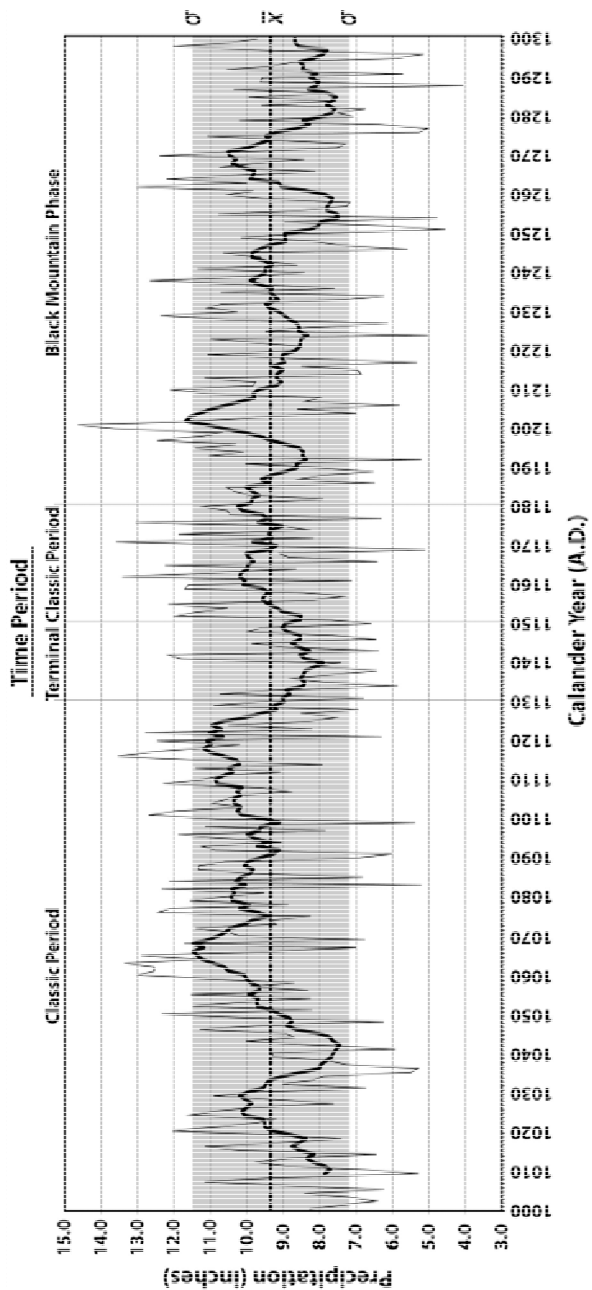

Figure 5.8: Changes in annual precipitation from the Classic period through the Black Mountain phase (ca. A.D. 1000-1300). Information taken from Grissino-Mayer et al. (1997). The bold black line represents a 10-year moving average. The dashed black line is the 878-year mean for this area of New Mexico (A.D. 622-1500) (mean = 9.34 inches) and the shaded areas represent one standard deviation from this mean value (standard deviation = 2.15 inches).

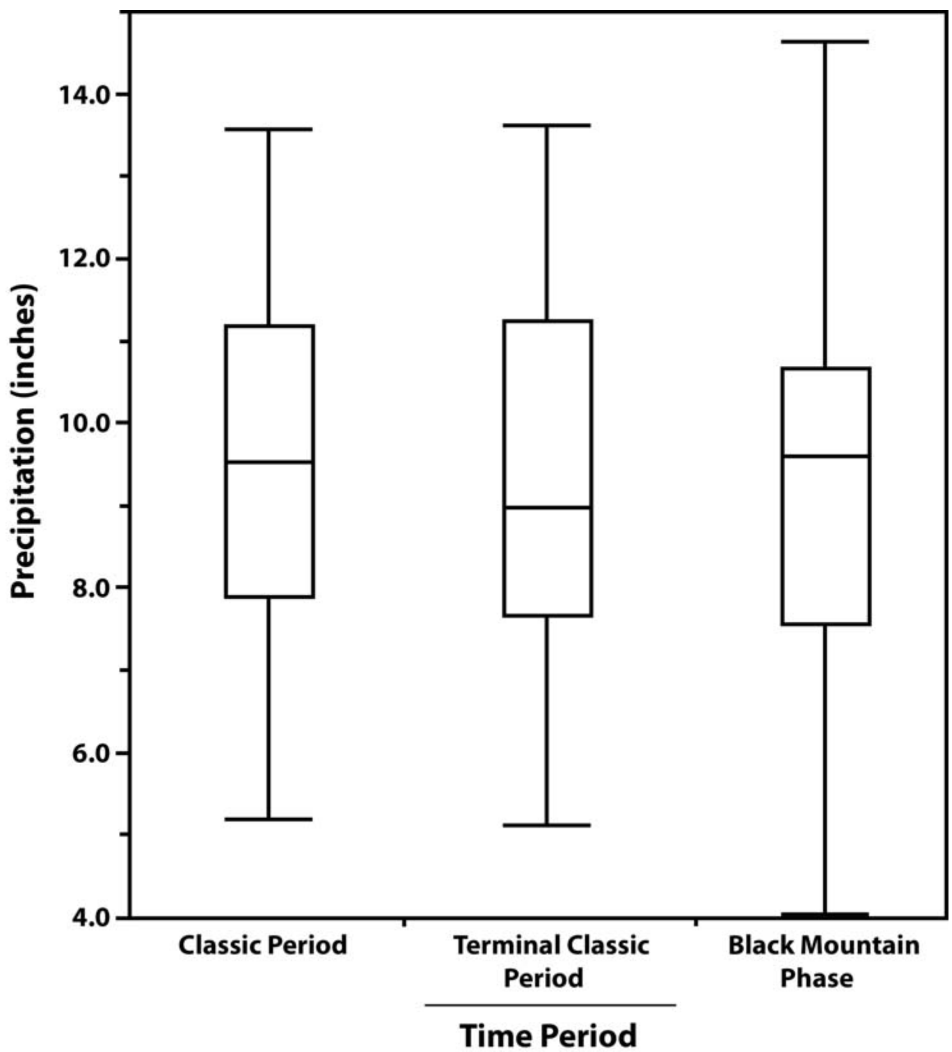

Figure 5.9: Box-plots depicting mean precipitation values and quartile spreads for each of the specified time periods.

differences in the amount of precipitation hypothesized to have fallen during the Classic period, Terminal Classic period, and the Black Mountain phase (Figure 5.9).

However, as researchers have noted (e.g. Creel 1996, 1999b, 2006b; Hegmon et al. 1999) these environmental fluctuations would have affected large areas and when compared to other populations inhabiting the Colorado Plateau and areas surrounding the confluence of the Salt and Gila Rivers, the Mimbres populations fared quite well during the environmental changes of the mid-Twelfth Century. Thus, regardless of where populations abandoning the Mimbres area decided to settle they would have experienced similar or worse situations unless there were additional incentives (pull mechanisms) that compelled them to establish new settlements, or join existing settlements, in other areas.

One of the most oft-cited pull mechanisms for these wandering Black Mountain phase masses is the rise of Casas Grandes in present day northern Chihuahua, Mexico (LeBlanc 1977, 1980a, 1980b, 1989; Shafer 1999a). It is a well-known fact that Casas Grandes was an important site in the prehistoric Southwest. The sheer quantity of exotic materials recovered from the site demonstrates the vast networks of interaction its inhabitants maintained. At the same time, the massive size of the site evidences a level of social organization above that witnessed in surrounding areas during the preceding periods. However, the dating of the site has become somewhat problematical specifically when used to argue that its development influenced the happenings of the Black Mountain phase. Somewhat early on LeBlanc (1980b) and others (e.g. Doyel 1976; Wilcox and Shenk 1977) began to question the chronology emerging from Di Peso's work at Casas Grandes (Di Peso 1974). Of specific interest is Di Peso's dating of the Medio period, the time when Casas Grandes was constructed and reached its apex in physical size and socio-political extent. Di Peso (1974) believed that the Medio period dated from A.D. 1060 through A.D. 1340 (LeBlanc 1980b, Lekson 1984) (Figure 5.1). However, as researchers began to delve into works surfacing from Di Peso's excavation they quickly noticed that Di Peso's dating of the Gila Polychrome ceramics present at his Medio period occupation predated the type's appearance by centuries in the Phoenix Basin. Di Peso (1974) argued that this ceramic type appears earlier in the areas surrounding Casas Grandes, despite evidence to the contrary that suggests a later production date of Gila Polychrome ceramics (ca. A.D. 1300-1400) (Carey 1931 and Kidder 1924 in Whalen and Minnis 2009:42; Crown 1994)

As researchers have shown, the main problems associated with these dates was Di peso's conflation of the dated event with the target event in his analysis of the dates associated with the 78 dated dendrochronology samples recovered during the course of his excavations (Dean and Ravesloot 1993; Lekson 2011; Whalen and Minnis 2009). This was further complicated by the apparent shaping of timbers to uniform dimensions. Apparently, none of the dated tree-ring samples recovered from the site represented actual cutting dates and there were an unknown number of outer rings missing from the dated specimens (Di Peso et al. 1974; Lekson 2011; Whalen and Minnis 2009; Wilcox and Shenk 1977). These problems associated with the dendrochronology samples recovered from Casas Grandes led Dean and Ravesloot (1993) to begin a sophisticated reanalysis of the original samples. Their study utilized a regression analysis established from the heartwood to sapwood ratio of dendrochronological and dendroclimatological samples present in northern New Mexico. The regression equation established from the samples permitted the researcher to estimate the number of outer rings that were missing from a specific beam at Casa Grandes with an estimated range of likely cutting dates. Dean and Ravesloot (1993) and others (e.g. Lekson 2011; Whalen and Minnis 2001, 2009) note that the dates obtained from this analysis thus tend to underestimate the actual cutting date of the specimens capable of being analyzed. Thus, structures present at Casas Grandes are "likely younger than the estimated cutting dates suggest" (Whalen and Minnis 2009:43). Based on their reanalysis of these samples, Dean and Ravesloot (1993) concluded that the Medio period at Casas Grandes dated to around A.D. 1200 through A.D. 1400 and that Salado Polychrome ceramics (i.e. Gila Polychrome) came from contexts dating to the A.D. 1300s through the A.D. 1400s (Dean and Ravesloot in Crown 1994:15).

While the dendrochronology samples were still waiting to be reanalyzed, some researchers shifted their attention to the radiocarbon samples dated as part of Di Peso's work. Both LeBlanc (1980b) and Lekson (1984, 2011) note that there are a few dates that suggest an "average end date of A.D. 1265±68" for Di Peso's Medio period (LeBlanc 1980:801; Lekson 1984:57). However, as Lekson (1984) notes one of these dates is associated with a construction time at Casas Grandes, one came from a roasting pit at the site, and the other two came from a different site (Reyes Site 2/CHIH D:9:14). Together, these data suggest that the target date LeBlanc (1980b) hoped to establish (i.e. the end of the Medio period at Casas Grandes) actually represented different dated events; namely the construction of a Buena Fe phase/Early Medio period room (A.D. 1300±50), the use of another Paquime phase/Medio period site (A.D. 1275±115 and A.D. 1275±40), and the use of a roasting pit at Casas Grandes (A.D. 1310±30) (Lekson 1984:57). The final radiocarbon date that Lekson (1984) interprets came from a remodeled structure that Di Peso believed represented a Tardio phase/Late Medio period habitation (A.D. 1480±90) (Lekson 1984:57-58). Lekson (1984) notes that the date range used by Di Peso (A.D. 1480±90) was an uncorrected date and that the corrected date of the sample is actually A.D. 1290 (1984:57). Thus, the structure actually likely dates to the end of the Buena Fe phase. While LeBlanc used this data to argue that the beginning of the Medio period was later than that established by Di Peso (ca. A.D. 1150), Lekson (1984) used this same data to push the end date of the Medio period established by LeBlanc (ca. A.D. 1300) further back to around A.D. 1400 (LeBlanc 1980: 804; Lekson 1984:59).

Shortly before Dean and Ravesloot were conducting their reanalysis of the tree-ring samples collected by Di Peso from Casas Grandes, Michael Whalen and Paul Minnis began their work on the Casas Grandes Regional Survey Project (Whalen and Minnis 2001, 2009). This project focused on the identification of archaeological sites on roughly 289 square kilometers of land surrounding Casas Grandes (Whalen and Minnis 2001:85-95). As a result of these survey endeavors, roughly 291 archaeological sites were identified (Whalen and Minnis 2001:93). Later, some of these sites were tested to gain insights into socio-political organization at Medio period communities within different levels of the emerging settlement hierarchy (Whalen and Minnis 2009). A total of four sites were chosen for testing, each one further away from the core, Casas Grandes. Being aware of the problems associated with deriving dates from dendrochronology samples in the area, Whalen and Minnis (2009) submitted a total of 84 radiocarbon samples to help establish temporal control for their excavations. The dates further revised the chronology for the region by establishing an A.D. 1200 beginning date for the Medio period and an end date of around A.D. 1450 (Whalen and Minnis 2009:67-70) (Table 5.1). Whalen and Minnis (2009) further argue that the Buena Fe/Paquime/Diablo phase designations established by Di Peso (1974) should no longer be used because they contain no real archaeological correlates (2009:68-69). Instead, they feel that the information present do permit the splitting of the Medio period into “early” and “late” stages. Based on a somewhat limited sample, the researcher believe that the Early Medio period is differentiated from its Late Medio period counterpart by the presence of Ramos Polychrome, Carretas Polychrome, and Escondida Polychrome ceramics at Late Medio period components and the absence of these types at Early Medio period components (Whalen and Minnis 2009:118-125). Based on these data they view the cut-off date for the Early Medio period as somewhere around A.D. 1300 (Whalen and Minnis 2009:118-125) (Figure 5.1).

While these data may appear on the surface to have somewhat put an end to the dating wars that erupted over the chronology of Casas Grandes established by Di Peso and colleagues (1974), Lekson (2011), notes that the revised chronology proposed by Whalen and Minnis (2009) may be suspect due to the statistical manipulations carried out on their samples as well as the contexts from which the samples were taken (2011:4). Lekson (2011) notes that radiocarbon dates obtained from structural timber are notorious for producing dates that overestimate the age of the targeted event. This is especially so if the tree’s outer rings are missing because these rings are the ones that “actively fix atmospheric carbon” (2011:4). If one were to obtain dates from structural timbers missing these outer rings, then the dated event actually becomes when the dated portions of the timbers stored its “fossil” carbon (Lekson 2011:4). Lekson believes that these problems are compounded by the statistical manipulations carried out on the dated specimens. Specifically, Lekson believes that the use of weighted means from pooled samples to produce an estimated span of occupation is problematic because the process of collecting weighted averages for grouped samples actually only increases the reliability of dating an event (Lekson 2011:4-5). For these reasons, Lekson decided to redo the analysis originally conducted by Whalen and Minnis (2009) and use the pooled weighted means to date specific events. His reanalysis of these data "indicate a relatively limited 'early Medio period' in the early 1200s, followed by a much more expansive Medio period development after 1250" and "Paquime itself probably began after 1300" (Lekson 2011:7).

As can be inferred from the above discussion, the dating of Casas Grandes, and in particular the Medio period, can be interpreted and reinterpreted in as many different ways as there are research agendas needing these dates. For the current analysis temporal data were pulled from multiple sources to begin to assess the likely occupational spans of various sites that contain architecture and artifact assemblages originally thought to represent some form of influence from the emerging Casas Grandes polity. Thus dated archaeomagnetic specimens and radiocarbon dates from 12 sites were analyzed. The majority of these were those used by Whalen and Minnis (2009) in their analysis of Medio period settlements surrounding Casas Grandes. Radiocarbon dates obtained from the actual site of Casas Grandes were obtained from the work of Phillips (2008) in his analysis of dating the termination of the site itself. The dates associated with the El Paso phase came from four sites excavated at Fort Bliss: Hot Well Pueblo, Sargent Doyle Pueblo, Madera Quemada Pueblo, and Sacramento Pueblo (Lowrey 2005; Miller and Graves 2009, 2012). A single set of archaeomagnetic dates from the Joyce Well pueblo represents the only set of absolute dates pulled from an Animas phase site (Schaafsma et al. 2002). Finally, two radiocarbon dates were collected from the Black Mountain phase Walsh site (LeBlanc and Whalen 1980) as were six archaeomagnetic dates (LeBlanc and Whalen 1980; Lekson 2011). Likewise, a total of five archaeomagnetic dates were collected from the Black Mountain phase component at the Old Town site (Creel 2006a).

The radiocarbon samples collected from these sites were corrected using the CALIB radiocarbon calibration program developed by Stuiver and Reimer (1993) and were calibrated to the INTCAL09 calibration curve (Reimer et al. 2009). All radiocarbon samples were reanalyzed to produce corrected calibrated dates. If multiple samples were collected from each individual site, these were pooled to create a single average radiocarbon date from the site. The results of this analysis are presented in Figure 5.10, as are the dates associated with individual archaeomagnetic samples taken from specific archaeological sites. While these data are constructed in a manner somewhat similar to that which Lekson (2011) opposed for the Medio period age estimates established for the sites analyzed by Whalen and Minnis (2009), they due show interesting patterns as well as a general agreement with the archaeomagnetic dates which were collected from sites.

Attempts were made to further refine the likely occupational span of sites used in this analysis. Specifically, the minimum and maximum date ranges for archaeomagnetic samples were averaged for individual sites where such samples were taken. These were used in conjunction with the 2-sigma probability of radiocarbon date age estimations. The minimum and maximum values of either the archaeomagnetic date ranges or the 2-sigma radiocarbon date estimations were used to establish likely occupational spans for these 12 sites (Figure 5.11). It should be noted that there are multiple problems associated with this analysis. First and foremost of these is the fact that it conflates multiple dated events (e.g. the time that organic materials stopped absorbing atmospheric carbon, the last time a hearth reached a critical temperature, etc.) into a single target event (i.e. the use life of a particular site). Further compounding this issue is the fact that many of the radiocarbon dates obtained from sites surrounding Casas Grandes (i.e. Sites 317, 242, 231, and 204) came from charcoal specimens that may or may not have been prepared in manner where the outer growth rings were removed from the beam prior to their burning. Similarly, many of the radiocarbon dates obtained from Casas Grandes were collected from construction timbers. As stated by Lekson (2011) problems associated with the set of dates collected from Medio period sites likely tend to

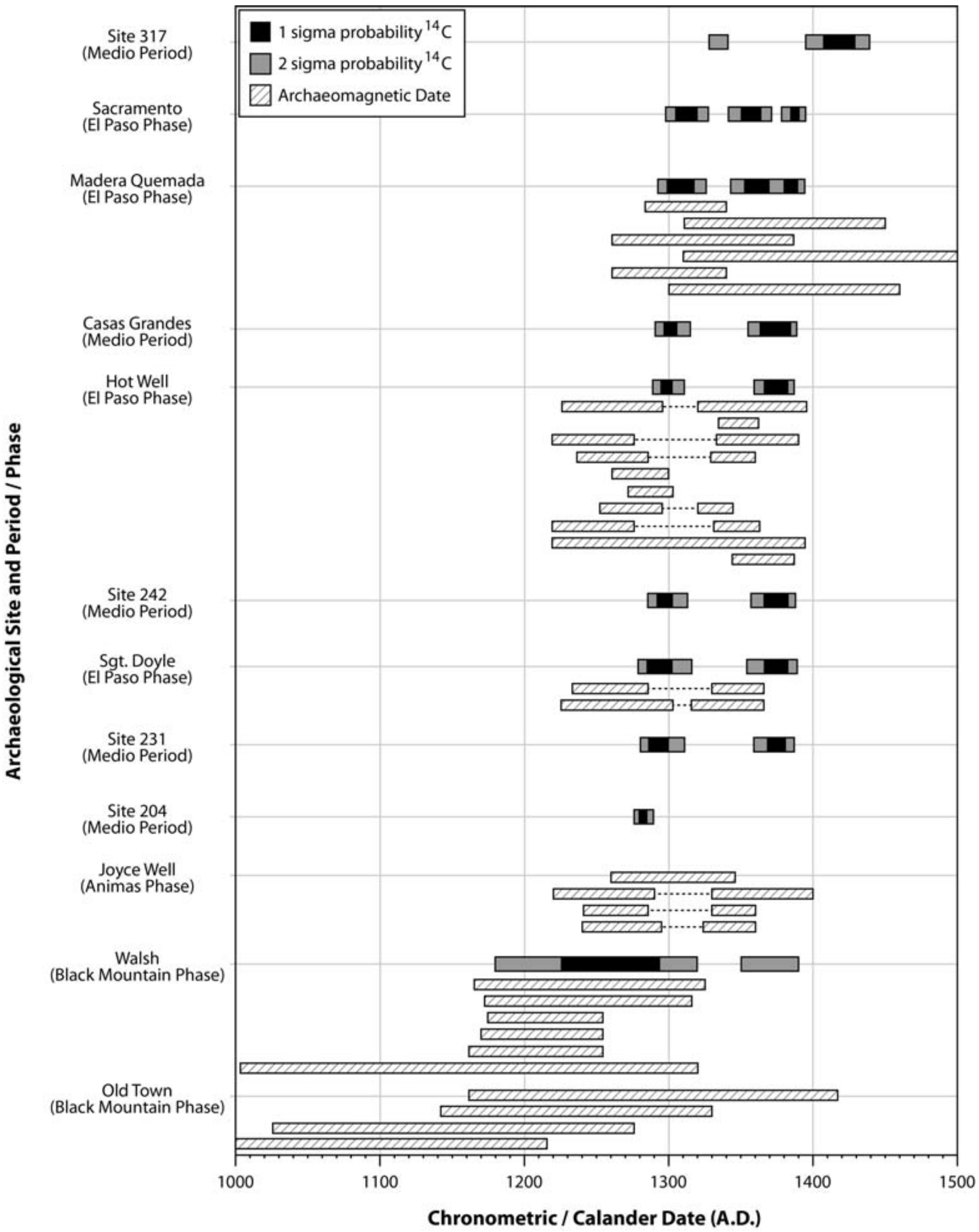

Figure 5.10: Plot of radiocarbon and archaeomagnetic dates associated with specified archaeological sites. The radiocarbon dates from Sites 204, 231, Sgt. Doyle, 242, Hot Well, Casas Grandes, Madera Quemada, Sacramento, and 317 represent pooled averages from multiple samples. Data taken from Creel (2006a), LeBlanc and Whalen (1980), Lekson (2011), Lowrey (2005), Miller and Graves (2009, 2012), Phillips (2008), Schaafsma et al. (2002), and Whalen and Minnis (2009).

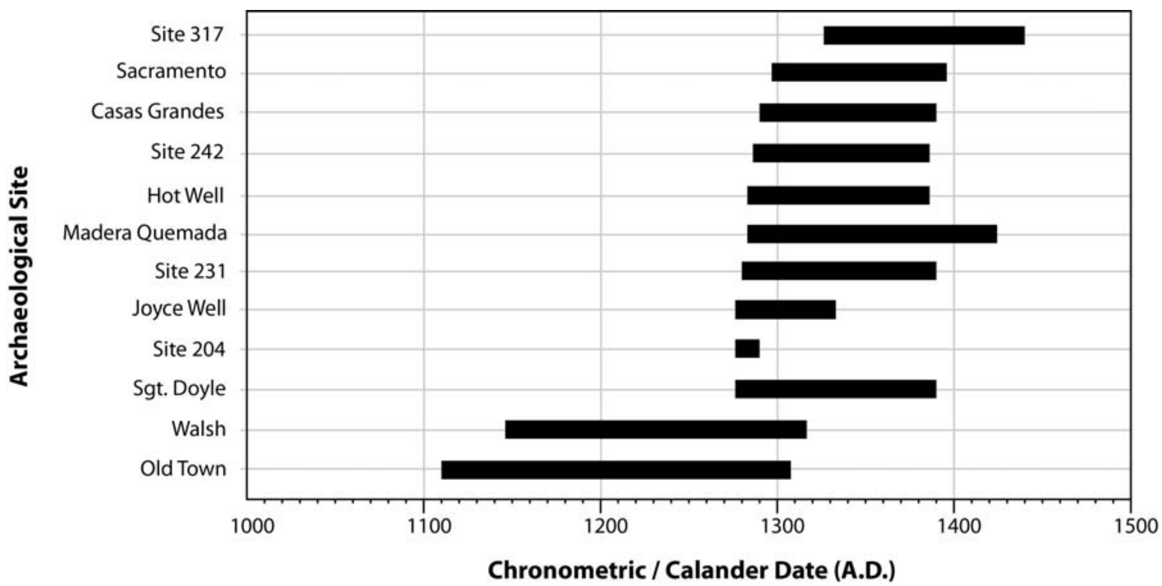

Figure 5.11: Occupational spans of specific archaeological sites discussed above. The date ranges associated with the Old Town site only represent dates obtained from the site's Black Mountain phase component. Occupational spans based on the average of archaeomagnetic date ranges as well as the 2 sigma distribution ranges associated with pooled radiocarbon dates. Data taken from Creel (2006a), LeBlanc and Whalen (1980), Lekson (2011), Lowrey (2005), Miller and Graves (2009, 2012), Phillips (2008), Schaafsma et al. (2002), and Whalen and Minnis (2009).

underestimate the actual date of their target events. However, a number of radiocarbon dates associated with these sites were collected from annual plants or bone collagen from burials (Phillips 2008; Whalen and Minnis 2009).

Where archaeomagnetic dates are present, these tend to represent the age spans used in the analysis. Rarely do either the 1-sigma or 2-sigma radiocarbon age determinations exceed those postulated by the archaeomagnetic samples. As was the case with the radiocarbon dates from Medio period sites, these archaeomagnetic samples likely underestimate the actual date of a structures use because their dated event corresponds to the last use a facility where a maximum temperature was reached. Another unfortunate circumstance surrounding these dates is that the magnetic polar curve established for the Southwest loops back around over itself at multiple time intercepts beginning around A.D. 1200. It is not uncommon for archaeomagnetic samples collected from sites dating to the mid-to-late Twelfth Century to come with multiple date ranges ranging from as early as A.D. 900 to as late as A.D. 1400 depending on the orientation of the magnetic particles pulled from dated features. Thus, while archaeomagnetic dated events represent the last use of a facility where its temperature reached a temperature high enough to realign its magnetic particles, the date error ranges established by the procedure likely overestimate the dated event for sites that post-date A.D. 900 because the magnetic polar curve for the Southwest begins to cross over its original path after A.D. 1200.

While the issues brought out above problematize the results of this analysis, they are not without merit. The fact that for the most part multiple radiocarbon dates are used to establish the average span of dates associated with sites potentially compensates for the possible use of construction timbers at Medio period sites. Likewise, the dates associated with the El Paso phase sites, the Animas phase site, and the Black Mountain phase sites are likely overestimating the initial use of these sites because of the error ranges associated with the Southwest archaeomagnetic curve. The results of these analyses are presented in Figure 5.11. As the figure shows, the occurrences taking place in the Mimbres area during the Black Mountain phase tend to appear before any other occurrence of similar architectural traits in other areas. It is worth noting that the majority of dates used in the analysis of the occupation of the Black Mountain phase settlements at Walsh and Old Town came from archaeomagnetic specimens. Thus the dates are likely associated with the end of these sites' use life. Despite this, they likely precede the occurrences taking place in the in the Jornada del Muerto, Animas area, and the Mexican state of Chihuahua by a few decades at least. Meanwhile, the occurrences taking place in these areas outside of the Mimbres area are likely contemporaneous with one another.

Chapter 6: The Old Town Ruin

Old Town is a large multi-component site located in the semi-desert grassland biotic province along the southern portions of the Mimbres River. Largely for convenience in recording, the site was somewhat arbitrarily divided into areas (Creel 2006a). Area A contains a large Classic period pueblo underlain by an extensive Late Pithouse period component; Area B of the site contains a Late Pithouse period component that appears to be continuous with that in Area A. Area C contains a large Black Mountain phase pueblo underlain by an extensive Late Pithouse period component and is situated on a relatively narrow ridge. Area D represents a midden area at the base of the cliff directly west of Area A.

The intent of the current chapter is to present an overview of the architectural remains within Area C which contains the Black Mountain phase component. Briefly, the Black Mountain phase pueblo at Old Town represents at least two separate construction episodes that overlay a substantial Late Pithouse period occupation. Preservation of Black Mountain phase architecture varies across the site. Some Black Mountain phase rooms along the periphery of the ridge have experienced so much erosion over the centuries that all that remains are small patches of floor adobe and wall footings. What I believe to be the later occupation is better preserved due in part to its later age and the fact that the architecture of this later occupation incorporated a substantial amount of cobble masonry into its architectural fabric.

This later occupation was targeted for excavation in 2006 and 2007. Because I was interested in household and technological organization and how these potentially changed from the Classic period through the Black Mountain phase, we chose this area due to the potential for greater depth of deposits and better preservation. We excavated two room suites, each believed to represent a "single household or family dwelling unit" (Shafer 1982:17).

Archaeological investigation at Old Town began in the early 20th century when various institutions sent archaeologist into the area to collect pottery specimens for their collections (Duff 1902, Fewkes 1914, Nelson 1920). While the Mimbres Foundation revisited the site in the 1970's, it wasn't until 1989 that professional archaeologists undertook substantial systematic excavation. In that year, archaeologists working with the Texas A&M University field school at NAN Ranch tested portions of the Classic period component. The following years saw extensive excavations undertaken by the University of Texas at Austin (Creel 1991, 1993, 1995, 1997, 1998, 1999a, 2006a; Taliaferro 2006; Taliaferro and Creel 2007). A total of 17 domestic pit structures were fully or partially excavated as were three large communal pitstructures, two kivas, and 15 surface structures (Creel 1991, 1993, 1995, 1997, 1998, 1999a, 2006; Taliaferro 2006; Taliaferro and Creel 2007) (Figure 6.1). Of interest here are the 10 surface rooms that were fully or partially excavated (Creel 1993, 1995, 2006; Taliaferro 2006; Taliaferro and Creel 2007).

Of the 10 rooms only 5 were completely excavated: Rooms C1, C2, C23, C27, and C28 (Figure 6.2). The five remaining rooms (Rooms C3, C8, C10, C11, and C34) were only partially excavated mainly due the poor preservation of deposits associated with the Black Mountain phase component. These excavated rooms represent only a small proportion of the 100 or more rooms within the Black Mountain phase component at the site. The presence of unique wall alignments in the southern portions of the site's Black Mountain phase component when compared to the architectural remains in the central portions of the Black Mountain phase occupation would seem to suggest that there are at least two room blocks present (Figure 6.2).

However, earlier Black Mountain phase rooms (Room C35) with wall alignment orientations matching the wall alignments in the southern portions of the Black Mountain phase component were found beneath one room in this central portion (Room suite C27/C34). While we know that this central room block and the potential rooms that underlie it are not contemporaneous, we do not know how these rooms articulated with rooms in the southern portions of Area C.

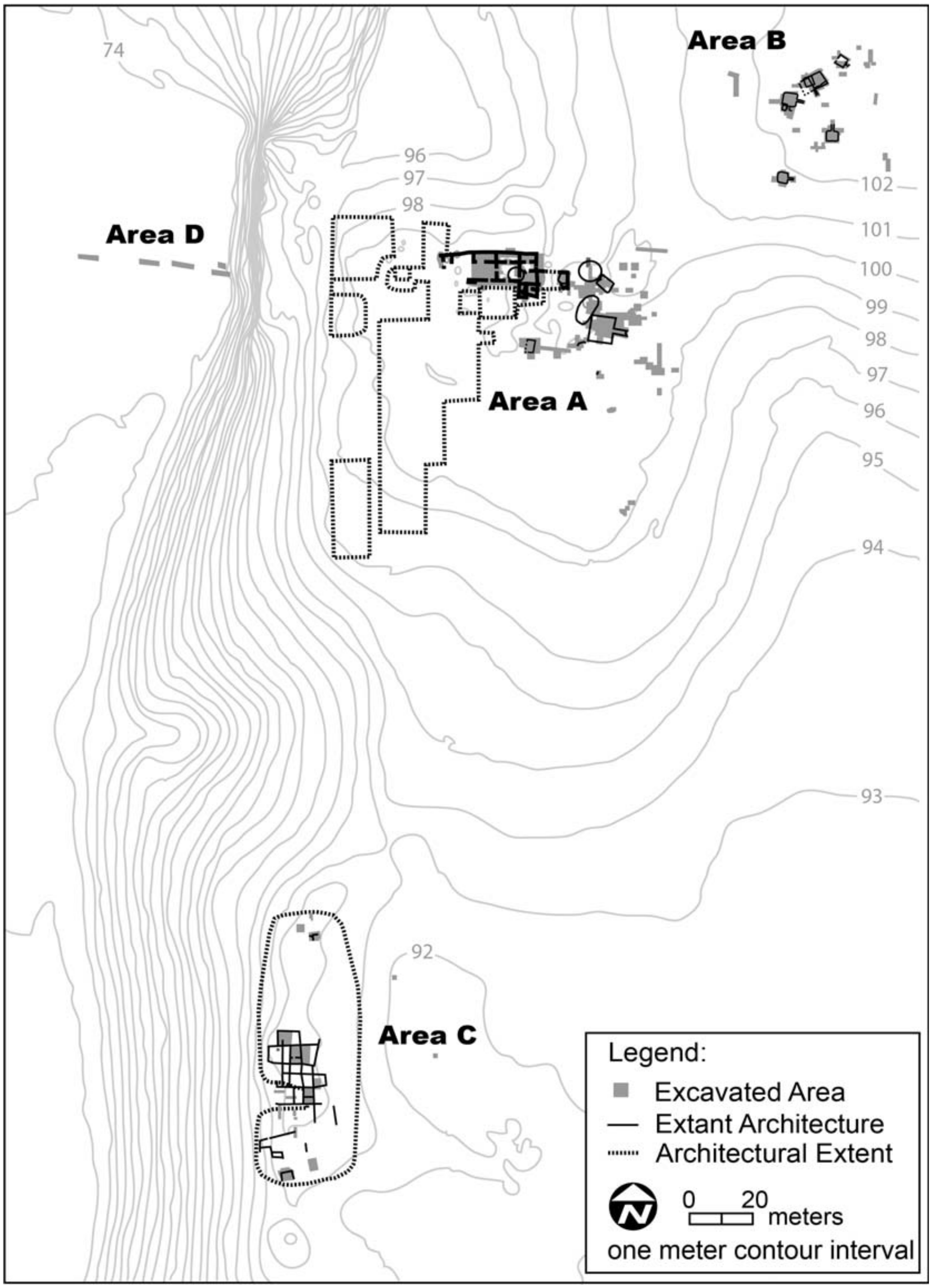

Figure 6.1: Old Town site plan.

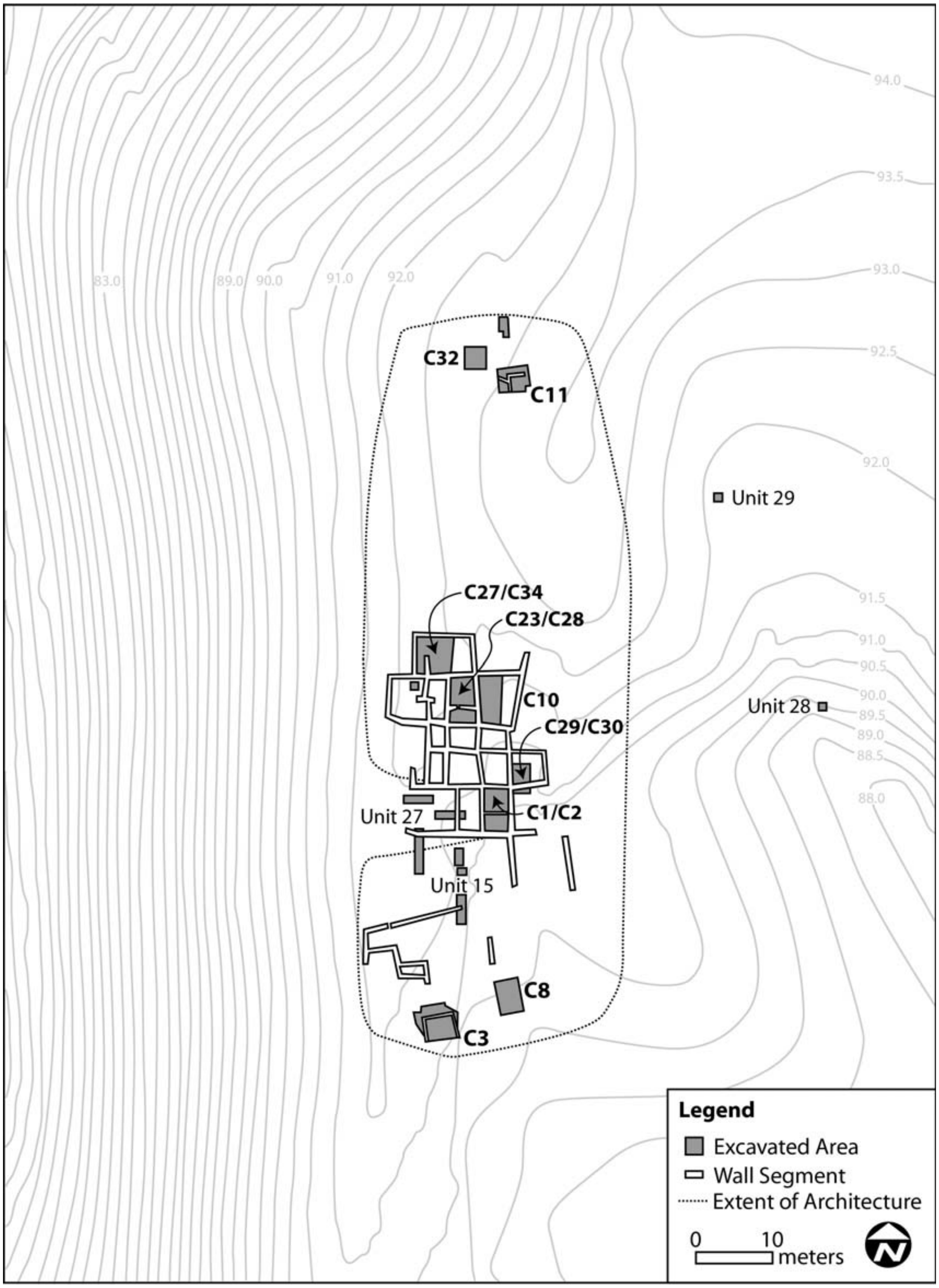

Figure 6.2 Plan of Area C at Old Town.

TESTING SEASONS

In 1993, a total of five units were excavated in the Black Mountain phase component of Old Town (Figure 6.2). These excavation units (Units 14, 15, 16, 17, and 18 Unit) were excavated primarily to expose rooms identifiable as surface expressions and to test for intact subsurface deposits in areas within and away from the visible architectural portions of Area C. In most cases, units were placed so that advantage could be taken of looter pits which, when cleared, tended to provide a quick indication of architecture presence/absence. Unit 14 was excavated to expose the Black Mountain phase rooms C1 and C2 which were visible as surface expressions (all rooms and other features in Area C were assigned a C prefix). This unit also verified the presence of Early and Late Pithouse components at Area C. Unit 16 was also opened to test remains visible on the surface. This unit exposed an almost completely destroyed Black Mountain phase Room (C3) with a Georgetown Phase pitstructure (Room C4) underneath. Limited investigations at Unit 17 also revealed the presence of another Black Mountain phase room (C8); though only wall trenching was conducted, floor remnants were detected at roughly 15 cm below modern ground surface (Creel 1993).

Area C was again targeted for excavation in 1994. At this time five more units were excavated in Area C. Again, these units (Units 24, 26, 27, 28, 29) were excavated primarily to expose rooms identifiable as surface expressions and to test for intact subsurface deposits in areas within and away from the visible architectural remnants. Unit 24 was excavated to investigate the Black Mountain phase rooms C10 and C23 that were visible on the surface. Though no formal floor surface was found in Room C10, features found beneath a layer of compact soil were indicative of Pithouse period components. Unit 26 was excavated to investigate possible wall remnants visible as surface expressions. Room C11, a Black Mountain phase room, was encountered during the course of this unit's investigation.

In 2006, numerous features were tested and some were targeted for additional excavation in 2007. These features (C28, C27, and C34) were those that contained the most direct evidence of architecture during the 2006 testing season. These features, as well as Feature C30 are discussed in more detail below. Other features were tested during the 2006 season but are not discussed further due to the fact that they either represented deposits associated with earlier Pithouse period deposits or were not intensively investigated enough to produce artifact densities suitable for comparative analyses. The reader is directed to Taliaferro (2006) for a description of these excavation units.

During the summer of 2007, the primary focus of the excavations was Black Mountain phase architecture and at least four rooms were partially or fully excavated, and two pitstructures of unknown age were tested. Another one or two pitfeatures, possibly pithouses, were encountered during the excavations but were not investigated beyond initial identification.

UNIT 14: ROOMS C1/C2

Architectural and Stratigraphic Summary

Rooms C1 and C2 were contiguous and were excavated due to their clear surface expression. Creel (2006a:218) notes that the floors of these rooms had been partially excavated into local bedrock to create a flat living surface. Deposits were relatively shallow and did not exceed 30 cm in depth. Room C1 measures roughly 3.1 meters by 3.3 meters, with a floor area of 10.2 square meters, while Room C2 measures 3.8 meter by 3.5 and has a floor area of 13.5 square meters. Room C1 and C2 are contiguous but do not appear to have been connected by a doorway (Creel 2006a:221, 223). Based on the wall bonding and abutments pattern, Room C2 appears to have been constructed after Room C1 was built (Creel 2006a:219). Both rooms were completely excavated, as were two test units to the east and west.

These test units measured one meter by two meters and were placed along the outer edges of the room C1 and room C2 wall abutments to further explore the bond-abutment pattern as well as determine if additional rooms were present in these areas. The test unit along the west wall of rooms C1 and C2 revealed “no recognized architectural remains but did find bedrock at a much shallower depth than the rooms

(C1/C2)" (Creel 2006:55). Creel (2006a) believed that area west of Rooms C1 and C2 contained no structures and represents a plaza area though test excavations in Unit 27 (see below) revealed the presence of a possible north/south wall alignment a few meters west of the 1993 Unit 14 excavations. The test unit placed along the Room C1/C2 east wall revealed the presence of feature C9, a Pithouse period structure. This feature was not excavated primarily to preserve it. Thus the exact depth of the feature is unknown though Creel (2006a) notes that the structure's "western edge clearly lies directly underneath the east walls of surface Rooms of C1 and C2" (2006a:55). Additional features were found beneath the floors of Rooms C1 and C2 that likely date to the Late Pithouse period as well (Creel 2006a:55).

Wall Construction and Preservation

The walls of Rooms C1 and C2 were constructed of coursed adobe set in footing trenches that measured roughly 10 centimeters in width and 10 centimeters in depth (Creel 2006a:221). Directly above these footing trenches "small tuff slabs" were set in adobe (Creel 2006a:221). Creel notes that these small tuff slabs were positioned horizontally in Room C1 while in Room C2 they were positioned vertically (Creel 2006a:221). Based on evidence present in excavated wall-fall, there were many cobbles that were incorporated into the architectural fabric of the walls of Rooms C1 and C2. As reconstructed from wall fall, these cobbles extended to a height of at least 1.2 meters along the walls of Rooms C1 and C2 (Creel 2006a:221).

The wall sections present in Rooms C1 and C2 were in various states of preservation. The northern wall of C1 was nearly completely destroyed by looting activities though portions of this wall were still intact along its eastern edge. The east, south, and west walls of Room C1 were better preserved though no section was complete. Where intact wall sections were missing along the walls of Room C1 footing trenches were normally still preserved. The walls of Room C2 were similarly differentially preserved.

Floor and Floor Features

The floors of Rooms C1 and C2 consisted of an adobe layer placed directly over bedrock. Two distinctive floors were encountered in Room C2 (Creel 2006a: 223), one directly on top of the other. Because of the amount of looting present in Room C1, as well as the high degree of bioturbation present in the room's fill, it is uncertain as to whether Room C1 had more than one floor or if the original floor experienced "substantial patching" (Creel 2006a 221).

There were several floor features within Rooms C1 and C2, the majority within the confines of Room C2. Here 26 features were either associated with the upper most floor or were found to have been excavated into bedrock along the looted portions of the room along its western wall. The majority of the 26 features in Room C2 represent postholes (n = 18), most of them along the western wall and likely reflecting the presence of room furniture (e.g. bench, bed, rack, etc.). Postholes also point to a two-post roof support pattern. A single hearth was located in Room 2; it was "well fired" and circular (Creel 2006a: 223). One disturbed child burial was encountered within the confines of Room C2. The remaining features present in Room C2 consisted of pits that were excavated into bedrock.

A total of 12 features were encountered in Room C1. No hearth was identified, but it is believed one had been present but was removed by looting activities. The majority of the features encountered in Room C1 were postholes (n = 7). No clear patterns could be discerned in the placement of these features. The single burial consisted of an infant who was interred with a killed plain smudged bowl (Creel 2006a: 221). The remaining features present in Room C1 were pit features excavated into bedrock.

Dating

As stated above, based on wall bond-abutment patterns, Room C2 was constructed sometime after Room C1. No absolute dates were retrieved from Room C1. However, archaeomagnetic samples recovered from the hearth present in C2 "yielded two intercepts, A.D. 1005-1035 and A.D. 1145-1330, the later apparently including the actual date" (Creel 2006a: 224). Thus, all we can say is these structures were constructed during the Black Mountain phase and that the construction of Room C1 predated the construction of Room C2.

UNIT 16: ROOMS C3

Architectural and Stratigraphic Summary

As with Unit 14, Unit 16 was initially excavated due to the presence of structural remains visible on the surface. These remains appeared to have also been looted and excavations commenced to determine the exact extent of this disturbance. Despite the heavy amount of looting that had taken place in this portion of Area C, a number of features were identified during the course of excavations that took place in Unit 16. Two of these features represented the remains of prehistoric structures: Rooms C3 and C4. Room C4 represents the remains of a Georgetown phase pitstructure while Room C3 likely represents the severely disturbed remnants of a Black Mountain phase surface room. Creel (2006a) notes that disturbance in the upper portions of the unit was so severe that only small remnants of wall sections and a tiny piece of floor were all that remain of Room C3 (2006a: 56, 225).

Wall Construction and Preservation

Only small fragments of the north wall of Room C3 were preserved. Despite this, there is enough information to tentatively assert that the construction of Room C3 mirrored the construction of Rooms C1 and C2. The remaining wall section of Room C3 indicates that a footing trench was excavated to bedrock, slabs were placed within the trench, and then the trench was filled with adobe. Based on the amount of cobbles found in disturbed fill as well as in the spoil piles left by looters, Creel (2006a) believes that the walls likely contained a substantial number of cobbles (2006a: 225).

Floor and Floor Features

Only a small portion of floor was present along the western wall of Room C3. This section of floor measured roughly 50 centimeters by 100 centimeters in maximum length and width and varied from one to five centimeters in thickness (Creel 2006a: 225). The adobe comprising the floor was laid directly on top of bedrock and varied in thickness to compensate for the depth of bedrock to create a flat living surface. A single feature associated with Room C3 was encountered. This feature represented the disturbed remnants of a hearth and based on its placement in relation to the preserved wall sections, indicate that the structure likely measured roughly three meters by three meters.

Dating

Despite the fact that the remnants of the hearth present in Room C3 were severely disturbed, archaeomagnetic specimens were collected. The dates associated with these specimens range from A.D. 1025-1275 (Creel 2006a: 225). Creel states that "this date range is too broad to be of much use" though it likely indicates that Room C3 dates to the Black Mountain phase.

UNIT 17: ROOM C8

Architectural and Stratigraphic Summary

Like Units 14 and 16, Unit 17 was excavated to determine the extent of looting in surface architecture remnants. Limited excavation took place in this unit, and the majority of the work centered on removing fill from the looted portions of the unit as well as trenching the south wall of Room C8. This trenching revealed that Black Mountain phase cultural deposits extended to a depth of about 15 centimeters below ground surface (Creel 2006a:57). Despite the limited amount of testing, the architecture visible from the surface indicated that, like the other room tested in 1993 describe above, Room C8 incorporated vertically set slabs within its wall footing trenches. Unlike Rooms C1, C2, and C3 however, Room C8 appears to have been constructed on fill above bedrock. This fill is likely more than 30 centimeters thick; and Creel believed that portions of Room C8 were constructed over a Pithouse Period feature (2006a:226). No other cultural features were encountered during the very limited testing in Unit 17.

Wall Construction and Preservation

Despite the limited amount of testing, the architecture visible from the surface indicated that, like the other room tested in 1993, Room C8 incorporated vertically set slabs within its wall footing trenches. While only the south wall was trenched, removal of loose fill from the surface also revealed the east, west, and north wall associated with Room C8. These wall sections were in various states of preservation with the north wall being the best preserved.

Floor and Floor Features

Because only the south wall of C8 was trenched, only a small portion of the floor was exposed, and all that can be said of the floor of Room C8 is that there is one present and it is constructed of adobe with a maximum thickness of five centimeters.

Dating

No absolute dates were recovered from the excavations that were conducted in Unit 17. Despite this, the structure bears similarities to the other structures excavated in Area C during the 1993 field season and thus was probably constructed during the Black Mountain phase.

UNIT 18/25: ROOM C10

Architectural and Stratigraphic Summary

During the 1993 field season, archaeologists noted the presence of a long east/west trending wall alignment north of Unit 14 (Creel 1995:15). At that time numerous rooms could be recognized based on the presence of large upright masonry slabs enclosing rectangular spaces. Based on the previous season's excavations, it was known that these upright slabs likely represented footing stones along the lower courses of wall sections. Unit 18/25 was originally excavated "to investigate the relationship between wall segments exposed east of the rubble mound and the Black Mountain phase architecture represented by the much disturbed rubble mound" (Creel 2006a:58). Both the rubble mound and the areas east of it were along this long east/west trending wall segment. In areas east of the rubble mound, a large room was recognizable based on the presence of upright slabs visible from the surface. The areas within the rubble mound are where the room suites C27/C34 and C23/C28 were later excavated (see below). The large room identifiable from the surface east of the rubble mound was given the designation Room C10. Based on the arrangement of upright slabs, it was known that Room C10 was irregularly shaped and measured 7 meters by 5.8 meters in maximum length and width and covered an area of roughly 35 square meters (Creel 2006a:227). Deposits in the excavated portions of the unit were relatively shallow and rarely exceeded 10 centimeters below ground surface. The majority of the material excavated in the unit represented undifferentiated fill, though directly above bedrock was a compact horizon.

Wall Construction and Preservation

The walls present in Room C10 were very similar in many regards to those encountered in Area C during the 1993 field season. Coursed adobe walls were constructed upon footing trenches that incorporated vertical upright slabs. However, these slabs were noticeably smaller than the vertical footing slabs present in Rooms C1 and C2 (Creel 2006a:227). While no intact sections of wall-fall were encountered during the course of the Room C10 excavations, the numerous cobbles present in the room fill suggests that the once standing walls likely incorporated cobble-masonry into its architectural fabric. All of the walls associated with Room C10 were severely eroded and only the lower wall bases remained intact. As stated above, the north wall was first recognized as a long continuous alignment that began in the northeast corner of Room C10 and continued west through the "rubble mound" and terminated at the rubble mound's western edge 19 meter away. This long northern east/west trending wall paralleled one to the south. This southern east/west trending composed the south wall of Room C10. The north/south walls running between these long wall sections appear to have abutted the long wall segments. As Creel (2006a:58) notes, this suggests that the long north and south walls of Room C10 were constructed at the same time with the dividing walls separating interior spaces/rooms between the long wall alignments being constructed afterward.

Floor and Floor Features

No floor was recognized during the course of excavating Room C10. As stated above, a compact horizon was encountered, and this horizon was found resting directly over local bedrock. This is thought to represent a layer beneath the floor of Room C10. There were several features beneath this compact horizon, though only a few postholes and possibly one sealed storage pit are believed to be associated with Room C10 (Creel 2006a:227). The features encountered beneath Room C10 are thought to date to the Late Pithouse period (Creel 2006a:58).

Dating

Again, because of the poor state of preservation of deposits associated with Room C10 as well as the fact that these deposits were heavily eroded, no absolute dates were obtained from the excavated portions of the room. However, based on the architectural similarities between Room C10 and the other excavated surface rooms in Area C as well as the ceramics encountered during excavation, it is believed that the room was constructed during the Black Mountain phase (Creel 2006a: 58).

UNIT 26: ROOM C11

Architectural and Stratigraphic Summary

Unit 26 was initially excavated to verify potential wall sections visible on the surface. During the excavations, portions of wall as well as portions of floor were encountered and these were given the designation Room C11. Like Unit 18/25, the deposits associated with Unit 26 were shallow and highly eroded, and only two wall alignments were encountered. These wall segments represented the north and west walls of Room C11. Beneath the scant remains of floor associated with this surface structure numerous features were identified. The majority of these represented pit features though one was found to represent either an Early Pithouse period or Late Pithouse period Georgetown phase structure (Creel 2006a:66, 127-128).

Wall Construction and Preservation

As stated above, only two wall alignments were encountered in Unit 26. These represent the north and west walls of Room C11. Neither the east nor south walls of Room C11 were encountered. Based on the data available, it appears that the construction of Room C11 mirrors the construction of Room C10 described above (Creel 2006a:66, 229).

Floor and Floor Features

A small section of floor was encountered along the western wall of Room C11. Because the room was heavily eroded, no floor features were found in the portions of the room that were excavated. This section of floor measured roughly one meter by two meters in maximum length and width. The thickness of the floor is unknown and nor floor features were found to have originated from the intact section of preserved floor.

Dating

Again, because of the poor state of preservation of deposits associated with Room C11 as well as the fact that these deposits were heavily eroded, no absolute dates were obtained from the excavated portions of the room. However, based on the architectural similarities between Room C11 and the other excavated surface rooms in Area C as well as the ceramics encountered during the course of the room's excavation, it is believed that the room was constructed during the Black Mountain phase.

UNIT 18: ROOM C27/34

Architectural and Stratigraphic Summary

During the summer of 2006, we tested areas then thought to be separate pueblo rooms, one designated Room C27. It was originally thought that the area comprising Room C34 was actually a series of smaller rooms that incorporated crushed bedrock into their footings and that these footings were distinctly different from the architectural remains present within the other portions of Area C. This area was chosen for further excavation in 2007 because of these differences in architecture and because it was thought that these differences would reveal important information on the construction sequence of the pueblo.

Once excavation began, it became apparent that the crushed bedrock distributed across the rooms in this portion of the site were the result of looting activities, and the area once thought to be multiple rooms was in fact a single, larger room with a walled-off corner herein designated room C27/34 (Figure 6.3). It consists of the large main room area with the southwest corner partially separated by a wall. The western two-thirds of C27/34 was excavated below floor, but the eastern third of the room was left unexcavated (as per directions from BLM) in part to avoid disturbance of a pothunter backdirt pile containing human bone apparently from a burial in the northeast corner.

In general, we found that some, but not all, of the walls fell into the room, directly onto what was probably roof adobe. The north wall apparently fell to the north outside the room, and the east wall presumable fell at least partly inside the room based on depth of fill comparable to that where the south wall fell. Fallen roof adobe lay directly upon the adobe floor, but was not always readily distinguished from it due to lack of burning and the deteriorated condition of the floor in the central portion of the room. There were no burned roof timbers or roof support posts, and there was essentially no burned thatching. Lying on the roof adobe and overlapping fallen wall segments was a distinctive dark deposit that is believed to represent weathered adobe that washed into the low areas created by wall remnants. Above either fallen wall segments or the dark deposits was a thin layer of loose soil that was in some places covered by pothunter backdirt piles, and several creosote and mesquite bushes grew in and adjacent to the room.

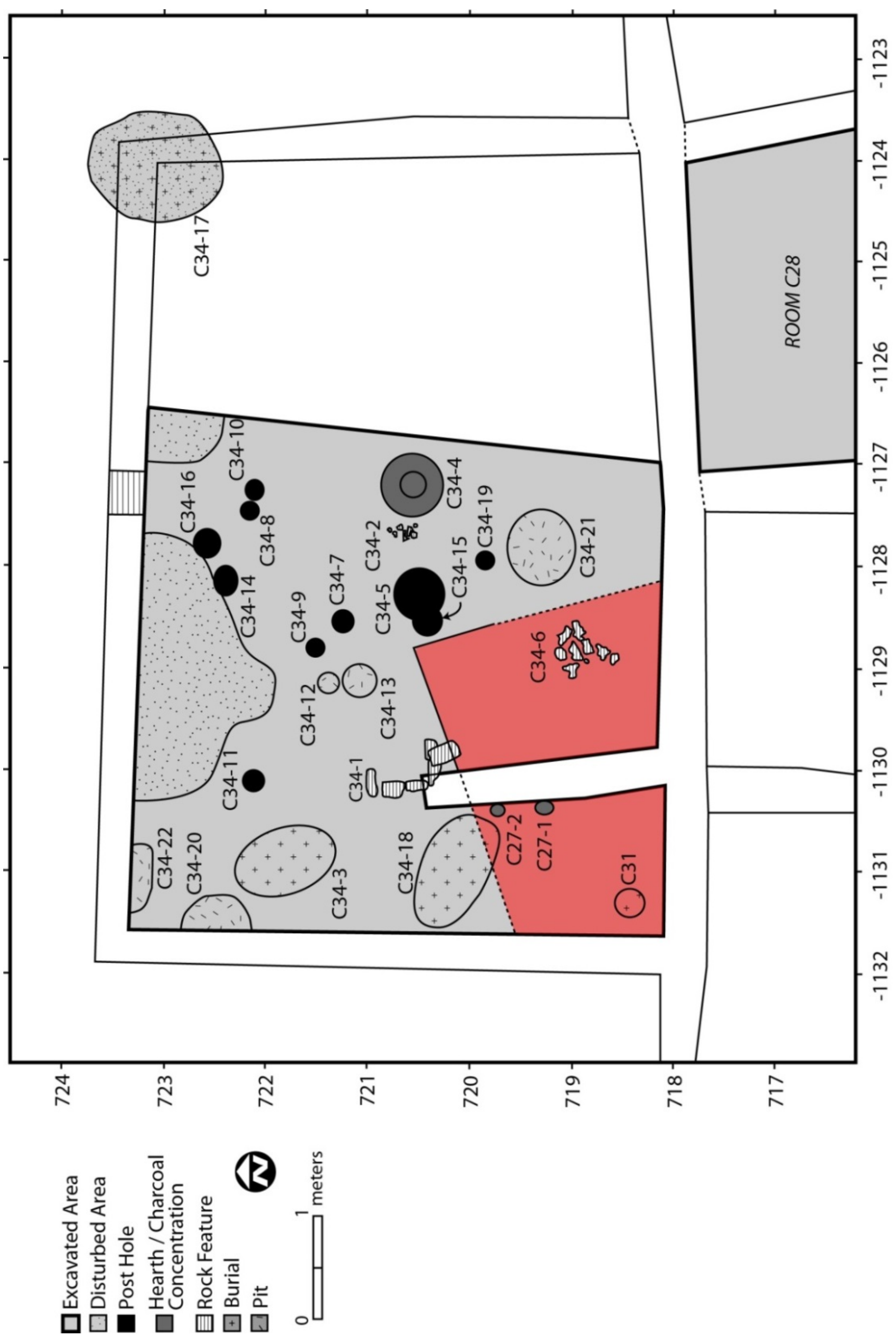

Figure 6.3: Plan view of the excavated portions of Room C34 and C27. Feature C35, an earlier Black Mountain phase room, is highlighted in red.

Table 6.1: List of features associated with Rooms C27/34.

Feature No.	Description	Feature No.	Description
C27-1	Concentration of charcoal and burned corn cobs	C34-11	Posthole
C27-2	Charcoal concentration	C34-12	Possible pit
C34-1	Possible mealing bin	C34-13	Possible pit
C34-2	Concentration of slabs from a probable roof vent	C34-14	Posthole
C34-3	Burial	C34-15	Posthole
C34-4	Collared adobe hearth	C34-16	Posthole
C34-5	Posthole	C34-17	Burial (looted in NE corner; looter excavation shown, not actual burial pit)
C34-6	Rock cluster with ash deposit beneath	C34-18	Burial
C34-7	Posthole	C34-19	Posthole
C34-8	Posthole	C34-20	Pit feature
C34-9	Posthole	C34-21	Pit feature
C34-10	Posthole	C34-22	Pit feature

Wall Construction and Preservation

The four outer walls and the short interior wall were readily identified during our excavations. The outer walls were all basically coursed adobe but all incorporated substantial masonry in the architectural fabric, thus making identification of wall remnants an easier task. As best we could tell without destroying the remnants, some sections of walls had vertical tuff slabs in the wall base, with horizontally laid tuff slabs above in the adobe courses. Most of these were relatively large slabs, and the walls were 30-50cm thick. Based on the fallen south wall that was laid over inside the room, we are confident that the walls were coursed adobe/masonry to a height of at least two meters.

The north wall was only partially preserved. There had been substantial looter activity in the northern portions of the room, and as a result, sections of the north wall were demolished. Where the wall section was preserved, it was roughly 50cm in width and still stood 30-40cm above floor. This wall measured roughly 7.60m in length. Roughly midway in the wall, there was a slab of Sugarlump rhyolite set horizontally approximately 15cm above floor. Too little of the wall remained for determining if this was part of a wall opening, but it was the only such occurrence in any remaining wall section and could well have been the base of a door or vent.

The south wall was better preserved, though it, too, had been partially destroyed by looter activities. This wall was 40-50cm in width and measured 7.74m in length. At 1.46m from the southwest corner of the room a 2.35m wall section came off the south wall and extended north. This wall section partially separated room C27 from the rest of C34. Like the north wall, the south wall segment had masonry incorporated into its matrix. In the western half of the wall, the masonry is well preserved, and both vertically and horizontally positioned rocks are present. In the eastern half of the wall, the amount of masonry seemed to decrease; although this could be a result of weathering, it may also be in part a result of looter activity in this portion of the room. The wall section separating C27 from C34 incorporated the largest slabs of any wall encountered during the 2006 and 2007 excavations. These slabs were placed vertically into the wall. Both this wall and most of the south wall remnant were preserved to a height of about 30cm above the floor. The western wall section was the best preserved of all and consisted of horizontally laid slabs that extended its entire length of 5.28m. This wall was 40-50cm thick and rose 20-30cm above the floor. The east wall segment was the least well preserved and was only noticeable due to the isolated occurrence of vertically placed rocks along its length, most of them probably part of the wall footing. Substantial looter activity has all but destroyed its northern and southern extremes.

Floor and Floor Features

As noted previously, the floor of C34 was apparently placed directly on top of bedrock except where there were underlying features. This floor was encountered directly beneath wall-fall and roof-fall. The floor was sufficiently worn in the central part of the room to the point that it was often difficult to identify. Much better preserved were the portions of the floor along the south wall where two floor layers could be discerned, one directly on top of the other. Because of the deteriorated condition of the floor in the central portion of the room, linkage of features to specific floor levels proved difficult or impossible. It appears that the wall separating C27 and C34 was part of the original construction due to C27's east wall bonding into C34's south wall and the fact that the floor sections exposed along the south wall of C34 did not continue beneath the east wall of C27.

Several features were assignable to Room C27/34 (Table 6.1, Figure 6.3), although few could be assigned to a specific floor. A well preserved collared adobe hearth that had been relined with adobe was in the central portion of the C34 portion of the room, and immediately above it in roof fall was a concentration of rhyolite slabs that are believed to have lined the roof vent directly above. There was a large, deep pit that may have been the hole for a roof support post; if so, we presume that another is present in the unexcavated area just east of the hearth. At the north end of the wall separating the C27 area was the remnant of a slab-lined feature of unknown function; its dimensions, so far as they are known, would be consistent with a mealing bin, though no metate was present. In addition, several probable or possible postholes were found beneath floor, many of them potentially predating room construction.

Three burials were found that could be linked to this room, one of them a secondary cremation (Feature C31 Figure 6.3), the other two flexed inhumations (Features C34-3 and C34-18, Figure 6.3, Table 6.1), all in the western portion of the room. As noted previously, a pothunter had looted a burial from the northeastern corner of the room that we presume was interred from its floor; however, given this disturbance and the fact that we did not excavate this area, we cannot be certain of its association. Under the terms of our ARPA permit and in consultation with the BLM, each of these burials (other than the cremation found in 2006—see below) was partially exposed, documented to the extent possible, and then recovered during the same day. A few small elements of human bone were encountered in various contexts during the excavation of this room; extensive rodent burrowing possibly moved them.

Found in the 2006 excavations, the cremation was in a large Playas Red Incised jar covered by a small rhyolite slab; no analysis was done of the remains since the permit did not allow for removal of human remains. However, the cremation container vessel was placed on bedrock that was encountered at a greater depth than in the northern portions of the unit. It was later found this represented a bedrock cut for room C35 which was associated with an earlier Black Mountain phase room (see below). Thus, the Playas Red Incised container (Feature C31) was placed so that it touched the living surfaces (i.e. floors) of both room C27 and room C35.

All three inhumations (the two we excavated and the one from the northwest corner) were adults. No objects were found with Feature C34-3 (adult female), but a large killed Playas Red Incised bowl was found over the face of the adult male in Feature C34-18. An olivella shell bead was also present in that portion of the grave fill removed during the partial exposure. There are, of course, no data on occurrence of objects with C34-17, the disturbed burial in the northeast corner.

Dating

Room C27/34 overlay room C35, a very poorly preserved, apparently small Black Mountain phase room whose walls were oriented slightly differently than those of C27/34. There was little evidence for dating C35 (no burned remnants, no hearth, few artifacts in the fill, etc.), but we were able to collect a set of archaeomagnetic samples from the collared hearth in C27/34 (Feature C34-4). These samples returned a date range of A.D. 910 – 1215. Unfortunately this date tells us little except that the feature was likely used during the Black Mountain phase. At this point, the best evidence for dating lies in the presence of a few small Tucson Polychrome sherds in the adobe of the fallen south wall that was well preserved and readily identified. If these were truly in the adobe at construction, it indicates that Room C27-34 was built in the very late AD 1200s or early 1300s. Tucson Polychrome has been found in small quantities elsewhere in Area C, so its occurrence in this room is not surprising.

UNIT 18: ROOM C35

Room C35 was first discovered in an attempt to discern the construction sequence of rooms C27/34 (Figure 6.3). In conducting the testing, a well-preserved floor was encountered roughly 25cm beneath the floor of C27/C34. Subsequent excavations followed this floor north and east to shallow bedrock cuts below the floor of C27/34. The west edge was more difficult to identify because of the presence of a complex of earlier and later features. No features were visible in the excavated portions of the room, and the only feature that was possibly found in association with the floor of C35 (C34-6) was a secondary cremation in a Playas Red jar that protruded through the floor of C27/34 and could represent an intrusive feature for both C27/34 and C35. Aside from the bedrock cut, which possibly represented the interior room edge, and a few small tuff rocks that may have been in the wall base, no intact wall remnants were encountered. The age of Room C35 is at present unknown, although it certainly predates overlying C27/35 that was built sometime around AD 1300. With present evidence, we can say only that this room dates to the Black Mountain phase.

UNIT 18: ROOMS C23 AND C28

Architectural and Stratigraphic Summary

In 1993, some of the walls that enclose Rooms C23 and C28 were traced and recorded as part of the excavation of Room C10 to the east (Figure 6.2). The area directly to the west of Room C10 was designated Room C23. As a result of the wall tracing effort during the 2006 field season, this area was thought to be composed of two rooms instead of just one. Accordingly, the northern room was designated Room C28, whereas the Room C23 designation was retained for the southern room. In 2007, this area was once again chosen for excavation due primarily to the fact that a substantial portion (four square meters) of Room C28 had been excavated in 2006. Initially, the

2007 excavations focused on defining the probable wall, tentatively identified in 2006, separating the two rooms. Testing in 2007 failed to reveal the presence of the wall in that location; in fact, it was found to be slightly south.

The wall remnants of rooms C23 and C28 were constructed of coursed adobe and, in general, were fairly well preserved. The lowest courses contained vertically set tuff slabs that served to bind the lower courses to those resting upon them, while the upper courses contained rocks placed horizontally, possibly to increase the rigidity of the walls. Based on the sections of intact wall-fall, all walls enclosing rooms C23 and C28 probably stood some two meters in height originally.

During the course of our excavations in these two rooms we encountered evidence suggestive of a remodeling episode in which the wall between the rooms was demolished and a new floor laid over the remnant wall base. However, in view of the evidence, and acknowledging alternative possibilities, we now believe that the two rooms were used, abandoned, and after some deterioration, began collapsing. In this interpretation, there are artifact assemblages and features for both the roof and floor of each room. These provide an important data set for the Black Mountain phase at Old Town.

Wall Construction and Preservation

The best-preserved section was that comprising the western wall of the rooms. This wall segment varied in height from roughly 10 cm on the northern and southern sections to ca. 25 cm in the central portions of the wall. Both the northern and southern ends had been destroyed by looter holes that effectively demolished the southwest and northwest corners of the room. In portions of this 5.7 m wall, specifically along the southern portions of room C28 and along the northern extent of C23, wall plaster was still intact. There were possibly two vents placed in this wall segment based on the presence of rhyolite slab concentrations found within the wall fall. There was no indisputable evidence for larger openings within this wall, though this could be a result of preservation.

The northern wall (the C28 section) was fairly well preserved, though it had eroded substantially more than the western wall. The height of the preserved remnant varied from roughly 10 cm on the eastern and western portions of the wall segment to roughly 20 cm in height in its center. This wall was also partially damaged on the east and west extremities by looting that effectively destroyed the northwestern and northeastern corners. The masonry incorporated into this wall seemed to differ from that incorporated into the western wall in that the rocks were substantially smaller and were spaced further apart.

The south wall of C23 was likewise partially disturbed by a looter's hole in the southwest corner of the room. In this wall, horizontally placed rocks were incorporated into the wall adobe. Wall heights ranged from 30 cm in the undisturbed western sections of the wall to roughly 15 cm in the eastern section.

The east wall segment was the least well preserved of all. This was due to the fact that most of the wall had eroded (or had otherwise been removed) and only 10 cm of wall remained throughout the extent of the 6.3 m segment. The masonry that was present was a mixture of horizontally and vertically placed rocks. The northern end of this wall segment had been destroyed by looter activities.

Roughly two meters north of the south wall was a 3.6-meter long wall that separated room C23 from room C28. The footings on this wall section were unlike any encountered during the course of the 2007 excavations. The footing was clearly visible between remnants of exposed, slightly higher bedrock present on both the north and south edges of the wall. This bedrock extended out about 5 cm and then dipped down below the floor level. There was a 20 cm wide opening in this wall section, one meter from the western wall that may have been a vent or door.

As with Room C27/34, most of walls seem to have fallen inside the confines of rooms C23 and C28. The south wall of Room C23 appears to have fallen first, followed by the west wall of Rooms C23 and C28. Good candidates for the wall fall originating from the north wall were not found, presumably because this fell to the north along with the rest of the south wall of Room C27/34. Likewise, the wall-fall originating from the eastern wall was not identified. It is possible that this wall collapsed to the east, but there was no evidence of it at all when the area was excavated in 1994; certainly no rock/slab remnants were identified (Creel 1995). Basically, we cannot identify the wall fall orientation for this wall nor the other walls of Room C10 primarily due to the fact that the room's deposits were so severely eroded prior to testing. The walls that did fall into the rooms C23 and C28 apparently fell sequentially, with the south wall falling before the west wall. The wall separating rooms C23 and C28 also fell into the center of the room, perhaps being caused to topple from the impact of the south wall when it collapsed.

The activity surfaces (floors and possible roof) of rooms C23 and C28 were for the most part well preserved and compact. After failing to locate the cross-wall hypothesized to have been present based on the testing in 2006, it was assumed that there was only a single room and that the first activity surface encountered beneath wall fall was roof fall. A number of features were encountered on this well prepared surface. As the excavations continued, the wall separating C23 from C28 was defined just below this distinct adobe surface. This overlying prepared surface could represent remodeling of the room(s), or could in fact be the fallen roof. The lower floor surface in rooms C23 and C28 was highly compact, and possibly burned, though no other evidence for burning was encountered. In the portions where it was preserved, it was unmistakable. Due to time constraints, no sub-floor excavations were conducted during the 2007 season.

Stratigraphy

The stratigraphy of Rooms C23 and C28 was complex. At present, the stratigraphic evidence suggests two possible interpretations, each with different implications concerning the life cycle of the architectural space.

The first is one where rooms C23 and C28 were combined into one room by demolition of the wall separating the two and a floor then laid down over the wall-fall. The second, simpler interpretation has the rooms abandoned, the wall separating them deteriorating and eventually collapsing, thereby causing portions of the roof to fall immediately onto the floor, with other portions of the roof and outer walls falling sometime later.

In the former, the dividing wall would have been demolished and another living surface would have been constructed over the rubble of this wall and over the floor lying on bedrock. Thus, the area that once comprised two smaller rooms would compose a single, larger room. After the room was abandoned, the room was allowed to fall into disarray.

In the latter scenario, the south wall of room C23 fell and possibly caused portions of the roof to fall as well. Not being able to support the weight of the roof overhead, the wall between the two rooms fell, and in all probability brought the rest of the roof down as well. Next the remainder of the walls fell, possibly being brought down by the force and weight of the roof collapsing. The north wall fell north into rooms C27/32, the east wall possibly fell into room C10, and the west wall fell into the confines of rooms C23 and C28.

As described above, the stratigraphy of rooms C23 and C38 was somewhat complex. Figure 6.4 presents generalized cross-sections through the deposits encountered in these rooms. Both rooms were either completely or partially covered by wall fall. The fallen west wall fall lay directly on and covered much of this surface. Consequently, we believe that only a short period of time elapsed between this surface's last use and the collapse of the west wall.

Likewise, wall fall deposits also covered portions of the lower floor. Nearly the entire floor of room C23 was covered by wall fall from the south wall and possibly the C23/28 wall. The lower floor in room C28 was also partially covered by wall fall that probably originated from the C23/28 wall. Little evidence for wall fall beneath the upper activity surface was found in the northern portions of room C28, though looting activity could have destroyed such evidence. In the undisturbed areas of this portion of the room, we encountered a fairly homogenous stratum of loamy clay that extended roughly 25 cm in depth between the base of the wall fall and the lower floor.

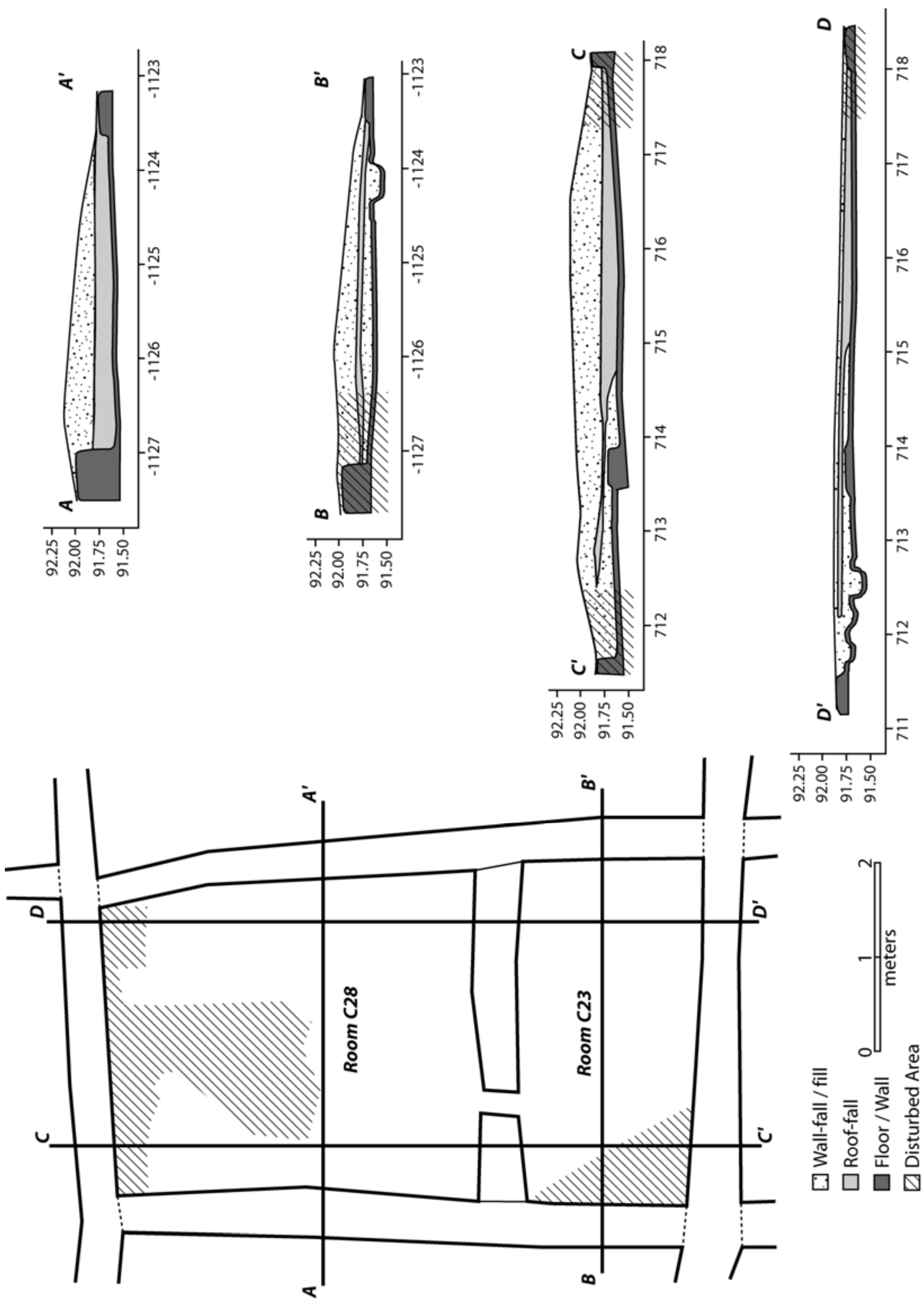

Figure 6.4: Generalized cross-sections through rooms C23 and C28.

Given these data, the most parsimonious explanation for these deposits is that the upper living surface was indeed the fallen roof. The most substantial evidence for this explanation lies in the stratigraphy of the deposits found within rooms C23 and C28.

Here, wall fall from the south wall as well as the central wall dividing the two rooms is found at and below the upper portions of this surface. For this situation to arise in the other scenario, where the room was remodeled into a larger living area, the south wall would also have to have been demolished as part of the room's remodeling. Because of the lack of architectural support features found in association with this upper living surface, this seems highly unlikely.

Room C23

There were two possible wall openings found within the wall-fall associated with Room C23. A concentration of flat rhyolite slabs (Figure 6.5-A) found embedded in the wall-fall from the west wall could attest to the presence of a vent within this wall. These slabs were found resting on top of one another and it is believed that they could represent a collapsed vent. In the wall between Rooms C23 and C28, there was an opening that was a vent or possibly a door. Its width of ca. 20 cm is perhaps more consistent with a vent than a door.

Roof and Roof Features

Prior to the identification of the wall separating Rooms C23 and C28, a number of artifact clusters were encountered along an easily recognizable break in the stratigraphy. This break was ca. 10 cm above the level at which floor was encountered in the C28 test unit from the previous season. For these reasons, all features found along this horizon were given C28 sub-feature numbers. One feature, however, was found above what would be Room C23. Feature C28-1, an isolated concentration of chalcedony and obsidian debitage with a number of projectile points manufactured from the same material, was the first feature located along the stratum that represents the upper surface of roof-fall (Figure 6.4, Figure 6.5-B, Table 6.2). This lithic concentration contained

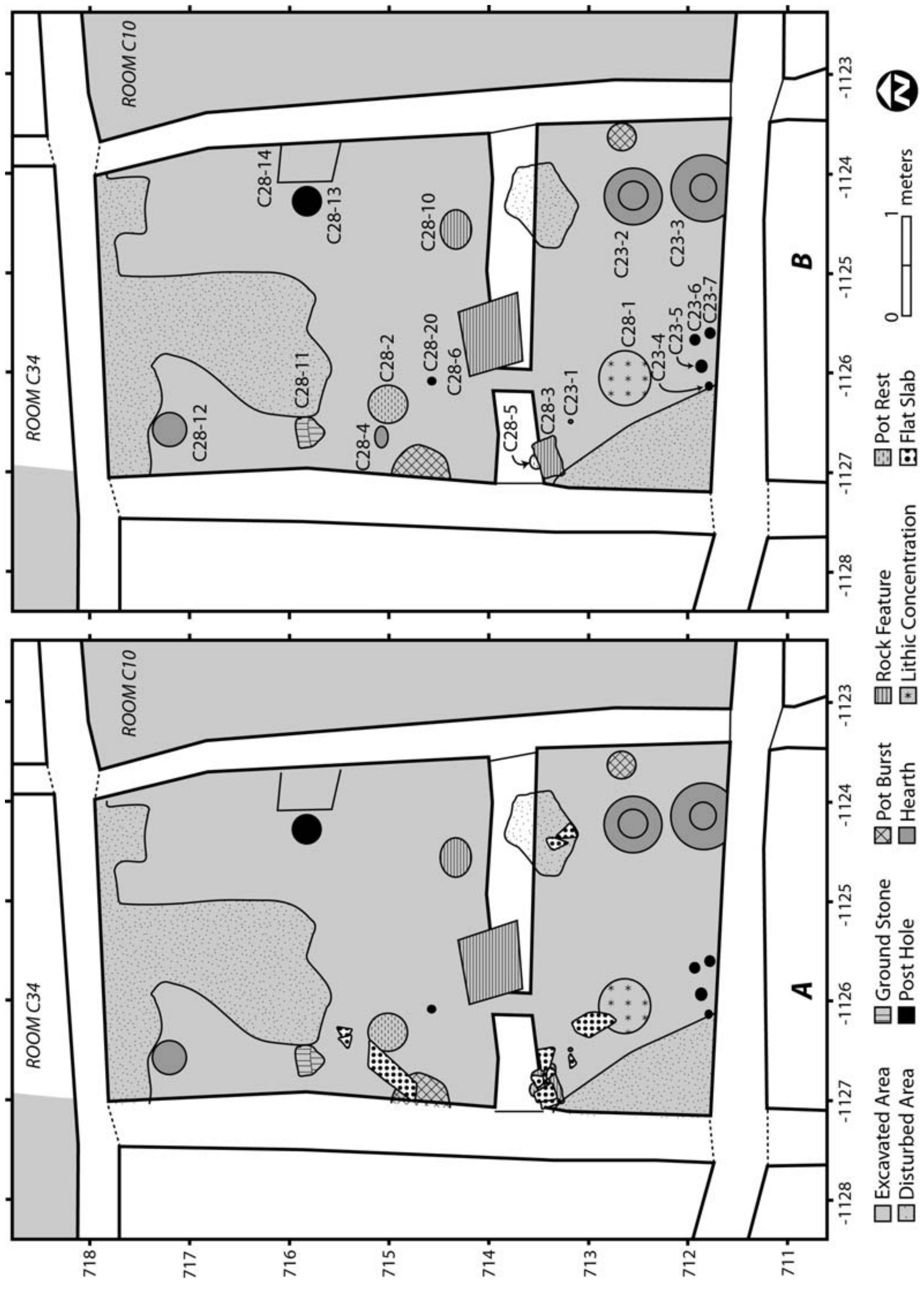

Figure 6.5: Plan view of Rooms C23 and C28. “A” shows the location of flat slabs in relation to features and “B” shows the location and designation of different features.

Table 6.2: Features associated with the upper and lower surfaces of Rooms C23 and C28

Feature No.	Description	Surface	Feature No.	Description	Surface
C23-1	Ochre stain on floor	Lower	C28-1	Concentration of chipped stone artifacts	Upper
C23-2	Hearth, collared	Lower	C28-2	Possible pot-rest	Upper
C23-3	Hearth, possibly collared	Lower	C28-3	Slab concentration (possible vent-box)	Upper
C23-4	Possible posthole	Lower	C28-4	Ash concentration	Upper
C23-5	Posthole	Lower	C28-5	Possible pot-rest	Upper
C23-6	Posthole	Lower	C28-6	Slab concentration (possible roof entry)	Upper
C23-7	Posthole	Lower	C28-10	Rock concentration	Upper
C23-8	Posthole	Lower	C28-11	Metate	Upper
			C28-12	Ash concentration in shallow basin/hearth	Upper
			C28-13	Posthole	Lower
			C28-14	Bedrock step	Lower
			C28-20	Possible Posthole	Lower

debitage from all or most stages of the lithic reduction sequence. It is presumed that the deposit represents the reduction locale of a number of arrow points. Most of the points from this feature were Hinton points, a type whose production began in the Terminal Classic period and continued into the Black Mountain phase.

Floor and Floor Features

As discussed earlier, the floor of this room was well preserved and compact. As best as can be discerned, this floor was apparently laid down directly on top of bedrock. The raised bedrock footing along the north wall of the room could indicate that the room was partially excavated into bedrock prior to wall construction.

Several features were found in association with the floor of Room C23. Two hearths were present, one (Figure 6.5, Feature C23-2) embedded within the floor. This circular hearth was collared (but not raised), with a maximum of about 55 cm. The nearly circular basin had a maximum diameter of 30 cm, with a depth of 15 cm. It contained little, if any ash or charcoal.

The other hearth, Feature C23-3, (Figure 6.5) was a few centimeters above floor level and immediately adjacent to the south wall. In general, this hearth was not as well preserved due to its near-surface location. It, too, may have been collared as indicated by the remnants of adobe found around it. But, it is also possible that this was a raised hearth built against the wall (like those in some contemporaneous sites to the south). It measured 70 cm in width with the circular basin itself measuring 30 cm in diameter. This hearth was shallower than Feature C23-2, being just 10 cm deep. It was full of ash and bone fragments. Feature C23-3 appears to have been used less intensively than Feature C23-2 if the color and texture of the hearth's lining is any indicator of intensity of use. The lining of Feature C23-2 was more oxidized and more thoroughly fired than that of Feature C23-3. Archaeomagnetic samples were collected from both hearths and fill from both features was collected for flotation analysis.

One possible and three more confidently identified postholes were found in the floor of Room C23 along the south wall (Figure 6.5). An awl manufactured from the ulna of an artiodactyl was found roughly 30 cm north of Feature C23-2. The remnants of the lower portions of a plainware vessel were likewise found roughly 20 cm from the same feature along the east wall of Room C23. Finally, there was an ochre stain (Feature C23-1; Table 6.2, Figure 6.5) on the floor.

Room C28

As mentioned previously, there was a possible doorway along the southern wall roughly one meter from where this wall abutted the west wall. The large rhyolite slab found within this room (Figure 6.5-A) was found in the rubble of the fallen west wall. We first believed that this slab could represent a lintel for a door in the west wall, but found no other evidence for a door. Likewise, the possible bedrock step against the east wall (Feature C28-14, Figure 6.5-B) was believed to be associated with a door, but too little of the wall remained for a confident assessment.

Roof and Roof Features

As stated previously, there were two distinct well prepared adobe surfaces encountered while excavating Room C23 and Room C28. Interestingly, no architectural support features such as postholes were encountered on the upper surface. The numerous rodent burrows, root holes, and looter disturbance that were pervasive in both rooms could have obscured these. Because these features were absent from this upper surface but were present on the surface found below it, we interpret this upper surface as the roof of Room C23/C8.

A suite of artifacts that probably represent primary refuse was present on the roof, or upper activity surface. The adobe on which these artifacts were found resting was distinct from the overlying wall fall in its texture and, along the western wall where it was first recognized, with regards to its color. The surface was more compact, more clayey and was lighter in color than the wall fall, which separated easily from the roof.

Two meters to the northwest of C28-1 was a concentration of sherds from a late El Paso Polychrome jar. These sherds were located directly west of a possible pot rest (Feature C28-2; Table 6.2, Figure 6.5) and against the west wall of Room C28. It is possible that the sherds represent the remains of a complete vessel. A substantial portion of the jar's rim, neck, and shoulder were capable of being refitted. These vessel portions were easily refitted due to the fact that the design element extended form the rom to shoulder of the vessel. The lower, undecorated, portions of the vessel were not refitted sue to the fragmentary nature of the El Paso brownwares found in the same contexts. Thus, we are uncertain if the sherds present on the roof of Room C28 represent the remnants of a complete El Paso Polychrome vessel. Based on the number of El Paso brownware sherds collected form this context I believe that there was a complete El Paso Polychrome vessel on the roof of Room C28 at the time of abandonment.

In addition to these two concentrations, a metate was also found resting on this surface (Feature C28-11; Table 6.2, Figure 6.5). It was found on a pedestal of four rocks set in adobe on the upper floor/roof-fall. This vesicular basalt metate was apparently a reused fragment representing approximately half of the original. It had a well-worn grinding surface, and was roughly 25 cm in width, 30 cm in length, and was 15 cm thick.

In summation, the upper activity surface contained the concentration of chipped stone tools and lithic waste flakes, one pot rest (Feature C28-2) near the sherd concentration described above, a small clump of adobe with a depression near the base of the north wall of Room C23 interpreted as another pot rest (Feature C28-5), an ash deposit (Feature C28-4), a metate, and a number of rhyolite slab concentrations (Table 6.2, Figure 6.5). Feature C28-6 consisted a number of rhyolite slabs in a roughly rectangular pattern. This feature could represent the remnants of a roof-entry box, though no evidence of an opening in the roof fall was noted in this area. The other rhyolite slab concentration, Feature C28-3, was found resting on the intact portions of the Room C23/C28 cross-wall. These slabs were found within wall fall and likely represent the remains of vent box located in the west wall of Room C23/C28.

Floor and Floor Features

Like the lower floor of Room C23, the floor of Room C28 was easily identified due to its compact nature. The floor was roughly 3-5 cm in thickness based on the profile encountered in the looted portions of the room. The floor adobe was laid directly on top of bedrock.

Lower floor features include a hearth, three possible or probable postholes, and a possible step against the east wall. The hearth rested on, or just above, the floor of this room (Feature C28-12, Figure 6.5-B). It was 40 cm in diameter and 10 cm in depth. This hearth was not collared but was, rather, a shallow basin full of ash. No archaeomagnetic samples were taken from this hearth due to the lack of suitable burned adobe.

One possible and two probable postholes were found in this floor, but there may have been others destroyed by the pot hunting. As noted previously, there was an area of raised bedrock found along the east wall of the room that was given the feature designation C28-14. It was approximately 70 x 50 cm and rose about 5 cm above the floor. This feature may have been a bedrock step relating to a door, though no evidence for one was found in the very low remaining wall segment.

Few artifacts were found on the lower activity surface of this room; however, two large andesite flakes were found together, abutting the western portion of the south wall. In addition, a quartz crystal was found roughly 50 cm south of the possible bedrock step, Feature C28-14.

Dating

As mentioned previously, the ceramic assemblage recovered from Rooms C23 and C28, which is composed primarily of El Paso Polychrome, Playas Redware (mostly incised), and Chupadero Black-on-white sherds, places the rooms within the Black Mountain phase.

The east wall of both rooms was apparently continuous and abutted both the north and south walls, though only the southeastern corner of this abutment was preserved well enough for this to be completely clear. Due to the fact that the southwest corner of C23 and northwest corner of C28 had been destroyed by looter activity, it is impossible to assess the bond/abut situation. Both the north wall of C28 and the south wall of C23 appear to be related to the construction of Room C10 given that they are continuous from the east wall of Room C10 to the western edge of the roomblock (Figure 6.2). The wall separating Rooms C23 and C28 was clearly abutted to both the east and west walls. Because the long east/west wall appears to have been continuous from the northeast corner of Room C10 to the northwest corner of the western most room, as does the parallel one on the south side of C10 and C23, we infer that all of the rooms between were built at the same time, although there may have been another wall or two added subsequently (as indicated by abutments).

It is interesting to note however, that the east wall of Rooms C23 and C28 is roughly ten degrees off grid north, while the west wall is almost directly in line with grid north. The alignment associated with the east wall more closely matches the alignment found in Room C35 and the southern portions of Area C (see below) and may represent earlier Black Mountain phase construction. If so, then the east wall may predate the west wall. In this scenario, rooms C23 and C28 would have been created in part from an earlier room by the addition of the west wall of Rooms C23 and C28 as well as the wall between them.

Archaeomagnetic samples were taken from both of the hearths in Room C23; however, only the samples collected from Feature C28-17 yielded results. The samples collected from this feature returned three date ranges: A.D. 910 – 1040, A.D. 1160 – 1415, and A.D. 1435 – 1690. Unfortunately these dates tell us little aside from the fact that the rooms were likely occupied during the Black Mountain phase.

UNIT 14: FEATURES C29 AND C30

The test units placed within Unit 14 posed the most problems of all excavations that took place in the summer of 2006. The decision to test this portion of the site was based upon both the high concentration of artifacts recovered from the wall-clearing that took place in this area and the well preserved rooms C1 and C2 that were excavated directly to the southwest of the units placed in this area. The highest proportion of artifacts witnessed during the course the wall clearing work was found in the area that would be encompassed by the testing of Features C29 and C30 (Figure 6.6).

Feature C29

Feature C29 consisted of portions of an alleged room that would have been contiguous to room C2. The stratigraphy of this area was very complex and consisted of thin alternating layers of what appeared to be dark grayish brown solid adobe and mottled layers of grayish brown fill. A possible floor was encountered at ca. 50cmbd in the first 1X1m unit set up within this feature. This floor was encountered directly above bedrock and there was a possible posthole within the western half of the unit. The unit was expanded to the west forming a 1X2m test unit. We believe that the eastern portions exposed a Pithouse period floor based on the presence of a possible posthole as well as an upright rhyolite slab in the western half of the eastern 1X1 meter unit. Judging from the ceramics recovered from the floor on the eastern half of the test unit, this floor belongs to a Late Pithouse period structure. The assemblage consists of San Francisco redwares, Style I Black-on-white, Style II Black-on-white, Three Circle Corrugated, and brownware sherds.

Feature C30

Feature C30 was originally tested by a single 1X1m test unit, which would later be expanded into a 2X2 unit directly north of the units comprising C29 (Figure 6.6). The initial unit encountered layers of wall melt mottled with what was probably burned wall plaster. A possible E/W wall section was exposed on the southern wall of this unit, as was a possible N/S wall section on the west wall of the unit. Wall-fall was found throughout the unit and was found directly beneath the surface in the southern portions of the unit while it was encountered at greater depths (ca. 11cm) in the northern portions of the unit (Figure 6.7). Bedrock was encountered at roughly 40cmbd and it would later be found that this was the level at which the original living surface was found. This unit had a possible double post-hole feature located roughly in its center and this posthole was dug into bedrock. To gain further information about this room, the unit was expanded north 1m. This unit again caused problems with interpretation because of the awkward stratigraphy and mottled condition of the wall-fall and wall-melt. High concentrations of charcoal were found in the units sank to test C30 possibly suggesting that the room burned, but no intact burned beams were found during the course of this feature's excavation. The north expansion of the test unit encountered wall-fall directly beneath the surface in the northern portions of the unit and likewise encountered wall-fall at depths of roughly 12cm beneath the surface within the southern portions of the unit. This could possible indicate that the northern wall collapsed south into the room and that the southern wall collapsed north into the room. Floor was again encountered at roughly 43cmbd with the wall-fall and wall-melt resting on top of floor. A possible informal hearth was encountered in the northern portions of this unit and was only faintly discernible base on differential color and charcoal concentration. No formal hearths were found in the course of this feature's testing.

Both of these units were expanded to the west to further test this feature, but neither was fully excavated to bedrock by the end of season. These western units exposed the western wall found in the C29 testing units and also found possible cross-walls running both N/S and E/W. The E/W segment could possibly represent that what was called Feature 29 actually consisted of 2 rooms with the wall section pretty much splitting the first 1X2 in half, and the N/S section likewise did the same between the east portion of the 2X2m unit and the western expansion of the original 1X2m unit. It could thus be possible that what was being called Feature C30 actually represented 4 distinct proveniences, where two main habitation rooms measuring approximately 1.5X1.5m were attached to possible ancillary rooms that measured 1X1.5m.

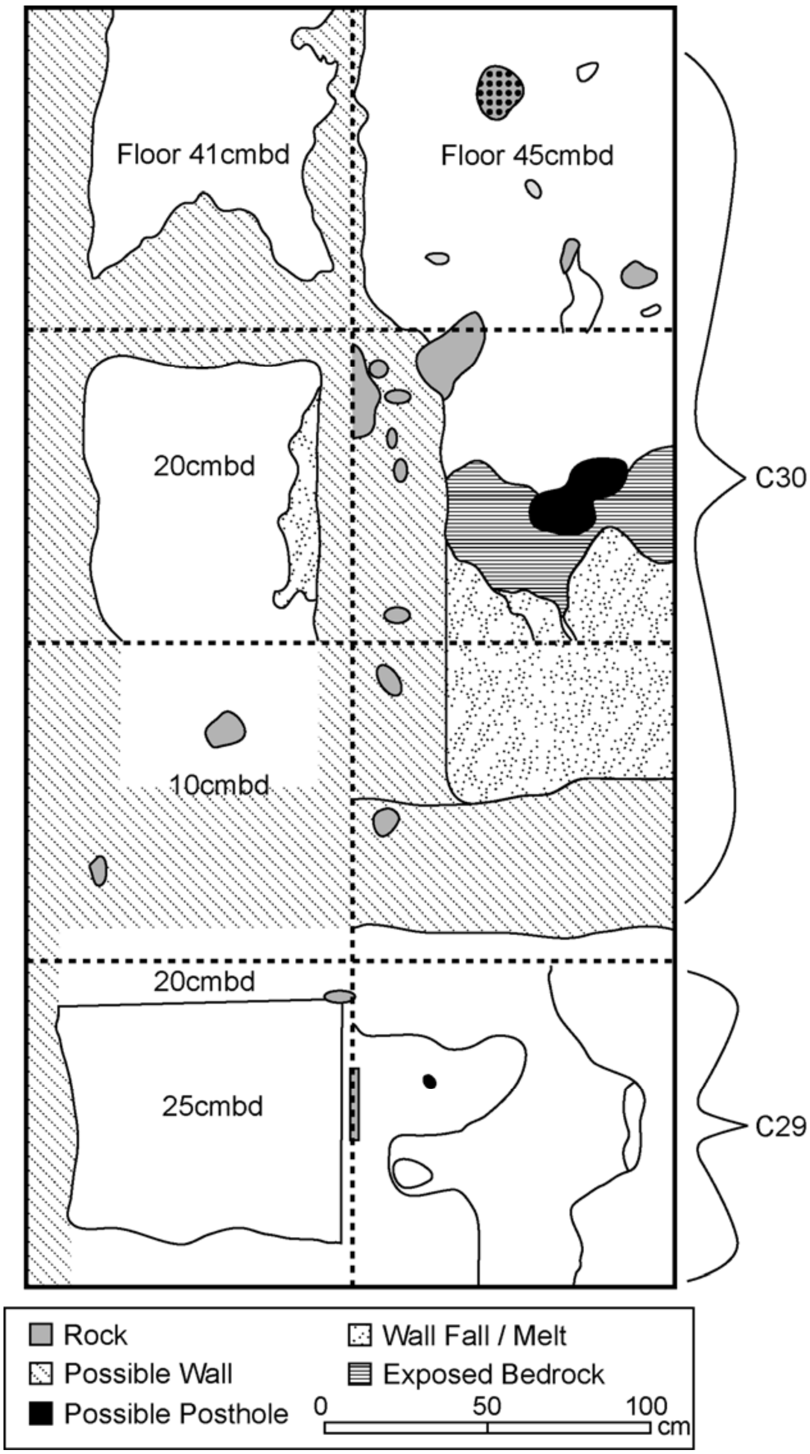

Figure 6.6: Unit 14 Feature C29 and C30 Plan.

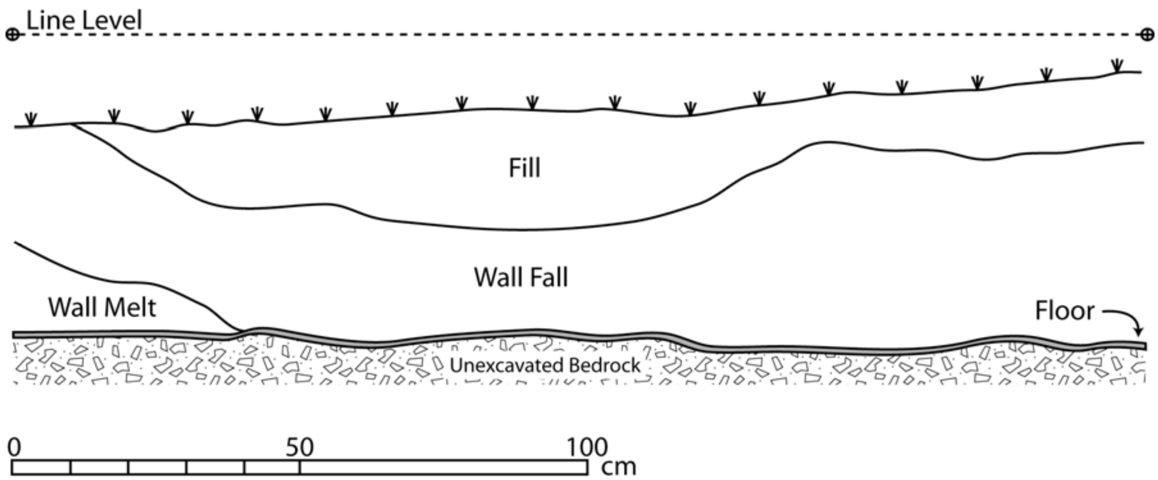

Figure 6.7: Unit 14 Feature C30 East Wall Profile (Northern Portion).

EXTRAMURAL FEATURES

There were a number of features in extramural areas surrounding the Black Mountain phase structures at Old Town. The majority of these represent either storage pits or thermal features and are described by Creel (2006a). A total of eight storage pits (Features C5, C6, C7, C14, C18, C19, C20, and C21) and three thermal features (Feature C12, C15, and C16) were all encountered while conducting excavations in the Black Mountain phase component of Old Town. However, because there is a substantial Late Pithouse period occupation in the same area, a confident assessment of temporal association for these features cannot be made. While Creel (2006a) notes that Features C19 and C20 likely predate the Black Mountain phase due to the fact that they were encountered beneath the floor of Room C10, we now know that this portion of the site represents a later Black Mountain phase occupation of the area. Thus, these features could have been used by the earlier Black Mountain phase inhabitants and were built over during the later Black Mountain phase occupation.

While the temporal affiliation of many of the extramural features in Area C is uncertain, it is believed that one feature type, slab-lined-basin shaped pits, are unique to later occupations. Two such features have been encountered in Area C at Old Town. One of these, Feature C22, is present in Unit 27 and the other, Feature C32, is present in Unit 26. Feature C22 consists of series of thin rhyolite slabs and cobbles arranged in a roughly circular pattern approximately one meter in diameter (Creel 2006a:68). These rhyolite slabs and cobbles formed a continuous paved surface. Feature C32 was similarly constructed (Figure 6.8) as a concentration of rhyolite cobbles and slabs in a roughly circular pattern approximately one meter by 75 centimeters. The cobbles and slabs are placed in such a manner that they create an almost continuous rock surface.

Features similar to these have been found at a few sites in the larger Mimbres region and are thought to represent the bases of granaries similar to those present at Salado sites in the Tonto Basin (Cosgrove and Cosgrove 1932:20-22; Jacobs 1994:207-213; Lekson 2002:46). Based on their frequent occurrence at Salado period sites, these features are believed to indicative of later occupations, in this case, the Black Mountain phase.

ARCHITECTURAL COMPARISONS

As mentioned in Chapter 5, the architectural characteristics that have been generally thought to differentiate the Black Mountain phase from the preceding Classic period are the use of coursed adobe architecture, larger rooms, a two-post roof support pattern, and the predominance of small circular clay-lined hearths. Although some of these architectural characteristics appear earlier in the Mimbres cultural sequence (Creel 1999b) most were encountered exclusively in the excavated Black Mountain phase rooms at Old Town. All hearths in Black Mountain phase rooms were of the small circular clay-lined variety. Hearths of this type were encountered in rooms C2, C3, C23, C28 and C34. Similarly, where preserved, rooms either exhibited a two-post roof support pattern (e.g. rooms C2, C28, and C34) or contained no primary roof support posts (e.g. room C23).

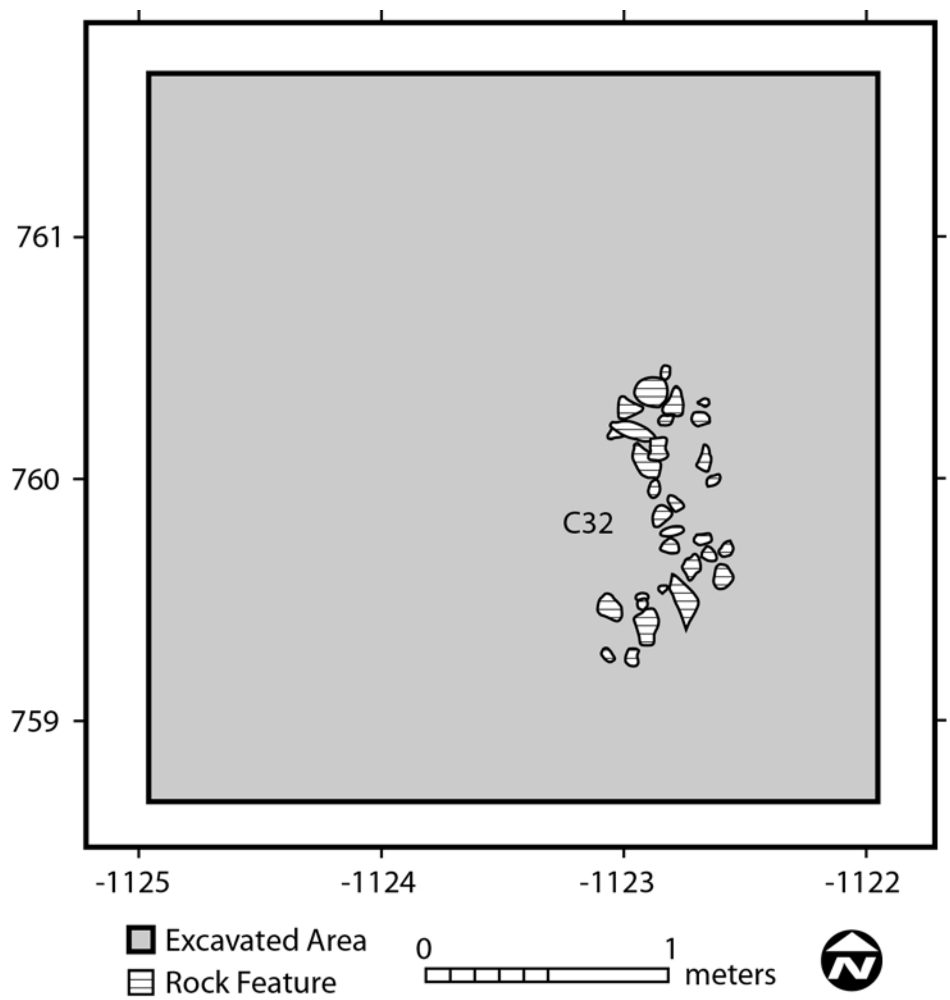

Figure 6.8: Feature C32 plan map.

As can be gleaned from the information presented above, all rooms were constructed of coursed adobe architecture. It should be noted however, that in those rooms where more than the lowest wall courses were preserved (e.g. rooms C23, C27, C28, and C34) there were substantial numbers of cobbles and slabs incorporated into the walls. In some instances, large quantities of masonry cobbles were also found in the remnants of wall fall. Based on the height of the intact wall alignments as well as the extent of wall fall containing cobbles, I estimate that some rooms possibly contained masonry architecture at least one meter high.

The final characteristic of Black Mountain phase architecture is the fact that rooms tend to be larger than rooms present in earlier periods. As shown in Figure 6.9 and Table 6.3, the data available from excavated rooms in the Mimbres area tends to support this conclusion. However, while Black Mountain phase rooms tend to be larger on average, there is a substantial amount of variability present in the size of excavated rooms dating to different time periods in the Mimbres area (Figure 6.10). Based on available for sites excavated in the Mimbres valley, there are statistically significant differences with regards to room area between Black Mountain phase rooms and rooms of other time periods (Table 6.4). Comparisons of pooled room sizes from other time periods except for the Black Mountain phase showed no statistically significant differences.

However, when one compares the size of room suites instead of individual rooms, it becomes apparent that there is less variability than the individual room data would indicate. As shown in Figure 6.11 and Table 6.5, data are available for only a limited number of room suites in the Mimbres area. The data that are available indicate that, in general, the diachronic and synchronic patterns with respect to the floor area of room suites tend to be similar for sites in the Mimbres valley. The one potential anomaly is the relatively large room suites present in the terminal Classic period structures at Old Town. Other room suites of similar size are present at NAN Ranch, Swarts, and Woodrow, though room suites of smaller size at NAN Ranch and Swarts lower the measures of

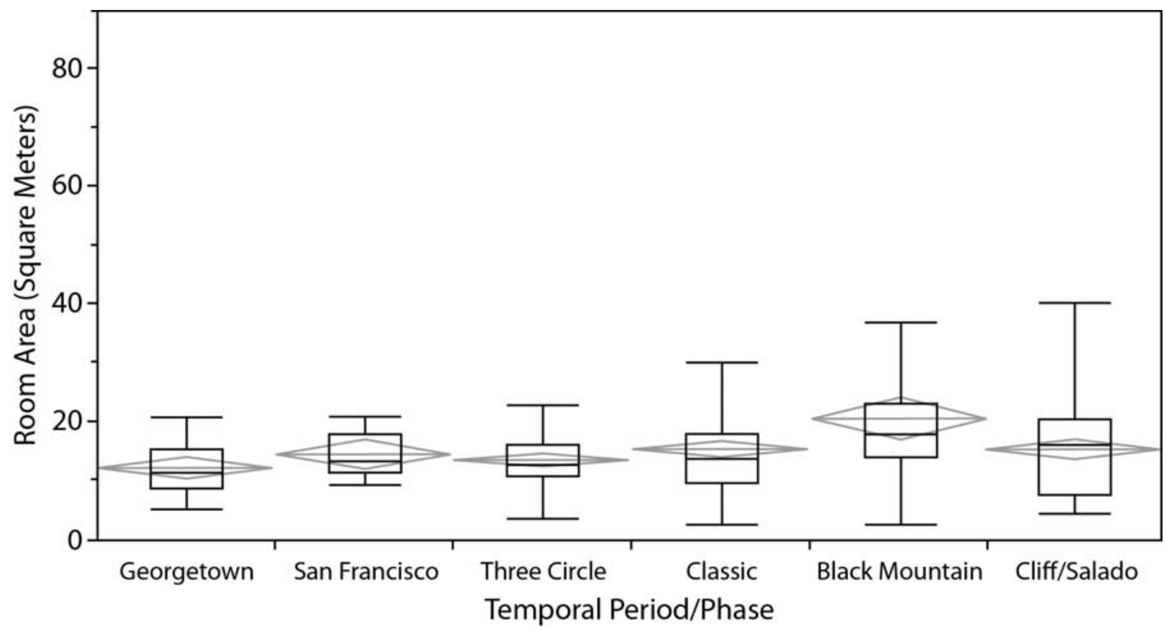

Figure 6.9: Box plots and mean diamonds depicting measures of central tendency for floor areas of structures dating to specific time periods.

Table 6.3: Number of rooms dating to each time period used in analysis as well as measures of central tendency for these rooms. Information taken from Anyon and LeBlanc (1984), Cosgrove and Cosgrove (1932), Creel (2006a), Nelson and LeBlanc (1986), Ravesloot (1979), Shafer (2003), Wallace (1998), and Woosley and McIntyre (1996).

Period/Phase	No. of Rooms	Min. Area	Max. Area	Mean Area	Area Std. Dev.
Georgetown	21	4.99	20.56	12.07	4.55
San Francisco	12	9.53	20.81	14.39	3.95
Three Circle	77	3.56	22.60	13.44	3.73
Classic	277	2.00	64.33	15.71	13.24
Black Mountain	33	2.68	52.95	20.55	10.38
Cliff/Salado	71	4.20	40.40	15.41	7.69

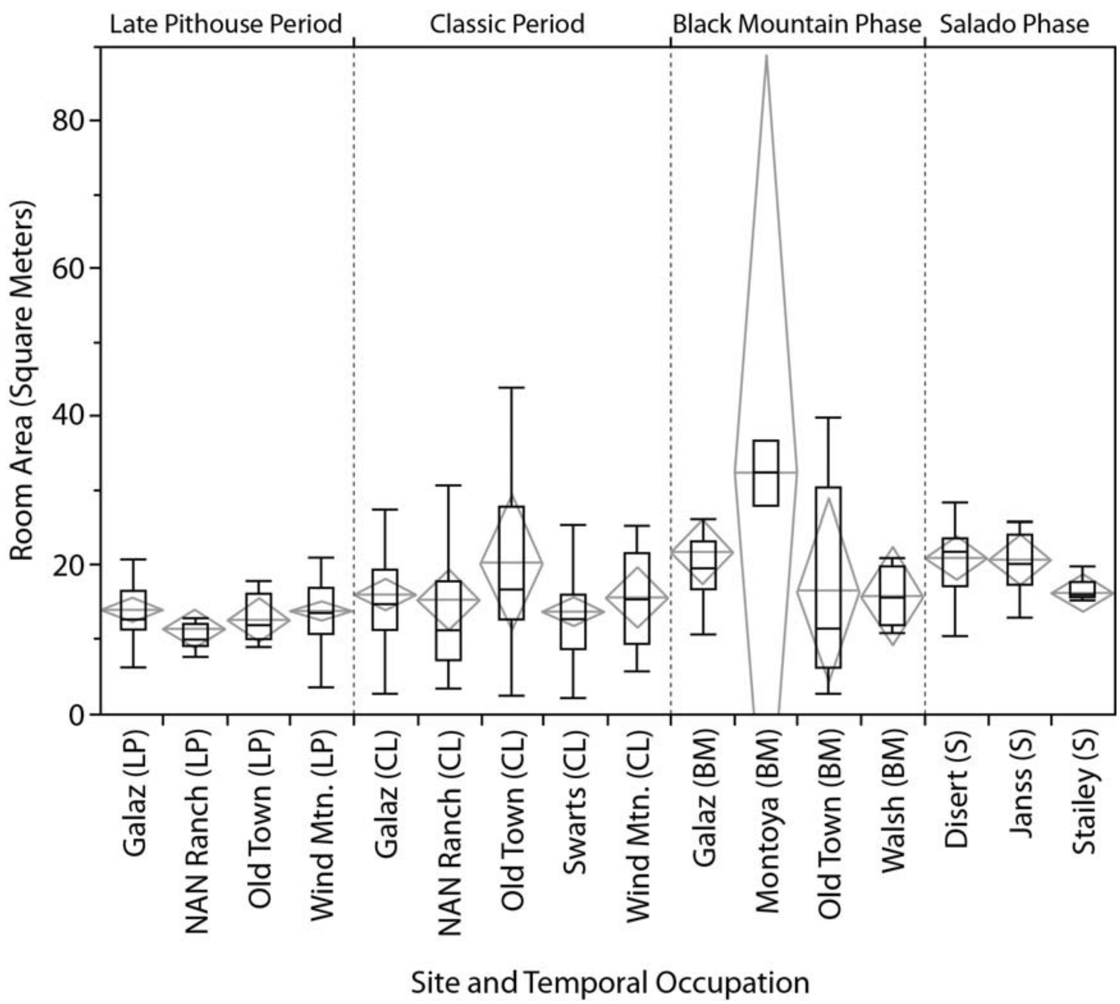

Figure 6.10: Box plots and mean diamonds depicting measures of central tendency for floor areas of structures excavated at specific sites dating to specific time periods. The period abbreviations in parentheses are: LP = Late Pithouse period, CL = Classic period, BM = Black Mountain phase, and S = Cliff/Salado phase.

Table 6.4: Results of Wilcoxan Rank Sum statistics for excavated room size in square meters between Black Mountain phase rooms and rooms dating to different time periods. Statistics were based on data presented in Table 6.3.

Paired Period/Phase	Score Mean Difference	Std Err Diff	Z	p - Value
Georgetown/Black Mountain	-15.66	4.39	-3.57	0.0004
San Francisco/Black Mountain	-9.89	4.43	-2.23	0.0255
Three Circle/Black Mountain	-28.14	6.64	-4.24	<0.0001
Classic/Black Mountain	-58.67	16.51	-3.55	0.0004
Salado/Black Mountain	-15.01	6.36	-2.36	0.0182

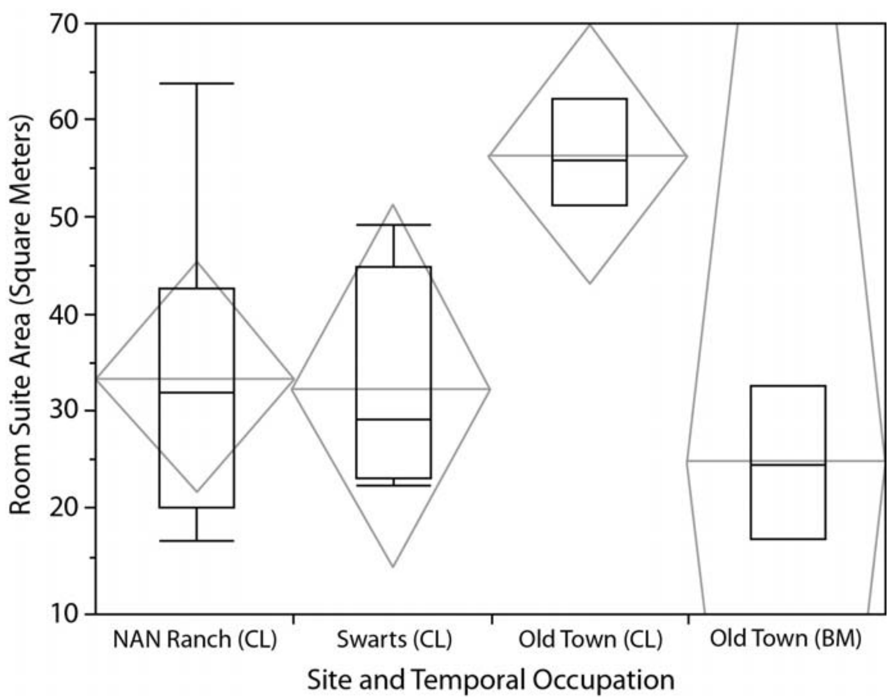

Figure 6.11: Box plots and mean diamonds depicting measures of central tendency for floor areas of room suites excavated at specific sites dating to specific time periods. The period abbreviations in parentheses are: CL = Classic period and BM = Black Mountain phase.

Table 6.5: Number of room suites dating to each time period used in analysis as well as measures of central tendency of floor area for these suites. Information taken from Cosgrove and Cosgrove (1932), Creel (2006a), and Shafer (2003).

Site and Period	No. of Suites	Min. Area	Max. Area	Mean Area	Area Std. Dev.
NAN Ranch (CL)	9	17.59	64.48	34.09	15.25
Old Town (CL)	3	51.28	62.26	56.56	5.51
Swarts (CL)	4	22.84	49.62	33.01	11.89
Old Town (BM)	2	17.61	33.24	25.43	11.05

Table 6.6: Results of Wilcoxan Rank Sum statistics for excavated room suite size in square meters between room suites at different sites and those dating to different time periods. Statistics were based on data presented in Table 6.5.

Paired Site Occupations	Score Mean Difference	Std Err Diff	Z	p - Value
Old Town (CL)/NAN Ranch (CL)	4.44	2.40	1.85	0.0645
Old Town (CL)/ Old Town (BM)	2.08	1.44	1.44	0.1489
Swarts (CL)/Old Town (BM)	1.13	1.62	0.69	0.4875
Swarts (CL)/NAN Ranch (CL)	0.54	2.34	0.23	0.817
Old Town (BM)/NAN Ranch (CL)	-1.53	2.59	-0.59	0.5557
Swarts (CL)/Old Town (CL)	-3.21	1.65	-1.94	0.0518

central tendency associated the size of room suites for these sites (Creel 2006a:212-215). Room suites at Woodrow were not considered for the current analysis. While the size of these room suites appear on the surface to differ substantially from other Classic period and Black Mountain phase room suites, the differences are not statistically significant (Table 6.6).

Based on these limited data, it could be argued that while individual room size does appear to increase through time, the size of room suites remains fairly constant from the Classic period through the Black Mountain phase. This potentially indicates that the amount of space deemed necessary for a household remained essentially constant for the inhabitants of the Mimbres valley throughout the Classic period and Black Mountain phase.

SUMMARY

The Black Mountain phase component at Old Town consists of a roughly 100-room surface structure arranged in perhaps two or more room blocks. A total of five Black Mountain phase rooms have been completely excavated at Old Town (C1, C2, C23, C27, and C28) and five others partially excavated (Rooms C3, C8, C10, C11, and C34) (Figure 6.2). There are at least two distinct Black Mountain phase construction episodes present at the site. The earlier episode dates to an unknown time during the Black Mountain phase. Based on the similarities of wall alignments between rooms in the southern portion of Area C and wall alignments present in room C35 beneath later construction, I believe that these rooms were basically contemporaneous.

The later construction episode was likely very late in the Black Mountain phase. As will be discussed in the following chapters, rooms within this portion of the site contained later ceramic types associated with their living surfaces as well as in their construction material, indicating that some structures were constructed after A.D. 1250. This later occupation could explain why attempts at obtaining absolute dates from deposits associated with the later construction episode have produced rate ranges with relatively lengthy temporal spans. The only absolute dates collected from Black Mountain phase contexts have been archaeomagnetic dates for hearths. The majority of these have been found in what I believe was the later Black Mountain phase occupation. The time period around A.D. 1250 is one where the southwest archaeomagnetic curve loops back over itself. If samples are collected from features dating from ca. A.D. 1225 to A.D. 1300, they will likely have a larger time range (ca. A.D. 1100-1300) that is of little use in distinguishing finer chronological differences (Lengyel and Eighmy 2002).

All of the rooms excavated in the Black Mountain phase component exhibit characteristics that were initially used to differentiate the Black Mountain phase from earlier occupations in the Mimbres area (LeBlanc and Whalen 1980). Based on the available data, all rooms were constructed using a combination of coursed adobe architecture and cobble masonry architecture, and the roofs of these buildings tended to be supported by a two-post roof support pattern. Similarly, when present, all hearths appear to be small circular clay lined hearths. Other features indicative of latter occupations such as such as cobble and slab pavements associated with granaries have also been recovered from the Black Mountain phase occupation.

The Old Town data indicate that the pattern of increasing room size through time originally hypothesized by the Mimbres Foundation (LeBlanc 1983) is true. However, these data do not likely correlate with recognizable social units for later time periods. Data pertaining to the floor area of room suites indicates that the size of Classic period and Black Mountain phase room suites are roughly similar. Thus, while the size of individual rooms appears to have increased through time and reached its maximum during the Black Mountain phase, the space needed by social groups occupying these structures appears to have changed little through time.

Unfortunately, the data are not available to investigate if there were changes in the ways activities were carried out in these spaces through time. In the following chapters I attempt to investigate the changing patterns of technological organization to serve as a proxy measure for the types of activities carried out in the confines in the household. I return to this issue in the final chapter of this dissertation.

Chapter 7: Mimbres Lithic Assemblages and the 2006 – 2007 Assemblages from Old Town

In the following chapter I begin my assessment of Mimbres lithic technological organization. I start with a rather lengthy section concerning different theories of lithic technology. These theories serve as a guide for my later analyses and allow me to characterize the manner in which lithic technology was organized at different sites along the continuum of the Mimbres chronological sequence. I follow this discussion with a comparison of different lithic assemblage collected from excavated sites in the larger Mimbres area. These analyses are limited by the fact that few researchers have conducted an in-depth analysis of lithic materials recovered from sites (but see Dockall 1991 and Nelson 1981). Those analyses that have been conducted focus on different flake and tool attributes and the comparability of these datasets is often limited. Despite this, there are certain characteristics of lithic technology that are capable of being analyzed in a synchronic and diachronic manner with these datasets. I follow these analyses with a discussion of the lithic assemblage recovered from the 2006 and 2007 testing seasons at the Black Mountain phase component at Old Town.

The results of the analyses of Late Pithouse period and Classic period lithic assemblages serve as a base of comparison for the organization of lithic technology during the Black Mountain phase. I view these characteristics as those that structure the organization of lithic technology. As such, they represent the "rules and resources" drawn upon by individuals in performing tasks associated with the manufacture of lithic tools. These rules and resources are transmitted and reproduced generationally. From the perspective of my main research agenda, it is assumed that if new, ethnically distinct, social groups settled an essentially unoccupied area, such as the Mimbres area, then the patterns associated with the "rules and resources" guiding performance would show some form of variability.

Throughout the course of 2006 and 2007 excavations that took place at the Old Town ruin (LA 1113) numerous chipped stone artifacts were recovered. These were analyzed by the author and interpreted in line with fairly standard theoretical perspectives to glean insights into the manner in which lithic technology was organized at the site during the Black Mountain phase. What follows is a brief overview of what I consider to be the "standard theoretical perspectives" that guided my interpretations of the lithic data.

Lithic technology, or "the various processes that contribute to the production of stone tools, including strategies of manipulation and sequencing, knapping equipment, and knowledge of raw materials and operative forces" has been approached in multiple ways since people first began to notice that extinct animals were found in association with stone implements which appeared to have been manipulated by human agency (Odell 2000:283). As stated in Chapter 2, my view of technology is somewhat consistent with the view posited above by Odell (2000) in that I see lithic technology as the rules and resources drawn upon by individuals in shaping stone raw materials into cultural products that are used to meet desired ends. These rules and resources are culturally defined and have a long history of development that dictate the correct manner of performance and sequence of operations to achieve the desired end product. With respect to stone tool production, our knowledge of these operational sequences has come primarily from researchers either studying the processes in societies where stone tools are still used, or by researchers who have developed knapping skills either by apprenticeship with groups still practicing these behaviors or by more competent peers.

During this apprenticeship individuals move from peripheral participant to full participant and acquire an ever-diverse skill set that hones their specific knowledge of the technological system (e.g. the materials used, the gestures needed to perform tasks, how to transfer energy to materials, etc.). While the general setting of this apprenticeship likely differs from settings prehistoric apprentices encountered, it is likely that the operational sequence followed by apprentices either prehistorically or in modern times bore certain similarities. Because of these modern practitioners and their replicative studies, we have gained valuable insights into the lithic reduction sequence used by prehistoric peoples (Bradbury and Carr 1999; Cotterell and Kamminga 1987; Crabtree 1972; Flenniken 1984; Ingbar et al. 1989; Johnson 1978; Johnson 1979; Mauldin and

Amick 1989; Newcomer 1971; Pelcin 1998; Shott 1996; Soressi and Geneste 2011; Speth 1972; Whittaker 1994).

In the following sections I use operational sequences to describe the "culturally and physically patterned way people reduced pieces of stone to useful tools" (Shott 2003: 95-96). While here I apply this notion to lithic technology, it can easily be applied to other aspects of society (i.e. ceramic technology, textile technology, irrigation technology, architecture, etc.). The notion of operational sequences is similar to the notion of the chaîne opératoire as constructed by Leroi-Gourhan (1964) and has even been loosely translated as such (Bleed 2001:105). The chaîne opératoire concept was "designed to identify and describe the material sequence(s) of gestural acts through which natural resources were modified (and re-modified) into culturally useful objects" (Dobres 1999: 129). However, most American archaeologists adhere to a different approach sometimes termed reduction sequence analysis (Bleed 2001; Shott 2003, 2007). There has recently been a resurgence of research outlining the differences that exist between the two approaches [Bleed 2001; Shott 2003; Tostevin 2011a (and papers therein)]. These differences are thought to produce complementary perspectives with chaîne opératoire practitioners embodying a more "emic" approach and reduction sequence practitioners embodying an "etic" approach (Tostevin 2011b). In this simple dichotomy between the two approaches, proponents of chaîne opératoire analyses are thought to be more aligned with an "ethnographic approach" where research is focused on understanding "the cognitive plan of the prehistoric artisan that guided the execution of a technological system" (Andrefsky 2009; Tostevin 2011b:354). In contrast, proponents of the reduction sequence paradigm are seen as pursuing a more "etic" approach which is divorced from understanding overarching cognitive structures and instead favors an outside middle-level or high-level theory to guide interpretation (e.g. technological organization, human behavioral ecology, cultural ecology, etc.) (Tostevin 2011b: 354). Finally, while chaîne opératoire/operational sequence analyses were originally formulated to focus on tool use and discard as well as initial production, in practice chaîne opératoire advocates rarely acknowledge these processes and produce little more than "warmed-over lithic reduction sequences" (Odell 2001: 81; Shott 2003: 100).

Thus, aside from focusing somewhat on cognitive structures, researchers conducting both chaîne opératoire/operational sequence analyses and reduction sequence analyses are essentially studying similar processes (Andrefsky 2009; Shott 2003). As both terms used to describe the different types of analyses implies, researchers using either a chaîne opératoire/operational sequence approach or a reduction sequence approach see lithic reduction as a continuum whereby "the relationship between flake attributes and the process of reduction is predictable" (Bradbury and Carr 1999:106). However, as Shott (2003) notes, while chaîne opératoire analysis "apparently emphasizes process and thereby embraces debris and failures, as well as finished tools," in practice it traditionally is only applied "to tool use and discard" not "to production" (Shott 2003:98-99). In Shott's (2003, 2007) view, this method of analysis is more similar to the notion that sequence models stand in opposition to: stage models. The stage model views lithic reduction as a staged process that can be defined by variability in flake and tool attributes (Bradbury and Carr 1999:105; Shott 1996; Shott et al. 2011). Most analyses that see reduction as a process that occurs in stages separate the different stages so that they represent a useful level of analysis (e.g. early stage biface versus a late stage biface, projectile point types, etc.). However, as researchers have pointed out, deciphering the parameters (i.e. metric measurements and specific stage attributes) of where one stage ends and another stage begins becomes problematic (Bradbury and Carr 1999; Shott 1994, 1996; Shott et al. 2011). This is especially so if one is dealing specifically with the byproducts of tool production (i.e. debitage). As researchers have pointed out, the debitage produced from the later portions of a reduction stage would be indistinguishable from the initial debitage produced from the next successive stage(s) of reduction (Bradbury and Carr 1999; Shott 1996; Shott et al. 2011).

Hopefully it will become fairly obvious that I favor the more American "reduction sequence" model and take active strides to ground my analyses in an organization of technology approach. However, I am interested in the mental, or cognitive mechanisms that guide lithic reduction in specific social settings. In my limited rendition of concepts underlying the chaîne opératoire/operational sequence versus reduction sequence debate outlined above, one of the main shortcomings of the American reduction sequence model is that it tends to lose sight of the individuals who produce the materials being analyzed in favor of other social phenomena that dictate how lithic technology is organized (e.g. mobility strategies, risk management, semiotic signaling, socio-political differentiation, etc.).

Since I am interested in how individuals transmitted cultural norms from one generation to the next, I am inherently interested in aspects of individual agency and cultural transmission. In my mind this view is more aligned with the chaîne opératoire/operational sequence perspective. However, I also feel that there are other social phenomena that influence how technology is organized and thus feel that the American reduction sequence model is also something that needs to be addressed. These social phenomena dictate what is capable of being reproduced generationally as some form of cultural norm that dictates how tool stone is to be reduced. In short, I feel that reduction sequence models provide the reasons why a certain lithic technology emerges and chaîne opératoire/operational sequence models provide the means of its propagation.

In the following sections I develop an abbreviated reduction sequence model as well provide a brief outline of the insights gleaned from studies of lithic technological organization. From here I move into discussions centered on the analyses of the lithic assemblages collected during the 2006 and 2007 field seasons at the Black Mountain phase component at Old Town (LA 1113). I end this section with a limited comparison of Classic period lithic assemblages and Black Mountain phase lithic assemblages in an attempt to elucidate the learning frameworks present during these time periods.

LITHIC TECHNOLOGY OPERATIONAL SEQUENCE

Lithic technology is a reductive technology that, as the term implies, entails the removal of material from a larger stone body to produce a finished item. The steps involved in the production of an item are referred to as its reduction sequence or its operational sequence of manufacture. Here, I present a brief reduction/operational sequence of lithic tools that has helped guide my analyses and interpretations of the lithic assemblages recovered from the 2006 and 2007 field seasons at the Old Town site (LA 1113). This reduction/operational sequence is described below outlines the steps involved in the production of stone tools from the procurement of raw materials through to the finished stone tool itself.

The first step within this lithic reduction sequence is the procurement of raw materials needed to produce lithic tools. As can be imagined, social groups throughout time have gone to considerable lengths to ensure that sufficient tool stone was present to conduct the activities of their daily lives. Despite this truism, there is a relative scarcity of research that has directly addressed tool stone procurement. To date there are generally two models that describe how individuals went about acquiring stone for use in their lithic technology. These two strategies view lithic procurement either as an activity performed for the sole task of obtaining lithic raw materials or as an activity that is accomplished when other tasks are being performed. These two strategies, referred to as direct procurement and embedded procurement respectively, were originally formulated by Binford (1979) who believed that the majority of procurement activities were embedded in other social practices (e.g. subsistence practices, exchange relations, etc.). In typical Binfordian fashion, these strategies are of course related to other social processes. In this case, Binford (1979) relates embedded procurement to curated technologies that "anticipate future needs" of the group and corporate access to the lithic stockpiles acquired to meet these needs (Binford 1979:266-267). Materials procured in this manner are generally used to meet the needs of the group and the activities undertaken with implements produced from these materials can be scheduled around other activities integral to group cohesion. Conversely, direct procurement is only likely to be practiced "in meeting situational contingencies" where "the need for tools is immediate" and the group stockpile has been depleted of adequate materials (Binford 1979:267).

Once adequate tool stone has been procured, the materials must be reduced for either transfer or use. Two types of tools can be produced from the procured material: chipped stone tools and ground stone tools. These two types of tools derive their name from the manner in which the tool is reduced, either by chipping away at the stone mass or by removing materials through abrasion or grinding. Removing material from a mass through the application of force so that the mass fractures in a controlled manner produces chipped stone tools. Conversely, using abrasive materials to remove small amounts of material until a desired form is obtained produces ground stone tools. It should be noted that both reduction by chipping and reduction by grinding could be used to produce a single tool (i.e. Neolithic stone axes which were initially reduced by chipping and finished or polished by abrasion/grinding) (Bradley and Edmonds 1993). Thus, while there are often distinct operational sequences for either ground stone or chipped stone implements, these operational sequences sometimes overlap and tools can enter the operational sequence for another tool type at any point in the sequence's continuum (Conlee 2002; Hayden and Nelson 1981; Searcy 2012; Will 2002; Wright 1992).

For most ground stone tools within the American Southwest, adequate tool stone materials are procured based on their granularity (e.g. fine-grain, coarse-grain, etc.), texture, portability, and durability (Adams 2002a). The method of reduction of these procured blanks differs depending on the intended use of the grinding implement being manufactured. Thus, implements such as a stone palette manufactured from slate or a pottery polishing stone manufactured from chert will experience a different reduction sequence when compared to a through trough metate manufactured from vesicular basalt. Since only traditional ground stone tools (i.e. manos and metates) were recovered from excavations undertaken at the Black Mountain phase component at Old Town (LA 1113), only the reduction/operational sequence associated with these tool types will be discussed further (but see Adams 1989, 1993, 2002a, 2002b, 2005; and Wright 1992 for a discussion of other tool types).

The reduction sequence involved in manufacture of ground stone implements often goes unnoticed in the archaeological record. This is due to a number of factors but is primarily due to 1) the byproducts of pulverizing or grinding by abrasion are often not noticeable in the archaeological record, and 2) other techniques used to produce ground stone implements (e.g. using chipped stone tools) are often misinterpreted as resulting from the production of other tool types (e.g. chipped stone tools) (Conlee 2002; Will 2002; Wright 1992). In some instances, suitable ground stone blanks are present in the immediate area surrounding an archaeological site and can be made functional with little alteration. This is probably the case for a number of ground stone tool types though other tool forms do require some initial alteration to rough out the desired cultural form. This is especially so for areas where stone is quarried as opposed to opportunistically procured.

Hayden (1987) has demonstrated that chipped stone implements were not only used in the manufacture of ground stone tools among extant Mayan groups, but that the initial reduction of manos and metates in the region required the removal of flakes from a quarried mass to begin shaping the blank (Hayden 1987; Hayden and Nelson 1981; Searcy 2012). This demonstrates that, in some instances, ground stone implements were initially reduced by percussion flaking until the artisan attained a rough approximation of the desired form. Once the artisan obtains the desired roughed out form, the implement is further thinned so that it approximates a functional tool. In Hayden's (1987) study, this portion of the reduction sequence included the preparation of the grinding surface and the production of legs around the metate. This was accomplished through percussion flaking as well as through pulverizing/pecking the material into the desired form. The final portion of the reduction sequence in Hayden's (1987) study was the finishing of the ground stone tool. In this portion of the reduction sequence, all of the roughed out and pulverized edges of the metate were abraded so that their surfaces were smooth.

It should be noted that Hayden's (1987) account of mano and metate manufacture represents an ethnographic account of the practice. However, other researchers have found items similar to those used by Hayden's informant at prehistoric quarries (Fowler

1945; Hayden and Nelson 1981; Heyerdahl 1958; Holmes 1897). While no known ground stone bedrock quarry sites are present in the Mimbres area of southwestern New Mexico, it is likely that the ground stone present in the area went through a similar reduction sequence however abbreviated. The presence of metate blank stockpiles at Casas Grandes in Chihuahua, Mexico demonstrates that 1) such quarries were present in the prehistoric Southwest, 2) these blanks were initially reduced off site, and 3) metate production was likely a specialized activity at Casas Grandes (Costin 1991; DiPeso et al. 1974; Van Pool and Leonard 2002).

At present, we are uncertain as to the distribution of these Casas Grandes metates, though we are certain that morphologically similar metates are present throughout large portions of the Prehispanic Southwest. While I do not mean to suggest that the production of trough metates was a specialized activity in areas outside of Casas Grandes, Mexico, I do suggest that some of the ground stone present in these areas followed a similar reduction trajectory beginning with quarrying of a blank followed by their initial reduction by percussion flaking, further thinning by percussion flaking and pulverization/pecking, and finished by the abrasion/grinding of thinned surfaces.

Studies of fracture mechanics have shown that one of the key characteristics of lithic materials needed to produce chipped stone tools is the material's ability to fracture in a conchoidal manner. Generally, these materials are "the more homogenous and isotropic varieties of siliceous stone" that allow flake removal to be controlled through the initiation, propagation, and termination phases of flake formation (Cotterell and Kamminga 1987:677; Domanski et al. 1994). These preferred materials are homogenous in the sense that they are free of severe inclusions, cleavage planes, and internal fractures that could cause failure in the flake formation phases, and are isotropic in the sense that this homogeneity is present throughout the entire mass of the tool stone.

If the chosen tool stone meets these requirements, they can be reduced by applying force to specified locations on the procured stone mass, or core. There are a limited number of ways that force can be applied to a core so that materials are removed in a controlled manner. The most common method of flake removal involves the use of another item, a hammer, to apply force directly to the core. This method of reduction is referred to as direct percussion. Two hammer types can be used in the application of force: a hard hammer whose mass and plasticity is equal to or greater than that of the object being reduced, and a soft hammer whose mass and plasticity are less than that of the core. Other methods or reduction include indirect percussion, where force is applied to an intermediate item before being applied to the stone mass being reduced; bipolar reduction, where the item being reduced is rested on another item before force is applied directly to the object being reduced; and pressure flaking, where force is applied directly to a core by another item (indenter) and flakes are removed by gradually increasing the pressure from the indenter to the core. Some researchers believe that each of these different methods of reduction produce distinctive attributes on flakes (e.g. diffuse bulbs of percussion, wider striking platforms, etc.), though these distinctive attributes can also be produced using other methods (Crabtree 1970; Hayden and Hutchings 1989; Henry et al. 1976; Kooyman 2000; Newcomer 1970; Odell 2003; Whittaker 1994).

INSIGHTS GLEANED FROM LITHIC ANALYSES

The study of lithic technology offers insights into a multitude of social practices. From the perspective of technological organization, analyses of lithic assemblages have been used to make inferences about practices as diverse as mobility strategies, risk management, design optimality, semiotic signaling, and social complexity (Andrefsky 1994; Bamforth 1991; Bamforth and Bleed 1997; Barton 1997; Bleed 1986; Cowan 1999; Daniel 2001; Kelly 1988; Kuhn 1991; Nelson 1991; Odell 1998; Parry and Kelly 1987; Sackett 1982; Schriever et al. 2011; Shafer an Hester 1983; Tomka 2001; Torrence 1983; Weissner 1983). Technological organization in this sense refers to the larger "economic and social variables that influence" the "strategies of making, using, transporting, and discarding tools and the materials needed for their manufacture and maintenance" (Nelson 1991:57). These social and economic variables are dependent upon conditions that are present in the natural environment including the distribution and predictability of a particular resource (Nelson 1991). Often, many of these social phenomena are intertwined such that the organization of lithic technology in a particular social system is a direct response to multiple social and environmental influences.

The beginning of the operational sequence for lithic technology will generally begin with the selection of a raw material with suitable properties that allow for flake formation and flake removal (Cotterell and Kamminga 1987). Generally these materials will be of a fine enough grain and will be free of severe inclusion, voids, and naturally occurring cleavage planes to allow the knapper to control flake removal through the initiation, propagation, and termination stages (Amick and Mauldin 1997; Domanski et al. 1994). These conditions will ensure that the individual knapper has the ability to produce a tool that meets the necessary criteria needed to successfully perform a task (Nelson and Lippmeier 1993: 286-287). As this statement implies, a preconception of the future tool's use is a determining factor in the selection of material used in its manufacture. Other technological constraints will likewise be contributing factors in the selection of adequate materials (Bleed 1986; Kelly 1988; Nelson 1991; Parry and Kelly 1987).

Design Optimality of Lithic Tools

The design characteristics of the lithic technology used by a social group plays a role in determining the general manner in which the technology is organized. Researchers interested in these aspects of lithic technological organization generally note that at least two design options can be implemented within a social system: reliable designs and maintainable designs (Bleed 1986; Nelson 1991). Both of these design systems respond to the patterning of resources in a particular environment. Generally reliable designs are best suited for environments where resources are distributed in an unpredictable manner. In these situations tools must function when needed because the risk of failure is high due to an uncertain resource encounter rate. Tools designed to enhance their reliability tend to be "overdesigned" in that they are "sturdy" to ensure they function when needed (Bleed 1986:739-740). If a tool does fail when needed, reliable tool design systems incorporate other tools that can function in a similar manner to ensure successful exploitation of the resource in question. Reliable tools tend to be manufactured and maintained prior to their intended use (Bleed 1986:739-741). This ensures that when the resource in question becomes available, that it can be successfully exploited. Conversely, maintainable tools are better suited for exploitation of resources that are predictable in both the timing and the location of their occurrence. Usually each component of a maintainable tool design system is engineered to perform a specific task and these components are often modular in design to allow for easy replacement when part of the tool system fails (Bleed 1986:740-741).

Mobility Strategies and Lithic Technology

Studies dealing with how group mobility influences lithic technological organization have demonstrated that reduction trajectories differ substantially depending upon the duration of a site's occupation. Thus, people occupying an area for a short amount of time tend to organize their lithic technology differently from groups who occupy an area for an extended period of time. These studies show that settlements occupied for a long duration tend to contain a more diverse array of lithic artifacts indicating that a varied set of behaviors took place at these locations. Conversely, sites occupied for limited durations tend to contain a less diverse array of tool types indicating that the activities which took place at these locations were not as varied as those of the long-term occupations (Bamforth 1991; Cowan 1999; Nelson 1991). This pattern relates directly to the transport costs of stone tools and stone raw materials. If groups move frequently, they tend to organize their technology so that artifact transportability is accentuated (Kelly 1988; Shott 1986; Torrence 1983). In these scenarios tools that are able to perform multiple tasks are often chosen over a very specialized tool kit with more technological units. Thus only one tool capable of performing the same tasks as multiple specialized tools needs to be transported from camp to camp (Nelson 1991; Shott 1986).

While studies demonstrate that the diversity of tools present in a given social systems responds to group mobility, researchers are often quick to point out the type of mobility employed by a group also plays an important role in the ways people organize their technologies. Binford's early formulation of the forager and collector concepts carried expectations for the utilization of tool stone based on its availability as well as the types of activities that took place at a site (Binford 1980). Generally, an expedient technology will be practiced in areas where raw materials are abundant and resources are homogenously dispersed and predictable. This type of technological organization favors Binford's forager concept that "moves consumers to goods with frequent residential moves" (Binford 1980:15). This system of mobility relies on the predictability of resources in both time and space in order to schedule the residential moves. If such conditions exist, these groups tend to "map onto…critical resources within the foraging range of the residential base camp" (Binford 1980:15). One of the primary critical resources mapped onto by such groups would have had to have been adequate tool stone that was present in sufficient quantities to ensure all the activities that took place at both the "residential base camps" as well as "locations" would be successful and not prone to failure (Binford 1980:9). Where raw materials are scarce and resources are likewise distributed in an unpredictable patchy manner, a curated technology is likely to be practiced (Binford 1979, 1980). This scenario favors Binford's collector concept that "moves goods to consumers with fewer residential moves" (Binford 1980:15).

As the statements above infer, group mobility somewhat dictates what technological strategy will be implemented by a group, but the distribution of tool stone also influences group mobility and the technological organization of a group. The availability of suitable raw material is an important factor influencing the technological strategy used by social groups (Amick and Mauldin 1997; Andrefsky 1994; Binford 1979, 1980; Brantingham and Kuhn 2001; Gould and Saggers 1985; Nelson 1991; Parry and Kelly 1987; Roth and Dibble 1998; Wenzel and Shelley 2001). A different technological strategy would be implemented in areas where suitable raw materials were present throughout the landscape when compared to an area where suitable raw materials were present in only a few select localities (Andrefsky 1994; Brantingham and Kuhn 2001; Daniel 2001; Kuhn 1991). Likewise, if a group were planning to stay at an area for a prolonged period of time they would most likely choose an area where sufficient quantities of lithic raw materials were present. This would ensure that the group occupying this area would have an adequate supply of materials to carry out the varied set of behaviors associated with long duration encampments (Andrefsky 1994). Scheduling the establishment of these encampments around a supply of tool stone would ensure that the group would not deplete their lithic tool kit and would allow them to refurbish their tool stone reserve for the next series of logistical or residential moves (Daniel 2001; Jones et al. 2003).

Knowledge of where tool stone outcrops plays an important role in determining not only how and where people move but also partially influences reduction trajectories as well. At a gross level, reduction trajectories are often classified as either curated or expedient technologies. As stated above, Binford's forager and collector concepts carried expectations for how groups would organize their lithic technology based on the distribution and predictability of resources in the environment (Binford 1979, 1980). These phenomena are seen as factors that influence not only group mobility but also how groups perceive the risk associated with a resource's procurement.

Using this line of rationale, Parry and Kelly (1987) conducted a comparative analysis of various groups practicing different mobility and subsistence strategies. Their research showed that there were correlations between sedentary populations and expedient technologies, as well as between groups practicing maize horticulture and using an expedient technology (Parry and Kelly 1987).

Recently this simplistic dichotomy of expedient and curated technologies has come to the forefront of discussions concerning the organization of lithic technologies (Andrefsky 2008, 2009; Bamforth 1986; Nash 1996; Odell 1996). Many researchers now view curation along a spectrum that reflects a "tool's actual use in relation to its maximum potential use" (Andrefsky 2009: 71). Thus all tools are located along a spectrum ranging from low to high use in relation to maximum potential use. Despite this reformulation of the curation concept, researchers agree that there are multiple factors that influence lithic technological organization, reduction strategies, and tool use. Some of these factors are discussed below.

Risk Management and Lithic Technology

Often, lithic technologies, and arguably other technologies as well, are seen as ways of managing risk (Bamforth and Bleed 1997; Bousman 1993, 2005; Macdonald 2008; Nelson 1991, 1996; Torrence 1983). In these situations, risk is seen as the probability of failure and the costs associated with, or magnitude of, such failure (Bamforth and Bleed 1997:112; Bousman 1993:65; Nelson 1996:108; Torrence 1989:58-60; Torrence 2001:77). The majority of anthropological studies that address risk focus on the social mechanisms that groups rely on to relieve the threat of emerging subsistence stress (e.g. Minnis 1985, 1996; Weissner 1982). From these perspectives, mechanisms such as resource pooling, storage, distribution practices, mobility, and the establishment and maintenance of social networks are seen as responses to risk that arise to ensure that the probability of loss or failure is mitigated (Binford 1979, 1980; Butzer 1988; Minnis 1985, 1996; Weissner 1982). In most of these scenarios, risk is mitigated by distributing either resources or resource encounter rates so that both the probability of failure and the cost of failure associated with subsistence activities is dispersed and some resources are available even in the leanest of times. As Torrence (2001) notes, most of these social mechanisms of risk mitigation involve fairly long time scales (i.e. weeks, months, and/or years) and buffer both the probability and cost of failure over these durations (Torrence 2001:77). Certain technological mechanisms of risk mitigation such as lithic industries operate on smaller time scales in situations where resources are in some cases only present for minutes.

From the perspective of lithic technology, risk is reduced by ensuring that sufficient tools are present to obtain a resource and that these tools will not fail when needed (Bamforth and Bleed 1997; Bousman 1993, 2005; Macdonald 2008; Nelson 1991, 1996; Torrence 1983, 1989; Ugan et al. 2003). These criteria, referred to as reliability and maintainability (Bleed 1986), and others, are often design characteristics groups employ in their lithic technology. The majority of studies dealing with risk as it relates to lithic technology have focused more on the probability of loss and therefore see lithic technology as responding more to successful capture and rarely assess the costs of failure beyond relative terms (Bamforth and Bleed 1997). These studies unintentionally make it seem as if technologies solely respond to circumstances where the cost of failure is high and that activities with low-failure costs are of little importance to group decision making strategies. However, as Bamforth and Bleed (1997:117) and others (e.g. Torrence 1989) point out, costs will differ depending on the contexts in which actions are carried out. For instance, the cost of failure in hunting endeavors would be relatively low if the majority of a group's sustenance is obtained from cultigens. However, if the cultigens fail due to unforeseen or unforeseeable circumstances (e.g. drought, disease, etc.), the cost of failure associated with the unsuccessful hunting endeavor will increase dramatically (Bamforth and Bleed 1997:117; Torrence 1989:64).

For these reasons modeling risk or other technological behaviors becomes a somewhat tricky enterprise and as researchers have noted, it is best suited for situations where "environmental constraints, and most particularly the climate of risk, are quite strict and where a restricted range of solutions is viable" (Torrence 2001:75). Despite this recognition, studies of risk minimization have generated a few generalizations that are applicable across cultures. Perhaps the most cited study of risk minimization is Torrence's study of the concept as it relates to global variation in latitude (Torrence 1983, 1989, 2001). In her view, risk increases as both the seasonality and abundance of resources decreases and the mobility of resources increases (Torrence 1989, 2001). As Torrence notes, "failure costs, and therefore the level of risk, increase toward the poles because the availability of food decreases with longer winters and there are fewer alternative resources because species diversity has an inverse relationship with latitude" (Torrence 2001: 79). With increases in risk, groups should invest more time in technologies to ensure that the probability of loss in subsistence quests is lessened. This investment, in Torrence's view, leads to highly structured tool kits that allow individuals to successfully capture resources that have a high probability of loss (Bamforth and Bleed 1997; Torrence 1983, 1989, 2001). Thus, when the probability of loss (risk) is high, people will invest in developing a more diverse tool kit with highly specialized tools that increase the potential of successful capture (Torrence 1989).

Structure in this sense refers to the composition, diversity, and complexity of the tool kit used by groups in their subsistence endeavors (Torrence 1983, 1989, 2001). The composition of a tool kit merely refers to the functional categories of tools commonly used by a group to meet various ends (e.g. end scraper, knife, projectile point, etc.), diversity is simply a measure of the different types of tools present in an assemblage, and complexity refers to "the number of parts per tool or the number of components in a tool kit" (Torrence 1983:13). Each of these structural phenomena varies in relation to a group's subsistence base. The composition of a group's technology will vary in relation to the distribution and predictability of that group's subsistence base. These criteria, distribution and predictability, directly influence a resource's search time (time spent locating a resource) and pursuit time (the time from initial location to procurement). Torrence (1983) argues that technology is used to minimize both but is better suited for mitigating pursuit time. Generally, as either search time or pursuit time increases so too does the composition of a group's technology. However, as Torrence (1983, 1989) notes, this is not always the case and the composition of a technology will also vary depending of the type of resource being sought (e.g. terrestrial, aquatic, etc.) as well as the mobility of this resource (e.g. highly mobile or stationary). Thus, the composition of a technology, while potentially positively correlated with search time and pursuit time, is a relatively weak proxy measure of the severity of risk associated with subsistence practices when compared to the diversity and complexity of hunting technologies.

Unlike the composition of a technology, the diversity of a technology appears to be positively correlated with the severity of risk associated with subsistence practices (Torrence 1983, 1989, 2001). Thus, as the severity of risk increases so too does tool kit diversity. This pattern is brought about by the fact that highly specialized tools designed with a limited number of functions in mind are necessary to procure and process resources when they are available. These specialized tools are more efficient than generalized tools and it is possible that multiple specialized tools will be needed to minimize risk associated with a single activity (Torrence 1983:13, 18; 2001:79-80). These patterns are generally responses to resource availability and specialized tool kits tend to be adaptations to situations where a limited number of resources are available and where these resources are only available for a limited amount of time. In these situations, risk is minimized by "increasing the technological component of subsistence practices" by "devising highly efficient, special-purpose tools for each of the small number of tasks involved" (Torrence 1983:18).

In contrast to the case for the presence of specialized tool kits, generalized tool kits tend to represent adaptions for areas where the range of potential resources is relatively large at any one point in time. In these situations, "it would be difficult to transport a tool kit specialized for the pursuit of each species" and would be more efficient to carry a tool kit "capable of capturing a wide range of resource types" (Torrence 1983:18). Thus, as risk increases due to either the number of available resources, the seasonality of a resource, or the mobility of a resource, one can reasonably expect groups to diversify their technology and begin investing time in developing specialized tools specifically designed to procure these resources successfully. This will lead to a tool kit which contains a more diverse array of types than tool kits used by groups who live in areas where the number of resources and their seasonal availability are not as limited. If multiple resources are available at any one time for an extended period, groups will likely invest more time in designing a generalized tool kit that would allow group members to procure multiple resources as they are encountered.

Similarly, tool complexity also shows a strong positive correlation with increasing risk (Torrence 1983, 1989, 2001). As stated above, complexity refers to the "number of technounits that create a finished artifact" (Torrence 1983:19). Like tool kit diversity, tool kit complexity is thought to respond to increased seasonality. In these scenarios, a complex tool that incorporates many working parts is adaptively advantageous in that it increases the likelihood of successful resource capture. The time spent in designing such an implement ensures that it functions when needed and is easily refurbished if one part of the system fails. Torrence (1983, 1989, 2001) notes that, like tool kit diversity, artifact complexity increases with latitude. She interprets this pattern to indicate that the pursuit of higher risk resources at higher latitudes requires the use of complex tools to mitigate the probability of failure in subsistence activities. She argues that, like tool kit diversity, complex artifacts are used to lessen search and pursuit time, but are also used to lessen handling time by aiding in the retrieval process in high latitude areas.

Based on the above observations, it appears that certain aspects of lithic technology are organized to reduce the risk associated with subsistence activities. Specifically, for Torrence (1983, 1989, 2001) both tool kit diversity and tool complexity appear to be sensitive indicators of increasing risk associated with subsistence pursuits. While Torrence believed that these aspects of technology appear to be correlated with increases in latitude, and thus increasing seasonality and mobility of resources, other researchers have noted that risk in subsistence pursuits is not solely limited to the increased seasonality and mobility of resources in high latitude area and that groups all over the world shift from "risk-prone" to "risk-adverse" strategies as environmental conditions and resource availability dictates (Bousman 1993:65). As these researchers note, all groups shift their long-term and short-term strategies based on the seasonality of a resource, the abundance of resources, and the predictability of resources (Bousman 1993:66-67; 2005). In these circumstances, design characteristic of lithic technology other than tool-kit diversity and complexity appear to respond to group perceptions of subsistence risk, though "functional requirements and manufacture/maintenance patterns" are also conditioning factors (Bousman 2005: 197; Nelson 1996).

As Bousman (1993, 2005) and Nelson (1996) note the design characteristics of a given technology tend to respond how groups organize their subsistence practices. For Nelson (1996) technological strategies vary according to whether groups engage in specialized subsistence practices or diversify their resource base. Groups who have specialized their resource base are viewed as those who obtain the majority of their nutrients from a very limited number of resources. Generally, these are groups who practice monoculture and augment the returns of this subsistence practice by limited hunting and gathering of specific resources. Groups who undertake this subsistence strategy "use a variety of reliable, specialized, efficient tool forms" that may necessitate substantial investment to produce (Nelson 1996:120). For Nelson, these "reliable, specialized, efficient" tools consist of "relatively large, thick, sloping shoulder, wide-based, and wide-stemmed points which are not made from glasses or dense rock" and other specialized tools that accentuate reliability and use-efficiency (Nelson 1996:119, 124). Groups practicing this form of subsistence would tend to have a "diverse tool-kit of specialized forms" (Nelson 1996:124).

In contrast, groups that diversify their resource base are those that increase the inventory of wild resources into their subsistence practices. While these groups may be horticulturalists, they do not receive the majority of their resource returns from a single resource or limited number of resources. As Nelson (1996:121) notes, "diversifying strategies favor variety over intensity." This diversification of the resource base can be accomplished by adding crops to the inventory of those that are cultivated or by hunting and gathering a more varied set of resources. Groups that practice a diversifying strategy rely on a "reliable, versatile, and portable tool-kit" that evidences "less production investment" than the reliable, specialized tools used by those practicing a resource specialization strategy (Nelson 1996:123). Groups practicing a diversifying strategy tend to contain a tool-kit that incorporates small projectile points with barbed shoulder and loose hafts that are "made on flakes with few reduction steps" and other tools that accentuate tool "reliability, versatility, flexibility, and portability" (Nelson 1996:123, 124).

While Nelson (1996) acknowledges that subsistence practices are also informed by the "settlement and social strategies" present within a social system, she does not directly address how these phenomena influence the patterned variability in the archaeological record (Nelson 1996: 121). Building from the work of researchers interested in design optimality, Bousman (1993, 2005) notes that technological strategies that accentuate the reliability of a tool-kit tend to respond more to the costs associated with failure and that groups who tend to maximize the maintainability of a tool-kit respond more to the probability of failure (Bousman 2005:196). These phenomena are related to issues brought out by both Torrence (1983, 1989, 2001) and Nelson (1991, 1996) and are related to time spent investing in the design and manufacture of technological aids. If the costs of failure are high, groups will tend to invest more time and energy accentuating the reliability of an implement. Conversely, if the costs of failure are lower, "the manufacturing and maintenance costs of tools may have a greater role in determining technological strategies" (Bousman 2005:196). In these instances, which likely resemble Nelson's diversifying strategy, groups will tend to design generalized tools that can be applied to multiple tasks and are easily refurbished to reduce the probability of failure. In these situations groups who focus more on tool-kit reliability are seen as pursuing a strategy that maximizes resource return and groups that focus more on tool-kit maintainability are seen as interested in minimizing the time spent in tool manufacture and maintenance (Bousman 2005:196).

To begin to place these patterns into a social context Bousman (2005), citing Binford and Binford (1966), separates tool use into two categories: extractive tools, those used in the "direct exploitation of environmental resources"; and maintenance tools, those used in meeting the "nutritional and technological requirements of the group" (Binford and Binford 1966:291). Based on a limited ethnographic data set, Bousman (2005) suggests that hunter-gatherer groups generally employ two strategies of tool use and maintenance. These two strategies are related to mobility practices with residentially mobile groups extensively repairing their extractive tools and using expediently produced maintenance tools; and logistically mobile groups producing reliable extractive tools that are "replaced rather than repaired" and who use highly curated maintenance tools "that are repaired until exhausted and their utility fully depleted" (Bousman 2005:197). Bousman (2005), citing Kuhn (1989), believes that the "replace-before-failure" strategy used by hunter-gatherer groups is one way to reduce the cost of failure associated with resource procurement. In contrast, when the probability of failure is high, groups will use and refurbish their extractive tools until they are exhausted (Bousman 2005:197).

If we follow Bousman's rationale, it would appear that residential mobility would be an advantageous adaptation to situations where the probability of failure is high and that logistical mobility would be adaptively advantageous to situations where the costs of failure are high. This leads to the possibility of different groups employing diversely different technologies to meet the varied ends of everyday life. These different technologies respond to vastly different life-ways that appear to represent adaptations to the risks associated with subsistence practices. Through these actions people unwillingly create situations where particular technologies can come to be seen social markers in that one group's technological adaptation can be seen as distinct from another group's technological adaptation. These situations are at the center of issues pertaining to style and technological aids.

LITHIC TECHNOLOGY SUMMARY

The discussion of insights gleaned from lithic analyses demonstrated that there are generally two agreed upon methods of organizing lithic technology that correspond to different design strategies. Following Nelson (1996) I term these specialized and generalized design strategies. As shown in Table 7.1 these two design strategies are differentiated from one another based on the performance characteristic that is accentuated, the distribution of exploitable resources, when lithic tool production takes place, the relative use of tools in relation to their maximum potential use, group mobility, the type of tool kit present, the investment in production of this tool kit, the risk the tool kit responds to, and the relative use of extractive and maintenance tools.

Based on the data presented in Table 7.1, lithic technologies with a specialized design strategy are those that focus on accentuating reliability so that tools function when necessary. These tools are used to acquire resources that are unpredictable and must function when necessary. Because groups who tend use this technological design strategy focus on resources that are unpredictable, these tools are designed to minimize the cost of failure. This is accomplished through developing a series of specialized tools that are manufactured prior to their intended use. Similarly, the unpredictability of the resource base, coupled with the specialized tool design, usually means that there groups tend to focus on a limited number of resources for their sustenance. When the resources in an area are exhausted, groups implementing this design strategy tend to move to where other resources are available. Finally, because tools with a specialized design strategy

Table 7.1: Characteristic of different lithic technology design strategies.

	Design Strategy	
	Specialized	Generalized
Performance Characteristic	Reliability	Maintainability
Resource Distribution	Unpredictable	Predictable
Production	Prior to Use	As Needed
Tool Use	Curated/High	Expedient/Low
Group Mobility	Relatively Mobile	Relatively Sedentary
Tool Kit Type	Diverse/Specialized	Simple/Generalized
Resource Base	Limited	Large
Production Investment	High	Low
Respond to	Failure Costs	Failure Probability
Extractive Tool Use/Design	Highly Curated	Highly Expedient
Maintenance Tool Use/Design	Expedient	Curated

are manufactured prior to use so that the cost of failure is minimized, more investment in production is usually given to tools of this design category. Because of this high investment cost, the tools used to extract resources from the environment experience more use than tools used to process raw materials into finished products or to process materials obtained with extractive tools.

In contrast to a lithic technology that focuses on a specialized design strategy, lithic technologies that implement a generalized design strategy focus on accentuating tool kit maintainability. Groups implementing this design strategy usually inhabit an area with a predictable and large resource base to exploit. In order to exploit this diverse resource base tools are produced quickly as needed and are usually only used for a short period of time. Thus, the tools manufactured in this design system tend to be fairly simple and are designed to be used to meet a variety of ends. As a result, tools used to extract resources from the environment see relatively little use when compared to tools used to process resources and maintain technological systems. Groups implementing this design strategy tend to be relatively sedentary due to the diverse and predictable resource base near settlements. Because tools with a generalized design are used as needed, their design is a response to the probability of failure rather than the cost of failure.

Most researchers differentiating these various characteristics of specialized and generalized design systems treat them as if they are distinct to particular types of social organization. However, as discussed below, I believe that both can exist in the same social system depending on the type of resource being sought. Thus, the same social group can have a lithic technology that exhibits both a specialized design system as well as a generalized design system depending on the distribution and predictability of resources in their diet.

MIMBRES VALLEY LITHIC ASSEMBLAGES: INTER- AND INTRA-SITE COMPARISONS

During the 2006 and 2007 field seasons a total of 3,447 pieces of lithic debitage were recovered from testing and excavations conducted in Area C at the Old Town Ruin. These pieces of debitage were analyzed in a manner outlined by Shott (1994). The method of analysis advocated by Shott (1994) consists of a minimum attribute set for individual flake analyses and takes into account both staged and continuous forms of variation in flake attributes. Shott (1994) notes that lithic analysis "requires a minimum set of attributes not linked by assumption to particular knapping behaviors…that impart a maximum of information with a minimum of effort" and "should include only those (attributes) that are especially informative of variation in reduction processes and tool curation" (Shott 1994:79). This minimum attribute set was primarily established in efforts to guide archaeologists to collect data that would allow for comparisons between assemblages analyzed by different researchers, though other issues, such as the stage/continuum debate, were also influential concerns (see above). The minimum attribute set established by Shott (1994) consists of measurements of weight, cortical variation, dorsal scar count, platform angle, platform class, condition, raw material, and size grade (1994:79-81). Figure 7.1 depicts many of the variables comprising Shott's (1994) minimum attribute set. Each of these attributes were recorded for the lithic assemblages collected during the 2006 and 2007 field seasons within Area C at the Old

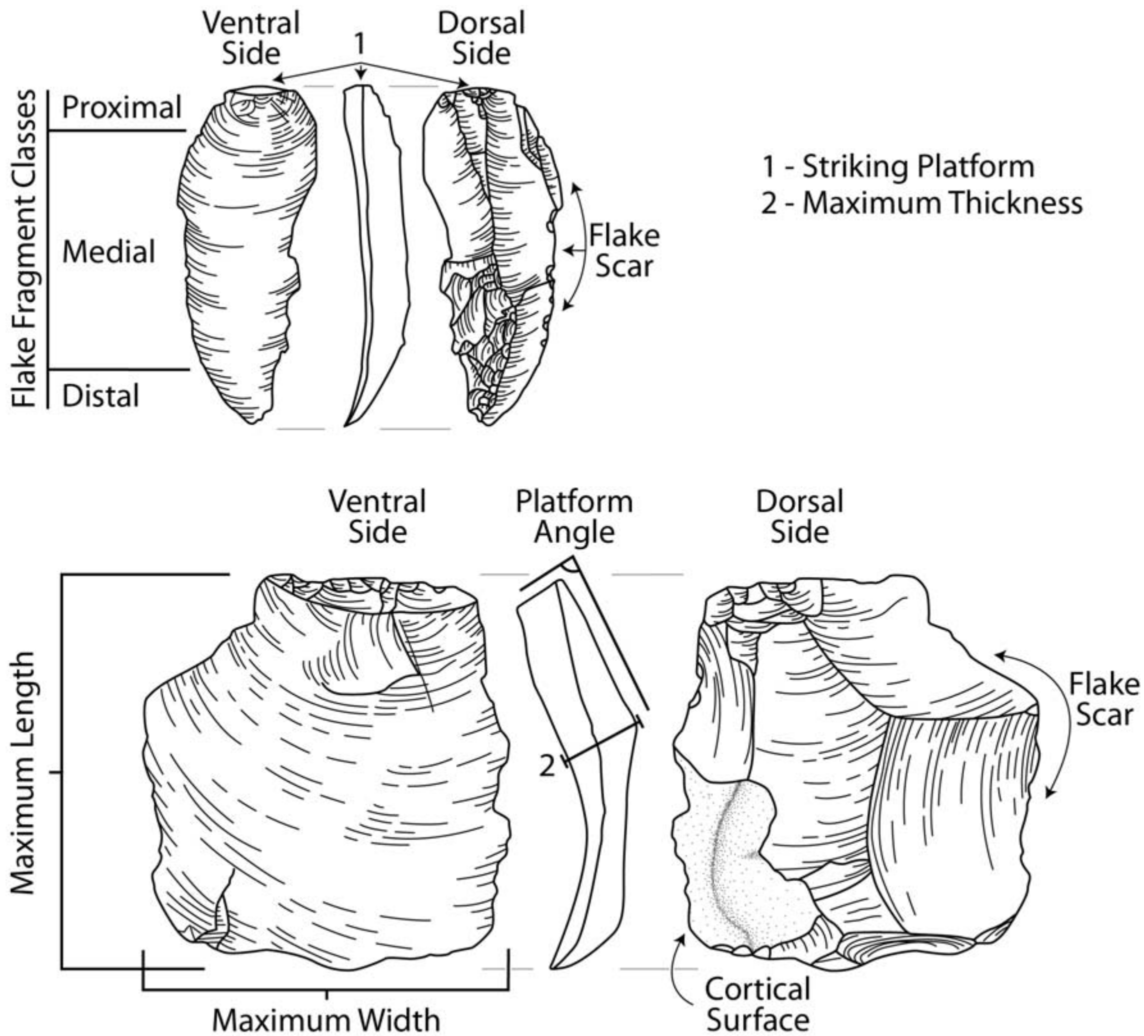

Figure 7.1: Some of the variables associated with Shott's (1994) minimum attribute set and how these were recorded for the current analysis (after Andrefsky 1998).

Town ruin and will be discussed further below. While size grade is aimed at characterizing the overall dimensions of an individual flake, measurements of maximum length, maximum width, and maximum thickness were also recorded for the 2006 and 2007 debitage assemblages.

Analyses were conducted by carrying out a series of statistical tests that measured the probability that assemblages recovered from different contexts were drawn from the same sampling universe. For nominal and interval scale data (e.g. cortical variation, dorsal scar count, platform class, flake condition, raw material type, grain size, and size grade), Chi-square ($\chi 2$) tests and Fisher's exact tests were carried out. The decision of which statistic to use was based on the sample sizes of phenomena being compared. If it was shown in the Chi-square statistic that expected values were less than five then Fisher's exact tests were performed. In some instances however, this shortfall with the Chi-square statistic was overcome by implementing a resampling strategy using Monte Carlo simulations. In general these tests were chosen due to the uncertainty of the distribution of the data. Because both the Chi-square statistic and the Fisher's exact test do not assume that data is normally distributed, these tests provide adequate estimations of sample similarity. The majority of these statistical tests were carried out using the Tool for Quantitative Archaeology software package (Kintigh 2006).

For the Fisher's exact tests, contingency tables were configured so that only one variable was measured between assemblages. This was accomplished by establishing the variable being measured in one column and the remainder of the assemblage from an analytical unit in another. The set up for the 2X2 contingency tables can be expressed as:

	Raw Material 1	Assemblage Remainder	
Room/Site 1	a	(T1-x)	T1
Room/Site 2	b	(T2-y)	T2
	a+b	(T1-a)+(T2-b)	T1+T2

Where "a" represents the frequency of Raw Material 1 in the Room/Site 1 assemblage, "T1" represents the total number of flakes recovered from Room/Site 1, "b" represents the frequency of Raw Material 1 in the Room/Site 2 assemblage, and T2 represents the total number of flakes recovered from Room/Site 2. Thus the contingency table measuring the proportion of andesite/basalt flakes within the assemblages recovered from room C23/C28 and C27/C34 would be expressed as:

	And/Bas	Remainder	
C23/C28	358	426	784
C27/C34	150	120	270
	508	546	1054

Finally, it should be noted that all information presented in the following sections displaying the results of Fisher's exact tests represents the two-tailed probability of the test statistic.

For data organized at the interval scale (e.g. weight, maximum length, maximum width, maximum thickness, and platform angle), statistical tests were carried out using a Wilcoxan rank sum statistic. Again this test was used do the fact that the data present for comparison were not normally distributed. The Wilcoxan rank sum statistic is similar to a pairwise Student's T test, but is used for comparing non-normally distributed data. These tests were carried out using the JMP 10 statistical software package.

Inter-Site Comparisons

As stated above, lithic raw material variability often conditions the ways a particular raw material is capable of being reduced. Because adequate tool stone, both adequate in quality and quantity, is necessary for many aspects of prehistoric daily life, groups often structure their social organization so that these resources are present when needed. In the Mimbres area, there is sufficient tool stone present in the local alluviums along the drainage basins as well as in the surrounding geological formations to ensure that groups were near sufficient raw materials to produce the technological aids needed in their daily activities. Because the majority of the surrounding geological formations resulted from Tertiary period volcanic activities, there is no shortage of igneous rocks in the surrounding landscape. This is reflected in the local prehistoric lithic assemblages by the overwhelming presence of debitage struck from coarse-grained rocks of igneous origins (e.g. basalt, rhyolite, and andesite). Because the area was subject to extensive volcanism, hydrothermal sedimentary rocks (e.g. chalcedony) are also common. Chert, a sedimentary cryptocrystalline rock, is also present locally, though erodes out from earlier marine sedimentary deposits which underlie the extensive Tertiary period deposits in the region. Finally, obsidian, the only non-local raw material common to the region's prehistoric lithic assemblages, outcrops roughly 90 kilometers northwest (Mule Creek and Cow Canyon source groups), north (Gwynn Canyon source group), and south (Antelope Wells and Sierra Fresnal source groups) of the Mimbres River Valley. Thus the raw materials present in prehistoric lithic assemblages recovered from the Mimbres area tend to mirror the frequency of raw materials in the local environment with igneous rocks (basalt, andesite, and rhyolite) being most common followed by those derived from hydrothermal processes (chalcedony), sedimentary processes (chert), and lastly non-local volcanic glass (obsidian).

While this may be so, there could also be selective pressure exerted on technological systems by the overarching social structure or by individual preference that would dictate which raw materials were to be chosen to meet particular ends. Of the many lithic analyses conducted on assemblages recovered from tested sites in the Mimbres area, most record some information pertaining to the assemblages' raw material variability. Perhaps one of the most important qualities inherent in tool stone variability is its grain size. This quality effects both the tool stone's isotropy and homogeneity with these qualities increasing with decreasing raw material grain size. Thus fine-grained materials tend to be more isotropic and homogenous than coarse-grained materials. Conversely, while most studies tend to record some information on raw material grain size, fewer record information on the actual rock types used by the sites' inhabitants in their lithic technology. Because most studies tend to collect data pertaining to some level of raw material variability present in tested sites' lithic assemblages, these data can be used to investigate raw material procurement strategies both across space and through time.

In order to determine the synchronic and diachronic patterns of raw material procurement strategies within the larger Mimbres area, a series of statistical tests were carried out that measured both the relative proportions of tool stone grain size and raw material type across time periods and between site occupations. The first of these series of comparisons looked at the distribution of coarse- and fine-grained raw material types across time periods in the Mimbres area. These data were compiled from published sources (e.g. Diehl and LeBlanc 2001; Dockall 1991; Nelson 1984, 1986; Schriever 2002; Schriever et al. 2011) and includes information derived from the Early Pithouse period McAnally site; the Late Pithouse period and Classic Period occupations of the Galaz and NAN Ranch Ruins; the Classic Period occupation of the Mattocks site; the Salado period occupations of the Janss, Stailey, and Disert sites; as well as data obtained from the 2006 and 2007 field seasons at the Black Mountain phase component of the Old Town ruin. For the present study flakes struck from basalt/andesite cores and rhyolite cores were considered coarse-grained materials and flakes struck from chert, chalcedony, and obsidian cores were considered fine-grained materials. The number of flakes belonging to each grain size category present at the different site occupations is presented in Table 7.2 and the proportion of coarse- and fine-grained materials by temporal period is depicted in Figure 7.2. Tallies for discrete temporal spans (e.g. Early Pithouse period, Late Pithouse period, etc.) were obtained by adding similar temporal occupations of different sites listed in Table 7.2. For instance, the number of coarse- and fine-grained materials recovered from Classic period contexts were derived from the sum of materials present in Classic period contexts at the Mattocks, Galaz, and NAN Ranch ruins. All data in Table 7.2 with the exception of tallies from the Florida Mountain site were used to calculate the number of coarse- and fine-grained flakes present within assemblages associated with separate temporal spans of the area's cultural chronology.

The results of these analyses demonstrate that there are more differences than similarities between different temporal occupations and between different sites with regards to the overall texture of their respective lithic assemblages. The Chi-square statistics demonstrated that the Early Pithouse period assemblage and Black Mountain phase assemblage ($\chi2 = 0.3849$, df = 1, p = 0.5349) and the Late Pithouse period assemblage and the Classic period assemblages ($\chi2 = 0.4596$, df = 1, p = 0.4978) were the only paired assemblages drawn from different time periods that were likely to have been drawn from the same sampling population at the 95 percent confidence interval.

Table 7.2: Number of flakes struck from cores of different textures recovered from contexts dating to specific time periods.

	Coarse	Fine	Total
Early Pithouse	2297	641	2938
Late Pithouse	7469	3167	10636
Classic	10397	4326	14723
Black Mountain	2717	730	3447
Cliff/Salado	10344	19153	29497
Total	33224	28017	61241

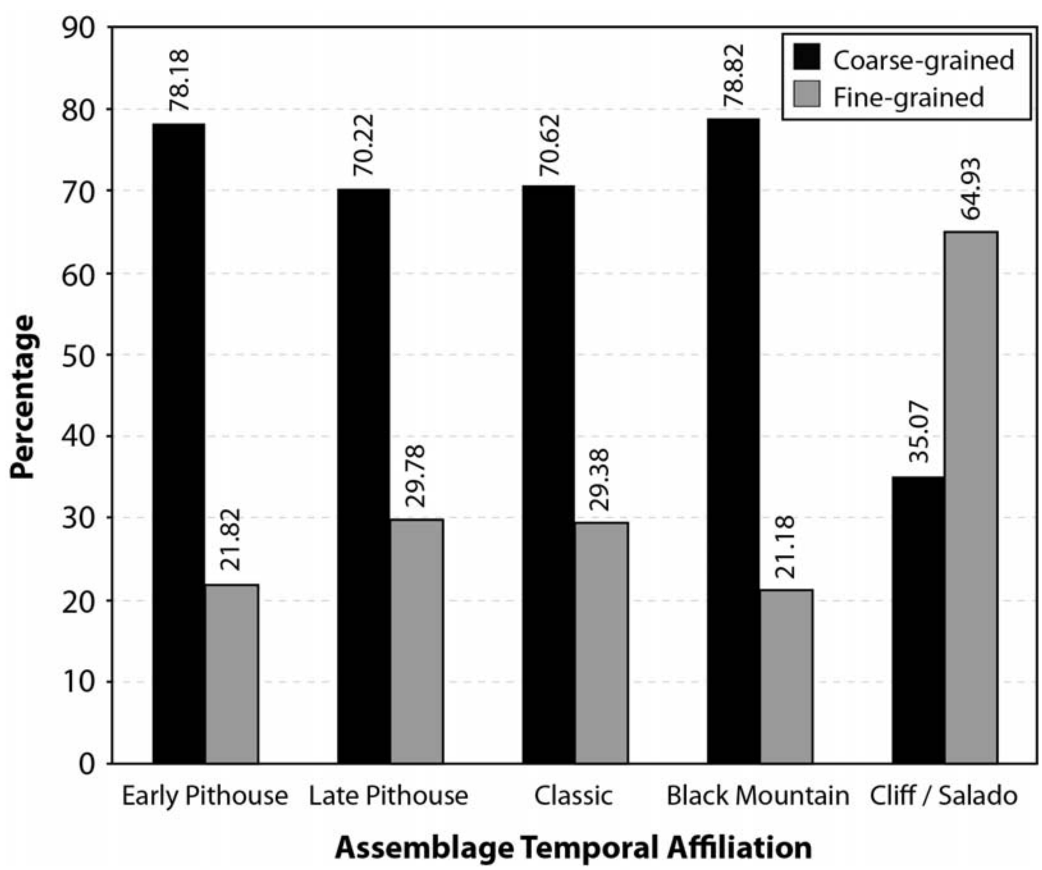

Figure 7.2: Percentage of flakes struck from cores of different texture recovered from contexts dating to specific time periods.

Perhaps the strongest pattern present in the data is the high proportion of fine-grained materials in assemblages recovered from Cliff/Salado phase contexts. The combined Salado phase assemblages differed significantly from earlier assemblages due to the higher than expected frequency of fine-grained materials from Salado phase contexts (Early Pithouse period: $\chi2 = 2088.21$, df = 1, $p < 0.001$; Late Pithouse period: $\chi2 = 3913.99$, df = 1, $p < 0.001$; Classic period: $\chi2 = 4983.66$, df = 1, $p < 0.001$; and the Black Mountain phase: $\chi2 = 2469.32$, df = 1, $p < 0.001$). The assemblages collected from other time periods differed in a varied manner. As discussed above, the Early Pithouse assemblage showed no statistically significant difference to the assemblage collected from the Black Mountain phase component at Old Town. Conversely, the assemblages collected from Late Pithouse period and Classic period contexts exhibited no statistically significant differences with regards to their proportion of coarse- and fine-grained materials. The Early Pithouse period and Black Mountain phase assemblages differed significantly from Late Pithouse period ($\chi2 = 72.24$, df = 1, $p < 0.001$ and $\chi2 = 96.16$, df = 1, $p < 0.001$ respectively) and Classic period ($\chi2 = 69.34$, df = 1, $p < 0.001$ and $\chi2 = 93.62$, df = 1, $p < 0.001$ respectively) assemblages due to the higher than expected frequency of coarse-grained materials in Early Pithouse period and Black Mountain phase assemblages and/or the higher than expected frequency of fine-grained materials in Late Pithouse period and Classic period assemblages.

Additional statistical tests were carried out to determine if changes in the procurement of specific raw materials were accountable for the above-mentioned patterns. To conduct these analyses, a series of Fisher's Exact Tests were conducted that measured the relative proportions of flakes struck from cores of particular raw materials in relation to their occurrence in different temporal periods. The data used to conduct these statistical analyses are presented in Table 7.3 and their proportions are depicted in Figure 7.3. As this figure depicts the vast majority of flakes recovered from sites in the Mimbres Valley are derived from igneous rocks (andesite/basalt and rhyolite). The Late Pithouse Period tallies were derived from assemblages collected from NAN Ranch

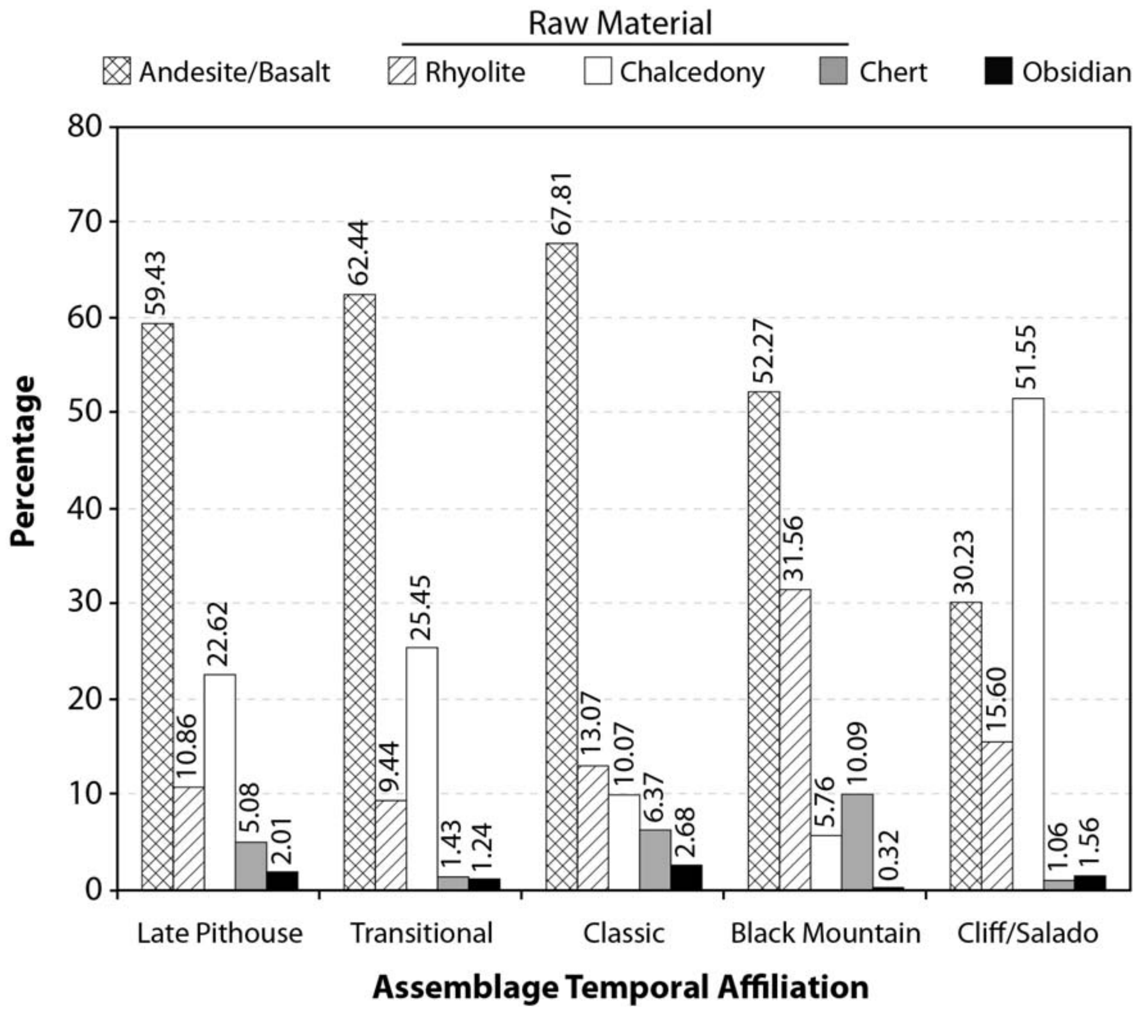

Figure 7.3: Percentage of flakes struck from cores of different raw materials recovered from contexts dating to specific time periods.

Table 7.3: Number of flakes struck from cores of different raw materials recovered from contexts dating to specific time periods.

	Andesite/ Basalt	Rhyolite	Chalcedony	Chert	Obsidian
Late Pithouse	5532	1011	2106	473	187
Transitional	655	99	267	15	13
Classic	2351	453	349	221	93
Black Mtn.	1797	1085	198	347	11
Salado	9456	4879	16125	331	488

(Dockall 1991) and Galaz (Anyon and Leblanc 1984). This assemblage was composed primarily of flakes struck from andesite and/or basalt cores (ca. 59%), followed by flakes struck from chalcedony cores (ca. 23%). Flakes struck from rhyolite, chert, and obsidian cores composed the remaining 18 percent of the assemblage. A similar pattern was present in the Transitional period. This assemblage was composed of mixed Three Circle phase and Classic period deposits recovered from the Galaz ruin (Anyon and LeBlanc 1984). Again, the assemblage was composed primarily of flakes struck from andesite and/or basalt cores (ca. 62%) with flakes struck from chalcedony cores constituting approximately 26 percent of the assemblage. The remaining 12 percent of the assemblage was composed of flakes derived from rhyolite, chert, and obsidian cores. The Classic period assemblage was derived from the excavations conducted at NAN Ranch (Dockall 1991) and Galaz (Anyon and LeBlanc 1984). This assemblage was also composed primarily of flakes struck from andesite and/or basalt cores (ca. 68%) with flakes struck from rhyolite cores being the next most prevalent material in the assemblage (ca. 13%). The remaining 19 percent of the assemblage was composed of flakes struck from chalcedony, chert, and obsidian cores. The Black Mountain phase assemblage was composed of materials recovered from the 2006 and 2007 seasons at Old Town. This assemblage was again composed primarily of flakes struck from andesite and/or basalt cores (ca. 52%) with flakes struck from rhyolite cores also being fairly common (ca. 32% of the assemblage). The remaining 14 percent of the assemblage was composed of flakes struck from chert, chalcedony, and obsidian cores. Finally, the Cliff/Salado assemblage was composed of materials derived from the excavations conducted at Janss, Stailey, and Disert (Nelson and LeBlanc 1986). This assemblage was composed primarily of flakes struck from chalcedony cores (ca. 52%) with flakes struck from andesite and/or basalt cores being prevalent as well (ca. 30% of the assemblage). The remaining 18 percent of the assemblage was composed of flakes struck from rhyolite, chert, and obsidian cores.

As can be discerned from the data presented above as well as that depicted in Figure 7.3, there is considerable variability between time periods in relation to the proportion of flakes struck from cores of different raw materials. The statistical tests carried out to assess the patterning of this variability demonstrated that there were more statistically significant differences present between assemblages than there were similarities (Table 7.4). These data indicate that the predominance of andesite/basalt flakes in Classic period assemblages differs significantly from all other time periods ($p<0.0001$ for Late Pithouse, Black Mountain, and Salado components; $p=0.0015$ for Transitional period deposits). Likewise, Late Pithouse period and Transitional deposits contained significantly more andesite/basalt flakes than Black Mountain phase and Cliff/Salado phase components ($p<0.0001$ for all combinations). The only components that contained proportions of andesite/basalt flakes that were likely derived from similar sampling populations were those present in Late Pithouse period and Transitional assemblages ($p=0.0629$).

Similar situations presented themselves for the other raw material types (Table 7.4). In fact the proportions of flakes struck from all raw materials across time periods show more statistically significant differences than they do similarities. Because of this it is likely more useful to discuss the similarities in raw material proportions between assemblages recovered from contexts attributed to specific time periods. The major similarities between datasets are those present between the Late Pithouse period assemblage and the Transitional period assemblage. These assemblages contain similar proportions of flakes struck from andesite/basalt cores ($p = 0.0629$), rhyolite cores ($p = 0.156$), and obsidian cores ($p = 0.0967$). There were also similarities between the

Table 7.4: Probabilities that the proportion of flakes struck from particular raw materials in paired temporal assemblages were drawn from the same sampling population. These probabilities were derived from conducting Fisher's Exact Tests for the data presented in Table 7.3. Probabilities in bold text are statistically significant at least at the 95 percent confidence interval.

	And/Bas	Rhyolite	Chalcedony	Chert	Obsidian
Pithouse/Transitional	0.0629	0.1560	**0.0438**	**0.0000**	0.0967
Pithouse/Classic	**<0.0001**	**0.0006**	**<0.0001**	**0.0049**	**0.0248**
Pithouse/Black Mountain	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**
Pithouse/Salado	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.0036**
Transitional/Classic	**0.0015**	**0.0015**	**<0.0001**	**<0.0001**	**0.0051**
Transitional/Black Mtn.	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.0010**
Transitional/Salado	**<0.0001**	**<0.0001**	**<0.0001**	0.2819	0.4492
Classic/Black Mountain	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**
Classic/Salado	**<0.0001**	**0.0001**	**<0.0001**	**<0.0001**	**<0.0001**
Black Mountain/Salado	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**

Table 7.5: Number of flakes struck from different materials recovered from different temporal contexts at NAN Ranch and Galaz.

Site	Period	And/Bas	Rhyolite	Chalcedony	Chert	Obsidian
NAN Ranch	LP	2345	632	659	392	130
NAN Ranch	CL	1194	342	215	189	70
Galaz	LP	3187	379	1447	81	57
Galaz	T	655	99	267	15	13
Galaz	CL	1157	111	134	32	23

Transitional period assemblage and the Cliff/Salado phase assemblage in respect to the proportion of flakes struck from chert cores ($p = 0.2819$) and obsidian cores ($p = 0.4492$). While the similarities between the Transitional period assemblage and the Cliff/Salado phase assemblage may point to similar procurement practices across temporal occupations, I believe that the similarities between the Late Pithouse period assemblage and the Transitional period assemblage reflect exploitation of materials as they are present in the natural environment. Because the Pithouse period assemblage and the

Transitional period assemblages are both composed of materials recovered from the excavations at Galaz, these similarities could merely reflect the opportunistic exploitation of the natural environment during these time periods. The difference between these assemblage with respect to the proportion of chalcedony and chert flakes in their assemblage likely reflect different procurement practices though separating variability caused by the distribution of raw materials in the natural environment versus variability cause from cultural processes would be difficult for the remainder of these temporal assemblages.

For this reason, only different temporal assemblages recovered from the same sites were further analyzed to look at potential shifts raw material procurement strategies through time in the Mimbres Valley. These data are only available for the excavations conducted at both NAN Ranch and Galaz (Anyon and LeBlanc 1984; Dockall 1991). The number of flakes struck from cores of differing raw materials recovered from different temporal contexts at these sites is present in Table 7.5. This information was then used to conduct a series of statistical tests that measured the proportion of flakes struck from differing raw materials between time periods at each site to determine if the different temporal assemblage were drawn from the same population or represented changes in raw material procurement practices.

These statistical tests demonstrated that there were some statistically significant differences present between temporal assemblages recovered from the same site (Table 7.6). However, these differences were considerably less than the scenario depicted in Table 7.3 and Table 7.4 where the proportions of flakes struck from different raw materials associated with pooled temporal occupations were measured against one another. The tests conducted on the NAN Ranch and Galaz assemblages demonstrated that there were statistically significant differences between the NAN Ranch Late Pithouse period assemblage and the NAN Ranch Classic period assemblage in respect to the greater proportion of flakes struck from andesite/basalt cores recovered from Classic period contexts when compared to the site's Late Pithouse period occupation ($p = 0.0261$,

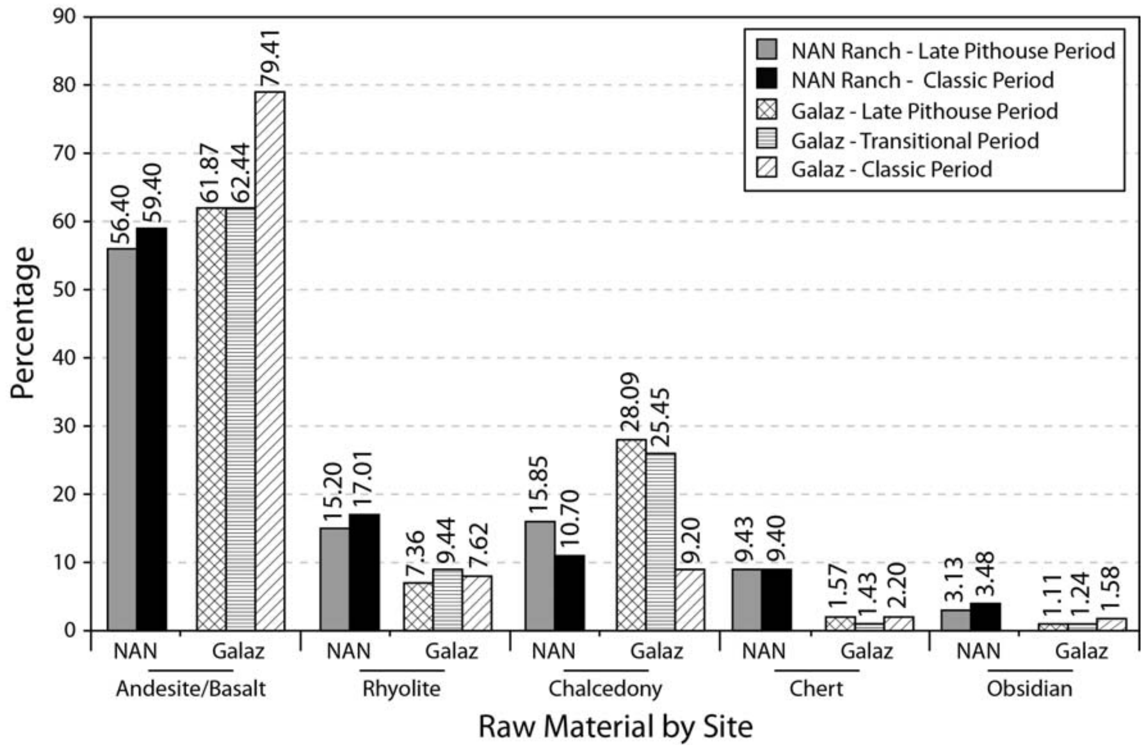

Figure 7.4: Percentage of flakes struck from differing raw materials recovered from different temporal contexts at NAN Ranch and Galaz.

Table 7.6: Probabilities that the proportion of flakes struck from particular raw materials in paired temporal assemblages were drawn from the same sampling population. These probabilities were derived from conducting Fisher's Exact Tests for the data presented in Table 7.5. Probabilities in bold text are statistically significant at least at the 95 percent confidence interval.

	And/Bas	Rhyolite	Chalcedony	Chert	Obsidian
NAN CL/NAN LP	**0.0261**	0.0680	**<0.0001**	1.0000	0.4901
Galaz LP/Galaz T	0.7535	**0.0260**	0.0817	0.7860	0.7479
Galaz LP/Galaz CL	**<0.0001**	0.7342	**<0.0001**	0.1360	0.1735
Galaz T/Galaz CL	**<0.0001**	0.1083	**<0.0001**	0.1810	0.5027

Fisher's Exact Test). Similarly, the Late Pithouse period occupants at NAN Ranch appeared to reduce chalcedony cores more frequently than their Classic period counterparts ($p < 0.0001$, Fisher's Exact Test).

With regards to the temporal assemblage recovered from Galaz, there were significant differences with regards to the proportion of rhyolite flakes recovered from Late Pithouse period and Transitional period contexts ($p = 0.0260$, Fisher's Exact Test), between the proportion of andesite/basalt flakes and chalcedony flakes recovered from Late Pithouse period and Classic period contexts ($p < 0.0001$ for both, Fisher's Exact Test), and between the proportion of andesite/basalt flakes and chalcedony flakes recovered from Transitional period and Classic period contexts ($p < 0.0001$ for both, Fisher's Exact Test). While the proportions differ, both datasets point to an increasing utilization of flakes struck from andesite/basalt cores and decreasing utilization of flakes struck from chalcedony cores from the Late Pithouse period through to the Classic period (Figure 7.4). Thus, controlling for geographic distribution in raw material availability, there appears to be an overall pattern of increasing use of andesite/basalt and a decreasing use of chalcedony at NAN Ranch and Galaz from the Late Pithouse period through the Classic Period.

If this pattern proves to be Valley-wide it could point to an increased used of locally available raw materials through time as well as depletion of specific materials in the immediate surroundings. However, as the data stands, it is not possible to make such a claim. Because comparative data from Old Town is not currently available, and because raw material procurement practices somewhat seem to be conditioned by the availability of specific raw materials in the immediate environment of sites, further analyses concerning the patterning of lithic raw material during the Black Mountain phase occupation of the site must stand on their own.

Intra-Site Comparisons

A series of statistical tests were carried out to determine if the variables recorded for individual flakes differed significantly between different contexts and at different levels of analysis. The first of these analyses focused on discerning if inter-site similarities were present between lithic assemblages excavated in the Mimbres Valley. Surprisingly, there are few extensive studies of lithic assemblages recovered from many of the large site excavated in the valley. Those studies that do exist tend to focus on a subset of the variables recorded for the assemblage recovered from the 2006 and 2007 field seasons at Old Town. As will be discussed below, these variables generally consist of some measure of raw material variability within the overall assemblage recovered from specific sites.

Because the data collected for each flake within the assemblage represent different scales of data, different statistical measures were calculated to see if assemblages were drawn from the same sampling population. For nominal and interval scale data (i.e. cortical variation, dorsal scar count, platform class, condition, raw material type, and size grade) Chi-square calculations and Fisher's Exact Tests were conducted depending on the size of the sample from each sampling context. If the sample was large enough (i.e. expected values were ≥ 5) Chi-square calculation were conducted. If the sample size in any of the sampling contexts fell below this threshold, then probabilities were calculated using Fisher's Exact Tests. However, for ratio scale data (i.e. platform angle, weight, maximum length, maximum width, and maximum thickness), pairwise Wilcoxan rank sum tests were carried out to assess the probability that each paired sampling context were representative of the same sampling population.

Cortical Variation

Cortical variation refers to the amount of cortex present on a flake's dorsal surface. This cortical material represents the weathered surface of parent material and, depending on the depositional environment, formation episode, and exposure process of the parent materials, covers some portion of a procured core's outer surface. For the present study, cortical variation was measured based on the proportion of the flake's dorsal surface covered by cortical material. Primary flakes are those whose dorsal surface is composed entirely of cortical material. Thus, 100 percent of a primary flake's dorsal surface consists of cortical material. Secondary flakes are those that retain some cortical material on the flake's dorsal surface as well as some exposed underlying raw material. These flakes were determined to contain between 99 percent to less than one percent cortex on the dorsal surface. If a flake contained some cortex on its dorsal surface but was not entirely covered by cortical material, it was labelled a secondary flake. Finally, tertiary flakes are those which retain no cortical material on their dorsal surface. Because these flakes are void of cortex they are sometimes referred to as interior flakes.

In most circumstances, the tripartite description of cortical variation as primary, secondary, and tertiary flakes is used as a proxy measure for the reduction sequence of a particular material. Because many of the materials in the study area are available as river cobbles, or other materials that have been exposed and thus allowed to weather, primary flakes usually represent the first ones removed during a core's reduction sequence. Secondary flakes thus represent those that are removed after primary flakes. Finally, because tertiary flakes contain no cortex, these are usually removed in the latter stages of the reduction sequence. While there are some circumstances under which these assumptions do not hold, such as where materials are quarried from extensive deposits and no cortex is present on procured cores, they do hold true for most of the materials used in the current study area.

The majority of differences present in the amount of cortical variation present on flakes recovered from excavated rooms' roof and/or floor assemblages is accounted for by the proportion of primary, secondary, and tertiary flakes recovered from room C27/C34 when compared to other excavated rooms (Figure 7.5). Specifically, room C27/C34 contains a proportionally smaller amount of secondary flakes and proportionally more tertiary flakes when compared to room C23/C28 ($p = 0.0044$ and $p = 0.0149$ respectively, Fisher's Exact Test). Similarly, room C27/C34 was found to contain proportionally more primary flakes, less secondary flakes, and more tertiary flakes when compared to room C30 ($p = 0.0498$, $p = 0.0007$, and $p = 0.0195$ respectively; Fisher's Exact Test).

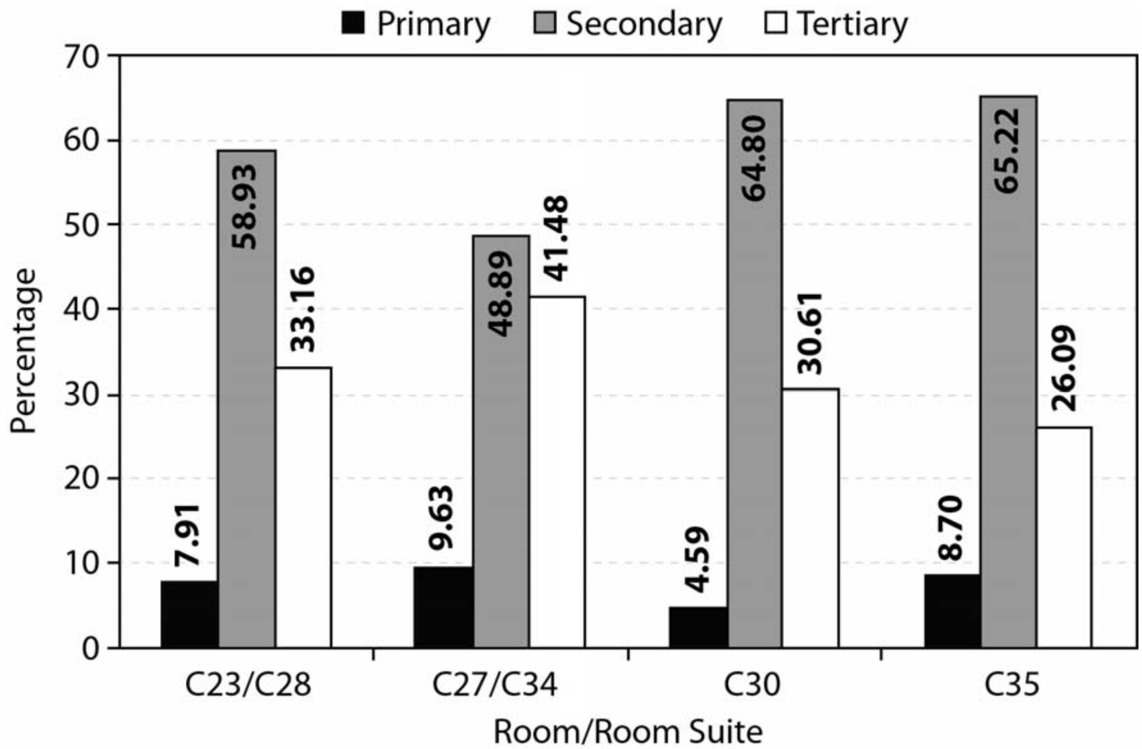

Figure 7.5: Proportion of primary, secondary, and tertiary flakes recovered from excavated rooms' roof and floor assemblage.

When compared across raw material types, the majority of this overall variation is accounted for by the variability present in the andesite/basalt flake assemblages recovered from each of the excavated rooms. Thus, room C27/C34 was found to contain a proportionally smaller amount of secondary andesite/basalt flakes and proportionally more tertiary andesite/basalt flakes when compared to room C23/C28 ($p < 0.0001$ and $p = 0.0038$ respectively, Fisher's Exact Test). Room C27/C34 was also found to contain proportionally more primary andesite/basalt flakes, less secondary flakes of this material, and more tertiary andesite/basalt flakes when compared to room C30 ($p = 0.0145$, $p = 0.0004$, and $p = 0.0259$ respectively; Fisher's Exact Test).

The only other difference present with the amount of cortical variation present on flakes struck from cores of distinct raw materials was with respect to the proportion of secondary and tertiary chert flakes recovered from rooms C27/C34 and C30. Room

C27/C34 was found to contain a proportionally smaller amount of secondary chalcedony flakes when compared to room C30 ($p = 0.0254$, Fisher's Exact Test) while room C30 was found to contain a proportionally smaller amount of tertiary flakes when compared to room C27/C34 ($p = 0.0254$, Fisher's Exact Test).

Finally, with regards to cortical variation present on flakes, analyses were conducted that measured the proportions of different amounts of cortical variation present on flakes of different grained materials (Figure 7.6). For these analyses, andesite/basalt flakes and rhyolite flakes were considered to be coarse- grained materials and chert and chalcedony flakes were considered to be fine grained materials. These analyses demonstrated that there were different manners of reducing materials depending on the texture of the raw material being worked. Specifically, it appears that fine-grained materials were more likely to be more extensively worked than coarse-grained materials. Thus, flakes derived from coarse-grained materials tended to retain more cortex on their dorsal surfaces. It was found that there were proportionally more primary and secondary flakes struck from coarse-grained cores when compared to fine-grained cores ($p = 0.0012$ and $p <0.0001$ respectively, Fisher's Exact Test). Conversely, there were proportionally more tertiary flakes struck from fine-grained cores when compared to those struck from coarse-grained cores ($p < 0.0001$, Fisher's Exact Test).

When the proportion of coarse- and fine-grained materials with different categories of cortex present on their dorsal surface were compared across excavated rooms were compared, statistically significant differences were only encountered for coarse-grained materials. These analyses demonstrated that there were proportionally more secondary coarse-grained flakes within the roof/floor assemblage recovered from rooms C23/28 and C30 when compared to room C27/C34 ($p = 0.0046$ and $p = 0.0046$ respectively, Fisher's Exact Test) (Figure 7.7). However, room C27/C34 was found to contain proportionally more tertiary coarse-grained flakes when compared to room C23/C28 ($p = 0.0116$, Fisher's Exact Test). Lastly, room C27/C34 was found to contain proportionally more coarse-grained primary flakes when compared to room C30 ($p = 0.0459$, Fisher's Exact Test).

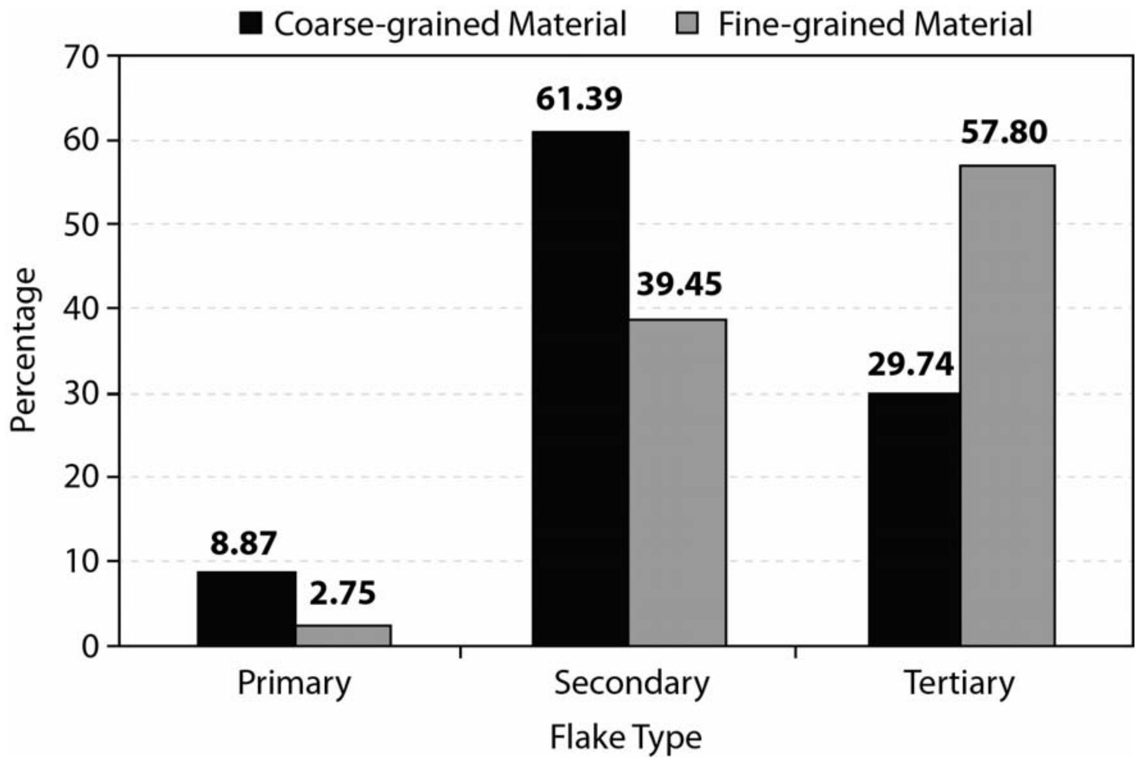

Figure 7.6: Proportion of primary, secondary, and tertiary flakes recovered from excavated rooms' roof and floor assemblages that were struck from coarse- and fine-grained cores.

There are many possible formation processes that could influence the patterns outlined above such as differential use patterns, reduction strategies, discard patterns, abandonment practices, and so on. However, these patterns also reflect cultural behaviors that were negotiated by the individuals and groups occupying the space within each constructed feature and therefore serve as proxy measures for manner in which different cultural behaviors were organized. Currently, the available data suggests that were differences between the amount of cortex present on a flake's dorsal surface, the raw materials of a flake, and the room from which the flake was recovered. Specifically, the vast majority of identified differences between room assemblages appears to do with

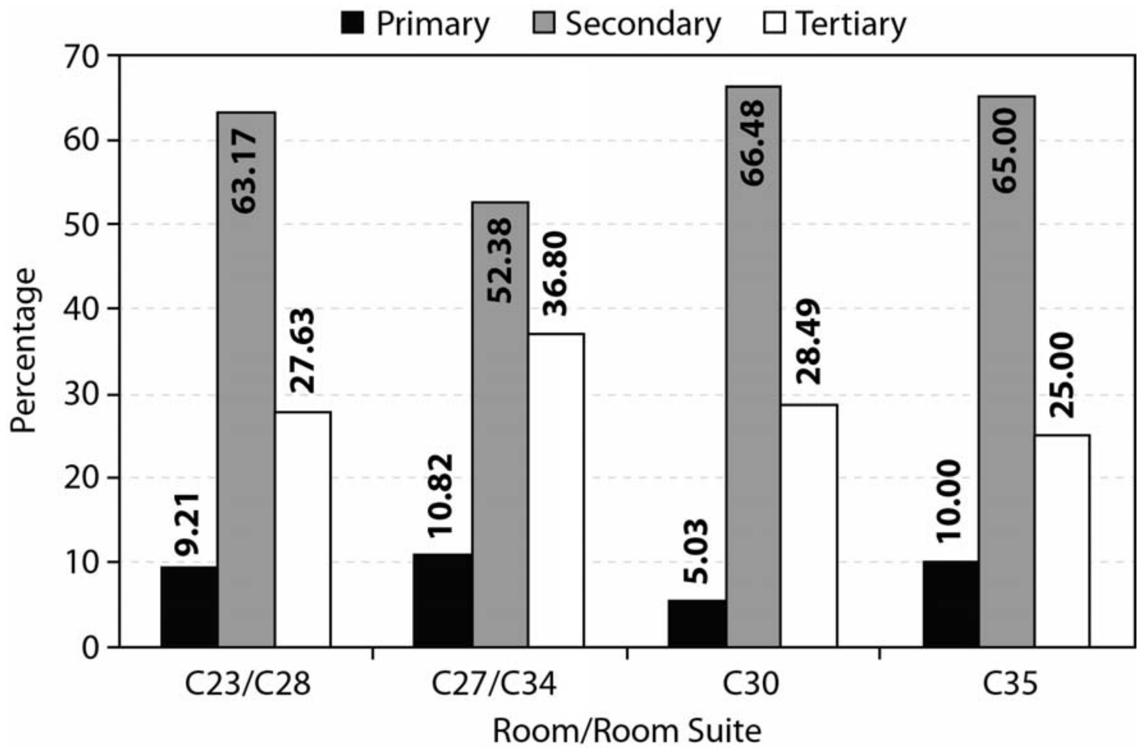

Figure 7.7: Proportion of primary, secondary, and tertiary flakes struck from coarse-grained cores recovered from different excavated rooms' roof and floor assemblages.

the proportion of primary and tertiary andesite flakes recovered from room C27/C34 when compared to rooms C23/C28 and C30. These data potential show that the individuals inhabiting these structures had differing methods for reducing andesite/basalt cores. If similar methods did exist then these same data potentially demonstrate that the inhabitants or these structures exhibited different methods of refuse disposal, potentially indicating differential preference for particular flake types.

When the data regarding flake cortical variation are partitioned out by the texture of the cores from which they were struck processes occurring at a larger scale are illuminated. As shown in Figure 7.6, there appears to be different methods of reducing cores of different textures. Specifically, fine-rained cores appear to be more thoroughly reduced than their coarse-grained counterparts based on the higher proportion of tertiary fine-grained flakes.

Scar Count

Scar count refers to the number of negative flake scars on a flake's dorsal surface. These scars provide evidence for the number of flakes removed prior to the flake retaining the negative flake scars. In some instances this can be used as a measure of reduction intensity as more intensively reduced cores are likely to contain more negative flake scars on each flake's dorsal surface. However, there are particular circumstances in more formal core reduction sequences, there areas with many flake scars are systematically removed to produce new surfaces from which to begin isolating striking platforms. Be this as it may, it is believed that for informal reduction sequences, that increasing numbers of dorsal scars indicates different levels of reduction intensity, at least on a relative scale.

For the present study the number of negative flakes scars present on each flake's dorsal surface was counted. The recording scale for this variable went from one to six. Each representing the number of negative flake scars present on flakes' dorsal surfaces. If a flake contained more than five negative dorsal scars, it was coded as a six. Thus, any flake with five or more negative flake scars was coded as six. Statistical tests were carried out to determine if there differences between excavated rooms' roof and floor assemblages with respect to the number of negative dorsal scars present on each flakes. The majority of differences in the number of dorsal scars encountered on flakes recovered from different rooms' roof and floor assemblages exist with andesite/basalt flakes. These differences are primarily due to the low proportion of flakes with no dorsal scars from room C30 when compared to rooms C23/C28 ($p = 0.0235$, Fisher's Exact Test) and C27/C34 ($p = 0.0145$, Fisher's Exact Test). No other statistically significant differences were present between these rooms' assemblages with respect to the number of dorsal scars present on flakes struck from cores of differing raw materials.

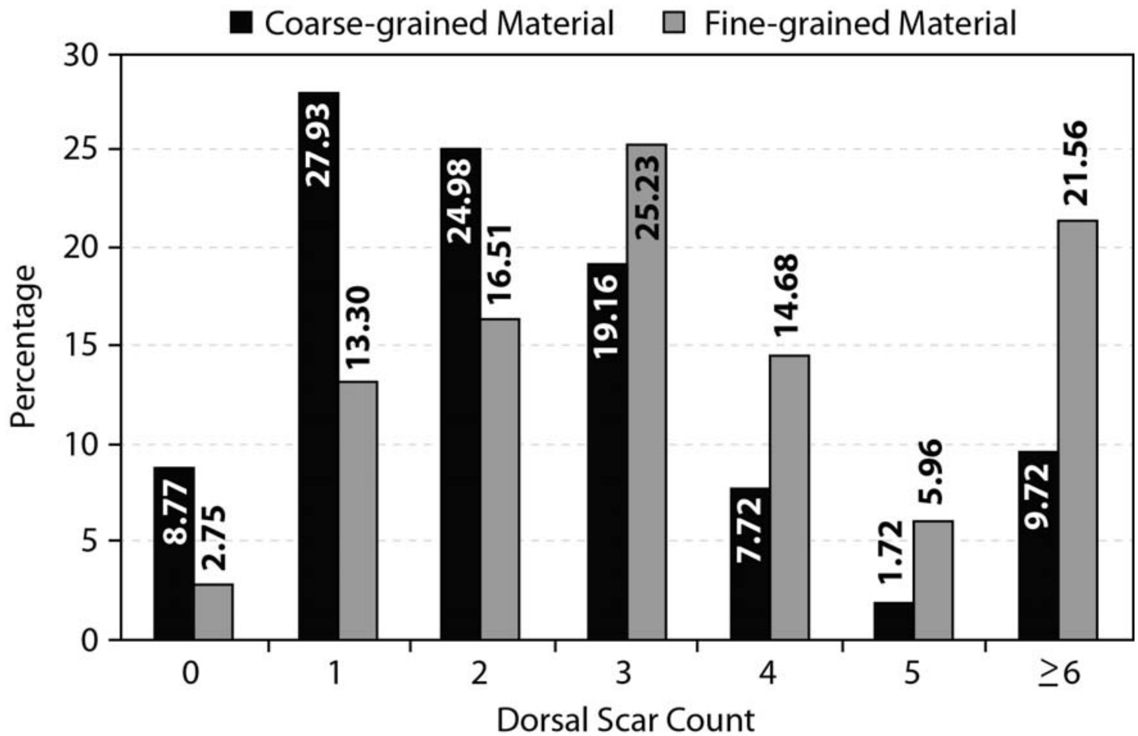

Figure 7.8: Proportions of flakes struck from coarse- and fine-grained cores that retain the specified number of negative flake scars on their dorsal surface.

However, these data do potentially point to differing methods of reducing cores of different raw materials. Data pertaining to number of negative dorsal scars present on coarse-grained materials (i.e. andesite/basalt and rhyolite) versus fine-grained material (i.e. chalcedony and chert) point to differences in the reduction intensity of these material types (Figure 7.8). In general it appears that coarse-grained material was not as intensively worked as fine-grained material. There are statistically significant differences present between these material types and the number of negative dorsal scars present on flakes originating from these material types. The cutoff for this reduction intensity appears to be three negative dorsal scars. Thus there are proportionally more coarse-grained flakes with zero, one, or two negative dorsal scars when compared to flakes derived from fine-grained material ($p = 0.0008$, $p = 0.0012$, and $p = 0.0065$ respectively, Fisher's Exact Test). This situation reverses itself when one considers the proportion of flakes struck from these different material types containing in excess of three negative dorsal flake scars. In these situations, the proportion of flakes struck from fine-grained materials is greater than that struck from coarse-grained materials with respect to those flakes containing four negative flake scars ($p = 0.0024$, Fisher's Exact Test), five negative flake scars ($p = 0.0009$, Fisher's Exact Test), and those exhibiting more than five negative flake scars ($p < 0.0001$, Fisher's Exact Test). There was no statistically significant difference with respect to the number of flakes struck from coarse- or fine-grained materials containing three negative dorsal flake scars ($p = 0.0512$, Fisher's Exact Test).

Platform Class

Platform class refers to the type of striking platform present on a flake's proximal end. Thus, this variable could only be measured for complete flakes or proximal flake fragments. Three types of platform classes were differentiated: flat and/or cortical platforms, faceted platforms, and crushed platforms. Flat and/or cortical platforms were those striking surfaces which were either platforms that were composed of the outer cortical surface of a core, or were those that were flat surfaces across the entirety of the platform area. Generally, flat platforms are the result of simply using a single negative flake scar as the platform with no additional preparation. Faceted platforms were those that contained multiple negative flake scars across the platform surface. In most cases, the negative flake scars resulted from the removal of platform preparation flakes. These flakes were removed to isolate the platform striking surface and represent increased efforts to control flake removal through the initiation, propagation, and termination phases of flake formation. Finally, crushed platforms were those which contained evidence of battering along the platform surface. This evidence usually consisted of multiple hinge fracture scars across the platform surface. These hinge fracture scars resulted from multiple instances where force was delivered to the platform surface though this force was not enough to drive flakes from the core mass. Instead, small flakes, usually with hinge or step terminations, are removed along the platform's dorsal surface.

If this battering persists along the platform, portions of the platform can shatter, causing the interior portions of the platform away from the dorsal surface to become dislodged. Crushing of the platform surface can represent intentional actions aimed at isolating platform striking surface or can result from chance as multiple unsuccessful attempts are made to dislodge flakes from a core.

With respect to platform class, it appears that inhabitants of all rooms/room-suites exhibited similar methods of preparing flakes for removal. The vast majority of flakes recovered from excavated rooms (ca. 78 percent) either retained cortical surface as the striking platform, or simple consisted of a singular flat surface that represented the remnants of a negative flake scar (Figure 7.9). The remaining platform types used in the current study consisted of formally faceted platforms (ca. 10 percent) whereby multiple flakes were removed from the platform area to isolate where the flake initiation force would be delivered, or consisted of crushed platforms (ca. 12 percent) where the platform surface exhibited evidence of battering.

These platform types showed little variation across excavated room assemblages and few statistically significant differences were noted between room assemblages. The only differences present were with regard to the platform type present on chalcedony flakes (Figure 7.10). These differences had to do primarily with the high proportion of chalcedony flakes with faceted platforms recovered from room C30 when compared to rooms C23/C28 ($p = 0.0239$, Fisher's Exact Test) and C27/C34 ($p = 0.021$, Fisher's Exact Test). Similarly, room C27/C34 contained proportionally more chalcedony flakes with a cortical/flat striking platform when compared to room C30 ($p = 0.0291$, Fisher's Exact Test).

As with the dorsal scar count data, platform class data seems to point to differences in raw material reduction intensity and conservation. When the different platform classes are compared for coarse- and fine-grained materials, somewhat expected patterns emerge. Flakes derived from coarse-grained material contain more cortical/flat platforms when compared to flakes derived from fine-grained material ($p < 0.0001$,

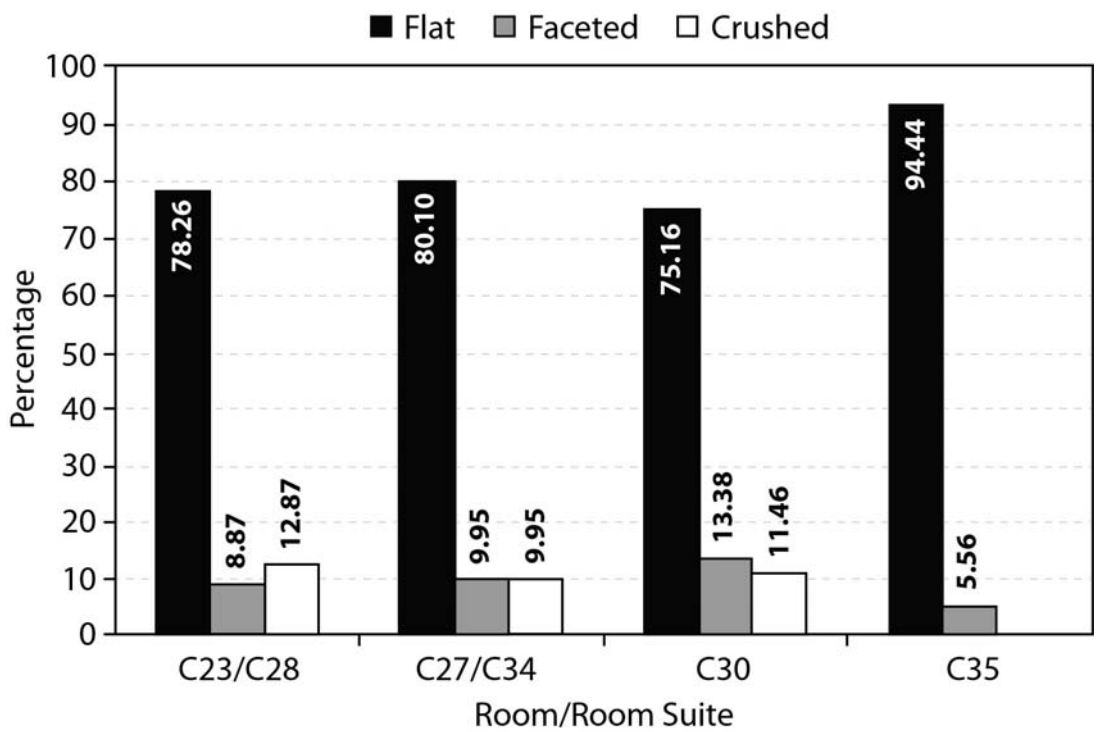

Figure 7.9: Proportion of different platform classes present on flakes recovered from each of the excavated rooms' roof and floor assemblages.

Fisher's Exact Test) (Figure 7.11). Conversely, flakes struck from fine-grained materials contain proportionally more faceted and crushed platforms when compared to coarse-grained materials ($p = 0.0085$ and $P < 0.0001$ respectively, Fisher's Exact Test). These data indicate that more time was taken to isolate platforms before delivering the initiation force to remove flakes from fine-grained materials. Thus, more care was taken to control the flake formation process through the initiation, propagation, and termination phased with these materials. It is likely that these steps were taken in efforts to maximum the use-life of fine-grained cores and thus conserve fine-grained raw materials.

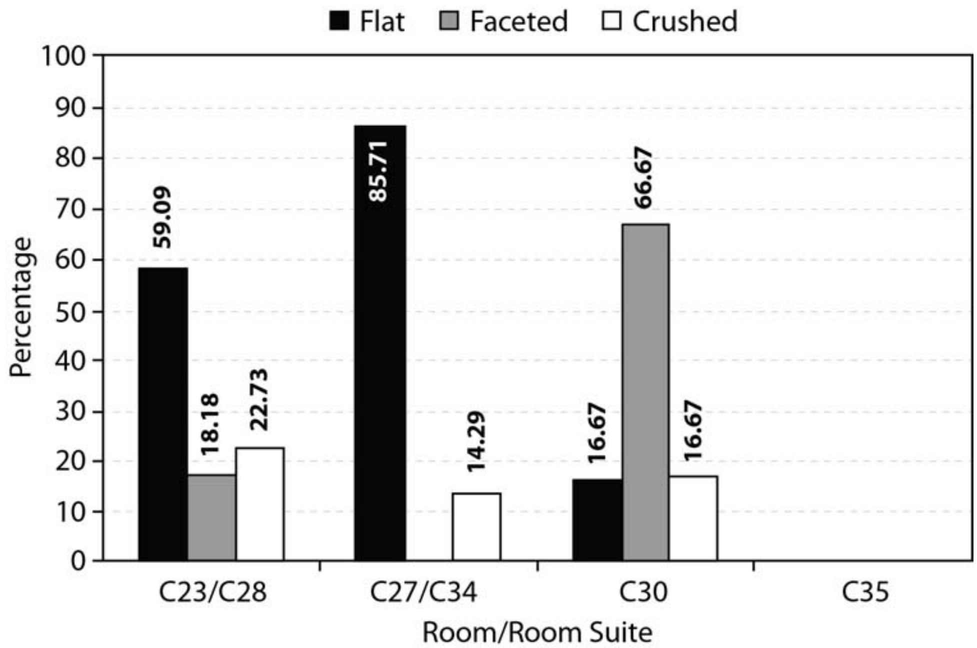

Figure 7.10: Proportion of different platform classes present on chalcedony flakes recovered from each of the excavated rooms' roof and floor assemblages.

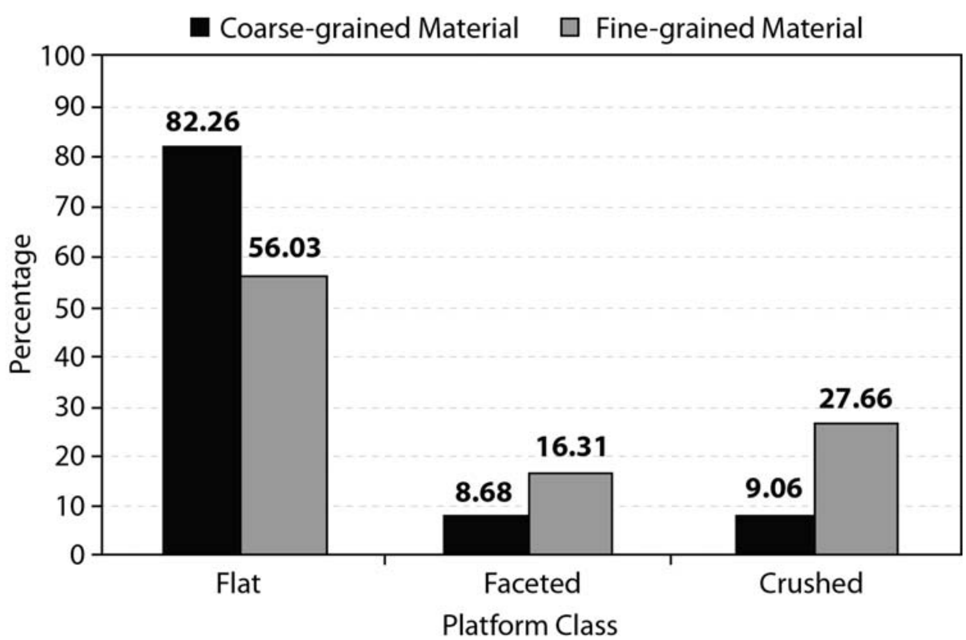

Figure 7.11: Proportion of platform classes present on flakes struck from cores of specified texture.

Condition

Flake condition refers to completeness of flakes removed from cores. For the current study, flakes were assigned to different condition classes based on the presences of specific attributes. The condition types included complete flakes, or those with intact distal ends retaining a striking platform, intact margins along the medial portions of the flake, and distinct proximal ends with intact terminations. Different flake fragment categories were devised based on portion of the flake which was recovered. Proximal flake fragments were those which retained a striking platform but lacked other characteristics associated with complete flakes. Distal flake fragments were those which retained termination characteristics but lacked features associated with the proximal end of the flake (i.e. a striking platform). Medial flake fragments were those which contained flake attributes but lacked characteristics common to the proximal and distal portions of flakes (i.e. a striking platform and termination traits). Flake margin fragments represent those pieces of flakes along the lateral margins. The flake fragments were differentiated by presence of feathered edges along one margin and an abrupt fracture along another. This fragment type contained no evidence of characteristics common to the proximal and distal portions of flakes. Finally, shatter, or angular debris, represents flake types that result from the application of force to a core which was applied in such a manner that a bending initiation fails to propagate through the rock mass. This condition type is usually differentiated by its relatively small size and the presence of multiple sharp edges along all faces of the dislodged piece. Figure 7.12 displays the proportion of each flake type recovered from each of the excavated room's roof and floor deposits.

With respect to the condition of flakes present in each excavated room's assemblage, nearly every room contained similar proportions of complete flakes, different types of flake fragments, and shatter or angular debris. The only significant difference between assemblages was between room C23/C28 and room C27/C34 ($p = 0.031$, Fisher's Exact Test). This difference was based on the higher proportion of flake margin fragments present in room C23/C28 when all raw materials are considered. However, this difference did not pattern out when separate raw materials were considered

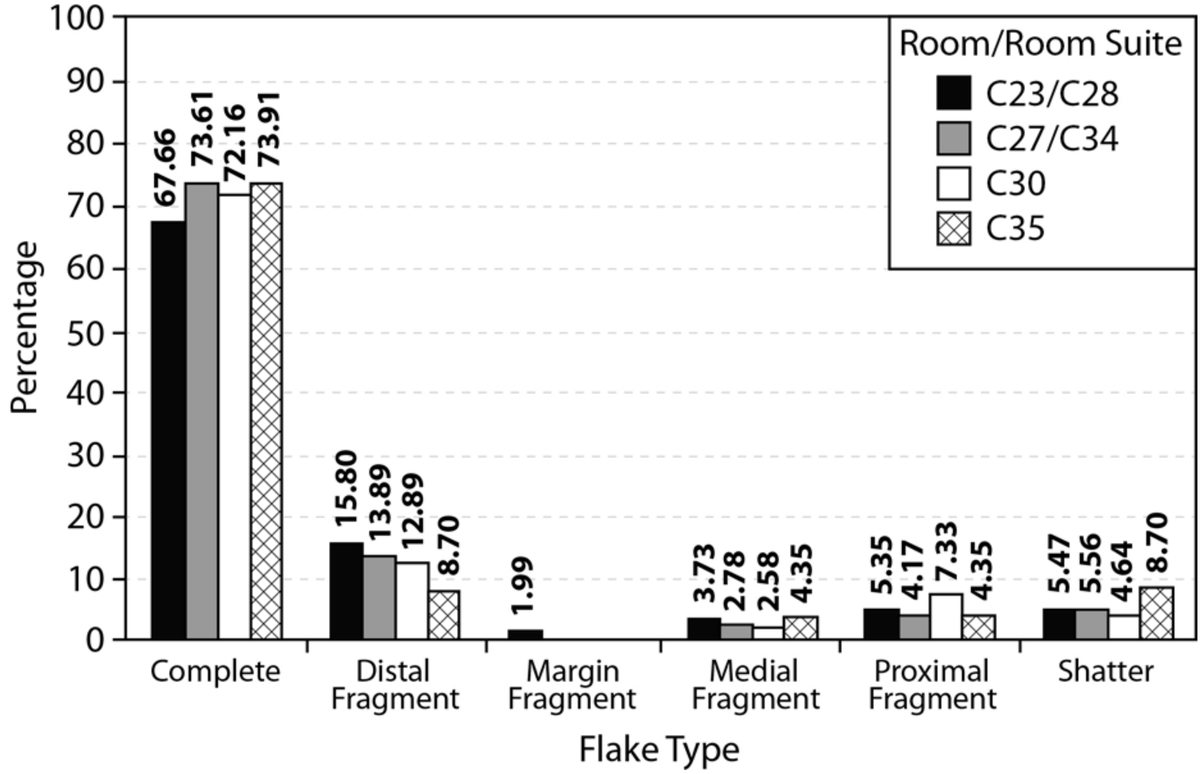

Figure 7.12: Depiction of the proportion of different flake types recovered from each of the excavated rooms' roof and floor deposits.

and there were no statistically significant differences present with respect to the proportion of flakes of different condition types (i.e. complete, distal fragment, margin fragment, medial fragment, proximal fragment, and shatter/angular debris) struck from cores of differing materials recovered from excavated rooms' roof and floor assemblages. These data suggest that similar formation processes were acting upon the formation of flakes of differing raw materials. These formation processes potentially include both natural and cultural transforms and could indicate that similar taphonomic processes were acting upon flakes in different room contexts as well as indicating that similar method of flake removal were practiced across social groups inhabiting these rooms. The flake removal process including, but are not limited to, the amount of force applied to the platform to initiate flake formation and the angle at which this force was applied. These characteristics are those which represent learned behaviors and directly affect fracture mechanics associated with lithic technology. If these variables were not applied similarly across analytic units, there would be more variability across sampling contexts with regards to the condition of flakes.

When one considers the condition of flakes in relation to the texture of raw materials from which they were struck more interesting patterns emerge (Figure 7.13). Specifically, proportionally more complete flakes struck from coarse-grained materials were recovered from excavated rooms' roof and/or floor assemblages when compared to fine-grained materials ($p = 0.0001$, Fisher's Exact Test). Conversely, fine-grained materials were more likely to show up in the archaeological record as flake fragments. With respect to the current data set, there were proportionally more fine-grained medial flake fragments and pieces of shatter/angular debris when compared to coarse-grained material ($p = 0.035$ and $p = 0.0012$ respectively, Fisher's Exact Test). These patterns likely demonstrate two phenomena. First, at the site/occupation level, proportionally more flakes were struck were coarse grained materials. Thus the higher likelihood that complete flakes will be recovered. Second, because flakes derived from fine-grained materials are more likely to be smaller in size due to more extensive reduction of fine-grained cores as well as originating in smaller nodules, they are more susceptible to breakage. Also, because fine-grained materials are more brittle, they are more likely to produce shatter in the knapping process especially if care isn't taken to control flake formation through the initiation, propagation, and termination phases. Finally, the higher proportion of shatter associated with fine-grained materials likely points to differences in the primary method of reduction. While direct hard- or soft-hammer percussion would likely cause this brittle fine-grained material to shatter, this flake type (i.e. shatter) is commonly associated as a byproduct of bipolar percussion. Thus, the high relative proportion of this flake type associated with these material types could indicate that fine grained materials were initially reduced by bipolar percussion.

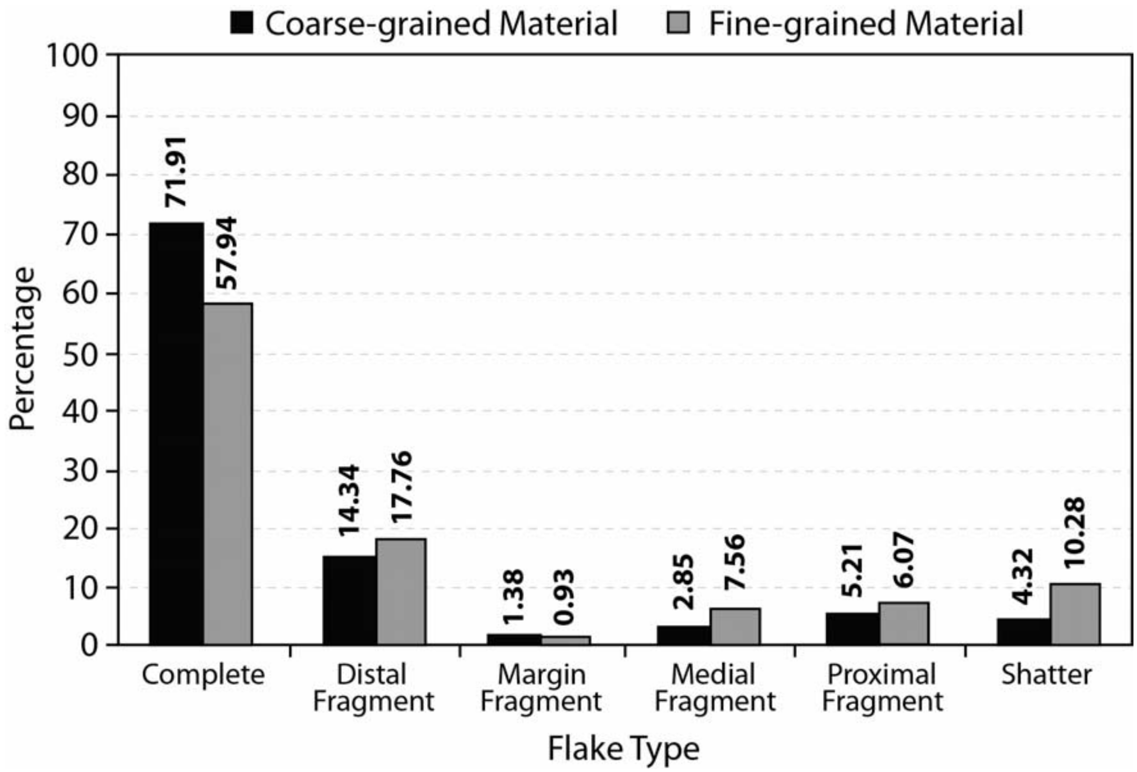

Figure 7.13: Proportions of different flake types struck from cores of different textures.

While these relationships were noted for the entirety of the assemblage recovered from excavated rooms, they fail to pattern out between excavated rooms. The only statistically significant differences that emerged from the comparisons between excavated rooms' roof and floor assemblages resulted from the high proportion of coarse-grained marginal flake fragments recovered from room C23/C28 when compared to room C27/C34 and room C30 ($p = 0.0485$ and $p = 0.0489$ respectively, Fisher's Exact Test). These differences resulted from the fact that the only marginal flake fragments struck from coarse-grained materials were recovered from room C23/C28.

Raw Material

All flakes recovered from excavated rooms/room-suites were classified as being stuck from andesite/basalt, chalcedony, chert, obsidian, or rhyolite cores (Figure 7.14). While there is more variability present in the assemblage, these raw materials were chosen because they are the most numerous and because other researchers have used them previously. When the proportion of flakes struck from differing raw materials was compared across excavated rooms, a few statistically significant differences were noted. Most of these differences are accounted for by the proportion of andesite/basalt flakes, chalcedony, and chert flakes recovered from the roof and floor of room C23/C28. These analyses demonstrated that the lithic assemblage recovered from roof and/or floor contexts in room C23/C28 contained smaller proportions of andesite/basalt flakes when compared to room C27/C34 and room C30 ($p = 0.0058$ and $p = 0.0003$ respectively, Fisher's Exact Test). Similarly, the roof and floor assemblages associated with room C23/C28 contained proportional more chalcedony flakes when compared to room C30 ($p = 0.0013$, Fisher's Exact Test). Finally, both roof and floor assemblages associated with both room C23/C28 and room C27/C34 were found to contain proportionally more chert flakes when compared to room C30 ($p = 0.0006$ and $p = 0.0029$ respectively, Fisher's Exact Test).

Grain

The grains size of a raw material simply refers to its general texture. For the raw materials commonly used in the production of chipped stone implements in the Mimbres area only two overall textures were used: coarse-grained materials and fine-grained materials. Coarse-grained materials are those macrocrystalline rocks whose grains can easily be identified by visual inspection and include materials such as rhyolite, andesite, and basalt. Conversely, fine-grained materials are those cryptocrystalline rocks whose individual grains cannot be easily identified by simple visual inspection. These rock types include materials such as chalcedony and chert. It should be noted that obsidian, a volcanic glass, was included with the fine-grained materials even though its crystalline structure is not considered to be cryptocrystalline.

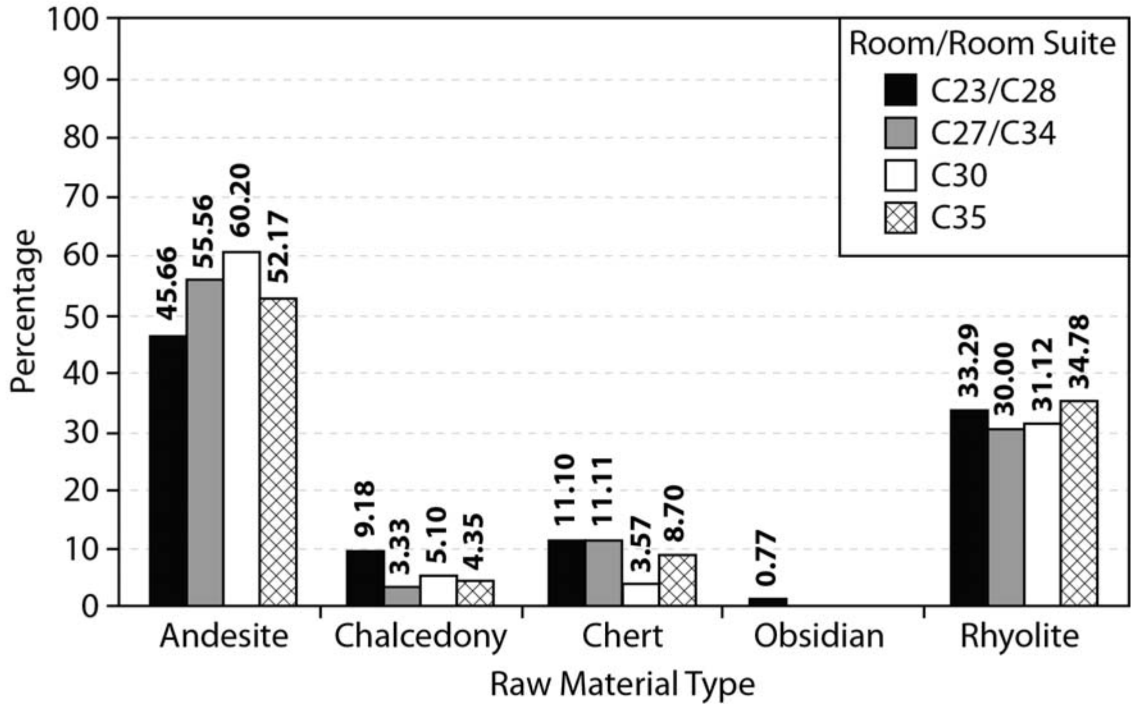

Figure 7.14: Proportion of flakes recovered from different rooms' excavated roof and floor deposits that were struck from cores of the specified raw materials type.

The statistical tests carried out to assess the similarity of the proportion of coarse- and fine-grained materials recovered from each excavated rooms' roof and/or floor assemblage demonstrated that these proportions varied considerably across sampling contexts (Figure 7.15). Nearly every assemblage recovered from excavated differed significantly from one another with respect to the proportion of coarse- and fine-grained materials recovered from their roof and/or floor assemblages. Room C23/C28 was found to contain a lower proportion of coarse-grained materials and a higher proportion of fine-grained materials when compared to room C27/C34 ($p = 0.0039$, Fisher's Exact Test) and room C30 ($p < 0.0001$, Fisher's Exact Test). Similarly, the assemblages recovered from room C27/C34 and room C35 differed significantly from room C30 due to their higher proportion of fine-grained material and lower proportion of coarse-grained materials (p =

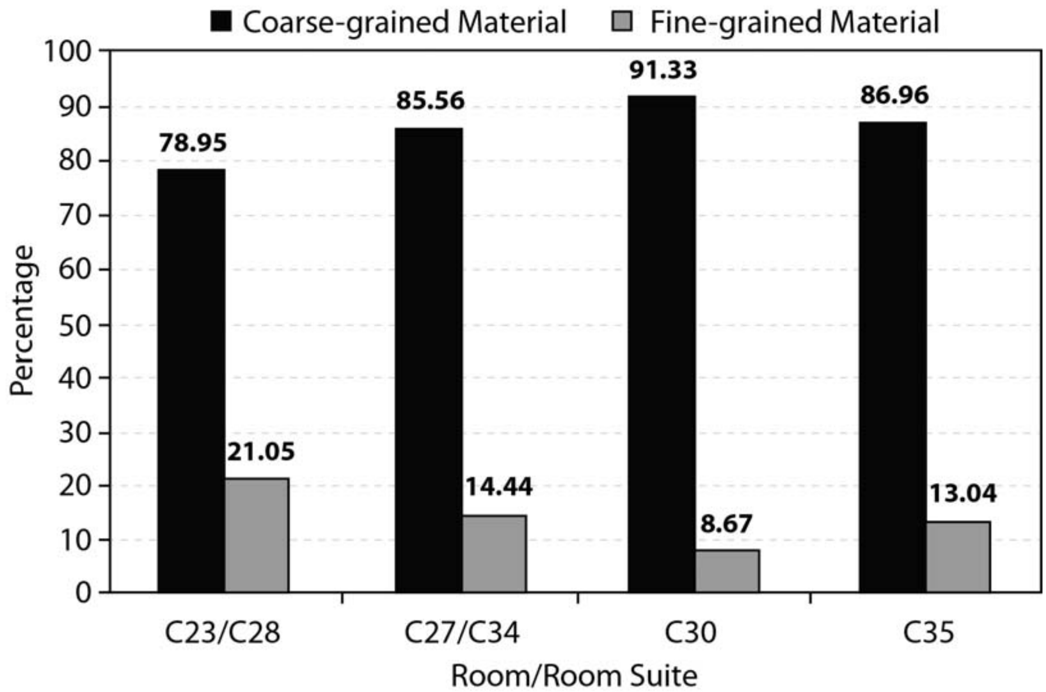

Figure 7.15: Proportion of flakes recovered from roof and floor contexts in each excavated room that were struck from cores of the specified texture.

0.001 and p = 0.0209 respectively, Fisher's Exact Test). The only assemblages which were similar in regards to the proportion of coarse- and fine-grained materials recovered from their roof and floor contexts were those recovered from room C23/C28 and room C27/C34 when compared to room C35 (p = 1 and p = 0.5874 respectively, Fisher's Exact Test).

Size Grade

There are a number of statistically significant differences present between excavated rooms though the majority of these pertain to smaller size grade categories (those less than or equal to 1.25 inches) (Figure 7.16). Within this category of flake sizes, there are apparent differences in floor assemblages that contain more flakes of the smallest of the size grade categories (i.e. ≤ 0.25 inches). Rooms with more flakes of this size were found to contain fewer flakes of the larger size grade flakes (i.e. ≥0.25 ≤1.25

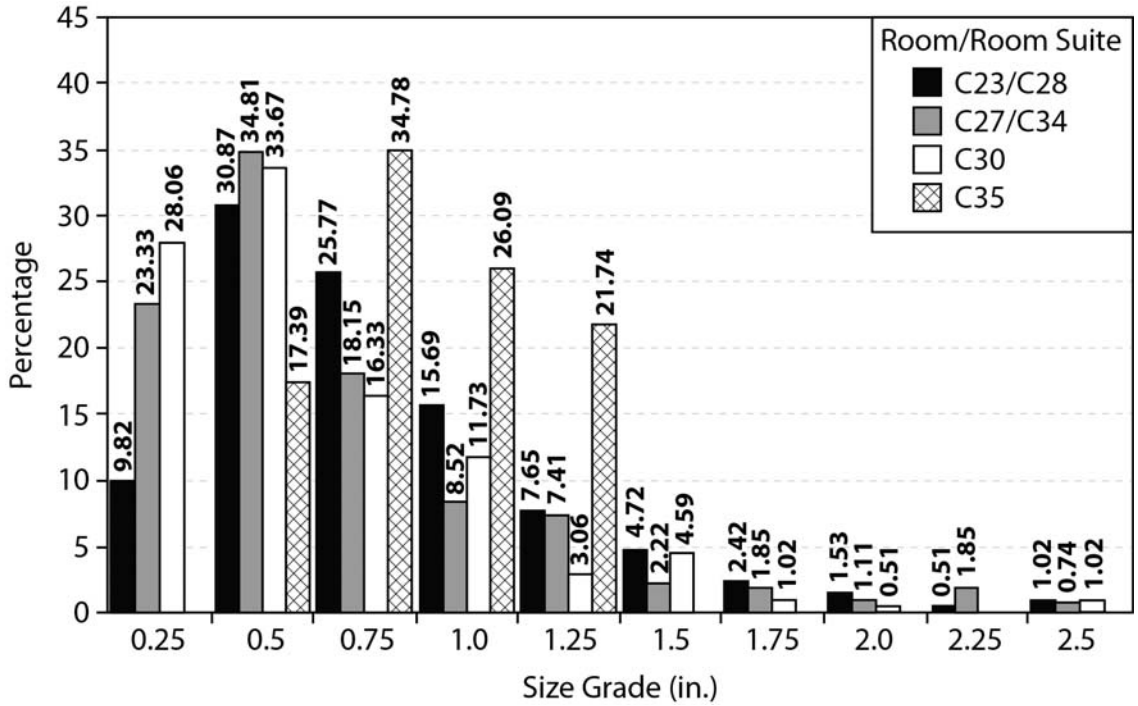

Figure 7.16: Proportion of flakes recovered roof and floor contexts associated with each excavated room that were assigned to the specified size-grade.

inches). Specifically, room C23/C28 was found to contain a smaller proportion of flakes whose size grade was less than or equal to 0.25 inches when compared to rooms C27/C34 ($p < 0.0001$, Fisher's Exact Test) and room C30 ($p < 0.0001$, Fisher's exact Test). These same patterns were found for room C35 whose floor assemblage contained no flakes in this size grade (C27/C34: $p = 0.0037$, Fisher's Exact Test; C30: $p = 0.0015$, Fisher's Exact Test). However, this situation was reversed for flakes in the 0.75 inch size grade category. Room C23/C28 was found to contain proportionally more flakes of this size when compared to room C27/C34 ($p = 0.0104$, Fisher's Exact Test) and room C30 ($p = 0.005$, Fisher's Exact Test). Similarly, room C35 contained proportionally more flakes of this size than room C30 ($p = 0.434$, Fisher's Exact Test). These same patterns were present for flakes within the 1.0 and 1.25 inch size grade category. With regards to the 1.0 inch size grade category, room C27/C34 was found to contain proportionally fewer flakes of this size when compared to room C23/C28 ($p = 0.0029$, Fisher's Exact Test) and room C35 ($p = 0.0169$, Fisher's Exact Test). Finally, room C35 was found to contain proportionally more flakes than room C23/C28 ($p = 0.0313$, Fisher's Exact Test), room C27/C34 ($p = 0.0348$, Fisher's Exact Test), and room C30 ($p = 0.0025$, Fisher's Exact Test).

The vast majority of these differences are accounted for by the proportion of andesite/basalt flakes of different size grades present in each of the rooms' roof and/or floor assemblages though smaller variations in flakes of different sizes were present with regards to proportions of chalcedony, chert, and rhyolite flakes. Variations in the proportions of different sized flakes from rooms C23/C28 and C35 are primarily responsible for most of the statistically significant differences between assemblages followed by variation in rhyolite flakes. This is to somewhat be expected given the fact that most of the flakes present in the room assemblages were struck cores of these materials types. For andesite/basalt flakes room C23/C28 differed from both rooms C27/C34 and C30 due to the low proportion of flakes less than or equal to 0.25 inches in size-grade ($p < 0.0001$ each, Fisher's Exact Test). Similarly, room C35 contained no andesite flakes of this size grade (0.25 inches) which differed significantly from the proportion present in room C30 ($p = 0.0355$, Fisher's Exact Test). Room C23/C28 also differed from room C30 with respect to the proportion of andesite/basalt flakes of a 0.75 inch size-grade recovered from their excavated roof and/or floor deposits ($p = 0.0467$, Fisher's Exact Test). Finally, Room C23/C28 was found to contain a smaller proportion of andesite/basalt flakes of a 1.25-inch size-grade when compared to room C35 ($p = 0.049$, Fisher's Exact Test). This same pattern was present for room C30 which also contained a smaller proportion of 1.25 inch size-graded andesite/basalt flakes when compared to room C35 ($p = 0.0371$, Fisher's Exact Test).

For rhyolite flakes, all of the variation present between assemblages can be accounted for by differences in the proportion of different size-graded flakes present in room C30. For 0.25-inch size-graded flakes, room C30 contained a higher proportion of rhyolite flakes of this size grade when compared to room C23/C28 ($p = 0.0006$, Fisher's Exact Test). Aside from this difference, the only other differences with respect to rhyolite flakes of different size-grades were with those of 1.25 inches in size. In regards to this size-grade, because room C30 contained no flakes of this size grade it contained a lower proportion of flakes when compared to room C23/C28 ($p = 0.0066$, Fisher's Exact Test), room C27/C34 ($p = 0.0105$, Fisher's Exact Test), and room C35 ($p = 0.0119$, Fisher's Exact Test).

The differences between the overall size of flakes struck from particular raw materials present in each excavated rooms' roof and/or floor assemblage could point to cultural differences in reduction strategies between each domestic group occupying these spaces. Specifically, with respect to andesite/basalt flakes, it appears that the inhabitants of room C35 did not reduce this material as extensively as the inhabitants of rooms C23/C28, C27/C34, and C30. Similarly, the inhabitants of room C30 appear to have more extensively reduced rhyolite cores when compared to the inhabitants of rooms C23/C28, C27/C34, and C35. However, there are other possible cultural behaviors that may account for the differences in the proportions of different sized flakes of different materials within each of the excavated rooms' assemblages. (e.g. disposal practices, abandonment patterns, room use-life, etc.). Accounting for how these other cultural processes affect the composition of the excavated structures' lithic assemblages is difficult. Thus, while particular rooms/room suites potentially implemented different reduction strategies, these differences could be the cumulative result of multiple formation processes.

Again, the differences present within the datasets patterns out in a more meaningful fashion when one compares the grain of these materials and the proportion different size-graded flakes struck from materials of differing textures. When one compares the proportion of flakes of different overall sizes struck from different textured materials it appears that fine-grained materials were more extensively reduced when compared to coarse-grained materials. Within the assemblages recovered from all excavated rooms/room-suites the proportion of smaller flakes is greatest for fine-grained materials. The only statistically significant differences between the proportions of size-graded materials with respect to flake texture are present with 0.25-inch size graded materials (p = 0.0488, Fisher's Exact Test) and 0.50-inch size graded materials (p = 0.0252, Fisher's Exact Test). These data suggest that fine-grained materials are usually more extensively reduced when compared to coarse-grained materials. However, there are substantial differences in the size of available cores between different textured materials. Usually, coarse-grained materials are available as larger cores when compared to fine-grained materials. This is drawn out in the dataset by the absence of fine-grained flakes greater than 2.0 inches in overall size. Regardless, I believe that the Black Mountain phase inhabitants of Old Town took active strides to conserve fine-grained materials and reduced them differently than coarse-grained cores.

Weight

The weight of a flake simply refers to how heavy the flake is and was measured in grams using an Ohaus digital scale with 0.1 gram accuracy. While this attribute was recorded for all debitage recovered during the 2006 and 2007 field seasons at Old Town, only data pertaining to complete flakes was used in the current analysis. Table 7.7 presents the descriptive statistics for weight of all complete flakes recovered from excavated rooms' roof and floor assemblages. Because this is a ratio/continuous scale variable, examination of similarities between different excavated rooms' roof and floor assemblages was carried out using the Wilcoxan rank sum statistic. No statistically significant differences were noted with respect to the weight of each complete flake recovered from different rooms' roof and floor contexts. These results suggest that when

Table 7.7: Descriptive statistics concerning the weight of complete flakes in grams for those flakes recovered from excavated rooms' roof and floor assemblages.

Room	N	Minimum	Median	Maximum	Mean	Std. Dev.
C23/C28	544	0.1	1.2	105.3	4.18	10.31
C27/C34	160	0.1	0.9	70.9	3.79	8.87
C30	140	0.1	1.2	34.6	3.64	6.14
C35	17	0.4	1.8	9.9	2.81	3.07

all flakes are considered as a whole assemblage, the individuals inhabiting each of these rooms produced flakes which were similar in weight.

While this pattern was discerned when all complete flakes were compared across sampling contexts, it failed to pattern out when raw materials were separated out based on their texture. When comparisons concerning the weight of complete flakes struck from either coarse-grained or fine-grained materials are taken into account, the only significant difference that emerges between sampling contexts, or excavated rooms' roof and/or floor assemblages, is that present between room C27/C34 and room C30 with respect to the weight of complete fine-grained flakes ($Z = 2.2755$, $p = 0.0229$), between C27/C34 and C35 ($Z = 2.1965$, $p = 0.0281$), and between C27/C34 and C23/C28 ($Z = -2.7496$, $p = 0.006$). This pattern is based on the fact that complete fine-grained flakes recovered from room C27/C34 tend to be lighter than those recovered from other excavated rooms' roof and floor contexts.

The descriptive statistics and measures of central tendency for the weight of complete flakes struck from coarse- and fine-grained materials recovered from each rooms' excavated roof and floor contexts are presented in Tables 7.8 and 7.9 and Figures 7.17 and 7.18. As these tables demonstrate, there is little variability in the weight of complete flakes struck from coarse-grained materials recovered from excavated rooms' roof and floor assemblages. While the average weight of flakes appears to differ slightly between sampling contexts (Figure 7.17, Table 7.8), the inter-quartile spread of the weight of flakes recovered from these contexts is similar. However, this situation is different with respect to the weight of fine-grained flakes recovered from these same contexts. With respect to complete flakes derived from fine-grained materials, means tend to vary considerably, especially between rooms C23/C28 and C30. These differences in en values do not however differ significantly from one another. Conversely, the inter-quartile spread of weight of complete fine-grained flakes recovered from excavated rooms' roof and floor assemblages does differ significantly. As can be seen in Figure 7.18, the weight of flakes present in room C27/C34 between the first and second quartile all fall below the values of the first quartile associated with complete flakes recovered from other rooms.

When the weight of complete struck from distinct raw materials were compared across assemblages the above mentioned differences somewhat pattern out. Specifically, the Wilcoxan rank sum statistics demonstrated that there were statistically significant differences present with respect to the weight of complete chalcedony flakes recovered from excavated roof and floor assemblages associated with room C27/C34 and C23/C28 ($Z = -1.9889$, $p = 0.0467$); complete chert flakes recovered from rooms C30 and C27/C34 ($Z = 2.3679$, $p = 0.0179$); and rhyolite flakes recovered from rooms C30 and C23/C28 ($Z = -2.2724$). These data suggest that room C27/C34 contains chalcedony flakes which weigh less than those present in room C23/C28; that room C30 contains complete chert flakes that tend to weigh more than those present in room C27/C34; and room C30 contains rhyolite that weigh less than those present in C23/C28.

The combination of these data demonstrate that the weight of complete flakes, especially those struck from fine grained materials, is variable across the Black Mountain phase component at Old Town. While the differences outlined above could be due to raw material variability, it is unlikely that these differences would exist if raw material procurement and reduction strategies were organized at a level above which the differences are noticed (i.e. domestic units). Based on these data, it appears that the inhabitants of room C27/C34 organized their lithic technology differently from surrounding rooms. Here, it appears that people routinely produced flakes struck from fine-grained material that weighed less than those produced by the inhabitants of other rooms. These patterns could indicate that the individuals inhabiting room C27/C34 more fully reduced fine-grained cores than their neighbors. Differential refuse disposal

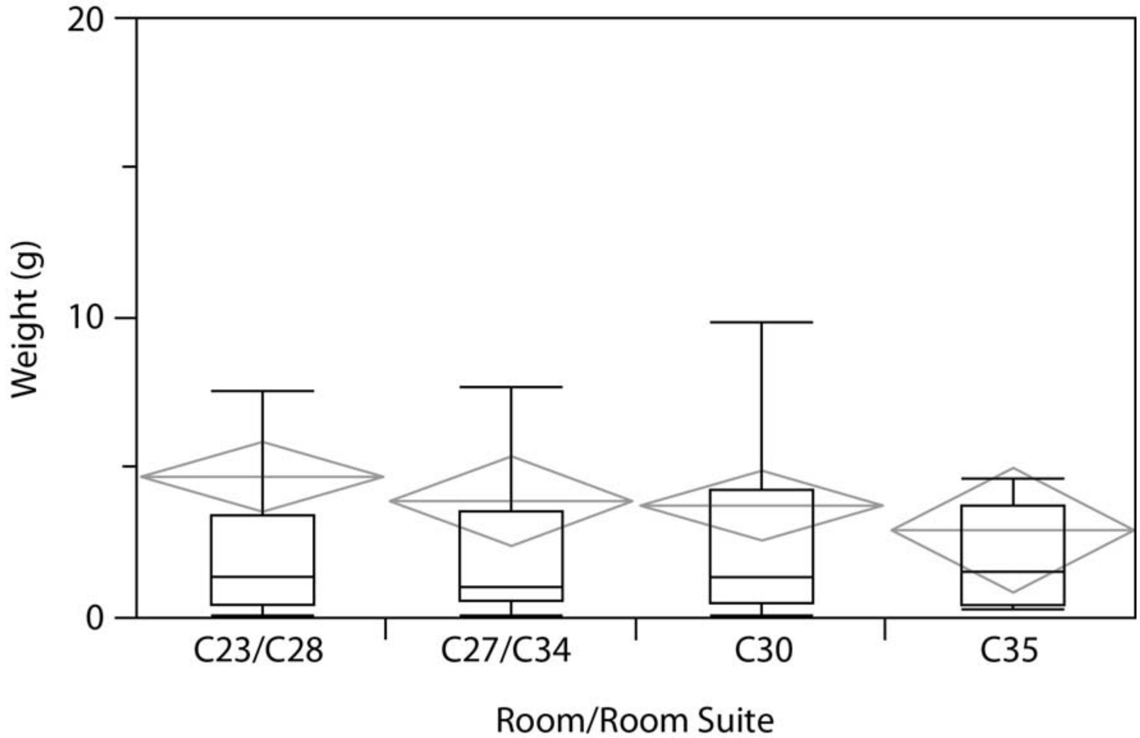

Figure 7.17: Box plots and mean diamonds depicting measures of central tendency for the weight of complete flakes struck from coarse-grained materials recovered from specified rooms' excavated roof and floor contexts.

Table 7.8: Descriptive statistics concerning the weight of complete coarse-grained flakes in grams for those flakes recovered from excavated rooms' roof and floor assemblages.

		N	Minimum	Median	Maximum	Mean	Std. Dev.
Room	C23/C28	407	0.1	1.3	105.3	4.79	11.66
	C27/C34	137	0.1	1.1	70.9	4.01	8.98
	C30	129	0.1	1.3	34.6	3.86	6.35
	C35	13	0.4	2.3	10.4	3.01	3.39

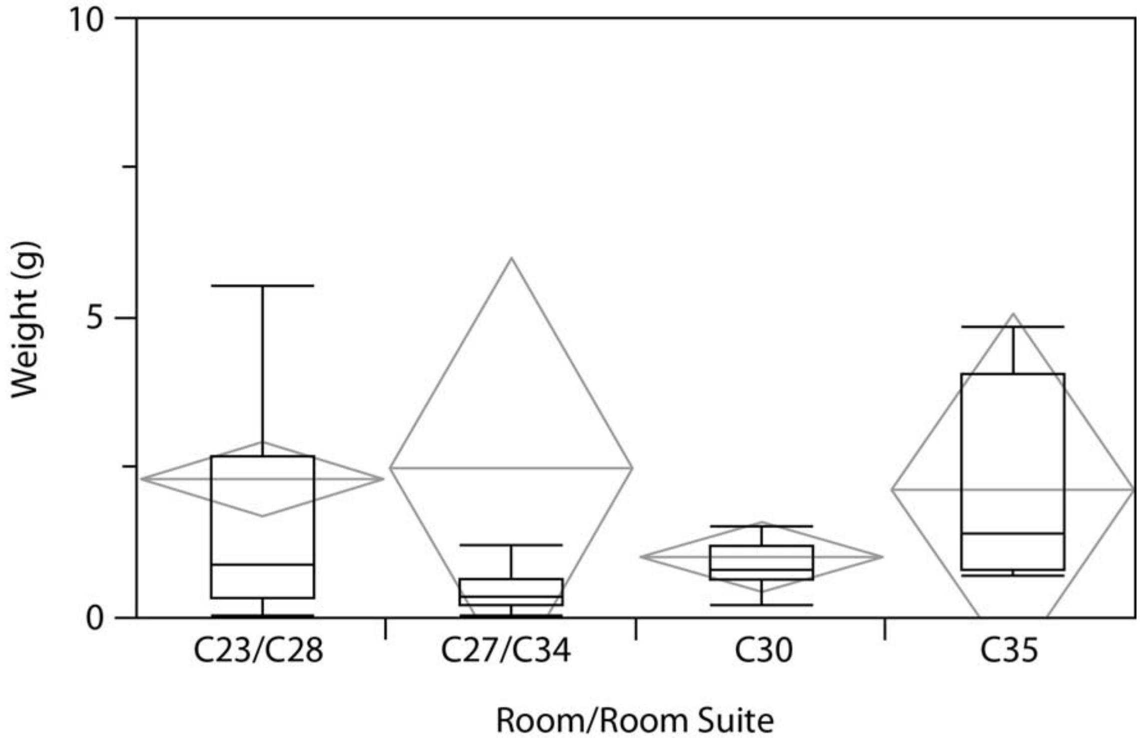

Figure 7.18: Box plots and mean diamonds depicting measures of central tendency for the weight of complete flakes struck from fine-grained materials recovered from specified rooms' excavated roof and floor contexts.

Table 7.9: Descriptive statistics concerning the weight of complete fine-grained flakes in grams for those flakes recovered from excavated rooms' roof and floor assemblages.

		N	Minimum	Median	Maximum	Mean	Std. Dev.
Room	C23/C28	137	0.1	1	23.4	2.37	3.71
	C27/C34	23	0.1	0.5	39.7	2.55	8.26
	C30	11	0.3	0.8	3.2	1.08	0.79
	C35	4	0.8	1.5	4.9	2.175	1.88

processes could account for these differences in that perhaps the individuals present in room C27/C34 were more systematic in their removal of larger flakes struck from these materials. While this scenario is a possibility, the presence of heavier fine-grained flakes within the room's assemblage seems to contradict this assertion.

Length

As was the case for the weight of flakes, while the maximum length of flakes was recorded for each piece of debitage present in the 2006 and 2007 lithic assemblages, only the maximum length of complete flakes will be discussed further. The maximum length of complete flakes represents the maximum distance from the striking platform on the flake's proximal end to the termination on the flake's distal end. This measurement was taken using a set of calipers and was measured in millimeters.

Like other ratio-scale data collected for the debitage assemblage, statistical tests between sampling strata were carried out using a series of pairwise Wilcoxan rank sum statistics. The first series of these tests was conducted comparing all flakes recovered from roof and floor contexts from each of the excavated rooms (Table 7.10). These series of statistical tests demonstrated that there were no statistically significant differences present between room assemblages with respect to the maximum length of flakes regardless of raw material texture or type.

Additional statistical tests were carried out that measured the relationship of maximum flake length and raw material grain texture across excavated roof and floor assemblages. These tests demonstrated that there were no statistically significant differences with respect to maximum flake length and coarse-grained materials across sampling strata (Figure 7.19 and Table 7.11). However, there were differences with respect to the maximum length of complete flakes struck from fine-grained materials (Figure 7.20 and Table 7.12). Specifically, complete fine-grained flakes recovered from room C27/C34 tended to be larger than those recovered from room C23/C28 ($Z = 2.7602$, $p = 0.0058$).

Table 7.10: Descriptive statistics concerning the maximum length of complete flakes in millimeters for those flakes recovered from excavated rooms' roof and floor assemblages.

Room		N	Minimum	Median	Maximum	Mean	Std. Dev.
	C23/C28	544	7	18.25	98.9	20.96	11.07
	C27/C34	160	8.3	17.4	59.4	19.77	9.81
	C30	140	6.2	17.25	68.4	19.99	10.45
	C35	17	7.7	19.8	33	19.88	8.12

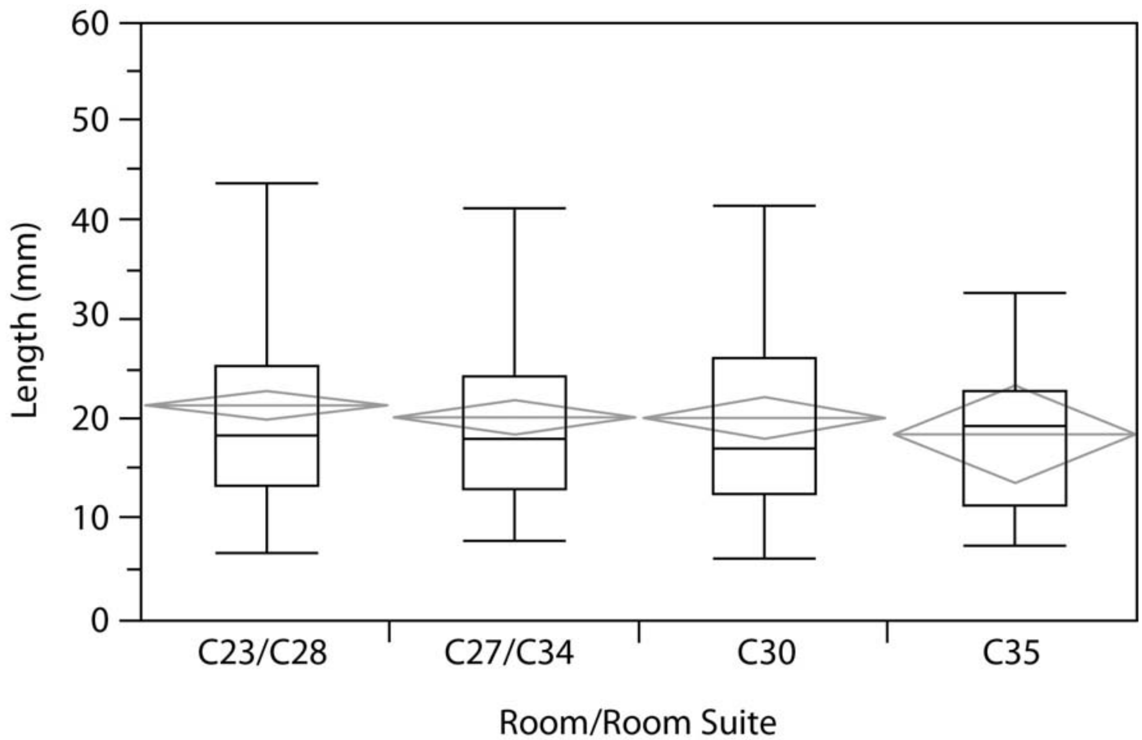

Figure 7.19: Box plots and mean diamonds depicting measures of central tendency for the maximum length of complete flakes struck from coarse-grained materials recovered from specified rooms' excavated roof and floor contexts.

Table 7.11: Descriptive statistics concerning the maximum length of complete flakes struck from coarse-grained cores recovered from excavated rooms' roof and floor assemblages.

Room		N	Minimum	Median	Maximum	Mean	Ste. Dev.
	C23/C28	407	7	18.5	98.9	21.54	11.84
	C27/C34	137	8.3	18.4	59.4	20.45	9.76
	C30	129	6.2	17.4	68.4	20.34	10.79
	C35	13	7.7	19.8	33	18.78	7.94

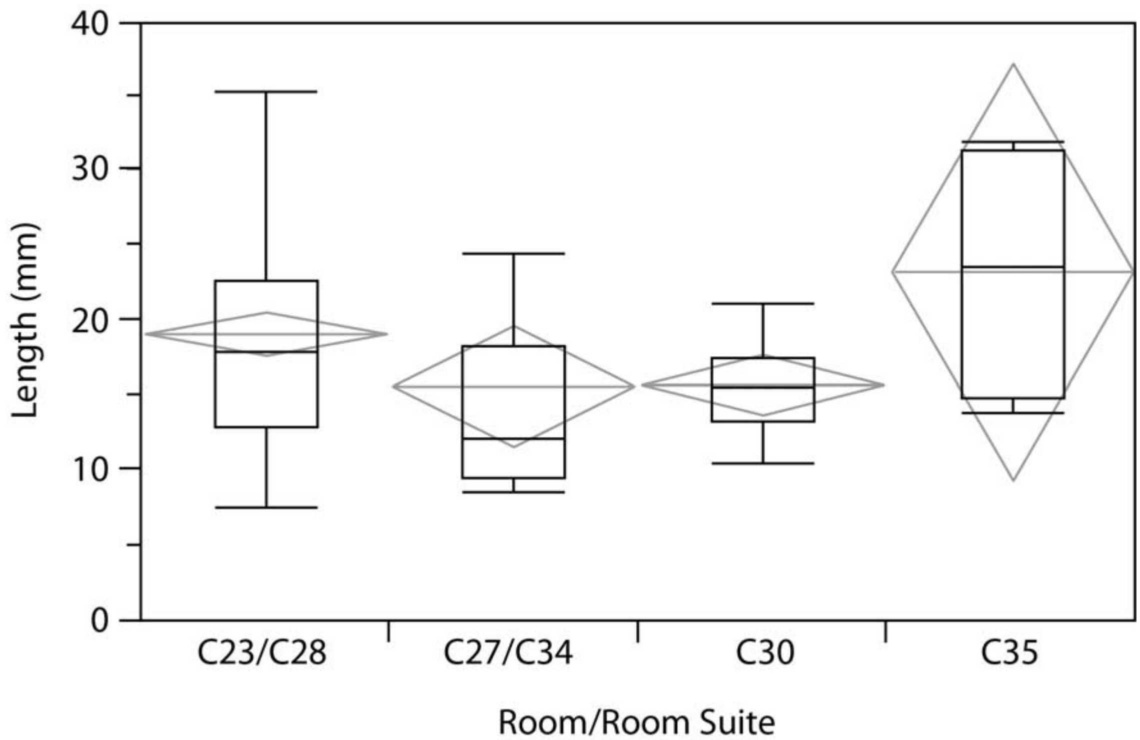

Figure 7.20: Box plots and mean diamonds depicting measures of central tendency for the maximum length of complete flakes struck from fine-grained materials recovered from specified rooms' excavated roof and floor contexts.

Table 7.12: Descriptive statistics concerning the maximum length of complete flakes struck from fine-grained cores recovered from excavated rooms' roof and floor assemblages.

		N	Minimum	Median	Maximum	Mean	Std. Dev.
Room	C23/C28	137	7.5	18	51.3	19.22	8.18
	C27/C34	23	8.6	12.5	49.6	15.73	9.35
	C30	11	10.7	15.7	21.3	15.81	3
	C35	4	14	23.8	32.1	23.43	8.79

In an effort to see what raw materials were responsible for these differences, additional tests were carried that measured the length of complete flakes struck from specific raw materials across different rooms' excavated roof and floor assemblages. The results of these tests demonstrated that the differences established for the maximum length of complete flakes struck from fine-grained materials were the result of the maximum length of complete flakes struck from chalcedony. With respect to complete chalcedony flakes, room C23/C28 was found to have larger flakes than those present in room C27/C34 ($Z = 2.2717$, $p = 0.0065$). It was also found that there were a number of statistically differences present with the length of complete rhyolite flakes recovered from the excavated rooms' roof and floor assemblages. These differences resulted from the fact that the complete rhyolite flakes recovered from room C30 tended to be smaller in maximum length than those recovered from rooms C23/C28, C27/C34, and C35 ($Z = -3.4613$, $p = 0.0005$; $Z = -3.3058$, $p = 0.0009$; and $Z = -2.3436$, $p = 0.0191$ respectively) (Figure 7.21).

In all, these tests demonstrate that there are more similarities than differences present with respect to the maximum length of complete flakes recovered from excavated rooms' roof and floor assemblages. The differences present between room C23/C28 and C27/C34 could potentially indicate that more intensive reduction took place at one of

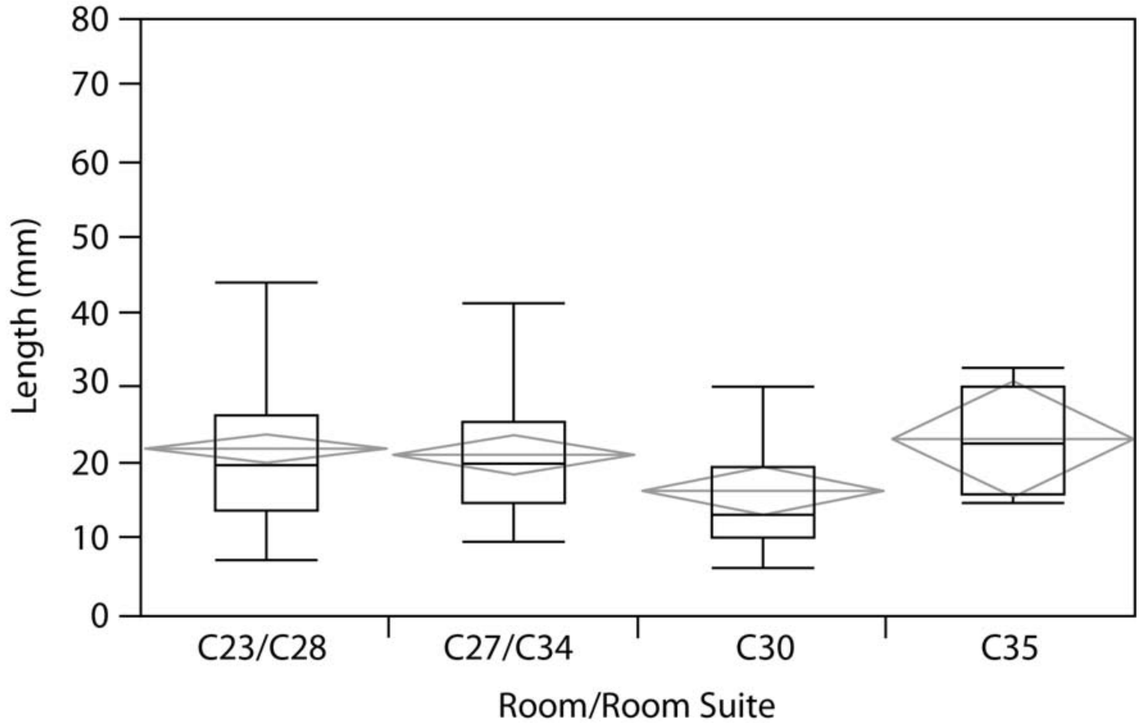

Figure 7.21: Box plots and mean diamonds depicting measures of central tendency for the maximum length of complete flakes struck from rhyolite cores recovered from specified rooms' excavated roof and floor contexts.

these rooms. However, arguments could be made that chalcedony reduction intensity could be greater at either room. The higher frequency of larger chalcedony flakes in room C23/C28 could indicate that more early stage reduction took place within the confines of this room. Conversely, the higher frequency of smaller chalcedony flakes within room C27/C34 could indicate that more later stage reduction took place in this room's confines. Another explanation could be centered on raw materials variability. It could be that the inhabitants of the final occupation of room C23/C28 found a rather large piece of chalcedony to reduce and this produced larger flakes than normally obtained from similar raw material nodules.

Similarly, there are many potential explanations to the patterns present with the length of complete rhyolite flakes. The above data could indicate that more later stage reduction of rhyolite cores took place in the confines of room C30 when compared to rooms C23/C28, C27/C34, and C35. However, these interpretations of raw material reduction intensity rest on the patterns discerned for other debitage attribute data.

Width

As was the case for the other flake attributes, while the maximum width of flakes was recorded for each piece of debitage present in the 2006 and 2007 lithic assemblages, only the maximum width of complete flakes will be discussed further. The maximum width of complete flakes represents the maximum distance spanning the flake's lateral margins. This measurement was taken using a set of calipers and was measured in millimeters.

Like other ratio-scale data collected for the debitage assemblage, statistical tests between sampling strata were carried out using a series of pairwise Wilcoxan rank sum statistics. The first series of these tests was conducted comparing all flakes recovered from roof and floor contexts from each of the excavated rooms (Figure 7.22 and Table 7.13). These series of statistical tests demonstrated that there was one statistically significant difference present between room assemblages with respect to the maximum width of flakes regardless of raw material texture or type. This difference concerned the fact that, when all complete flakes are compared across sampling strata, room C30 tends to contain flakes that are wider than those present in room C27/C34 ($Z = 2.0339$, $p = 0.0420$).

When other statistical tests were carried out that broke the complete flakes down into different raw material categories (e.g. coarse-grained materials and fine-grained materials) as well as specific raw materials, no statistically significant differences were noted as being present between each rooms' excavated roof and floor assemblages with respect to the width of complete flakes. These data suggest that all complete flakes were similar in width across sampling strata regardless of raw materials differences.

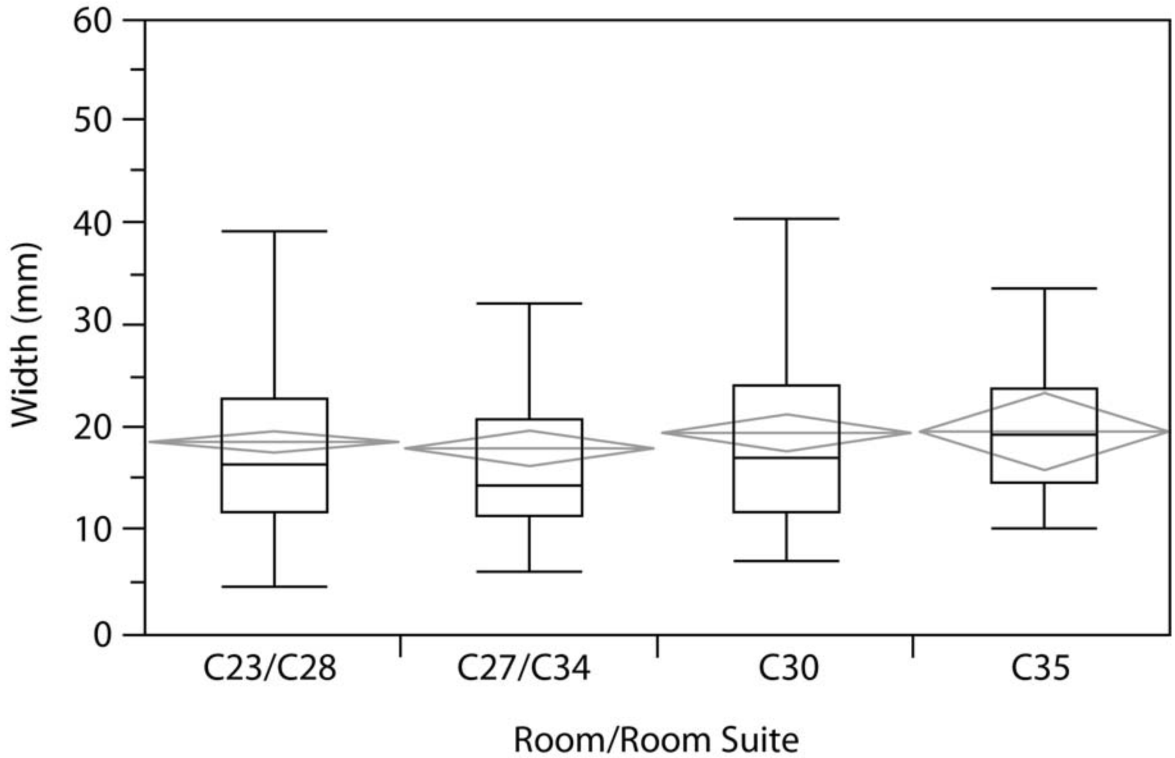

Figure 7.22: Box plots and mean diamonds depicting measures of central tendency for the maximum width of complete flakes recovered from specified rooms' excavated roof and floor contexts.

Table 7.13: Descriptive statistics concerning the maximum width of complete flakes in millimeters for those flakes recovered from excavated rooms' roof and floor assemblages.

Room	No.	Minimum	Median	Maximum	Mean	Std. Dev
C23/C28	544	4.7	16.7	82.9	18.86	10.12
C27/C34	160	6	14.55	69.4	18.1	11.01
C30	140	7.4	17.65	57.6	19.56	9.83
C35	17	10.2	19.3	34.1	19.69	6.76

Thickness

Maximum thickness was measured for each piece of debitage recovered from the 2006 and 2007 field seasons. The maximum thickness of complete flakes represents the maximum distance spanning the flake's ventral and dorsal faces. Statistical tests were carried out that measured the different distributions of maximum thickness across different rooms' excavated roof and floor assemblages. The first of these statistical tests were carried out to measure the differences in thickness between all complete flakes recovered from the roof and floor assemblages associated with each room that was tested during the 2006 and 2007 field seasons. The results of these tests demonstrated that there were no statistically significant differences between sampled strata with respect to the thickness of all flakes recovered from their confines (Table 7.14).

When different raw material types were separated and compared across excavated rooms' roof and floor assemblages, a different pattern emerged. Specifically, when the thickness of complete flakes struck from raw materials of differing textures was compared across excavated room's roof and floor assemblages room C23/C28 was found to have thicker fine-grained flakes when compared to room C27/C34 ($Z = 2.4103$, $p = 0.0159$).

Table 7.14: Descriptive statistics concerning the maximum thickness of complete flakes in millimeters for those flakes recovered from excavated rooms' roof and floor assemblages.

Room		N	Minimum	Median	Maximum	Mean	Std. Dev.
	C23/C28	544	1.1	5.15	31.1	6.16	3.77
	C27/C34	160	1.2	4.8	29.8	5.86	4.38
	C30	140	1.6	5.2	29.7	6.31	4.19
	C35	17	2.5	5.8	13.5	6.25	3.14

However, this pattern failed to present itself when the thickness of complete flakes struck from specific raw materials was compared across excavated rooms. Instead it was demonstrated that room C30 tended to have thicker chert flakes when compared to those recovered from room C27/C34 ($Z = 2.2752$, $p = 0.0229$). It was also shown that room C30 tended to have thinner rhyolite flakes when compared to room C23/C28 ($Z = -2.2727$, $p = 0.023$).

Platform Angle

For the present study exterior platform angle was used to measure the platform angle variable. This variable represents the angle between the platform surface and the exterior dorsal surface of the flake. This angle was measured with the aid of a goniometer as degrees. The measures of central tendency associated with these platform angle determinations are presented in Figure 7.23 and in Table 7.15. As can be discerned from both Figure 7.23 and Table 7.15 there was little variability across different excavated rooms' floor and roof assemblages with respect to exterior platform angle. When one compares the exterior platform angles present on all flakes recovered from excavated rooms' roof and floor assemblages against each other, no statistically significant differences emerge. Based on these data it appears that, when all flakes regardless of the texture of a particular and the specific raw material a flake was derived from, exterior platform angle, and thus the angle at which force was applied to a core, is fairly consistent across sampling strata.

However, this pattern disappears when one looks at differences in raw material. Specifically, when exterior platform angle is compared across sampling strata with respect to the texture of the flakes' raw material, significant differences begin to emerge. These differences are primarily due to the smaller platform angles present on fine grained flakes recovered from room C30 in relation to those recovered from room C35 ($Z = -2.6065$, $p = 0.0364$). Unfortunately these differences fail to pattern out when the platform angle present on flakes struck from cores of specific raw materials are compared across excavated rooms' roof and floor assemblages. When the specific raw materials are taken

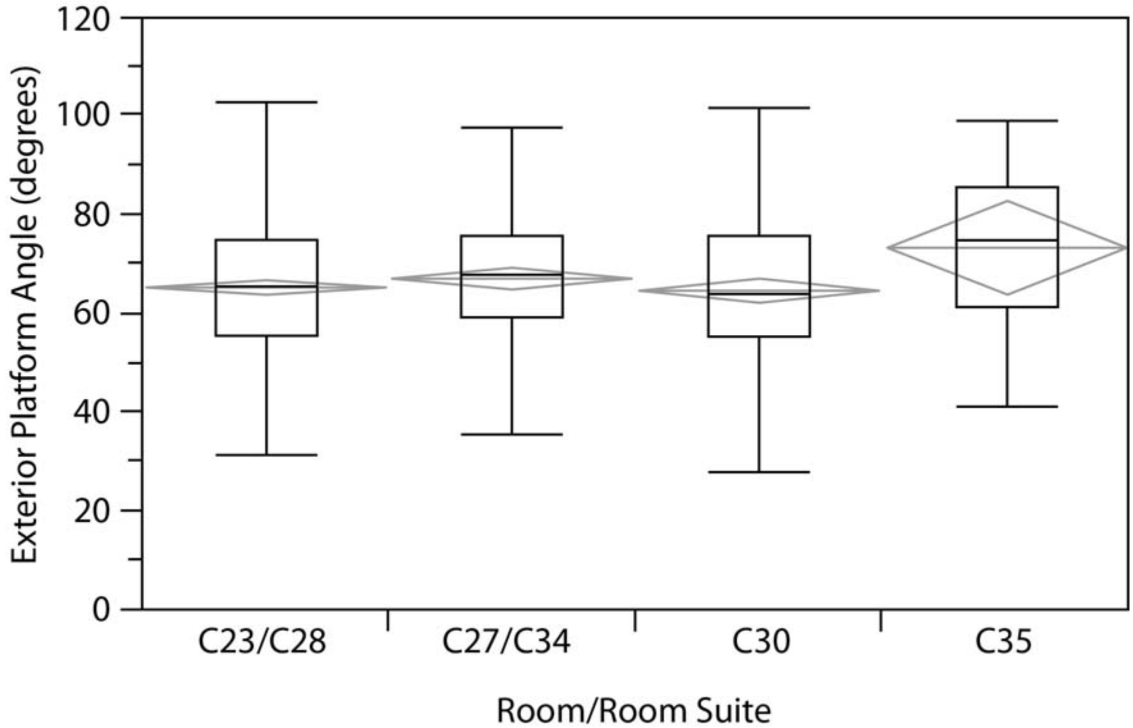

Figure 7.23: Box plots and mean diamonds depicting measures of central tendency associated with exterior platform angles measured for all flakes recovered from specified rooms that retained a platform.

Table 7.15: Descriptive statistics concerning the exterior platform angle for those flakes recovered from excavated rooms' roof and floor assemblages.

Room		N	Minimum	Median	Maximum	Mean	Std. Dev.
	C23/C28	595	31	65	118	65.71	14.48
	C27/C34	168	36	68	98	67.38	11.84
	C30	155	28	64	102	64.66	12.97
	C35	18	41	70.5	99	70.83	15.28

in to account, the only differences that emerge are those present on rhyolite flakes. Again, room C30 was found to differ from room C27/C34 ($Z = -2.3676$, $p = 0.0179$) and room C35 ($Z = -2.4093$, $p = 0.016$) based on the smaller platform angles present on rhyolite flakes recovered from room C30. Room C23/C28 was also found to have rhyolite flakes with smaller platform angles than those present in room C35 ($Z = -2.2730$, $p = 0.023$).

Together these data suggest that there were more similarities than differences across rooms with respect to the exterior platform angle present on flakes. When raw materials are separated out, room C30 appears to have an assemblage with smaller exterior platform angles when compared to room C27/C34 and room C35. These data could suggest that these flakes were either removed from pieces that were partially reduced bifaces or that a different learning framework was present with the inhabitants of room C30 where they systematically set up their platforms with angles which were more acute than their neighbors.

SUMMARY

As can be discerned from the above discussion, the lithic assemblages recovered from archaeological sites throughout the Mimbres area exhibit some variability. Drawing conclusions concerning the regional variability of lithic assemblages is hindered by the fact that few studies have been conducted on lithic assemblages recovered from sites. While the majority of studies that have delved into interpreting patterns present in this artifact class record some information, the comparability of these studies is limited by the fact that different researchers approach assemblages in different manners and each has tended to focus on a different set of attributes.

Be this as it may, most researchers have at the very least recorded some information pertaining to raw material variability (e.g. Diehl and LeBlanc 2001; Dockall 1991; Nelson 1984, 1986). Comparisons of the proportions of different raw material types present in these assemblages reveals that there are more differences between assemblages than similarities. These data potentially point to the fact that raw material exploitation at these sites is conditioned by the availability of raw material in the natural environment surrounding sites. Temporal patterns at individual sites indicate that use of coarse-grained materials such as andesite and basalt increases through time as the utilization of fine-grained materials such as chalcedony decreases through time. This pattern reverses during the Cliff/Salado phase which stands out due to the high proportion of chalcedony flakes recovered from sites dating to this time period.

From an inter-site perspective, there may be differences between Mimbres assemblages but the mechanisms responsible for these differences is consistent through the Early Pithouse period through the Black Mountain phase. These data suggest that the inhabitants of settlements dating to these different time periods were relatively fixed on the landscape and made use of locally available raw materials through time. As time passed, the frequency of fine-grained materials likely decreased due to the opportunistic harvesting of these materials by individuals of preceding periods.

The patterns present with respect to the Cliff/Salado phase inhabitants of the valley suggests that the people present during this time period organized their lithic technology differently from peoples of the preceding periods. It appears that the inhabitants of the Valley during this time period targeted chalcedony for utilization. It is likely, given the density of occupation in the Valley during earlier time periods and the potential for much higher population densities and thus increased raw material exploitation, that Cliff/Salado phase peoples had to exert considerable effort to acquire the amount of this material present at Disert, Janss, and Stailey.

Based on these data there does not appear to be an overarching social structure that dictated how individual groups organized their lithic technology during the Late Pithouse period through to the Black Mountain phase. It appears that lithic technology was organized as an adaptation to each individual community's local environment. It is likely that lithic technology throughout the Mimbres sequence, including the Black Mountain phase, consisted of tools which were designed to enhance their maintainability in order to exploit resources that were predictable in both time and space. The inhabitants of the Valley from roughly A.D. 550 through A.D. 1300 were likely relatively sedentary and exploited locally available raw materials to produce a relatively simple generalized tool kit that could be used to exploit a variety of natural resources in the immediate surroundings of the village.

From an intra-site perspective, the assemblages recovered from individual excavated Black Mountain phase rooms suggests that some variability was present with respect to the technological style used to reduce cores. Table 7.16 displays the statistically significant differences present between excavated rooms' roof and floor assemblages with respect to nominal and interval scale variables recorded for each piece of debitage. One of the most obvious patterns depicted in Table 7.16 is the relative lack of statistically significant differences between assemblages when compared to the assemblage recovered from room C35. This pattern is likely due to the limited testing conducted within this room's confines and the small size of the lithic assemblage recovered from the room's roof and floor contexts (n = 23).

The other pattern that is rather apparent is the fact that size grade data shows a considerable amount of variability between assemblages. As stated above, much of this variability is accounted for by the differences in the relative size of andesite/basalt debitage recovered from excavated rooms' roof and floor assemblages. In particular, room C35 contains a higher proportion of larger flakes (e.g. 0.75 – 1.25 inch size graded flakes) of this material when compared to rooms C23/C28, C27/C34, and room C30. Likewise, room C23/C28 contains a smaller proportion of 0.25 in size graded andesite/basalt flakes when compared to rooms C27/C34 andC30. At first glance these patterns would seem to suggest that the inhabitants of room C35 did not reduce items struck from andesite/basalt cores as extensively as the inhabitants of other rooms. However, the limited exposure of room C35 as well as differential refuse disposal practices could account for these differences.

As was the case for the size grade data, the majority of the other significant differences recognized in the analysis of nominal and interval scale data is primarily a result of differences with respect to the reduction of andesite/basalt cores. I believe that

Table 7.16: Statistically significant differences between specified rooms' roof and floor assemblages with respect to the specified nominal and interval-scale variable and the specified debitage category. An "X" denotes that there is a statistically significant difference present between room assemblages.

		Paired Rooms / Room-suites					
	Debitage	C23/C28 - C27/C34	C23/C28 - C30	C23/C28 - C35	C27/C34 - C30	C27/C34- C35	C30 - C35
Cortical Variation	All Debitage	X			X		
	Coarse-grained	X	X		X		
	Fine-grained						
	And/Bas	X	X		X		
	Chalcedony						
	Chert				X		
	Rhyolite						
Scar Count	All Debitage				X	X	
	Coarse-grained				X		
	Fine-grained						
	And/Bas		X		X		
	Chalcedony						
	Chert					X	
	Rhyolite						
Platform Class	All Debitage						
	Coarse-grained						
	Fine-grained						
	And/Bas						
	Chalcedony		X		X		
	Chert						
	Rhyolite						
Condition	All Debitage	X					
	Coarse-grained	X	X				
	Fine-grained						
	And/Bas						
	Chalcedony						
	Chert						
	Rhyolite						
Material	All Debitage						
	Coarse-grained	X	X				
	Fine-grained	X	X				
	And/Bas	X	X				
	Chalcedony	X					
	Chert		X		X		
	Rhyolite						

Table 7.16 (continued): Statistically significant differences between specified rooms' roof and floor assemblages with respect to the specified nominal and interval-scale variable and the specified debitage category. An "X" denotes that there is a statistically significant difference present between room assemblages.

		Paired Rooms / Room-suites					
	Debitage	C23/C28 - C27/C34	C23/C28 - C30	C23/C28 - C35	C27/C34 - C30	C27/C34 - C35	C30 - C35
Grain	All Debitage	X	X		X		X
Size Grade	All Debitage	X	X	X		X	X
	Coarse-grained	X	X	X	X	X	X
	Fine-grained	X	X			X	
	And/Bas	X	X	X		X	X
	Chalcedony		X				
	Chert	X	X				
	Rhyolite		X		X		X

these patterns represent a continuation of the patterns recognized with the inter-site comparisons in that individual groups are making use of locally available raw materials though are doing so in different ways that are distinct to specific communities of practice. The relative absence of statistically significant differences between sampling contexts with respect to flakes struck from rhyolite cores is surprising in this regard given the fact that this material is available locally and is present in higher proportions at Old Town than other sites in the Mimbres area (Figure 7.3).

When one examines the patterns present with respect to ratio scale variables different pattern emerges (Table 7.17). As can be seen in Table 7.17, there is less variability across sampling contexts with respect to the weight, length, width, thickness, and exterior platform angle of flakes struck from differing raw materials across sampling contexts. Those differences that are present are associated with flakes struck from fine-grained materials or flakes struck from rhyolite cores. In general, these differences tend to pattern out based on the total sample size from individual contexts with larger samples tending to contain larger flakes than the context with a smaller sample. For instance, the

Table 7.17: Statistically significant differences between specified rooms' roof and floor assemblages with respect to the specified ratio-scale variables and the specified debitage category. An "X" denotes that there is a statistically significant difference present between room assemblages.

		Paired Room / Room-suite					
	Debitage	C23/C28 - C27/C34	C23/C28 - C30	C23/C28 - C35	C27/C34 - C30	C27/C34 - C35	C30 - C35
Weight	All Debitage						
	Coarse-grained						
	Fine-grained	X			X	X	
	And/Bas						
	Chalcedony	X					
	Chert				X		
	Rhyolite		X				
Max. Length	All Debitage						
	Coarse-grained						
	Fine-grained	X					
	And/Bas						
	Chalcedony	X					
	Chert						
	Rhyolite		X		X		X
Max. Width	All Debitage				X		
	Coarse-grained						
	Fine-grained						
	And/Bas						
	Chalcedony						
	Chert						
	Rhyolite						
Max. Thickness	All Debitage						
	Coarse-grained						
	Fine-grained	X					
	And/Bas						
	Chalcedony						
	Chert				X		
	Rhyolite		X				
Platform Angle	All Debitage	X					
	Coarse-grained						
	Fine-grained						X
	And/Bas						
	Chalcedony						
	Chert						
	Rhyolite			X	X		X

number of flakes recovered from roof and floor contexts associated with room C23/C28 (n = 544) outnumbers those present in similar contexts in room C27/C34 (n = 159). The differences present between rooms C23/C28 and C27/C34 with respect to ratio scale variables are the result of larger chalcedony flakes being present in room C23/C28.

With all of these data in mind, perhaps the strongest patterns for similarities between contexts exist when one considers how cores composed of coarse-grained materials were reduced when compared to how fine-grained cores were reduced. Flakes struck from fine grained materials stand out due to their evidence of platform preparation, the relatively high number of negative flake scars present on their dorsal surface, and the fact that they tend to retain less cortex on their dorsal surface when compared to flakes struck from coarse-grained materials. These patterns demonstrate that considerable effort was taken to more intensively reduce fine-grained cores and thus conserve raw material when compared to coarse-grained cores.

These data potentially indicated that two design strategies were in place simultaneously at Old Town during the Black Mountain phase. Coarse-grained materials were likely reduced with a generalized design strategy in mind. Tools derived from these materials (i.e. andesite/basalt and rhyolite) were manufactured from materials that were predictable in time and space and were used to capture resources that were similarly distributed. Based on the fact that the majority of these flakes retained some remnant of a cortical surface and the fact that they exhibit little evidence of platform preparation, flake tools were likely produced as needed and experienced relatively little used in relation to their maximum potential use. These data indicate that production investment was likely minimal.

Conversely, fine grained materials exhibit characteristics that are more commonly associated with a specialized design strategy. Flakes derived from these materials tend to show more evidence of production investment in the preparation of flakes prior to removal. Based on the characteristics of fine-grained flakes recovered from excavated rooms within the Black Mountain phase component at Old Town, these flakes were likely removed in the reduction of more formal tools and thus indicate that a more diverse tool kit was manufacture from fine-grained materials. This assertion is further supported in the following chapter which demonstrates that projectile points are more commonly manufactured from fine grained materials. These tools were likely manufacture prior to their intended use and were used to capture a limited number of resources that were unpredictable in their encounter characteristics (e.g. distribution, seasonality, etc.).

With these patterns in mind, the majority of the differences outlined above appear to reflect situations whereby the rules governing social behavior associated with lithic technology were somewhat site specific with respect to the raw material utilization. I feel that the reduction of coarse-grained materials was likely something that was transmitted and reproduced at the household level. This is based on the fact that the majority of variation present in the assemblages recovered from excavated rooms is attributable to this raw material type. The fact that there is little variability between excavated room's assemblages with respect to fine grained materials suggests that there was some form of overarching social structure that dictated how these materials were to be reduced and the members of this community of practice followed the rules established by this social organization's learning framework regardless of the household the community member belonged to. However, the fact that the majority of statistically significant differences present between assemblages dealt with the coarse-grained materials most common in the site's immediate surroundings suggests that these differences were generated by differential household practices.

Thus, lithic technology appears to have been organized at various levels. On one level the reduction of coarse-grained materials was likely organized so that it accentuated characteristics common to a generalized design strategy. Current evidence suggests that the transmission and reproduction of the knowledge associated with this method of technological organization was carried out at the household level. Conversely, the reduction of fine-grained materials was organized so that it accentuated characteristics common to a specialized design strategy. The information presented above indicates that the transmission and reproduction of the learning frameworks associated with this method of technological organization was carried out at a scale above the individual household.   At present, I am uncertain as to the extent of the community of practice associated with the reduction of fine-grained materials.   This issue will be further explored in the following chapter that investigates patterns in the formal chipped stone tool assemblages recovered from different temporal occupations in the larger Mimbres area.

Chapter 8: Formal Chipped Stone Tools and Obsidian Studies

Based on the patterns recognized in the previous chapter, additional analyses were carried out to determine the scale at which the lithic specialized design strategy technology was organized. In order to accomplish this task, I primarily use data collected from the excavations conducted at Old Town and offset this with data presented by Dockall (1991) in his analysis of the lithic assemblage collected from the NAN Ranch ruin. Data pertaining to the technological choices available to prehistoric peoples of the Mimbres area with relation to their formal chipped stone tool technology is limited. Specifically, this data relates to metric attributes associated with the projectile point assemblage recovered from Old Town as well as raw material variability associated with projectile points in throughout the area. I use data pertaining to raw material variability to assess if groups were exploiting similar resources through time. These data include broad categories pertaining to rock type as well as individual raw material source use associated with obsidian artifacts. Where available, I use these data to investigate diachronic and synchronic patterns at the inter- and intra-site levels to determine if there were shifts in raw material procurement and use practices. As previous chapters have iterated, these analyses are necessary in order to more fully characterize how different technologies were organized during different time periods. Again, one would expect to see differences in the ways in which formal chipped stone tool technology was organized if different social groups were responsible for their manufacture. This would reflect the existence of different learning frameworks associated with the social practices of production, distribution, transmission and reproduction. Thus, for the Black Mountain phase, I would expect to see differences in raw material utilization through time if new social groups entered a substantially depopulated area. In the following chapter I delve into these issues by fist investigating patterns present in the formal chipped stone tool assemblages recovered from Old Town and NAN Ranch.

THE NAN RANCH AND OLD TOWN FORMAL CHIPPED STONE TOOL ASSEMBLAGE

To begin assessing the organization of formal lithic tool technology within the Mimbres area, the utilization of raw materials for the production of formal tools was investigated. The majority of this analysis was conducted on the formal tool assemblage recovered from the Old Town site and used the typology developed by Dockall (1991) for the assemblage recovered from the NAN Ranch ruin (Figure 8.1). These types are primarily differentiated by their overall size and their basal morphology. As depicted in Figure 8.1, San Pedro dart points in Dockall's (1991) typology are primarily differentiated from other dart points by their larger size though the presence of deep side notches are also a defining characteristic of the type. This produces a relatively large point with fairly wide shoulders and an expanding stem. San Pedro bases are generally convex though flat bases are also common. Dockall (1991) notes that there could be two varieties of this point type at NAN Ranch. These two varieties are differentiated by size and Dockall suggests that this could be a result of temporal variation. At NAN the smaller variety of the San Pedro point was generally found in later context deposits, possibly suggesting that these smaller San Pedro points were the result of curation practices. Chiricahua points are differentiated from other dart points primarily based on the presence of fairly deep corner notches as well as a basal notch. Stems are usually expanding and shoulders are usually barbed though the curation of these points often leads to a parallel stems. Type D1 points are characterized by the presence of shallow corner notches that produce a relative short expanding stem and small shoulders. Basal edges vary in shape from straight to convex. Type D2 points are similar to D1 point but are side notched. Type D4 points are similar to Chiricahua points but lack basal notches. D4 points contain an expanding stem hafting element that results from the production of relatively deep corner notches. The shoulders of this point type are barbed and basal edges vary from convex to straight in shape. Finally, type D5 points are characterized by the presence of barbed shoulders that result from the presence of deep corner notches. Dockall (1991:240) notes that the D5 points recovered form NAN Ranch are variable in their morphology and may represent multiple types.

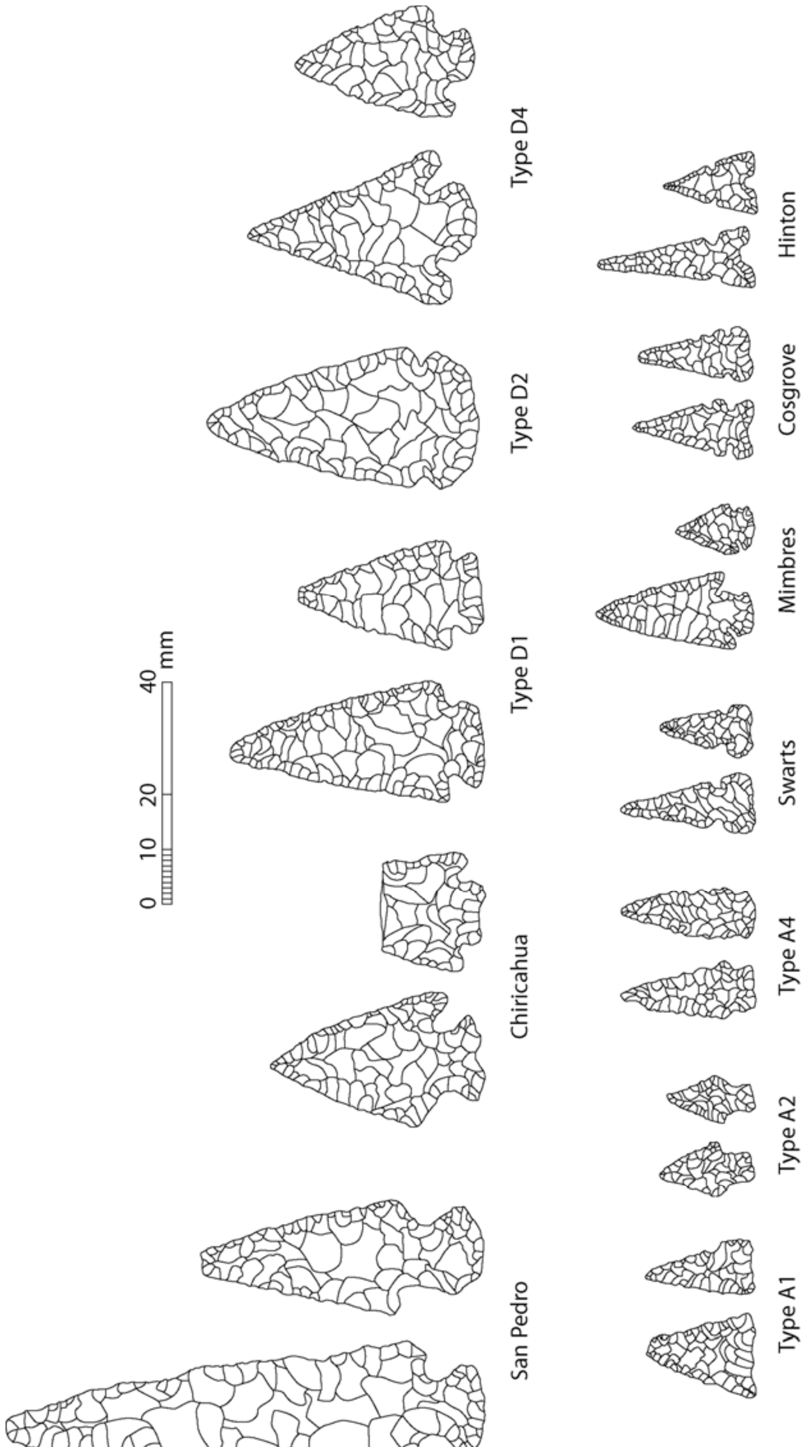

Figure 8.1: Depiction of morphological variation present in some of the types outlined by Dockall (1991).

Arrow points are differentiated from dart points by their smaller overall size. Like the dart point types established by Dockall (1991), the arrow points in his typology are differentiated from one another primarily on the morphology of their hafting element. Cosgrove points are small triangular side-notched projectile points with multiple side notches on one or both lateral edges. Basal edge and haft element edges are variable and the multiple side notches along lateral edges are the key defining characteristic of this type. Hinton points are small side notched projectile points that also have a basal notch. Lateral haft element edges range from straight and expanding to convex/rounded. A possible variant may be present in this type as some specimens classified under type have smaller blades that could be the work of intentional craftsmanship or could be the result of the curation of points. Mimbres points are characterized by the presence of corner notches that create an expanding stem point. Basal edges vary from straight to convex with convex basal edges being the most common. Swarts points are primarily differentiated from other arrow points types by the presence of side notches. These points exhibit a broad range of basal edge morphology and haft element edges range from convex to straight and expanding or parallel. Type A1 points are characterized by their triangular to oval shape and by the fact that no notches or stems are absent. Dockall (1991) notes that this point type likely represents points in a preform stage of reduction. Type A2 points are corner notched points characterized by the presence of parallel to slightly expanding stems. Generally these stems are relatively large when compared to the point's blade element. The shoulders of type A2 points are usually horizontal though two specimens typed as A2 points in the Old Town assemblage were barbed. Type A3 points are characterized by the presence of original flake attributes on either the ventral or dorsal side of the point. Usually retouch is confined to the point's margins. Type A4 points a generally side notched triangular points with expanding stems and straight to convex basal edges. Dockall (1991) notes that this group within his typology was created to accommodate those points that were not easily assigned to other groups and that some of these points may actually represent reworked examples of other point types. Type A5 points are characterized by the presence of original flake scar attributes on either the point's dorsal or ventral side. However, unlike Type A3 points, Type A5 points exhibit pressure flaking scars on the entirety of either the ventral or dorsal side.

Establishing a temporal association for each of these point types is somewhat difficult due to the disturbed nature of sites within the Mimbres area. On a general level, dart points are believed to have preceded arrow points which accompanied the introduction of bow and arrow technology in the area sometime around A.D. 500 (Roth et al. 2011). Dart points of similar style to those found at Mimbres sites have been found at earlier sites throughout the Southwest and their occurrence at Mimbres sites can be accounted for by multiple cultural processes (Sliva 1999). Primary among these are the potential co-occurrence of both dart and arrow points at sites dating to the time period of the introduction of bow and arrow technology. It is believed that the period of this technology's initial introduction represented one of experimentation where groups figured out ways to reorganize different social structures to accommodate the technology. Other processes such as opportunistic use of earlier point styles by later inhabitants as well as the potential multi-functionality of some design styles could explain the presence of dart points within components post-dating the introduction of the bow and arrow into the Mimbres area.

On the other hand, arrow points are a little easier to assign a temporal affiliation. As mentioned above, it is likely that all arrow points belong to components that are later than the Early Pithouse period. Based on the excavations conducted at the NAN Ranch and Old Town sites, Dockall's type A3, A4, A5, and Mimbres points appear to have first been produced during the Late Pithouse period. Refining the temporal affiliation to a phase within this period is difficult for the type A3, A4, and A5 points due to the fact that these points types somewhat represent catch-all groups established by Dockall (1991). These point types represent those that are either expediently fashioned from flakes or whose morphology did not permit their assignment to other provisional type groupings. Mimbres points are usually associated with Three Circle phase occupations at both sites. Dockall's type A1 and A2 points were found in both Three Circle phase contexts and Classic period contexts at NAN Ranch. It should be noted that a subset of points originally typed as A1 points from Old Town possibly represent a later point style that likely post-dates A.D. 1200. This point style is similar to the A1 type in that it represent a triangular point, but differs in the fact that its base is concave forming a shallow notch along the width of the base. This point style is common at Cliff/Salado phase sites in the Mimbres area [see Dolan and Putsavage 2013 (Figure 4: 5-10) and Nelson 1986 (Figure 8.1: AA-NN and Figure 8.3: A-E)]. The only point types definitively associated with the Classic period are Swarts and Cosgrove points. These point types are exclusively found in Classic period components at both NAN Ranch and Old Town. Finally, Hinton points are likely associated with the Terminal Classic period and Black Mountain phase. While Dockall (1991) notes that these point styles are associated with Classic period contexts at NAN Ranch, points of this type are associated with later occupations at Old Town.

The formal chipped stone tool assemblage from Old Town was chosen to conduct further analyses primarily because it represents the only assemblage that has both been analyzed for its morphological characteristics in accordance to Dockall's typology and has had chemical compositional analysis conducted on points which were manufactured from obsidian. While the other sites which have been excavated have had their assemblages analyzed in both a morphological and compositional sense, the typology used in these analyses makes it nearly next to impossible to assign types outlined by Dockall to formal chipped stone tool assemblages analyzed by other researchers (e.g. Diehl and LeBlanc 2001; Nelson 1984, 1986). Similarly, while the assemblage collected form NAN Ranch was used by Dockall in the creation of his typology, and could thus inform our current study, only very limited compositional analyses were conducted on obsidian artifacts from the vast assemblage collected from this site. Finally, because of the isolated nature of the different temporal components at Old Town, its formal tool assemblage is well suited to investigate temporal changes in raw material utilization.

The formal tool assemblage at Old Town was manufactured from five lithic materials: chalcedony, chert, obsidian, rhyolite and andesite/basalt (Table 8.1). The relative proportions of each lithic material show that the majority of projectile points were manufactured out of obsidian followed by chert, chalcedony, rhyolite, and then

Table 8.1: Number of projectile manufactured from differing materials at each of the analytic areas at Old Town.

	Andesite /Basalt	Chalcedony	Chert	Obsidian	Rhyolite	Total	Percent
Area A	3	12	65	95	4	179	80.63
Area B	0	4	7	4	2	17	7.66
Area C	1	10	7	8	0	26	11.71
Total	3	26	79	107	6	222	
Percent	1.35	11.71	35.59	48.20	2.70		100

andesite/basalt. At the Old Town site, 107 points were fashioned from obsidian, 79 from chert, 26 from chalcedony, six were fashioned from rhyolite, and three were fashioned from andesite/basalt. While simple analysis of this data indicates that obsidian appears to be the preferred material for the production of projectile points at the site, the nature of the site's occupation allows for the analysis of temporal trends with regards to resource exploitation. To further investigate potential trends in the data set, a series of nonparametric tests were conducted to test the relationships between occupational area/temporal period and lithic resource utilization.

Multiple Fisher's Exact tests were conducted comparing the distribution of raw materials between the different occupational zones. These tests were configured in a manner similar to that outlined in the previous chapter and weighed the proportion of projectile points manufactured from distinct raw materials between paired excavation areas at Old Town. The results of these analyses indicated that Area A differed from Area B and Area C due to the lower proportion of chalcedony projectile points in Area A ($p = 0.037$ and $p < 0.0001$ respectively). Conversely, Area B and Area C were found to have a significantly lower proportion of obsidian projectile points when compared to Area A ($p = 0.023$ and $p = 0.0374$ respectively). Based on this information it appears that the people inhabiting Area A had a preference for manufacturing projectile points out of obsidian when compared to groups occupying the other areas of the Old Town site.

In earlier analyses I interpreted these patterns as representing the increasing preference for projectile points manufactured from obsidian during the Classic period (Talaiferro 2004). On one level the above patterns substantiate these claims based on the major components associated with Area A, Area B, and Area C (see Chapter 6). Because Area A contains the site's Classic period component, I interpreted the difference with respect to higher obsidian projectile point counts as reflecting patterns associated with this temporal occupation.

However, when one compares the projectile points recovered from distinct temporal contexts, the above mentioned pattern is not present. As shown in Table 8.2, when one considers the temporal context from which projectile points were recovered, the proportion of projectile points manufactured from particular raw materials is more proportional across time periods than they were for the different excavation areas presented in Table 8.1. With this in mind, it is not surprising that the only statistically significant difference between projectile point assemblages recovered from different temporal contexts is a result of the higher proportion of chalcedony projectile points present in Black Mountain phase contexts when compared to Three Circle phase contexts ($p = 0.0068$, Fisher's Exact test).

These data indicate that at Old Town the utilization of different raw materials in the production of projectile points remained fairly constant from the Late Pithouse period through the Black Mountain phase. The one exception to this would be the proportional increase in the use of chalcedony during the Black Mountain phase. However, as one may notice, there is a substantial decrease in the total number of projectile points recovered from excavations at Old Town in comparison to those that were recovered from specific temporal contexts. This difference is primarily due to the disturbed nature of deposits associated with the site (Creel 2006a) and the inability to confidently assign projectile points collected from the site to deposits associated with distinct temporal occupations.

Table 8.2: Number of projectile points manufactured from differing raw materials that were recovered from contexts dating to the specified time period at Old Town.

Period/Phase	Andesite /Basalt	Chalcedony	Chert	Obsidian	Rhyolite	Total	Percent
San Francisco		2	2	2	1	7	7.2
Three Circle	2	3	19	29	2	55	56.7
Classic		3	6	12		21	21.6
Black Mountain	1	5	3	5		14	14.4
Total	3	13	30	48	3	97	
Percent	3.1	13.4	30.9	49.5	3.1		100

For these reasons, a more in-depth analysis of projectile point types was undertaken. These analyses primarily focused on discerning if there were distinct projectile point types associated with specific time periods as well as to investigate if there were patterns present in the utilization of different raw materials for the production of specific projectile point types.

At a very broad level, the projectile point typology can be separated into two broad categories, dart points and arrow points, that separate out based on the larger overall size of the former (Figure 8.1). When one compares the relative proportion of different projectile point forms (i.e. dart points and arrow points) that are manufactured from different raw material types, the major pattern that exists is the tendency for arrow points to be manufactured from obsidian (Table 8.3). The pattern leads to a number of statistically significant differences with respect to the proportion of dart and arrow points manufactured from different raw materials. At Old Town, there was a higher proportion of dart points manufactured from andesite/basalt, chert, and rhyolite when compared to arrow points ($p = 0.017$, $p < 0.0001$, and $p = 0.0376$ respectively; Fisher's Exact test). Conversely, there was a higher proportion of arrow points manufactured from obsidian when compared to dart points ($p < 0.0001$, Fisher's Exact test). At NAN Ranch, there was a higher proportion of dart points manufactured from chalcedony, chert, and rhyolite when compared to arrow points ($p < 0.0001$, $p = 0.0001$, and $p < 0.0001$ respectively; Fisher's Exact test). There was a higher proportion of arrow points recovered from the site that were manufactured from obsidian when compared to dart points ($p < 0.0001$, Fisher's Exact test). These statistically differences between dart and arrow point assemblages disappear when one removes the projectile points manufactured from obsidian. Thus, these differences are a result of the higher proportion of arrow points manufactured from obsidian at both NAN Ranch and Old Town.

Additional statistical tests were carried out in order to more fully investigate the patterns associated with the arrow point assemblages recovered from NAN Ranch and Old Town. These analyses were focused on identifying if particular point types were more commonly manufactured from particular raw material types. The breakdown of different arrow points by type and raw materials is depicted in Table 8.4. The results of these analyses demonstrate that there were a number of statistically significant differences with respect to the arrow point types manufactured from obsidian and chert at Old Town. These differences were primarily the result of the higher proportion Cosgrove, Swarts, A3, and A4 point types manufactured from obsidian when compared to other arrow point types (Table 8.5). Based on the temporal affiliation of these point types, specifically Cosgrove and Swarts points, it would appear that the overwhelming preference for producing projectile points form obsidian peaked during the Classic period. The patterns present with respect to the high proportion of Type A3 and A4 points could indicate that the processes responsible for this pattern were present during the Three Circle phase though the sample size of both point types is relatively small. Drawing conclusions on the raw material patterning associated with Type A4 points is hindered by the fact that the type represents a grouping established by Dockall to accommodate points not easily assigned to other point types. Thus, a point could have originally resembled another point type though through multiple behavioral processes (e.g. curation, refurbishing, etc.) characteristics that were once diagnostic were lost.

Table 8.3: Proportion of dart and arrow points collected from NAN Ranch and Old Town that manufactured from specified raw material types.

	Raw Material	Arrow	Dart
Old Town	Andesite/Basalt	1 (0.7%)	3 (9.4%)
	Chalcedony	18 (11.8%)	5 (15.6%)
	Chert	38 (25%)	20 (62.5%)
	Obsidian	93 (61.2%)	1 (3.1%)
	Rhyolite	2 (1.3%)	3 (9.4%)
	Total	152 (100%)	32 (100%)
NAN Ranch	Andesite/Basalt		2 (2.3%)
	Chalcedony	34 (14.9%)	37 (43%)
	Chert	26 (11.5%)	27 (31.4%)
	Obsidian	160 (70.5%)	1 (1.2%)
	Rhyolite	7 (3.1%)	19 (22.1%)
	Total	227 (100%)	86 (100%)

Table 8.4: Number of projectile points recovered from Old Town and NAN Ranch that were assigned to Dockall's typology and were manufactured from specified raw materials.

		Andesite /Basalt	Chalcedony	Chert	Obsidian	Rhyolite	Total	Percent
Old Town Arrow Points	Cosgrove	1	2	2	24		29	19.1
	Hinton		8	9	4		21	13.8
	Mimbres		3	11	16	2	32	21.1
	Swarts				27		27	17.8
	A1		3	9	4		16	10.5
	A2		2	6	7		15	9.9
	A3				5		5	3.3
	A4			1	6		7	4.6
	Total	1	18	38	93	2	152	100.0
NAN Ranch Arrow Points	Cosgrove		4	5	60	2	71	31.3
	Hinton		2	1	20		23	10.1
	Mimbres		6	9	16	2	33	14.5
	Swarts		9	7	41	2	59	26.0
	A1		3	1	12	1	17	7.5
	A2		3	1	2		6	2.6
	A3		1	1	2		4	1.8
	A4				7		7	3.1
	A5		6	1			7	3.1
	Total	0	34	26	160	7	227	100.0

Table 8.5: Probabilities resulting from Fisher's Exact tests that were set up to determine if the sample of particular point types manufactured from obsidian were drawn from similar populations.

	A1	A2	A3	A4	Cosgrove	Hinton	Mimbres	Swarts
A1		0.2734	0.0062	0.0186	0.0003	0.7048	0.1275	<0.0001
A2			0.0547	0.4853	0.0335	0.141	1	0.0001
A3				1	0.5732	0.0019	0.0567	1
A4					1	0.0033	0.1125	0.2059
Cosgrove						<0.0001	0.0142	0.0522
Hinton							0.0413	<0.0001
Mimbres								<0.0001
Swarts								

Different patterns were present with the arrow point assemblage recovered from NAN Ranch. Here, the majority of the differences present between arrow point types with respect to the raw materials from which they were manufactured resulted from the lower proportion of type A5 and Mimbres points manufactured from obsidian. The differences present with respect to the raw materials used to fashion type A5 points could result from the fact that this point type may represent a distinct stage in the reduction sequence before projectile points are fully bifacially retouched.

Together these data indicate that the use of obsidian for the production of projectile points increases through time so that arrow points are almost exclusively produced from this material. The Classic period inhabitants of Old Town used significantly more obsidian than any other raw material in the production of Cosgrove and Swarts projectile points. At NAN Ranch, this pattern is not present and the available data suggests that there are more similarities than differences in the utilization of different raw materials for the production of different types of arrow points.

I feel that this increase in focus on obsidian for the production of projectile points is directly related to the method of adoption of bow and arrow technology within the region. As stipulated by Roth and colleagues (2011), bow and technology was likely transferred into the region through guided variation sometime during the San Francisco phase or the Three Circle phase (Bettinger and Eerkens 1999; Eerkens and Lipo 2005;

Eerkens et al. 2005; Roth et al. 2011). Guided variation "entails transmission of information from a social model to a recipient, who then experiments with that information in search of an optimal or better character state" (Eerkens et al. 2005:169-170). In this scenario "traits are acquired and modified individually in piecemeal fashion" (Eerkens et al. 2005: 170). This method of transmission leads to more variability in the design system of a technology as individuals experiment with ways to make the technology more efficient in successfully carrying out the operations of daily life.

I used the Shannon-Weiner diversity index to measure the diversity of raw materials used in the manufacture of projectile points in the Mimbres area. This diversity measure takes into account both the richness and evenness of the variables in question, in this case both the different types or raw materials and the individual obsidian materials used to fabricate specific projectile point types. The formula for the Shannon-Weiner diversity Index is expressed as:

$$H' = -\sum p_i \ln p_i$$

Where "p_i" in this study represents the proportion of samples of a specific type manufactured from specific raw materials and "ln" represents a natural logarithm transform (Hill 1973; Spellerberg and Fedor 2003).

The results of these analyses are depicted in Figures 8.2 and 8.3. As Figure 8.2 and 8.3 illustrate, there appears to be an initial increase in the diversity of raw materials used in the manufacture of arrow points when compared to dart points likely manufactured prior to the full adoption of bow-and-arrow technology during the San Francisco phase. Through time the diversity of raw materials used in the production of projectile points decreases to its lowest point during the Classic period. As discussed above, this decrease in diversity is likely related to the growing preference for projectile points to be manufactured from obsidian.

The pattern of increasing preference for obsidian is of interest due to the fact that obsidian represents the only non-local material within most assemblages in the area (Dockall 1991, Nelson 1986). The nearest sources, Mule Creek and Antelope Wells, are in excess 90 kilometers from sites in the Mimbres Valley and would have likely taken considerably more effort to procure than other lithic materials that were equally suitable for the fabrication of projectile points. Because these sources are at such a great distance from the site, and the fact that other suitable cryptocrystalline materials to produce projectile points from were available within the immediate surroundings, the prehistoric peoples' decision to not only produce the majority of their projectile points from obsidian, but to also go to such great lengths to obtain this material, suggests the importance of the social relationships negotiated through the procurement of obsidian.

I interpret this data as representing a shift from transmission by means of guided variation to one where transmission follows a more conformist trajectory. Thus, when bow-and-arrow technology was introduced into the region, individuals experimented with the new technology. This experimentation by necessity included developing ways of organizing the technology and incorporating it into the overarching social system. Through time, and thus continued experimentation, obsidian came to be chosen as the preferred material from which arrow points were manufactured. I currently don't know why this occurred, though it is likely due to both the suitability of the material for the production of smaller projectile points as well as the negotiation of social relationships entailed in its procurement. Both the availability/predictability of obsidian as well as its physical characteristics (small size, brittleness, workability, sharpness, etc.) would have made it attractive as tool stone. However, the costs of procuring this material could have possibly out-weighed these attributes.

While potentially a circular argument, it is possible that the risk of failure associated with other materials that were present in the immediate surroundings and which were predictable (i.e. basalt and rhyolite) outweighed procurement costs. While individuals continued to produce projectile points from these locally available materials,

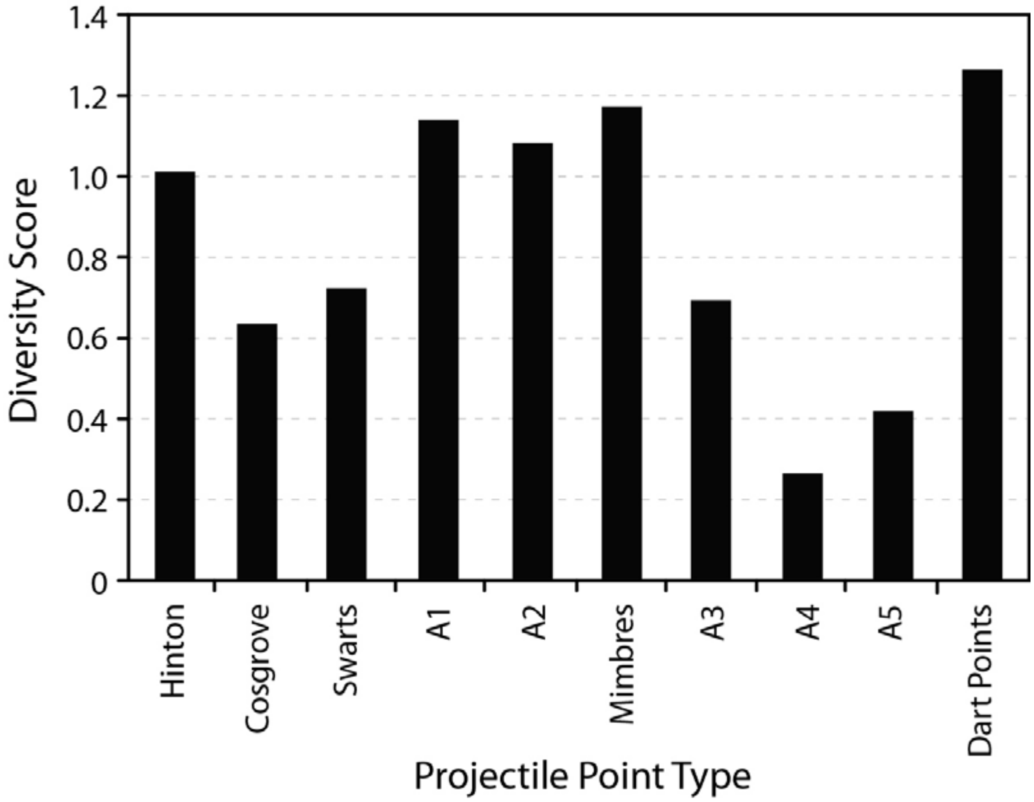

Figure 8.2: Shannon-Weiner Diversity Index scores for projectile point types common to the Mimbres Valley. The diversity scores are based on the proportion of specific projectile point types manufactured from different raw materials. The data used to calculate the diversity scores are presented in Tables 8.3 and 8.4.

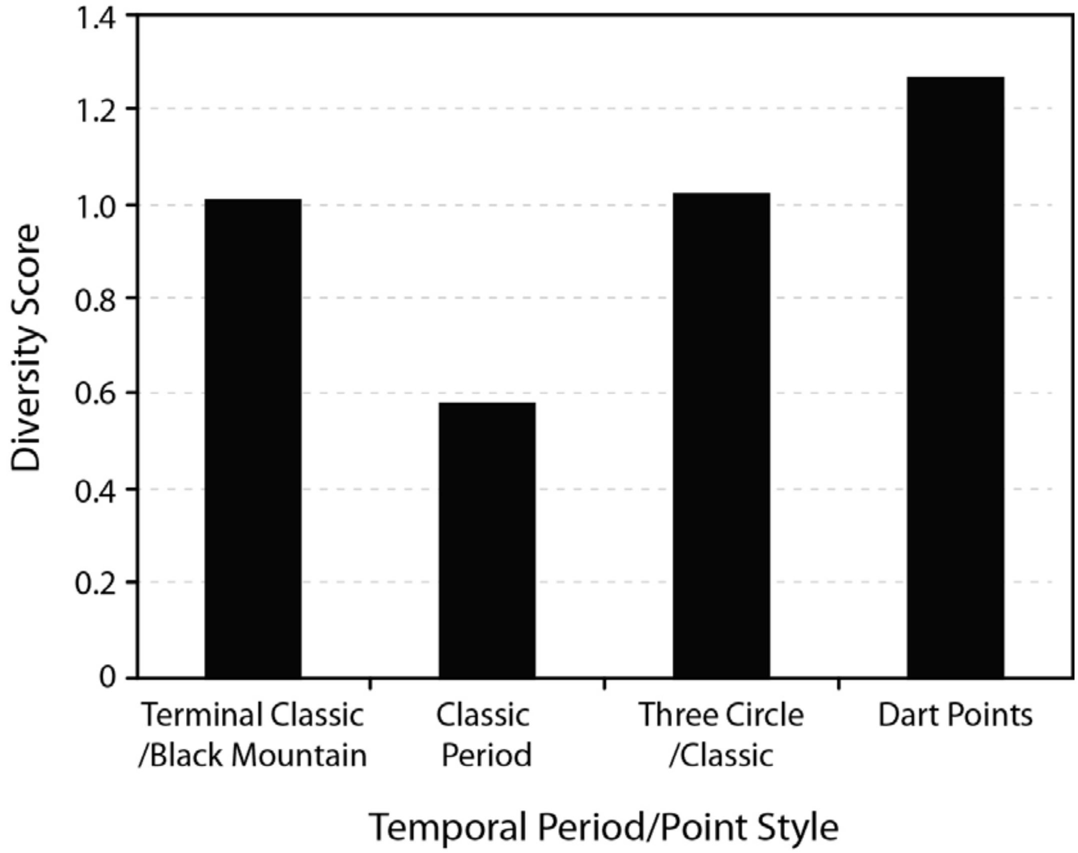

Figure 8.3: Shannon-Weiner Diversity Index scores for temporal periods based on projectile point types common to the Mimbres Valley. The diversity scores are based on the proportion of specific projectile point types manufactured from different raw materials. The data used to calculate the diversity scores are presented in Tables 8.3 and 8.4. All dart points were grouped into a single analytical unit. This was done primarily due to their uncertain temporal classification.

failure rates in the manufacturing process were numerous due to inclusions in the material that made knapping smaller tools an unpredictable endeavor. While these materials were unpredictable and prone to failure when being manipulated for smaller projectile points, in larger dart points they were not as detrimental to the manufacturing process because the larger surface area of these point types allowed the knapper to compensate for imperfections in the material being worked.

This may explain the decreasing diversity with regards to course-grained materials, but it does not explain the decreasing diversity of fine-grained materials (e.g. chert and chalcedony) in the projectile point assemblages. These differences however could be accounted for in the unpredictable distribution of these materials in the surrounding landscape. Carbonate deposits necessary for the formation of chert rarely outcrop in the Mimbres area. The vast majority of the surface geology in the area is the result of extensive Tertiary period volcanism. These volcanic deposits, and their subsequent erosion, buried thick Ordovician and Pennsylvanian Period limestone formations that are only exposed in uplifted areas (Elston 1957; McLemore et al. 1996). As McLemore and colleagues (1996) note, these deposits are exposed at nearly every historic and modern mining district in the areas surrounding the Mimbres River valley. The limestone deposits closest to both NAN Ranch and Old Town (the El Paso formation, the Montoya formation, the Lake Valley formation, and the Magdalena formation) are all reported as containing chert beds or chert nodules (Elston 1957). The closest of these deposits to the NAN Ruin is in excess of seven kilometers and the closest to the Old Town site is in excess of 14 kilometers. These chert sources are located along the lower margins of the uplift responsible for the Cookes Range. While the erosion of these deposits and other chert deposits in the surrounding uplifted areas has undoubtedly created secondary deposits within and along the stream channels draining into the Mimbres River, these nodules are not present in the river's alluviums in any significant quantity. Thus, while chert is an excellent toolstone that is quite frequently void of inclusions, its arrangement in the lithic landscape of the Mimbres area made it an unpredictable resource to acquire locally and procurement was likely opportunistic.

When suitable nodules of these materials were encountered, they were likely utilized. However, if specific outcrops were mapped onto the lithic landscape of the area, utilization of the individual source groups/limestone outcrops would not have been a difficult task.

Chalcedony on the other hand forms in relatively low-temperature (<300^0C) hydrothermal environments where silica is held in solution and allowed to crystallize (White and Corwin 1961). These materials are somewhat randomly distributed across the larger Mimbres area with few real source deposits. Because the surface geology of the larger area resulted from volcanic activities, the formation of silica saturated hydrothermal environments likely occurred over a large area. In my personal experience in surveying portions of this larger area, chalcedony is present in most of the higher elevation ranges surrounding the Mimbres Valley. This is especially so in areas where hydrothermal activities are still acting upon the local environment (e.g. areas where hot springs are still active). Usually, these deposits are associated with fissures located in earlier deposits. Hydrothermal water supersaturated in silica is extruded into these fissures where the silica precipitates out of the solution and begins to crystallize. Crystallization continues until the fissure is filled with chalcedony. White and Corwin (1961) note that this usually takes place within sedimentary rocks. These chalcedony masses are less susceptible to erosion than the surrounding matrix and over time, as the surrounding rock mass weathers, the chalcedony is left either as a surface deposit or is transported into a secondary depositional context. There are no known extensive chalcedony formations within the Mimbres Area, and it is believed that this material was opportunistically acquired as individuals randomly encountered the material.

As the above discussion somewhat demonstrates, the predictability of both a raw materials' location as well as its knapping qualities were potentially determining criteria in their selection for the manufacture of formal chipped stone tools. While I am uncertain as to the exact nature of the available raw materials in the vicinity of the sites used in the above analysis, both Dockall (1991: 136) and Nelson (1981: 128-129) suggest that the distribution of raw materials near an archaeological site likely influenced the raw material selection of the site's inhabitants.

The main discrepancy between the lithic assemblages recovered from sites in the Mimbres Valley is in regards to the proportion of obsidian debitage present at sites in relation to the number of projectile points manufactured from this material. These data could demonstrate that the majority of projectile points present at Mimbres sites came into the region as finished tools. Current data however does not necessarily support this hypothesis. Roughly 200 pieces of obsidian debitage were recovered from the excavations conducted at the NAN Ranch ruin (Dockall 1991). Of these, only 18 (9%) were primary flakes while 57 (28.5%) were secondary flakes. Dockall (1991) notes that at least ten specimens within the obsidian debitage assemblage represented the remnants of different types of bipolar cores the majority of which were likely the primary flakes in the assemblage. In general the proportion of obsidian flakes to projectile points is 1.24:1. Thus, for every 1.24 obsidian flakes there is one projectile point manufactured from obsidian at the NAN Ranch ruin. There are temporal variations within this flake-to-projectile point ratio that potentially demonstrates that the nature of obsidian circulation changed drastically from the Three Circle phase to the Classic period. Specifically, this ratio goes from 3.33:1 during the Three Circle phase (three obsidian flakes to every obsidian projectile point) to 0.58:1 during the Classic period (roughly two obsidian projectile points to every obsidian flake). This pattern is further drawn out when one considers the frequency of flakes retaining cortex that could represent the procurement of obsidian merkenites directly or through exchange with groups inhabiting areas around obsidian source locales. Generally the ratio of obsidian cortical flakes to projectile points during the Three Circle phase is 1.28:1. Thus for every 1.28 obsidian cortical flakes there is a projectile point manufactured from this material. This decreases substantially during the Classic period where the obsidian cortical flake-to-projectile point ratio is 0.2:1 (five projectile points to every cortical flake). These data potentially indicate that individuals inhabiting the NAN Ranch ruin during the Three Circle phase obtained enough obsidian in nodule form to manufacture all the projectile points present at the site during this time period. However, the 0.2:1 ratio of obsidian cortical flakes-to-projectile points present during the Classic period demonstrates that while some obsidian was coming into the site in nodule form, the majority of points entering the site were likely initially reduced elsewhere.

While the above analyses deals specifically with variation in the raw materials used by inhabitants of the Mimbres Valley in the production of projectile points, these analyses do not deal with variation in other attributes of projectile points recovered from sites in the area. In order to begin investigating the variability in these points additional analyses were conducted using the metric attributes recorded for points collected in the valley (Taliaferro 2004). Variation in the length, width, thickness, the length-to-width ratio, and attributes associated with hafting practices (e.g. the shoulder to basal corner measurement, base width, neck width, and haft length) were measured by calculating these attributes' coefficient of variance for each projectile point type. The results of these analyses are depicted in Figures 8.4 and 8.5.

The results of these analyses seem to counter the patterns present in raw material utilization. This is especially so for the metrics which measure the overall size of the projectile points (e.g. length, width, thickness, and the length-to-width ratio) (Figure 8.4). Variance in all of these attributes tends to increase over time and the anomaly present in the dart points can be accounted for by the fact that there are two variants in the San Pedro type, a large and small variety (see above), that contribute to the increased coefficient of variance for this type. However, this pattern is somewhat reversed for the arrow point assemblage when one looks at attributes associated with projectile point hafting elements. The coefficients of variance for these variables tend to decrease from the Three Circle phase through the Classic period (Figure 8.5). The exception to this pattern is the shoulder-to-basal corner (SBC) measurement whose coefficient of variance tends to increase through time.

There are multiple possible interpretations to these particular patterns. The first of these is that the increasing variation in projectile point overall dimension (Figure 8.4) is a result of curation practices. As points were used more frequently, the need to refurbish points increased. Both patterns, increasing variation in overall dimension (Figure 8.4) and decreasing variation in haft elements (Figure 8.5), could be accounted for if these points were refurbished while still hafted. In this scenario only the portions of the point above the hafting element would be reduced in the refurbishing process. Another scenario is that the standardization of projectile point design decreased through time. Thus, during the periods prior to the introduction of bow-and-arrow technology there was a stricter mental template in place that dictated how points were to be produced. This template dictated not only the overall dimensions of projectile point form, but also informed how hafting elements were to be produced. When bow-and arrow technology was introduced, new templates needed to be produced that informed projectile point morphology. The increased variance in metric variables demonstrates that individuals were experimenting with design styles but were confined to a common hafting material, thus the decreased variance in hafting element attributes.

Taken together these data demonstrate that there is a decreased diversity in the raw materials used in the manufacture of projectile points through time. Specifically, this decrease in diversity relates to the increased use of obsidian in projectile point manufacture beginning during the Three Circle phase and culminating during the Classic period. I interpret this data as representing either individual or group experimentation with the introduction of new technology into the area during this time period, namely bow-and-arrow technology. With the introduction of this technology people had to reorganize their lithic industries to accommodate smaller projectile points. During this period of experimentation fine-grained raw materials (e.g. chalcedony, chert, and obsidian) became the preferred materials from which projectile points were manufactured. This was primarily due to the decreased likelihood of failure in the knapping process of these materials. Through time, obsidian came to be chosen over all other materials for unknown reasons, though the material's physical properties (i.e. ease of knapping, and sharpness) were probably determining characteristics of this pattern.

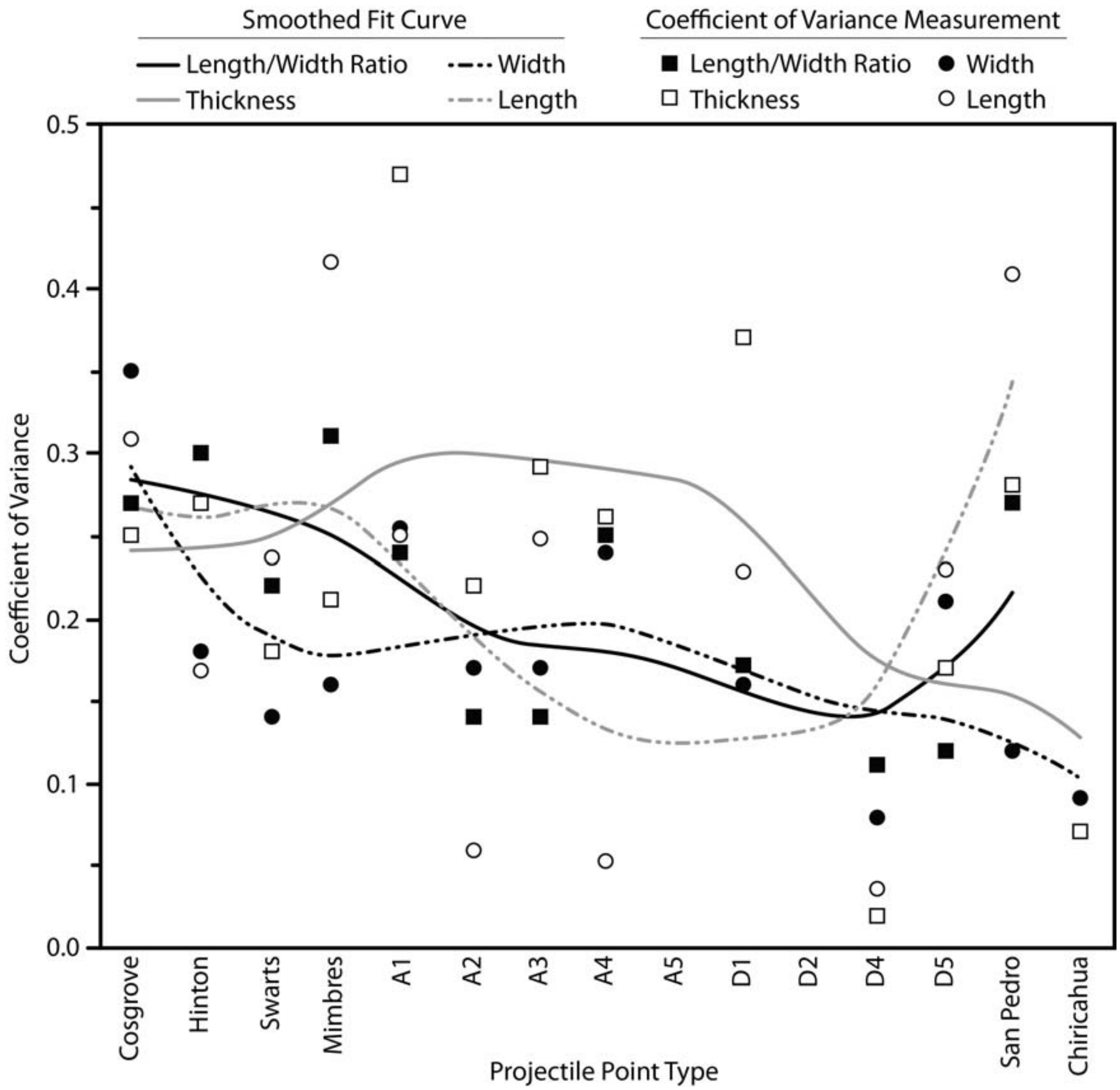

Figure 8.4: Coefficient of variance calculations for length, width, thickness, and the length-to-width ratio based on metric measurements for specified projectile point types. Information taken from Taliaferro (2004).

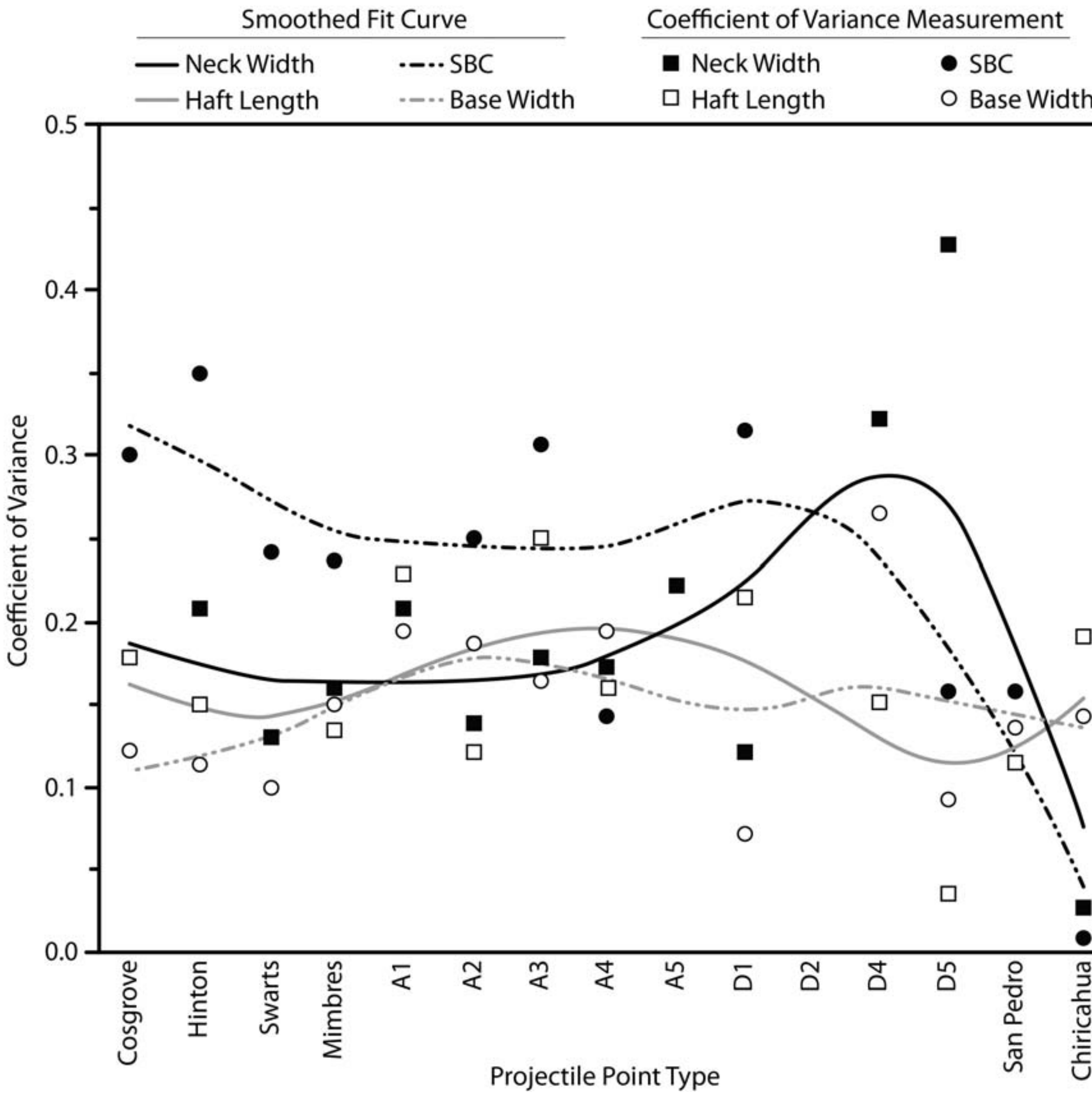

Figure 8.5: Coefficient of variance calculations for neck width, haft length, base width, and shoulder-to-basal corner measurement (SBC) based on metric measurements for specified projectile point types. Information taken from Taliaferro (2004).

The period of experimentation continued during this shift to obsidian use as the preferred material from which projectile points were manufactured. This is evidenced by both the specific obsidian source groups that were utilized in the production of projectile points as well as the manner in which these materials appeared in the Mimbres Valley. While Mule Creek source materials always represented the majority of the material in the obsidian assemblages present on sites in the Mimbres Valley, the use of specific sub-group materials in the larger Mule Creek source group fluctuated through time. Again, we see decreasing diversity in the Mule Creek sub-group source use through time. This pattern culminates during the Classic period when the Mule Creek Mule Mountain and Mule Creek Antelope Creek source groups come to dominate the area's sourced obsidian assemblage. Furthermore, the manner in which these materials entered the Valley changed as well. As is evidenced by the debitage sample collected from the NAN Ranch ruin, it appears that during the Three Circle phase materials probably entered the region in their raw nodule form and projectile points were reduced on site. This changed during the Classic period when the majority of obsidian likely entered the area as pieces which were either initially reduced off-site or entered the area as finished projectile points.

While variability decreased through time with regards to the raw materials utilized in the production of projectile points by the inhabitants of the Mimbres Valley, variation in projectile point morphology increased through time for certain variables. This is especially so for those variables that characterize the overall dimensions of projectile points. However, variation in the variables that characterize projectile point hafting elements decreased through time. I interpret this pattern as representing both the practice of refurbishing points while they were still hafted as well as representing the continued experimentation with the design characteristics associated with bow-and-arrow technology.

All of these patterns potentially point to a shift from transmission by means of guided variation to conformist transmission with regards to raw material utilization but the reverse for projectile point morphology. The data presented above demonstrates that individuals began experimenting with ways to incorporate a newly introduced technology into their various communities of practice. This is demonstrated by the initial increase in diversity of raw material used in the production of arrow points. As more people began experimenting with the technology, obsidian was chosen as the preferred material from which projectile points were to be manufactured. At this point, sometime during the Three Circle phase, transmission ceased to the dictated by guided variation and become more closely aligned with conformist transmission. As this pattern continued, diversity in the number of obsidian source materials diminished through time culminating during the Classic period when the majority of the area's projectile points were manufactured from materials deriving from one of two source locales: Mule Creek Antelope Creek and Mule Creek San Francisco River Alluviums. Conversely, variation in the morphology of different projectile point types increased through time. This indicates that during the time periods preceding the introduction of bow-and-arrow technology that there was a stricter mental template in place that dictated how projectile points were to be manufactured. During these time periods transmission was likely guided by conformist transmission as individuals manufactured points in coherence to this template.

After the introduction of bow-and-arrow technology variability in point morphology increases, indicating that while some mental template was present that dictated certain key characteristics of point morphology (e.g. basal morphology and notch type), individuals were free to experiment with other characteristics of point design. With this in mind, it is no coincidence that the typology outlined by Dockall (1991) relies on these key characteristics for discerning different point types in the region. While the presence of these discernible types may on the surface appear to point to a shift towards conformist transmission, the catchall types (i.e. types A3, A4, and A5) established by Dockall (1991) demonstrates that strict conformance to these emerging templates was not always practiced.

OBSIDIAN STUDIES

To further investigate this pattern of increasing preference of obsidian use in the manufacture of projectile points, additional analyses were conducted on a number of obsidian projectile points that have been submitted for chemical characterization. Previous analyses of sourced obsidian data from the Mimbres area have demonstrated that there are two general distribution networks responsible for the circulation of obsidian in the larger Mimbres region (Taliaferro et al. 2010). The northern distribution network was responsible for the circulation of Mule Creek source materials while the southern network was responsible for the circulation of southern source materials, particularly Sierra Fresnal and Antelope Wells source materials. Participants in the northern Mule Creek distribution system almost exclusively relied on materials originating from the Antelope Creek and Mule Mountain source locales of the Mule Creek source group while the inhabitants of the southern Mimbres area obtained obsidian from a more varied set of sources. The analyses that follow seek to refine the regional perspective outlined above by investigating the patterning of different obsidian source materials at the inter-site level using data derived from multiple sites in the Mimbres area and the intra-site level using data derived from Old Town.

To begin these analyses, the sourced obsidian assemblages present at Galaz, Swarts, and Old Town were compared to determine if there were differences in obsidian source utilization between villages. The decision to use these three sites was due to the fact that the sourced obsidian sample from these sites is the greatest of those within the Mimbres river valley. As depicted in Table 8.6, the sourced obsidian sample from Old Town contains roughly 61 percent of the sample collected from these three sites with the samples collected form Galaz and Swarts accounting for approximately 30 percent and 8 percent of the sample respectively. Nearly 90 percent of these samples were determined to have originated for source locales within the larger Mule Creek source group. The majority of these originated form Mule Creek Antelope Creek/Mule Mountain source materials. Lesser amounts of Mule Creek San Francisco River Alluvium materials (ca. 19 percent) and Mule Creek North Sawmill Creek materials (ca. 2 percent) were also present in these assemblages. The remaining samples were determined to have originated from five other source groups (Cerro Toledo, Valles Grande, Gwynn Canyon, Sierra Fresnal, and Antelope Wells).

Table 8.6: Number of obsidian samples recovered from each site that originated from the specified obsidian source group. The obsidian source groups are Cerro Toledo (CT), Valles Grande (VG), Mule Creek Antelope Creek/Mule Mountain (MCACMM), Mule Creek San Francisco River Alluvium (MCSFRA), Mule Creek North Sawmill Creek (MCNSC), Gwynn Canyon (GC), Sierra Fresnal (SF), and Antelope Wells (AW).

	CT	**VG**	**MCACMM**	**MCNSC**	**MCSFRA**	**GC**	**SF**	**AW**	Total	Percent
Galaz	2	1	74	5	7	1			90	30.4
Old Town	4	1	114	1	47	10	4	1	182	61.5
Swarts			21		3				24	8.1
Total	6	2	209	6	57	11	4	1	296	
Percent	2.0	0.7	70.6	2.0	19.3	3.7	1.4	0.3		100

The only notable pattern that emerged when comparing the proportion of different source materials present within these sites' obsidian assemblages is that Old Town contains a more diverse array of source materials when compared to Galaz and Swarts. The assemblage collected from Old Town was found to differ significantly from the Gala and Swarts assemblages based on the lower relative proportion of Mule Creek Antelope Cree/Mule Mountain source materials at Old Town ($p < 0.0001$ and $p = 0.0206$ respectively, Fisher's Exact test). Similarly, the obsidian sample collected from Old Town was found to differ from the sample collected from Galaz based on the higher proportion of Mule Creek North Sawmill Creek materials at Galaz ($p = 0.0162$) as well as the higher proportion of Mule Creek San Francisco River Alluvium materials at Old Town ($p = 0.0003$ Fisher's Exact test).

Of the sites from which obsidian samples have been submitted for chemical characterization Old Town is perhaps the only site with an assemblage that allows for one to analyzed obsidian procurement practice from the Late Pithouse period through the Black Mountain phase. As shown in Table 8.6, a substantial number of the site's obsidian artifacts have been submitted for chemical characterization. Unfortunately, only a portion of these are capable of being assigned to deposits associated with distinct temporal occupation. For the current analysis, only samples found in association with different architectural structures were analyzed (Table 8.7).

In comparing obsidian source utilization through time at Old Town, the data presented in Table 8.7 was used. For the intents of this analysis those samples pulled from contexts of a similar age were used to investigate the temporal patterns of obsidian procurement practices at Old Town. Thus, the Black Mountain phase assemblage, consisting of the samples collected from rooms C23/28, C1, and C2 was compared against the Classic period assemblages collected from rooms A1, A110, A2, A6, A7, and A92 and Late Pithouse period assemblage consisting of samples collected from the Three Circle and San Francisco rooms listed in Table 8.7. The results of these analyses demonstrated that there were no statistically significant differences between the different temporal assemblages at Old Town. Thus, obsidian procurement practices at the site remained fairly constant from the Late Pithouse period through the Black Mountain phase.

The data presented in Table 8.7 were also used to investigate the patterning of different obsidian source materials between different Black Mountain phase rooms. Again, no statistically significant differences were present with regards to the proportion of different obsidian source materials collected from rooms C1, C2, and C23/C28. These data suggest that groups inhabiting these rooms had similar access to these materials.

SUMMARY

The additional analyses undertaken to investigate the patterns present with tools manufactured with a specialized design strategy indicate that multiple processes affected the transmission and reproduction of the rules and resources drawn upon by this design strategy. With respect to the patterns drawn out in the previous chapter regarding the different reduction strategies associated with lithic raw materials, it appears that fine grained resources were indeed reduced in a manner different from coarse grained materials. The fact that few projectile points present in Late Pithouse period, Classic

Table 8.7: Number of obsidian samples collected from structures dating to a specific time period that originated form the specified source group. Not included in the table are a single specimen form Room A110 that originated from the Cerro Toledo source group and a single sample from room B9/B11 that originated from Valles Grande source materials. The source groups are the same as those presented in Table 8.6. The time periods associated with these contexts are the San Francisco phase (SF), the Three Circle phase (TC), the Classic period (CL), and the Black Mountain phase (BM).

Site	Period	Room	MCACMM	MCSFRA	GC	SF	AW	Total	Percent
Old Town	BM	C23/C28	5		2	1	1	9	10.6
Old Town	BM	C1	2					2	2.4
Old Town	BM	C2	3					3	3.5
Old Town	CL	A1	2	1				3	3.5
Old Town	CL	A110	4					4	4.7
Old Town	CL	A2	1					1	1.2
Old Town	CL	A6	1					1	1.2
Old Town	CL	A7	8	4				12	14.1
Old Town	CL	A92	1					1	1.2
Old Town	SF	A71				1		1	1.2
Old Town	TC	A10	3					3	3.5
Old Town	TC	A16	4			1		5	5.9
Old Town	TC	A47	2					2	2.4
Old Town	TC	A83	2					2	2.4
Old Town	TC	B2	4	9				13	15.3
Old Town	TC	B4	2		2			4	4.7
Old Town	TC	B9/B11	10	3	4			17	20.0
		Total	54	17	8	3	1	85	
		Percent	63.5	20.0	9.4	3.5	1.2		100

period, and Black Mountain phase deposits were manufactured from coarse-grained materials attests to the fact that fine-grained materials were commonly chosen for the production of projectile points. Thus, it is likely that materials such as chert and chalcedony were reduced locally as the debitage patterns would suggest. The fact that no statistically significant differences were present between site's arrow point assemblages with respect to the utilization of cryptocrystalline materials (e.g. chert and chalcedony) suggests that the exploitation of these materials remained fairly constant form the Late Pithouse period through the Black Mountain phase.

Perhaps the most overarching pattern present with respect to the formal tool assemblage recovered from Old Town and NAN Ranch regards the increasing utilization of obsidian in the manufacture of projectile points through time. I believe the utilization of this material is related to the experimentation with bow and arrow technology as well as other social mechanisms such as the existence of a fairly exclusive circulation network. Suffice it to say these processes led to the reduction in raw material diversity in point manufacture through time. The exception to this are the Hinton points that likely started being produced during the Terminal Classic period and continued to be produced during the Black Mountain phase. This pattern can either be explained by a reduction in the interaction network responsible for obsidian circulation and the increased local production of projectile points during this time period.

On a general level raw material diversity decreases through time. However, variation in point morphology increases through time. I interpret this pattern as resulting from the practice of refurbishing points while hafted. The fairly even coefficients of variance associated with arrow point hafting elements likely resulted from physical constraints associated with the size of arrow and atlatl shafts.

Despite the fact that obsidian utilization in the manufacture of projectile points increases through time, the manner in which these materials were obtained shows dramatic shifts. The data from the NAN ruin suggests that through time, these materials were increasingly coming into the area as partially finished products, if not completely finished points. The fact that the only point types that can confidently be assigned to a single distinct temporal span, Swarts and Cosgrove points, potentially points to the emergence of distinct production groups during the Classic period. The fact that the cortical obsidian debitage to point ratio reaches 0.2:1 (five points for every cortical flake) during this period suggests that these points were manufactured outside of the villages in which they are recovered.

Based on the analyses associated with the procurement of different obsidian source materials, it appears that certain sites, like Old Town, had access to a more varied set of resources, or chose to more frequently exploit these resources. Inter-site analyses demonstrate that some differences exist between sites with respect to obsidian source use. The intra-site analyses however demonstrate that obsidian source use changed little through time at Old Town. Once groups began obtaining resources from a particular area, these procurement practices remained stable from the Late Pithouse period through the Black Mountain phase. Similarly, there are no differences between individual households with respect to access to materials originating from particular obsidian sources.

Chapter 9: Ceramic Technology and the Old Town Black Mountain Phase Ceramic Assemblage

The study of ceramic technology in the Southwest has been at the forefront of archaeological research since shortly after the area joined the United States as part of the Texas Annexation of 1845, the Mexican Cession of 1848, and the Gadsen Purchase of 1853 (Merk 1978). There has been such a quantity of works dealing with ceramics in the area that some researchers view this body as "both bane and blessing to southwestern archaeologists" (Mills 1999: 243). While early studies in the area focused on type descriptions and assessing differences between cultural groups based on pottery differences, more modern ceramic studies have delved into analyses that focus on the social aspects of pottery production, use, and discard.

In the sections that follow I present a brief overview of the operational sequence for ceramic technology. I then discuss how studies of ceramic technology have increased our understanding of the processes associated with the technology's organization of production. I follow this with a discussion of how pottery production was organized in the Mimbres area during the Late Pithouse and Classic periods. These analyses serve as a base line for comparing how Playas pottery production was organized during the Black Mountain phase. This as well as an in-depth discussion of the Playas NAA data are discussed in the following chapter . Following this discussion I then begin my discussion of the ceramic assemblage collected from the excavations conducted at the Black Mountain phase component at Old Town.

CERAMIC OPERATIONAL SEQUENCE

In contrast to lithic technology described in Chapter 7, ceramic technology is an additive technology that, as the term implies, entails the combination of materials to produce a finished item. Here, I present a brief operational sequence of ceramic production that has helped guide my analyses and interpretations of the ceramic assemblages recovered from the 2006 and 2007 field seasons at the Old Town site (LA 1113). This operational sequence is described below and outlines the steps involved in the production of ceramic wares from the procurement of raw materials through to the finished vessel itself.

The operational sequence for ceramic production begins with the procurement of adequate clay raw material. Clay refers to fine-grained minerals that become plastic or malleable when water is added (Rice 2005: 36; Shepard 1956: 6). These fine grained minerals result from the weathering of older parent materials and can accrue in situ from the decomposition of the original parent material (primary clays), or the fine-grained materials eroded from parent materials can be transported through fluvial or alluvial processes to another place of deposition (secondary clays) (Rice 2005: 37; Shepard 1956: 11). Arnold's (1985: 39-49) observations on the distance traveled by modern groups to procure different materials used in their ceramic technology (e.g. paste, temper, slips, pigments, etc.) demonstrates that the most frequently used materials are procured close to the work area. In the majority of his case studies clay resources were procured from one to seven kilometers away from the potter's work area (Arnold 1985). In the Mimbres area there is no shortage of either primary or secondary clay deposits, though secondary deposits are more prevalent especially along the floodplains of the Mimbres River and its tributaries (Creel et al. 2002). Because of this the availability of clay resources would not have been a limiting factor of production and multiple locations of manufacture have been present in the Mimbres area.

Once suitable clay has been obtained, it can either be used in its natural state or must be further processed to make it useable. The latter is usually accomplished through removing impurities from the clay body, by adding additional aplastic materials to the clay body, or a combination of the two. The removal of impurities from a clay can be accomplished by sieving these materials from the clay, or through levigation, where clay particles are held in solution while other materials are filtered out (Rice 2005: 118). These processes affect two key characteristics of clays, their plasticity and shrinkage. Generally, the plasticity of clay, or its malleability, increases when water is added to the clay body. If clays contain too many impurities, its ability to be successfully manipulated can become compromised causing the emerging vessel to crack or collapse under its own weight. Conversely, if a clay body is too pure, other material must be added to it to make it acceptable for ceramic production. These materials, usually referred to as temper or aplastic agents, decrease the likelihood of cracking and/or failure during the drying and firing stages of the operational sequence.

To date, we are uncertain as to whether ceramics from the Mimbres area had impurities removed from clay bodies. Compared to other areas of the Southwest, there have been few petrographic studies of Mimbres ceramics that investigate the aplastic materials present in ceramic pastes used by prehistoric potters. Those that have been conducted have produced inconsistent results with respect to whether clays were modified by the addition of aplastic tempering materials (Hill 1999; Schriever 2008; Stoltman 1996; Wilson and Severts 1999). Despite this there appears to be a recent consensus that the majority of Mimbres painted ceramics did not have additional materials added to their pastes. They are thus considered to have been manufactured with "self-tempered clays" (Schriever 2008: 113).

Once the clay body has been tempered (if needed) "and has been made plastic by the addition of water, it is usually systematically manipulated, either by wedging, kneading with the hands, or foot treading" (Rice 2005: 119). This allows both moisture and any other added materials (e.g. temper) to be homogeneously distributed throughout the clay paste.

After the clay has been prepared in the culturally prescribed manner, it is ready to be manipulated into a desired form by the potter. As Rice (2005: 124) notes, there are six general methods commonly used to form a vessel: pinching and/or drawing, slab modeling, molding, casting, coiling, and throwing. While any one of these techniques can be used on its own to form a vessel, more often than not, a combination of methods is used.

Researchers have shown that the primary method of vessel construction in the Mogollon area is by coiling (Brody 2004: 81; Haury 1936a: 3; Shepard 1956). As the name implies, coiling refers to the "process of building up the vessel wall with superimposed rolls of clay" (Shepard 1956: 57). The thickness of these coils varies but “are usually two to three times the intended thickness of the vessel” (Rice 2005: 127). There are multiple methods of beginning the construction of a vessel using the coiling method and all usually start with the base. In some instances the coils are initially laid out in a spiral pattern beginning at the vessel’s base and continuing up to a specified height, while in other instances a clay disc is manipulated to chosen dimension before additional coils are incorporated into the vessel’s walls (Shepard 1956: 56-59). This initial course of coils is pinched together, drawn up and later scraped to remove the traces of the coils, increase the bonding between coils, and produce a relatively smooth surface. As one course of coils is bonded together, other courses are added on top to extend the vessel in a manner the potter dictates. On many non-decorated/non-painted ceramics in the Mimbres area the coils were left partially intact creating the different varieties of corrugated ceramics present at sites.

Once the vessel is formed, the next step in the operational sequence is finishing its exterior and/or interior surfaces. This can be accomplished by smoothing/burnishing these surfaces. In some cases this is the last step in the operational sequence prior to drying and firing while in other cases additional decoration may be applied to these finished surfaces. Burnishing is usually accomplished by rubbing the vessel’s surface with a smooth object so that the surface becomes somewhat lustrous (Rice 2005: 138). As Rice (2005: 138) notes, this is usually done when the vessel has been allowed to almost completely dry. If this step is done beforehand, the burnished surface will disintegrate as the vessel shrinks.

In some cases the vessel is finished after other surface decorations have been applied. There are numerous ways in which decorations can be applied to a vessel’s surface but only those present in the Mimbres area will be discussed further. Perhaps the most notable method of surface decoration in the region is through the addition of colored pigments. These pigments can be added as a slip, or as a pigment to form a painted design. Generally, slips are composed of clay of a different color than the paste used in the forming of the vessel. This different color clay is held in suspension and is applied to the vessel’s surface either by dipping the vessel in the slip, pouring and dispersing the slip by turning the vessel, or through wiping the slip onto the vessel's surface with one's hand or another item (e.g. a brush) (Rice 2005: 150). Usually for low-fired pottery the slip is applied after the vessel has been allowed to dry completely. This allows the slip to be absorbed into the vessel's surface without detaching due to differential shrinkage rates between the clay in the ceramic paste and the clay in the slip (Rice 2005: 150).

Aside from the application of color to a vessel's surface the other decoration methods common to ceramics in the Mimbres area consist of punctation, stylized corrugation, and incising. Punctated designs are carried out by penetrating the surface of a partially dry vessel with a small surface area implement (e.g. a stick, reed, awl, fingernail, etc.) (Rice 2005: 145). Corrugated pottery is formed by leaving portions of the original coils used in the vessel's formation partially unaltered. In the larger Mogollon area corrugation patterns are generally simple though they become increasingly complex through time (e.g. the difference between Three Circle Corrugated, Mimbres Classic Corrugated, and Tularosa Patterned Corrugated) (Haury 1936a; Hegmon et al. 2000; Rinaldo and Bluhm 1956). Finally, incised designs are accomplished by cutting lines into the surface of a vessel. As Rice (2005: 146) notes, "incising is one of the most variable techniques" and the outcome of the incised design depends on multiple factors (e.g. the plasticity of the paste; the type of instrument used to incise; the angle, pressure, and direction used to create the incised line; etc.). As was the case with corrugated pottery, the decorations on incised pottery in the Mogollon area also tends to become more complex through time (e.g. the difference between Alma Incised and Playas Red Incised) (Haury 1936a; Sayles 1936b).

Once the vessel has been formed, finished, and/or decorated, it must be allowed to dry so that all water is absent from the vessel prior to firing. This is one of the most the critical steps in the manufacturing process. If any moisture is present in the vessel when it is fired, the vessel will crack due to the expansion of the water molecules in the clay paste (Rice 2005: 67). The time necessary to dry a vessel varies depending on climate and the type of clay used in its manufacture. In general though, more arid climates require less drying time than moister ones. If the vessel is not dried properly, defects can also develop that could potentially result in warping during the drying process or failure during the firing process (Rice 2005: 152). We are uncertain as to how long Mimbres potters allowed their vessels to dry, though based on Arnold's (1985: 66-70) cross cultural comparisons of drying time, it is likely that this process took less than one week to complete. Based on his data, 72 percent of his case studies allowed their wares to dry for one week or less though one group of potters in Papua, New Guinea, allowed their wares to dry for multiple months (Arnold 1985: 66-70).

The final step in the operational sequence for ceramic production is firing. There are multiple stages of the firing process. These include "the dehydration period, when water is driven off at low heat to avoid too rapid formation of steam; the oxidation period, when carbonaceous matter is burned out from the clay, and iron and other compounds are fully oxidized; and the vitrification period, when the constituents of the pottery begin to soften and cement" (Shepard 1956: 81). These different stages of firing can be induced within an enclosed environment (kiln firing) or in the open. As Rice (2005: 153) notes, "kilns were widely used throughout the Old World in antiquity" but were not prevalent in the New World until the early sixteenth century. Thus, the majority of ceramics present in the New World were fired in an open setting. This usually consists of preparing a layer of fuel on the ground, placing the vessels to be fired upon this, and adding more fuel around the vessels. The lowest layer of fuel is normally the first to be ignited. In some instances a bed of coals is prepared prior to the placement of the base fuel layer described above. This step allows ground moisture to be removed prior to firing the vessels (Rice 2005: 156). Once the fuels are ignited, additional finer fuels may be added on top to insulate heat within the interior as well minimally control the oxidization environment (Rice 2005: 156).

Open firings are relatively short in duration lasting a for a few hours to only 15 or 20 minutes and generally reach temperatures between 600°C and 800°C (Rice 2005: 154, 157). In most cases the maximum firing temperature is achieved relatively quickly (within 10-20 minutes) and the fire burns out in a relatively short amount of time (within 40 minutes) (Rice 2005: 156-157; Shepard 1956: 84-85). Firing time, of course, will vary depending on the number of vessels being fired, the types of vessels being fired, fuel availability, and perhaps other factors. Once fired, the vessels are removed and allowed to cool.

THE ORGANIZATION OF PRODUCTION

Production refers to the "transformation of raw materials and/or components into usable objects" (Costin 1991: 3). In cultural systems, this production is influenced by different social and physical phenomena (e.g. who produces commodities, where commodities are made, the socio-political status of producers, how commodities are distributed and to whom, the raw materials used in commodity production, the distribution and access to these raw materials, etc.). It is the manner in which these different social and physical phenomena come together in a particular social system that characterizes that system's organization of production. Different commodities can have their production organized in different ways within the same social system.

While the above definitions are the ones I adhere to, some researchers have defined production as "the socioeconomic arrangements involved in practicing the craft as opposed to the mechanics of building a pot" (Rice 2005: 168). The number of such "socioeconomic arrangements" within a particular social system is immense and all would have some bearing on what researchers refer to as the organization of production. For example, Costin (1991: 9; 2000: 377) finds it useful to diminish the variability of "socioeconomic arrangements" into a smaller number of variables. All of these components inform how production is organized and go beyond the two variables Rice (2005: 180) considers the "most important for understanding the organization of production" (i.e. the scale and mode of production). However, Rice (2005: 180) is correct in that these "socioeconomic arrangements" are often analyzed as descriptions of the scale and intensity at which commodity production is organized (e.g. Peacock 1982; van der Leeuw 1977).

This is likely due to the fact that many of the models developed to investigate the organization of production initially focused on complex societies and the development of craft specialization (Mills and Crown 1995: 4; Rice 1996b: 176). These relatively early studies generally tended to focus on building production typologies with different "types" located along a scale/intensity continuum. Usually household production/specialization was at one end of the continuum and more complex forms of production/specialization (i.e. industrial factory production) were at the opposite end of the continuum. Separation of the different production systems along the continuum was based on a multitude of variables that ultimately responded to an individual researcher's dataset. For instance, some researchers divided their production types based on the amount of control exerted over the production process by elite patrons (e.g. Earle 1981; Sinopoli 1988) while others divide their types based on the standardization and efficiency of the production process (e.g. Hagstrum 1985; Rice 1981)

These studies have shown that environmental and social conditions structure the ceramic production system and that change within these production systems can arise from a multitude of sources (Arnold 2000; Costin 1991, 2000). Despite this realization, archaeologists still find it useful to categorize how commodity production is organized in terms of the degrees and types of specialization present in a social system (Costin 1991). Specialization in these instances is viewed as engaging in the production of a commodity with preconceptions of that commodity's exchange value in mind. Thus any time a commodity is produced beyond the immediate functional needs of the artisan, that commodity is seen as being the product of a specialist.

Using ethnographic data, Costin (1991) condensed the aforementioned socio-economic variables into four parameters that characterized how production could be organized. The first of these variables was the context of production that "describes the affiliation of the producers and the sociopolitical component of the demand for their wares" (Costin 1991: 11). The second variable, the concentration of production, describes the geographic distribution of production. The scale of production describes the composition of the production unit and takes into account the size of the labor unit and how individuals are recruited into its ranks (Costin 1991: 15). The final parameter used by Costin (1991) to describe the organization of production was the intensity of production that "describes the amount of time producers spent on their craft" (Costin 1991: 16).

Each of these parameters is arranged along a continuum. For the context of production, this continuum ranges from independent to attached and describes the position of the producer in relation to an elite sponsor. For the concentration of production the continuum ranges from dispersed to nucleated in relation to how production units are distributed. For the scale of production, the continuum ranges from small, kin-based production units to factory production units. Finally, the continuum for the intensity or production ranges from part-time production to full-time production. The manner in which a distinct social unit arranges their production in relation to these parameter continuums is used to describe how they organize their production.

Costin (1991) describes eight types, or methods of organizing production: individual specialization, dispersed workshops, community specialization, nucleated workshops, dispersed corvée, individual retainers, nucleated corvée, and retainer workshops. Each of these methods of organizing production differs with respect to where they are located along the parameter continuums outlined above. Individual specialization refers to individual or household production units distributed homogeneously throughout the larger population who produce for "unrestricted local consumption" (Costin 1991: 8; Costin and Hagstrum 1995: 621). Dispersed workshops are similar to individual specialization units except they are composed of more individuals who are more likely to be unrelated (Costin 1991; Costin and Hagstrum 1995). Community specialization is likewise similar to individual specialization units except the units are not dispersed homogeneously throughout the population and are instead "aggregated within a single community" (Costin 1991: 8; Costin and Hagstrum 1995: 621). Nucleated workshops are similar to community specialization units except they tend to be composed of larger labor forces that may be composed of unrelated individuals (Costin 1991; Costin and Hagstrum 1995). Dispersed corvée represent a small group of individuals distributed throughout the population who produce commodities on a part-time basis for a patron (Costin 1991; Costin and Hagstrum 1995).

Similarly, nucleated corvée represent a group of individuals who are aggregated at a specialized facility and produce commodities on a part-time basis for a patron (Costin 1991: Costin and Hagstrum 1995). Individual retainers are specialized producers who work on a full-time basis at a specialized facility and produce for a specific patron. Similarly, a retainer workshop is a group of individual specialists who produce commodities for a patron within a specialized facility (Costin 1991; Costin and Hagstrum 1995).

With regards to the context of production parameter, individual specialization, dispersed workshops, community specialization, and nucleated workshops all tend to organize production independently of the political economy (Costin 1991; Costin and Hagstrum 1995). In these scenarios, specialists tend to produce utilitarian goods whose distribution is not restricted and "that circulate within the subsistence economy" (Costin and Hagstrum 1995: 620). Conversely, dispersed corvée, individual retainers, nucleated corvée, and retainer workshops all tend to involve increasing levels of involvement within the political economy (Costin 1991; Costin and Hagstrum 1995). Here, goods are produced that maintain the socio-political differentiation present in a social system and are restricted in their distribution by either direct control of who obtains what goods and/or through producing social customs that dictate who consumes particular commodities. These goods are usually produced under some supervision to ensure that the socially encoded information embedded in the material items being produced are present and maintain the orthodoxy of the overall social system (Costin and Hagstrum 1995).

With regards to the concentration of production, individual specialization, dispersed workshops, and dispersed corvée are located closer to the dispersed end of the continuum. In these situations producers are distributed evenly in relation to consumers. This minimizes transport costs and time in commodity distribution. Community specialization, nucleated workshops, individual retainer, nucleated corvée, and retainer workshops tend to be located closer to the nucleated side of the concentration continuum. Here, production tends to be isolated to one or a few strategic locations. These locations are not equitably distributed with respect to consumers and commodities must be moved to consumers if demand is present.

The composition/scale of specialization describes the production unit and the complexity of the labor force as well as the social distance of its constituents. These parameters increase as one moves from a kin-based production unit to a factory production unit. Generally, individual specialization, community specialization, dispersed corvée, and individual retainer tend to be located closer to the kin-based side of the continuum. In these production situations large labor pools are generally not needed and production likely takes place on an as needs arise. The production unit usually consists of one individual within a household or by a small group of related individuals. At the opposite end of the spectrum are workshop/factory production units. Generally speaking, Costin's dispersed workshop, nucleated workshop, dispersed corvée, nucleated corvée, and retainer workshop types are located closer to this end of the continuum (Costin 1991). Here labor tends to be pooled from groups of unrelated individuals. These situations usually arise when production is mandatory (e.g. slave labor, indentured servitude, etc.), when there is differential access to the forces of production and the means of production, and/or when demand for a product exceeds the ability of smaller production units.

Finally, the intensity of production describes the amount of time producers spend fabricating goods. At the low end of the spectrum lies part-time production. Generally, individual specialization, community specialization, dispersed corvée, and nucleated corvée production units tend to produce more on a part-time basis when compared to dispersed workshops, nucleated workshops, individual retainer, and nucleated retainer production units who tend to produce on a more full-time basis. It should be noted that individual specialization and community specialization units can produce on a full-time basis when demand dictates or when scheduling conflicts with subsistence production are not present. However, these methods of organizing production generally use a part-time labor force.

Discerning how production was organized in a particular social system from archaeological remains rests on two general types of data: direct and indirect evidence of production. Direct evidence consists of the “tools, materials, and features used in the production process” (Mills and Crown 1995: 7). This evidence is primarily used to identify where production took place and can inform archaeologist as to the context, concentration, scale, and intensity of production. Indirect lines of evidence reside in attributes associated with whole and/or fragmentary ceramic vessels. Generally, these attributes are used to assess the degree of standardization in the production process or are used to assess the relative frequency of production in a given analytical unit (Costin and Hagstrum 1995; Hagstrum 1985; Longacre et al. 1988). These data typically are used to address the scale and concentration of pottery production.

With respect to pottery production in the Southwest, direct evidence is somewhat limited and consists of potter’s clay, firing facilities, and tools used in pottery manufacture. By far the most numerous markers of direct evidence of pottery production consist of tools used in the manufacture process (Mills and Crown 1995). Nearly all well documented sites in the Mimbres area have recorded some form of tool that could have been used in pottery production (Anyon and LeBlanc 1984; Cosgrove and Cosgrove 1932; Nelson and LeBlanc 1986; Nesbit 1931; Shafer 1985, 2003; Woosley and McIntyre 1996). These tools most often consist of pottery scrapers and polishing stones with distinct wear patterns (Geib and Callahan 1988; Hill 1985; Sullivan 1988; Waterworth and Blinman 1986). Sullivan (1988: 24) notes that the presence of these tools surrounding “pottery making and pottery firing facilities” represents the “most convincing evidence of on-site ceramic production.” While these forms of direct evidence are present in the Four Corners area (Bernardini 2000; Blinman and Swink 1997; Sullivan 1988) and in the Hohokam area (Haury 1976), they have yet to be encountered in the larger Mogollon culture area. In this area, more often than not, identifying pottery production resides on inductive logic that opposes the deductive logic of Sullivan’s perspective presented above. In these interpretations, pottery manufacture is hypothesized to have taken place based on the presence of tools commonly associated with the practice despite the fact that other forms of direct evidence are absent. While some archaeologist use the distribution of these tools types to assess the probable scale, intensity, and concentration of ceramic manufacture, other researchers note that these items could have been used for a variety of processes other than pottery production (Sullivan 1988: 31).

Perhaps one of better-known examples of direct evidence of pottery production in the Mimbres area was the potter's grave recovered from Room 14 at the NAN Ranch ruin (Shafer 1985, 2003). This burial represented the flexed inhumation of individual, probably an adult female, who was interred with a distinctive assemblage indicative of pottery making. This assemblage consisted of a number of worked sherds/pottery scrapers, polishing stones, smashed vessels, intact vessels, unfired Mimbres Black-on-white Style I vessels, lumps of white kaolin clay, and a broken Mimbres Black-on-white Style I vessel filled with red pigment (Shafer 1985, 2003:151).

The materials associated with this female are perhaps some of the only known examples of these materials in the Mimbres area. Other examples of raw materials used in pottery production were encountered at Swarts (kaolin clay lumps, pigment concentrations, etc.) and are likely present at other sites (Creel 2014, personal communication). To my knowledge, there are no other examples of unfired pottery vessels being recovered from sites. The only other examples of potter's clay being found at a site is from Room C2 at the Old Town Ruin (Creel 2006a: 223) and Room P at the Swarts Ruin (Creel 2014, personal communication). Despite this, no large cache of kaolin clay has been encountered in the area except for that interred with the female at NAN Ranch and Swarts, although small lumps of kaolin have been recovered at several sites including Old Town. However, as Sullivan (1988) notes, recovering such evidence of pottery production requires careful excavation, a situation that was not afforded to many of the region's archaeologist who were either working before field methods had been refined or were literally working in haste adjacent to heavy equipment.

Because the individual at NAN Ranch contained such a unique and diverse array of associated funerary objects, Shafer (1985) argued that pottery production in the

Mimbres area was organized as some form of craft specialization. Gilman and colleagues (1994) noted that Mimbres Black-on-white pottery was not produced by full-time craft specialists. This conclusion is based on the overall lack of evidence for socio-political differentiation within Mimbres society and the fact that few, if any, features indicative of pottery production (e.g. kilns, workshop areas, raw material procurement locales, etc.) have been encountered at excavated Mimbres sites (Creel 2006c; Gilman 1990, 2006). If full-time specialist were present, it is believed that such features would be discernible and there would be some pattern to the assemblage variability indicating a heterogeneous distribution of pottery producing tools and features. Such patterns, aside from the NAN Ranch burial, are absent from the region (Gilman 1989). However, LeBlanc (1983: 138-139; 2006) notes that the majority of Mimbres pottery could have been produced by a few individuals at specific sites on a part-time basis. Based on his analysis of similarities in design motifs on excavated Classic Mimbres Black-on-white vessels, LeBlanc (2006) postulates that there were only 20-40 potters working in the Mimbres area at any one point in time. While this may be so, the direct evidence of pottery production recovered from excavated sites neither confirms nor denies this claim. Similar conclusions were derived from other indirect lines of evidence such as the standardization of vessel morphology (LeBlanc 2006).

Using Costin's (1991; Costin and Hagstrum 1995) production parameters, it is possible to characterize in a preliminary way how Mimbres Black-on-white pottery production was organized. First, there is little evidence for the type of socio-political differentiation necessary for attached production to have taken place. While Shafer (1985), Creel (2006c), and others (Anyon and LeBlanc 1984:122; Creel and Anyon 2003: 76-77) present some of the best evidence for differential treatment of the dead within the Mimbres area, and thus socio-political differentiation, it is believed that these individuals were rare circumstances. Similarly, associated funerary objects recovered from a number of burials throughout the area shows that most individuals were interred with similar items and even though some individuals were interred with more and varied items, these individuals are homogeneously dispersed throughout sites (Gilman 1990, 2006). Based on this information, Gilman (2006) suggests that social differentiation took place within families but not between them. Taken together, these data point to a system of socio-political differentiation that is likely not based on ascribed status, but rather reflects the status earned by individuals. Furthermore, this differentiation is likely not hierarchal, where individuals are granted more power based on their position, and is instead more representative of a system where the socio-political differentiation present in society reflects the horizontal segmentation of behaviors each of which receives the same prestige (e.g. potter, hunter, forager, man, woman, child, etc.).

Determining the concentration of pottery production in the Mimbres area is a more difficult endeavor. As stated above, few of the features indicative of direct pottery production (e.g. kilns, workshop/manufacture areas, clay procurement locales, etc.) have been recognized through excavation. While this is likely due to sampling in that few projects have targeted extramural areas, the lack of such features in combination with the relatively wide-spread occurrence of other forms of direct evidence (e.g. pottery scrapers and polishing stones) would seem to indicate that pottery production was dispersed throughout the Mimbres area. However, compositional data, and possible stylistic data as well, indicate that some pottery production may have been more nucleated than the direct lines of evidence suggests. As noted previously, LeBlanc (2006) suggests that a handful of potters within the largest sites were responsible for the majority of pottery produced in the Mimbres area. Similarly, the extant compositional data point to widespread manufacture, though production of certain types of pottery (e.g. Mimbres Black-on-white Styles I-III and Three Circle Red-on-white) tends to be more concentrated at specific sites (Speakman 2013: 184-199). For instance roughly 50 percent of the Three Circle Red-on-white samples submitted for characterization were assigned to groups whose likely area of production were near the Harris site or Wind Mountain (Speakman 2013: 186). Similarly, approximately 30 percent of the Mimbres Black-on-white Style III samples submitted for INAA were assigned to groups that were likely produced near Swarts and Galaz (Speakman 2013: 186). These data suggest that while production was widespread throughout the Mimbres area, production was more intensive at some sites during certain time periods.

The scale of pottery production in the Mimbres area was likely based on smaller production units, probably individuals or members of the same household who shared other productive tasks. This assertion is based on the general lack of features and concentration of production related artifacts at specific locations that would be present if production was centered on larger-scale workshops. Costin (1991) notes that in order to discern the scale/composition of the production unit, one must take into account the production unit's size as well as its "principles of recruitment," or the way other producers are brought into the system (Costin 1991:15). The traditional view of pottery production in the Southwest is based on ethnographic analogy and posits that most potters are women who are responsible for forming and firing vessels. Usually, these same women are also responsible for decorating the vessel but in some communities, men also help with the decoration process. Generally, girls learn to make pottery when they feel they are interested. Under these circumstances, each individual decides when they want to start learning the craft, though most girls tend to start the learning process around five years of age (Crown 1999, 2001, 2002).

The learning process is largely based on imitation of skilled relatives and/or more competent peers, and formal instruction is rare. The learning process tends to mirror the operational sequence beginning with vessel formation and ending with learning the specifics of the firing process (Crown 1999, 2001, 2002). In her analyses of learning frameworks in the prehistoric Southwest, Crown (1999, 2001, 2002) notes that in some situations adults tended to aid children in the production process by scaffolding some activities, such as vessel formation, so that children could focus on learning other activities in the production process such as design skills. However, the majority of examples of unskilled pottery production in the Mimbres area show that children were primarily responsible for vessel formation and decoration in the learning process. This indicates that learning was primarily accomplished through observation and imitation though in some instances adults helped by scaffolding vessel formation and design layout and execution. These data again suggest that pottery production primarily took place at a small analytical level, with production based on the household or extended family being most probable. If production were organized at a higher analytical level such as a workshop or factory, it would be expected that the learning process would be implemented in a more complex apprenticeship system. In such systems, individuals being brought into the production process would first learn simple procedures associated with the production process such as obtaining raw materials or fuel for firing. Once these skills were mastered then they would learn another step in the production process such as mixing clay recipes. This would continue until the entire process was mastered and the apprentice actually becomes a producing member of the community of practice. The products of unskilled potters analyzed by Crown (1999, 2001, 2002) suggests that a fairly structured system of apprenticeship was present in the Mimbres area during the Late Pithouse and Classic periods though this structure does not mirror those expected of more intensive production units.

As stated above, there is some disagreement as to whether or not Mimbres pottery was produced by full-time or part-time specialists (Gilman 1989; Gilman et al. 1994; LeBlanc 1983, 2006; Shafer 1985, 2003). As Costin (1991) notes, the difference between these two perspectives is related to efficiency, risk, and scheduling of production activities. Efficiency in this sense refers to being able to lower production costs per unit of investment. In some instances this is accomplished through technological inputs (e.g. building large multi-chamber climbing kilns, obtaining materials with the aid of heavy machinery, etc.) while in others it demands more time spent in the production process. This is, of course, associated with demand for particular products and can be influenced by the geographical distribution of natural materials. If demand is present then groups can augment their subsistence production through commodity production. Demand can be partially generated by the unequitable distribution of both natural and cultural resources. If the natural resources needed to manufacture an item are not present in an individual's surroundings, those materials must either be imported so that production can take place, or finished goods must be brought in to meet demand. Importing raw materials, or going further to obtain these items, increases production cost. Similarly, if certain cultural items are needed for production (e.g. specialized facilities, personnel, technology, etc.); these must be obtained prior to beginning manufacture. Acquiring these needed cultural items also increases production costs. In either scenario, it is most likely that the cheaper solution, either import finished products or secure needed resources, will be chosen unless production is organized to accommodate the distribution of resources and producers.

Risk, in Costin's (1991) sense, refers to the ability to pull people from production activities and still be able to survive. This is related to scheduling in that if pottery production conflicts with the schedule of agricultural production then this increases the risk of pottery production. Costin (1991: 17) notes that pursuing a generalist strategy, where individuals can engage in both craft and agricultural production, is best suited for instances where "technology is simple or inexpensive." Once greater improvements are made to technological systems, the costs of production decrease. If a group interacts with another group who has improved their production process and can thus produce pottery in a more efficient manner, it becomes increasingly difficult for the interacting groups not to improve their production process as well.

Based on the direct and indirect lines of evidence discussed above, it is apparent that many of the larger sites in the Mimbres area produced pottery at some point in time. Of the different criteria that affect the intensity of production, efficiency is perhaps the one that was influential in the Mimbres area (or the one that has received the most attention). It has been postulated that production of Mimbres pottery in the southern portions of the Mimbres valley ceased by the beginning of the Classic period. This assertion is based on environmental reconstructions that show that inhabitants of the southern Mimbres valley were having to go further to acquire construction timbers through time as well as data demonstrating that riparian tree species were mostly absent during the Classic period (Creel 2006a: 89-90; Minnis 1985). Based on this and the fact that later pottery types are largely absent from compositional groups whose likely production zones are located in the southern valley, Creel and Speakman (Creel and

Speakman 2012; Creel et al. 2010; Speakman 2013) postulate that fuels necessary for pottery manufacture were likely exhausted in these areas by the Classic period. Because the inhabitants of these southern sites could not produce pottery as efficiently as those individuals at sites with adequate fuels, southern inhabitants began importing the vast majority of their pottery from other areas (Creel et al. 2010, Speakman 2013). Because these sites could not efficiently produce their own pottery based on the distribution of natural resources, the demand for ceramic containers undoubtedly changed the intensity of production at sites where pottery could be produced. The inhabitants at those sites likely began intensifying their ceramic production to meet increased demand.

The other two factors that influence production intensity, risk and scheduling conflicts, were likely equitably distributed throughout the region. While all inhabitants of the Mimbres area faced risk in subsistence practices, especially if engaged in agricultural production, this risk may have been heightened at sites with larger populations. Failure in subsistence endeavors would mean that more individuals would experience the shortfalls of a lean season. However, if resources were pooled for redistribution, then these shortfalls would affect smaller production groups more severely. In mitigating this risk, it makes sense that groups would diversify their subsistence base or invest in technological improvements to increase production or reduce the risk of failure (e.g. adoptions of irrigation or bow and arrow technology). While this was likely done by individuals at all sites regardless of size, site's with larger populations had more flexibility in implementing diversifying strategies so that subsistence production would not create scheduling conflicts with other activities. If the intensity of pottery production was increased at a specific site to meet the demands of sites whose inhabitants were incapable of producing their own, this would increase the risk of this activity in that time spent in producing pottery would be taken away from providing subsistence goods to other members of the social group. This risk could of course be mitigated if subsistence goods were exchanged for the pottery being produced.

Similarly, the scheduling of pottery production likely affected all populations along the Mimbres Valley. Since most of the larger sites appear to be the location of pottery production at some point in time (Speakman 2013), inhabitants around these sites had to ensure that the production of pottery did not conflict with other activities more vital to the daily lives of individuals. For this reason, pottery production was likely scheduled so that it did not conflict with key segments of various subsistence practices (e.g. spring planting, fall harvest, artiodactyl rutting seasons, etc.). Again, sites with larger populations could pool the required resources needed to meet the demands of labor bottlenecks more easily than sites with smaller populations. These larger sites could thus afford to engage in other activities during the labor bottleneck events.

Based on the data presented above, it appears that there were no full-time pottery specialists in the Mimbres area. This inference, again, is based on the apparent lack of formal features associated with pottery production at excavated sites. To be certain nearly every excavated site contains certain artifact classes that are indicative of pottery production (e.g. pottery scrapers, polishing stones, etc.). However, these artifacts are generally dispersed across sites and have yet to be found in association with features indicative of full-time specialization (e.g. workshop areas, formal firing facilities, etc.). If full-time specialists were present in the area prehistorically, we would expect there to be evidence of their presence and the frequency of both production features and tools would be greatest in areas where such specialists were present. Because no such concentration has been found or recognized, I believe that the majority of pottery production in the Mimbres area was conducted by part-time specialists. While all pottery production was probably conducted on a part-time basis, individuals at some sites produced more intensively than producers at other sites. This more intensive production likely took place at sites whose inhabitants had begun producing pottery for distribution to other sites where the resources needed for pottery production were absent. It is likely that the sites producing for distribution were those with larger populations. This would allow individuals within the group to spend added time on pottery production. Because of the higher population numbers, this added time spent on pottery manufacture would not increase the risk of subsistence failure and would not interfere with labor bottlenecks associated with subsistence activities because additional people would be present to take the place of those making pottery.

Taken together, the data pertaining to the context, concentration, scale, and intensity of pottery production in the Mimbres area from the Pithouse periods through the Classic period suggests that production was organized as individual specialization or community specialization (Costin 1991). Unfortunately, present data do not allow us to further refine this assessment. It is, in fact, likely that pottery production was organized as both individual/household specialization and community specialization simultaneously within the Mimbres area. Specifically, those areas shown to be the likely origin of ceramics found at sites in the southern Mimbres Valley during the Classic period are those that could have organized their pottery production near Costin's (1991) community level to meet the increased demand.

THE OLD TOWN BLACK MOUNTAIN PHASE CERAMIC ASSEMBLAGES

Ceramics common to the Black Mountain phase consist of Chupadero Black-on-white (Clark 2006; Mera 1931), El Paso Polychrome (Miller and Graves 2009, 2012; Miller and Kenmotsu 2004; Stallings 1931), and ceramics within the Playas series (Di Peso et al. 1974; Sayles 1936). Other types such as Three Rivers Red-on-Terracotta (Di Peso et al. 1974), various Chihuahuan Polychromes (Di Peso et al. 1974; Whalen and Minnis 2009), Tucson Polychrome (Di Peso et al. 1974; Neuzil and Lyons 2005), and St. John's Polychrome (Gladwin and Gladwin 1931) are encountered less frequently at Black Mountain phase sites. The dates commonly associated with these wares are presented in Table 9.1.

As can be discerned by the data presented in the table, a number of wares have a hypothesized beginning date of production around A.D. 1150 (i.e. Chupadero Black-on-white, El Paso Polychrome, Playas Red, and Three Rivers Red-on-terracotta). As discussed earlier, these wares are often encountered at Terminal Classic period occupation and thus their introduction into the area likely predates the beginning of the Black Mountain phase.

Table 9.1: Date ranges associated with ceramic types commonly found at Black Mountain phase sites.

Ceramic Type	Date Range	Reference
San Francisco Red	500 - 1000	Shafer and Brewington (1985)
Mogollon Red-on-Brown	650 - 750	Shafer and Brewington (1985)
Three Circle Red-on-white	730 - 770	Shafer and Brewington (1985)
Mimbres Black-on-white Style I	750 - 900	Shafer and Brewington (1985)
Mimbres Black-on-white Style II	880 - 1020	Shafer and Brewington (1985)
Mimbres Black-on-white Style III	1010 - 1130	Shafer and Brewington (1985)
Classic Corrugated	975 - 1130	Shafer and Brewington (1985)
Indented Corrugated	1000 - 1300	Wood (1987)
Chupadero Black-on-white	1150 - 1400	Breternitz (1966)
El Paso Polychrome	1150 - 1450	Miller and Graves (2009)
Playas Red	1150 - 1400	Mills (1986)
Three Rivers Red-on-Terracotta	1150 - 1350	Breternitz (1966)
St. John's Polychrome	1200 - 1300	Neuzil and Lyons (2005)
Tucson Polychrome	1275 - 1450	Neuzil and Lyons (2005)
Chihuahuan Polychromes	1200 - 1450	Whalen and Minnis (2009)

A number of studies have been conducted to determine the likely area of production of these types that appear in the Mimbres area during the mid-to-late 12th century. These studies have demonstrated that much of the Chupadero Black-on-white entering the area during this time was produced in the Sierra Blanca region of the Tularosa Basin (Clark 2006; Creel et al. 2002). Similarly, much of the El Paso Polychrome entering the area was likely produced in the areas surround the modern city of El Paso, Texas (Miller and Ferguson 2010). Based on the available data, the only pottery types characteristic of the Black Mountain phase that were produced in the Mimbres area are those belonging to the Playas series (Creel et al. 2002). An in depth analysis of Playas ceramic production is presented in the following chapter.

A total of 6464 ceramic sherds have been recovered from the excavations that were conducted within the Black Mountain phase component at Old Town as have the remains of four complete, or nearly complete, vessels. The majority of these sherds merely represented the broken fragments of once whole pottery vessels. However, there were some that appear to have been modified and reused after their initial breakage. These sherds are usually roughly rectangular or oval in shape and exhibit evidence of wear or smoothing along their edges. Sherds exhibiting similar wear patterns have been found at other site in the Mimbres area and have been interpreted as pottery scrapers. The 1989-2003 excavations (Creel personal communication, 2014) recovered 107 pottery scrapers from Old Town. The majority of these are believed to have been used during the Three Circle phase though one specimen represented a worked El Paso Polychrome sherd.

Nine such pottery scrapers were encountered during the course of the 2006 and 2007 excavations in Area C at Old Town. Of these, all but four were likely recovered form Pithouse period contexts. These other four represented worked sherds of later pottery types with three representing worked Playas series sherds, and one representing a worked Chupadero Black-on-white sherd.

Intra-site Analyses

To facilitate analysis and presentation, the ceramic assemblage was broken down into three general type categories: non-decorated, decorated, and undifferentiated ceramic classes. The non-decorated category consisted of ceramic types that were either plainwares or ceramics with minimal surface enhancement such as corrugated and smudged ceramic varieties. The decorated type class consisted of ceramic types that were either slipped, painted, or exhibited some surface treatment other than corrugations or smudging. Finally, the undifferentiated type class consisted of wares that could not be assigned to ceramic types within the non-decorated or decorated ceramic type classes. Of the 6464 ceramic sherds collected from the work conducted in Area C roughly 59.5 percent (n = 3845) were classified as types within the non-decorated type class, 37 percent (n = 2391) were classified as types within the decorated type class, and 3.5 percent (n = 228) were classified as wares within the undifferentiated type class. Only the non-decorated and decorated type classes will be further discussed.

The non-decorated category consisted of 11 different pottery types (Table 9.2). The majority of these were plain Mogollon Brownwares (n = 1624, or 42%) followed by Playas plainwares (n = 947, or 25%) and El Paso brownwares (n = 764, or 20%). Lesser quantities of smudged Mogollon Brownwares, Classic corrugated, Three Circle corrugated, Playas corrugated, Playas smudged, Tularosa smudged corrugated, and a ware similar to Ramos Black (Black Smudged) were also present in the assemblage (Table 9.2). Most of these samples originated from Unit 14 (n = 1152, or 30%), Unit 18 (n = 1109, or 29%), and general proveniences (n = 615, or 16%). Usually, those types constituting the majority of the overall non-decorated types category assemblage also constitutes of the majority of the assemblages collected from individual excavation units. Thus, for most excavation units, plain Mogollon brownwares comprise the majority of the assemblage followed by Playas plainware and El Paso Brownwares.

The decorated types category consisted of 2391 sherds that were classified as representing 26 different pottery types (Table 9.3). The majority of these samples were El Paso Polychrome sherds (n = 719, or 30%) followed by Playas Incised (n = 354, or 15%) and Playas Redware sherds (n = 269, or 11%). Most of these samples originated from Unit 18 (n = 799, or 33%), Unit 14 (n = 676, or 28%), and general proveniences (n = 357, or 15%). Again, those types constituting the majority of the overall non-decorated types category assemblage also constitutes of the majority of the assemblages collected from individual excavation units. El Paso polychrome sherds usually comprise at least 20% of excavation unit assemblages. Playas Red sherds and Playas Incised sherds are the next most common types encountered within excavation units.

Ceramic counts demonstrate that patterns similar to those outlined above are also present for assemblages associated with individual rooms. The majority of non-decorated ceramic types are plain Mogollon Brownwares comprising approximately 36 percent of the rooms' excavated assemblages (n = 780) (Table 9.4). El Paso Brownwares and Playas plainwares are the next most common types present in room assemblages, each comprising approximately 26 percent of the overall excavated room assemblages (n = 562 and n = 569 respectively).

Table 9.2: Non-decorated ceramic wares recovered from excavation units within the Black Mountain phase component at Old Town.

	Excavation Unit										
Ceramic Type	14	15	27	16	18	25	26	28	29	Gen.	Total
Mogollon Brownware	497	144	19	46	288	56	176			398	1624
Mogollon Brownware - Smudged	9	1			3		2				15
Classic Corrugated	3	16			16		8			6	49
Three Circle Corrugated	28	5	6	1	2	3	20			27	92
Indented Corrugated	3				1						4
El Paso Brownware	229	107			402		23			3	764
Playas Plainware	257	103	3	9	355	12	112			96	947
Playas Corrugated	75	3	5	9		11	39	1	1	69	213
Playas Smudged	21	6		1	29	5	4			6	72
Tularosa Smudged Corrugated	13	4		1	12	1	1			5	37
Black Smudged	17	4			1		1			5	28
Total	1152	393	33	67	1109	88	386	1	1	615	3845

Table 9.3: Decorated ceramic wares recovered from excavation units within the Black Mountain phase component at Old Town.

	Excavation Unit										
Ceramic Type	14	15	27	16	18	25	26	28	29	Gen.	Total
Mogollon R/B	4				2		2				8
Three Circle R/W							1				1
Mimbres B/W Style I	12	1	1	1	4		5			3	27
Mimbres B/W Style II	8			1	5		7			7	28
Mimbres B/W Style III	4				14		2			1	21
Mimbres B/W Style Ind.	77	15	2	2	57	3	26			49	231
San Francisco Red	5			1		1	1			9	17
Chupadero B/W	31	9	1	1	52	8	8			40	150
El Paso Poly.	176	41	8	51	353	13	16			61	719
Playas Red	83	33	3	3	104	4	13			26	269
Playas Red Incised	18	11	2		25	3	2			8	69
Playas Red Incised Rubbed	10	1			10		3				24
Playas Incised	107	26	3	10	52	13	51			92	354
Playas Incised Rubbed	26	28			47		24				125
Playas Red Corded	9				2	1	1				13
Playas Corded	1				6						7
Playas Red Corrugated	12	1	3	2	4	5	3			10	40
Playas Tooled	16	8	1		32	1	1			1	60
Playas Red Tooled	31	16	1	2	14	6	4			12	86
Playas Ind. Decoration	37	3		2	4	9	19			22	96
Tucson Poly.					9					2	11
Three Rivers R/T	2	4			1		1			9	17
White Mt. Redware	2	1				1				1	5
Reserve B/W	3						2			2	7
St. John's Poly.	1				2					2	5
Ramos Poly.	1										1
Total	676	198	25	76	799	68	192	0	0	357	2391

Table 9.4: Non-decorated ceramic wares recovered from excavated rooms within the Black Mountain phase component at Old Town.

	Excavated Room									
Ceramic Type	C1	C2	C30	C3	C23/C28	C27/C34	C35	C10	C11	Total
Mogollon Brownware	129	149	88	6	133	130	5	53	87	780
Mogollon Brownware - Smudged			6		1	2				9
Classic Corrugated		1	2		12	3	1		2	21
Three Circle Corrugated	10	10						3	14	37
Indented Corrugated			3			1				4
El Paso Brownware			170		219	166	7			562
Playas Plainware	25	26	151		202	124	8	11	22	569
Playas Corrugated	34	26	3	1				8	31	103
Playas Smudged	4	9	7		16	12		5	3	56
Tularosa Smudged Corrugated	3	6	4		3	9		1		26
Black Smudged	1	15								16
Total	206	242	434	7	586	447	21	81	159	2183

Table 9.5: Decorated ceramic wares recovered from excavated rooms within the Black Mountain phase component at Old Town.

	Excavated Room									
Ceramic Type	C1	C2	C30	C3	C23/C28	C27/C34	C35	C10	C11	Total
Mogollon R/B			1		2					3
Three Circle R/W										0
Mimbres B/W Style I		4			2	2			4	12
Mimbres B/W Style II		4	3		1	3			4	15
Mimbres B/W Style III			3		3	11			1	18
Mimbres B/W Style Ind.	13	13	12		20	32	1	3	9	103
San Francisco Red	1	2		1				1	1	6
Chupadero B/W	4	8	17		36	13		8	1	87
El Paso Poly.	29	80	44		217	118	5	13	13	519
Playas Red	10	18	35		60	37	3	4	4	171
Playas Red Incised	2	5	10		12	10	1	3	1	44
Playas Red Incised Rubbed			9		7	3				19
Playas Incised	26	44	30	3	21	26	1	13	30	194
Playas Incised Rubbed			15		23	20	3			61
Playas Red Corded	2	4	1		2			1	1	11
Playas Corded			1		5	1				7
Playas Red Corrugated	7	5			1	1		5	1	20
Playas Tooled	1	6	8		21	10		1		47
Playas Red Tooled	4	6	14		9	3		6	2	44
Playas Ind. Decoration	15	17		1	2		1	8	13	57
Tucson Poly.						9				9
Three Rivers R/T		2			1					3
White Mt. Redware		2						1		3
Reserve B/W	2		1						2	5
St. John's Poly.			1		2					3
Ramos Poly.			1							1
Total	116	220	206	5	447	299	15	67	87	1462

While these patterns characterize the overall assemblages collected from individual room contexts, there is variability between each room's assemblage. For instance, rooms C35, C23/C28, and C27/C34 both contain proportionally less plain Mogollon Brownware when compared to rooms C1, C2, C30, C10, and C11. While proportionally fewer plain Mogollon Brownwares are present in these contexts, they contain proportionally more Playas plainware and El Paso Brownware sherds. These differences could be accounted for by different researchers analyzing these assemblages or they could represent temporal trends in the manufacture of types within the non-decorated ceramics category.

With respect to types within the decorated ceramics category, sherds recovered from excavated rooms mirror the patterns present for ceramics recovered from excavation units. Again we see high proportions of El Paso Polychrome ceramics (n = 519, or 36%), Playas Incised ceramics (n = 194, or 13%), and Playas redwares (n = 171, or 12%) (Table 9.5).

These patterns pertain to the overall assemblage collected from excavated rooms and masks some of the variability present between assemblages collected from within these contexts. For instance, when one compares the proportion of ceramic types within the Playas series across room assemblages, rooms C2, C23/C28, and C27/C35 stand out due to the relatively low proportion of these sherds within their assemblages (ca. 47:, 34%, and 37% respectively). Other rooms' assemblages are predominantly composed of sherds belong to the Playas series. On average, ceramics within the Playas series comprise roughly 63 percent of the decorated ceramic assemblages recovered from room C1, C30, C35, C10, and C11. While rooms C2, C23/C28, and C27/C34 contain relatively low proportions of Playas series ceramics, they contain relatively high proportions of El Paso Polychrome sherds. On average approximately 41 percent of the assemblages collected from these rooms consist of El Paso Polychrome sherds (Table 9.5).

The data presented above demonstrate that there may be some differences between excavated room assemblages specifically with respect to the proportion of El

Paso Polychrome ceramics and ceramics within the Playas series between assemblages. These patterns could represent differential use/discard patterns between these assemblages or they could represent temporal patterns.

If the partially reconstructed El Paso Polychrome vessel found on roof fall (and inferentially on the roof) of Room C28 is representative of other samples within the assemblages recovered from rooms C23/C28 and C27/C34, these sherds could be associated with a late 13th century occupation of the site (Figure 9.1). This vessel represents what Miller and colleagues (Miller and Graves 2009, 2012; Miller and Kenmotsu 2004) refer to as the "late or classic variant" of El Paso Polychrome and was likely manufactured sometime after A.D. 1250. Vessels of the "classic variant" usually contain everted rims and designs are limited to the upper portions of the vessel. While not entirely discernible in Figure 9.1, the design field on the vessel recovered from the roof of room C23/C28 ends just below the vessel's shoulder. The design elements present on this vessel (e.g. stepped frets, and thick bands partitioning design areas) are also common to the classic variant (Miller 1995).

Similarly, ceramics within the Playas series are more common in Terminal Classic period contexts at Old Town when compared to El Paso Polychrome ceramics. Playas series ceramics comprise approximately 4 percent of the decorated ceramic assemblage recovered from rooms within the site's terminal Classic period room block. Conversely, El Paso polychrome ceramics compose only 1 percent of the terminal Classic period assemblage. Together, these data could indicate that Playas series ceramics are more common early in the Black Mountain phase and that El Paso polychrome ceramics become more common later in time.

Figure 9.1: Partially reconstructed El Paso Polychrome vessel found resting on the collapsed roof of room C23/C28 (centimeter scale).

Vessel Form and Function

On a general level, vessels obtained from sites in the Mimbres area can be broken down in to two broad categories: bowls and jars. Each of these show up in different contexts throughout the Mimbres sequence though bowls are more commonly found in mortuary contexts and jars are more commonly found in domestic contexts. However, as Shafer (2003) and Lyle (1996) note, these associations are heavily biased by sampling. In her analysis of vessel function at NAN Ranch, Lyle (1996) demonstrated that bowls tend to be common in burials, domestic contexts, and midden deposits. She attributed this pattern to the fact that bowls can be used for a variety of functions (e.g. food serving, preparation, storage, and semiotic signaling). Jars, on the other hand, tended to be most common in domestic and midden contexts at NAN. The potential function of this vessel type was more limited and was predominantly shown to be related to food preparation and storage (Lyle 1996).

In order to assess if similar patterns were present in the ceramic assemblage recovered from Old Town, the proportion of rim sherds representing either bowls or jars was tabulated (Table 9.6). The tabulations were based on the number of rim sherds with unique orifice diameters present in excavated portions of distinct rooms. Thus if there

Table 9.6: Number of bowl and jar rim sherds of different types recovered from rooms C23/C28, C27/C34, C30, and C35. No Chupadero Black-on-white jar sherds were present in the rim sherd assemblages recovered from these contexts. However, most of the other Chupadero Black-on-white sherds recovered from these contexts were from jars.

	Count		Mean Orifice Diameter	
	Bowl	Jar	Bowl	Jar
Playas Plainwares	3	8	15.7	8.9
Playas Redwares		4		8.8
Chupadero B/W	1	*	15	
El Paso Brownware	1	5	14	11.7
El Paso Polychrome	5	8	12.4	14.8
Mogollon Brownware	1	6	13	7.85
Mimbres B/W	5		18.5	

were four Playas Plainware jar rim sherds with an orifice diameter of seven centimeters which were recovered from Room C27/C34, these four samples were considered as originating from the same vessel. Data collected from whole or reconstructable vessels was also used. While this method probably underestimates the actual number of distinct vessels represented in the rim sherd assemblage, it was the only data available for comparison.

Based on analysis of rim sherds collected from the excavations conducted within rooms C23/C38, C27/C34, C30 and C35, jars dominate the assemblages collected from rooms in the Black Mountain phase component at Old Town. Overall, jars outnumber bowls nearly two-to-one. However, this ratio is misleading because the majority of the bowl rim sherds came from different styles of Mimbres Black-on-white ceramics found in these rooms' assemblages. If these samples are removed from consideration, then jars outnumber bowls nearly 3 to 1 (Table 9.6). This pattern is to be somewhat expected given that these contexts represent those commonly associated with this vessel type's function.

As depicted in Table 9.6, the greatest differential in the proportion of bowls and jars exists with Mimbres Black-on-white ceramics which were all bowls, and Playas Redwares which were all jars. While Table 9.6 shows that no Chupadero Black-on-white jar rim sherds were present in these contexts, there were many jar neck and shoulder sherds of this type recovered from these excavated rooms. Thus, the rim sherd data underestimate the number of jars within the whole assemblage as well as within the Chupadero Black-on-white type itself. The bowl to jar ratio for all other types demonstrate that jars outnumber bowls by at least 1.6 to 1 and in some circumstances as much as 6 to 1.

These patterns are perhaps to be expected given the context from which the sample originated. As Lyle (1996) and Shafer (2003) note, jars are more commonly associated with domestic contexts. Because all samples used in the analysis above were from domestic contexts, they should outnumber bowls in their occurrence. It is of interest to note that based on the limited set of burial contexts excavated within the Black Mountain phase component at Old Town, that most ceramic vessels associated with interred individuals were bowls (two out of three) (see Chapter 11). A similar pattern was present at Walsh and Montoya where bowls were more commonly associated with burials when compared to jars. Here, eight bowls were interred with individuals and four jars were encountered in similar contexts (Ravesloot 1979).

SUMMARY

The data pertaining to vessel form and subsequent interpretations of vessel function demonstrate that the majority of ceramics recovered from these different rooms reflect domestic functions. This pattern was to be expected given the fact that they were collected from domestic areas. Despite this, these patterns as well as the patterns present within the limited Black Mountain phase burial contexts demonstrate a measure of continuity between the Black Mountain phase and the Classic period with respect to the social structures governing ceramic use.

Multiple lines of evidence potentially demonstrate that rooms C23 /C28 and C27/C34 contain a ceramic assemblage that is likely later than assemblages present in rooms C1, C2, C3, C10, C11, C30, and C35. This is suggested by the higher proportion of ceramics belonging to the Playas series recovered from Terminal Classic period rooms and rooms C1, C2, C3, C10, C11, C30, and C35. These pattern as well as the fact that Room C35 lies beneath the floor of Room C27/C34, which has a higher proportion of El Paso Polychrome sherds when compared to these other rooms, suggests that the pattern for increased El Paso Polychrome sherds could be a phenomenon related to later Black Mountain phase occupations.

With respect to temporal variation as the cause of the increased proportion of El Paso Polychrome ceramics being present in rooms C23/C28 and C27/C34; I believe that rooms surrounding rooms C23/C28 and C27/C34 represent a later occupation in the Black Mountain phase component at Old Town. Evidence for this being a later occupation comes from multiple sources. First, during the course of excavating room C27/C34, small amounts of Tucson Polychrome were encountered in what was believed to have been wall fall. If this interpretation is correct, this would suggest that the structure was constructed sometime after A.D. 1275 (Neuzil and Lyon 2005). Second, room C27/C34 was found to overlie room C35 (see Chapter 5, Figure 5.12). These structures were found to represent independent habitations and Room C27/34 was not merely a remodeled Room C35. Furthermore, room C35 is oriented differently and this orientation mirrors the orientation of rooms C3 and C8 more than that of rooms C23/C28 and C27/C34. These patterns could only occur if these structures were not contemporaneous.

Finally, the area where these rooms are located is topographically higher than the surrounding areas. I believe that this is a result of two phenomena. The first of these is that the inhabitants of this building episode built on top of earlier occupations' deposits. The fact that room C27/C34 overlies room C35 supports this. Second, this area is higher than the surrounding area primarily because of the relatively high amount of cobbles incorporated into the structures' architectural fabric. These cobbles were likely scavenged from earlier structures that had fallen into disrepair.   Insert text from first paragraph here as it relates to temporal differences.

There is some evidence to suggest that the groups inhabiting Area C during these early and late Black Mountain phase occupations were related. This assessment is borne out by unique placement of a secondary cremation burial. Feature C31, the only cremation encountered at Old Town during our excavations, was recovered while sub-floor testing room C27. The remains of a cremated individual were interred in a Playas Red Incised jar during the occupation of room C27/C34 and were interred in such a manner that their final resting place touched the floors of both rooms C27/C34 and C35 (Figure 9.2). This suggests that the groups occupying room C27/C34 were cognizant of the presence of room C35. The placement of the interred individual so that they touched the living surfaces of both structure also suggests continuity between groups occupying these structures. Alternatively, it is possible that the jar's placement was a result of chance and just happened to be just the size to fit between the two floors.

Taken together these data point to the continuity of practices between the Classic period and the Black Mountain phase. The data pertaining to vessel form demonstrates that a particular set of structures dictating the contexts of ceramic use were transmitted generationally. The fact that similar patterns of use were present in domestic contexts at NAN and at the Black Mountain phase component at Old Town suggests that practices taking place in domestic contexts required similar organizing principles to be carried out.

The data pertaining to the frequency of different pottery types also suggests a measure of continuity between the Terminal Classic period component at Old Town and the site's Black Mountain phase occupation. While I interpret the shifting preference for El Paso Polychrome ceramics within rooms C23/C28 and C27/C34 as indicating temporal variation, chronological control throughout the Black Mountain phase component is poor and cannot adequately prove nor disprove this hypothesis. Other social mechanisms, such as household practices, could account for this variation, an issue I return to in Chapter 12.

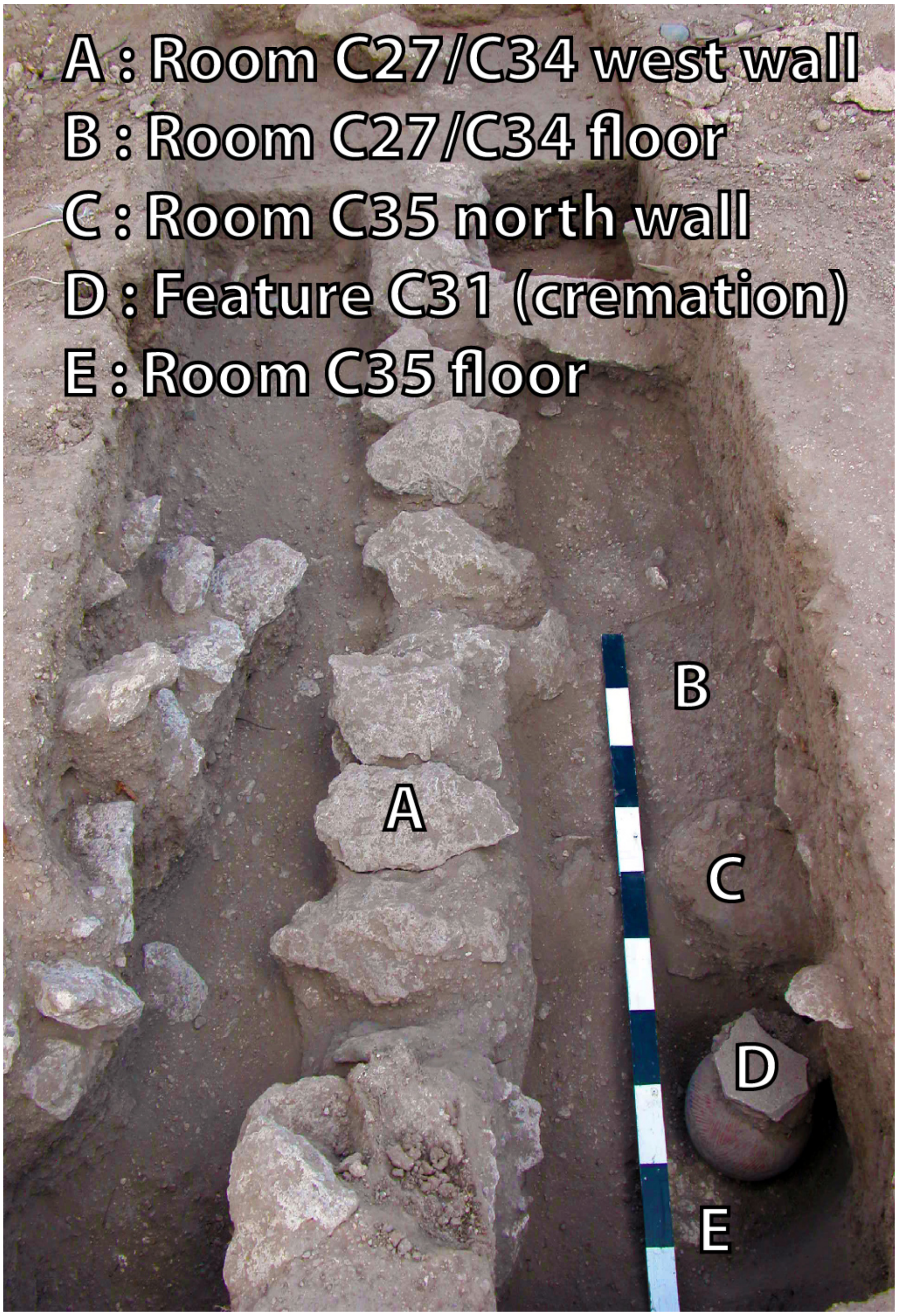

Figure 9.2: Photograph of the 2006 testing of room C27 showing the relationship of feature C31 (cremation) to the floors of room C27/C34 and room C35.

Finally, all of these patterns are related to socioeconomic arrangements. The analysis of the organization of production for Mimbres production demonstrates that Mimbres ceramics were produced by part-time specialists who organized production as either individual/household specialization or community specialization. The discrepancy between these two methods of production organization lies with the extent to which ceramics were distributed. Be this as it may, the similarities between assemblages outlined above could result from different manners of organizing production. Because Playas ceramics are those most likely produced locally during the Black Mountain phase, analyzing how these ceramics were produced would allow for a more complete understanding of the scale at which the practices discerned in this chapter were transmitted and reproduced. These issues are more fully developed in the following chapter that investigates the social structures associated with the production of ceramics within the Playas series.

Chapter 10: Playas Pottery Production during the Black Mountain Phase

In this chapter, I begin my discussion of Playas pottery production. My decision to focus on Playas pottery was influenced by the fact that ceramics within the Playas series are by far the most common pottery type encountered at Black Mountain phase sites in the Mimbres area (LeBlanc and Whalen 1980; Ravesloot 1979). Based on previous analyses, ceramics within the Playas series are demonstrably the only, or main, Black Mountain phase pottery type which was possibly produced in the Mimbres area (Clark 2006; Creel et al. 2002; Miller and Ferguson 2010). Because I am interested in the potential for local production, I chose to conduct additional analyses of ceramics belonging to the Playas series.

In the pages that follow I discuss the results of bulk chemical compositional analyses conducted on approximately 200 ceramics belonging to the Playas series. I follow this with an analysis of inter-site and intra-site variability in the distribution of ceramics manufactured from distinct compositional groups. I then analyze the organization of production for ceramics within the Playas series and compare this to manner in which production of earlier ceramic types was organized. These comparisons allow me to discern if the rules and resources governing ceramic technology changed alongside the introduction of new ceramic types.

PLAYAS POTTERY

Ceramics belonging to the Playas series are perhaps the most poorly classified of those commonly found in Black Mountain phase sites. When the type was originally defined in 1936 only two varieties were noted: Playas Red and Playas Red Incised (Sayles 1936b:31-37). At that time it was noted that these ceramics were commonly encountered in the northern portions of Chihuahua, Mexico, near Casas Grandes, though they were also encountered north of the international boundary (Sayles 1936b). Sayles notes that some plainware fragments are “probably identical” to the redwares he describes and notes that these "probably represent undecorated pieces" of Playas Red types (Sayles 1936b: 32-33).

When Di Peso and colleagues revisited the type description in 1974, they noted that many more varieties were present than had been previously recognized. Their analyses demonstrated that roughly 22 different design styles could be classified as Playas Red varieties (Di Peso et al. 1974:8:147). The majority of these design styles represent different exterior surface texturing techniques (e.g. incised, punctated/punched, corrugated, etc.) though others represent different ways of applying slip to vessels (e.g. Corralitos Bichrome Patterned Incised, Playas Red-on-brown, etc.) or of firing vessels (e.g. Ramos Black – Playas Red Variant) (Di Peso et al. 1974:8:147-168). Di Peso and colleagues note that there were numerous problems with assigning specimens to both provisional types as well as different design classes within the larger Playas Red group. These problems were primarily associated with the fact that in most cases the design field upon which decorations were applied rarely covered the vessel's entire exterior surface. Thus, there are undecorated portions of vessels that could not by themselves be assigned to a specific design style. This is problematic when the vessel is broken and enters the archaeological record because those undecorated portions of decorated vessels would be assigned to a non-decorated design style (e.g. Playas Red Standard Variant).

Another problem encountered by the researchers was the fact that all of the design styles present on Playas Red vessels had similar unslipped design counterparts that were assigned to different types. For instance if a sherd was incised and lacked a red slip, the sherd was classified as "Casas Grandes Incised" (Di Peso et al. 1974:8:147). However, if a sherd was incised and red slipped, then it would be classified as Playas Red Incised variety. These two problems would likely overestimate the presence of standard (non-decorated) Playas Red at sites as well as underestimate the total number of Playas decorated ceramics if they were classified primarily on the presence/absence of a red slip.

Playas ceramics typically range in color from red (2.5YR 4/6) to dark red (2.5YR 3/6) for the slipped varieties and light brown (7.5YR 6/4) to reddish brown (5YR 5/4) for the unslipped portions of vessels (Di Peso et al. 1974:8:149-150; Sayles 1936b:31). Paste colors associated with the interior cross-sections of sherds range from reddish brown (5YR 5/4) or reddish-yellow (5YR 6/6) to light brown (7.5YR 6/4) when carbon cores are absent or portions of the vessel are not smudged (Di Peso et al. 1974:8:149). When carbon cores were present, these ranged in color from gray (7.5YR 5/1) to very dark gray (7.5YR 3/1). Di Peso and colleagues (1974) note that carbon cores were present in roughly half of the undecorated Playas Red samples though most of the Playas Red - Ramos Black variants had very dark grey (5YR 3/1) paste colors. These data indicate that the vast majority of Playas Red ceramics were fired in an oxidizing environment though the Ramos Black variants were likely fired in a different manner (Di Peso et al. 1974:8:148-149).

PLAYAS POTTERY COMPOSITIONAL ANALYSES

To begin addressing how ceramic production was organized during the Black Mountain phase, numerous ceramics belonging to types commonly identified as Playas types (e.g. Playas Redware, Playas Red Incised, Playas Tooled, Playas plainware, etc.) were submitted for bulk chemical compositional analysis. A total of 102 playas ceramics were submitted for chemical characterization by means of Instrumental Neutron Activation Analysis (INAA) from three sites: Walsh, Montoya, and Old Town (Figure 10.1). These sites were chosen for sampling primarily because they represent the only three moderately tested Black Mountain phase sites present within the Mimbres Valley, though it should be noted that an intensive research project developed at the actual Black Mountain type site (LA 49) since my research agenda began taking shape. The samples collected from these three sites were primarily taken from contexts associated with living surfaces (e.g. floor, roof, and floor feature fill). These contexts were chosen for sampling because they represent those that are indisputably associated with Black Mountain phase occupations. However, because a representative sample of sherds from these contexts were sometimes lacking for specific rooms, some samples were collected from floor-fill contexts. It was initially hoped that 10 samples could be taken from each of the excavated rooms. This objective was for the most part met for rooms present at Walsh and Montoya. However, the sampling strategy was altered for the Old Town site. Here, roughly ten samples were collected from each of the excavated room-suites where present and known (e.g. C23 and C28, C27 and C34, etc.). As mentioned in previous sections, these room-suites were identified in the field by the presence of contiguous rooms that were connected by a common doorway. This sampling procedure developed as a result of the relatively small quantities of artifacts present within the desired sampling contexts.

The composition of this sample by site, room/room suite, and ceramic design style is presented in Table 10.1. As the table shows, the sample consists primarily of non-slipped Playas varieties (n= 78 or 76 percent) with red-slipped varieties constituting only 24 percent of the sample (n=24). While previous sampling strategies have tended to target the red-slipped varieties of Playas ceramics, certain design characteristics common to Playas varieties are commonly found on non-slipped vessels or non-slipped portions of red-slipped vessels. All of the samples are depicted in Appendix C. As Table 10.1 demonstrates, roughly half of the sample came from the Old Town ruin (n=48 or 47 percent) with samples drawn from the Walsh and Montoya sites constituting roughly 36 percent and 17 percent of the sample respectively. This complemented the existing sample of 106 ceramic sherds belonging to types commonly identified as Playas types which had been submitted for characterization by INAA. Thus, to date, a total of 208 samples of Playas ceramic types have been submitted for bulk chemical compositional analysis from approximately 27 archaeological sites (Figure 10.1, Table 10.2). It should be noted that not all of the sites present in Table 10.2 represent Black Mountain phase occupations and some, such as Simon Ranch, exhibit characteristics more commonly associated with later Cliff/Salado phase components.

Prior to the new samples being submitted there were three known compositional groups to which ceramics within the Playas series were grouped: Playas Red 1, Playas Red 2, and Main Playas Red (Creel et al. 2000). At the time these groups were defined, it was believed that ceramics classified as Playas types were being produced in the Mimbres Valley based on the presence of Mimbres Black-on-white and various Mogollon Brownware ceramics within these compositional groups. However, as will be

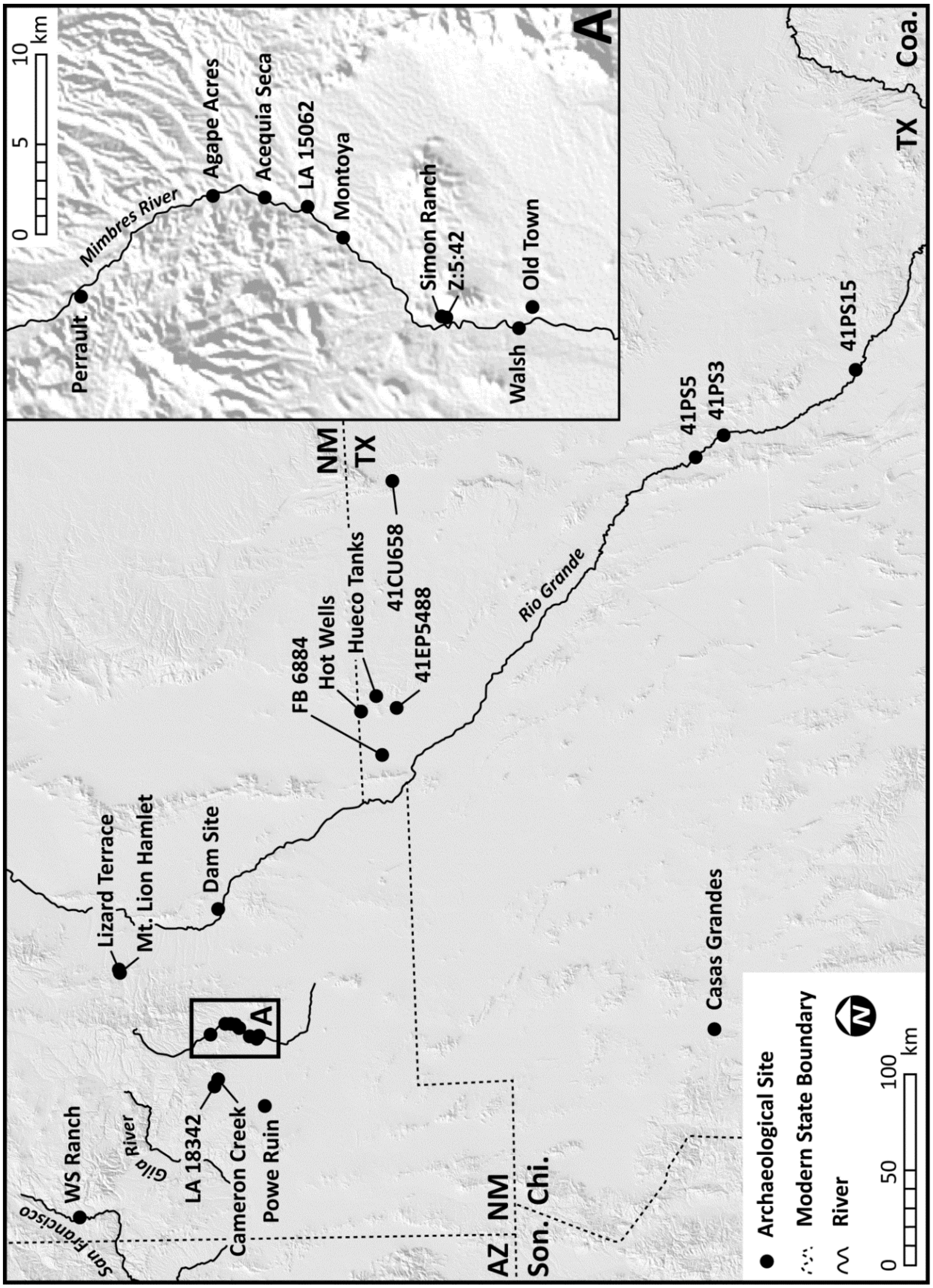

Figure 10.1: Location of sites from which Playas INAA samples have been submitted.

Table 10.1: Design characteristics by room/room-suite for INAA samples submitted as part of the current study.

Type/Design	Site/Room(s)													
	Walsh 10	Walsh 12	Walsh 18	Walsh 22	Montoya 4	Montoya 5	Old Town C1/C2	Old Town C10	Old Town C11	Old Town C27/C34	Old Town C23/C28	Old Town Misc. Floor Feature	**Total**	**Percent**
Playas Cord-marked		1	3		1								5	4.90
Playas Corrugated							3	2	2			1	8	7.84
Playas Incised	3		3	8	1	3	2	1	3	1	1	2	28	27.45
Playas Incised Rubbed										1	1		2	1.96
Playas Plainware	5			1	1	3	3	1	3	3	2	1	23	22.55
Playas Red Cord-marked											1		1	0.98
Playas Red Corrugated											1		1	0.98
Playas Red Incised	1	3		1				1		2			8	7.84
Playas Red Smoothed Corrugated													0	0.00
Playas Red Tooled										1	1		2	1.96
Playas Redware	1	1	1		4	2		1		1	1		12	11.76
Playas Tooled		3	2		2		2	1		1	1		12	11.76
Total	10	8	9	10	9	8	10	7	8	10	9	4	102	
Percent	9.80	7.84	8.82	9.80	8.82	7.84	9.80	6.86	7.84	9.80	8.82	3.92		

Table 10.2: Design characteristics by room/room-suite for all Playas INAA samples used as part of the current study.

Site	Playas Cord-marked	Playas Corrugated	Playas Incised	Playas Incised Rubbed	Playas Plainware	Playas Red Cord-marked	Playas Red Corrugated	Playas Red Incised	Playas Red Smoothed Corrugated	Playas Red Tooled	Playas Redware	Playas Tooled	Total	Percent
41CU688											1		1	0.48
41EP5488								1					1	0.48
41PS3			2										2	0.96
41PS5											2		2	0.96
41PS15											3		3	1.44
Acequia Seca							1	3		3			7	3.37
Agape Acres							3	6		4	3		16	7.69
Cameron Creek											3		3	1.44
Casas Grandes										3	3		6	2.88
Dam Site						1		1		1			3	1.44
FB6884											2		2	0.96
Hot Wells								1	3		1		5	2.40
Hueco Tanks CA5											1		1	0.48
Hueco Tanks SB4											1		1	0.48
Hueco Tanks SB6											2		2	0.96
LA15062								1		1			2	0.96
LA18342								2	2	2			6	2.88
Lizzard Terrace								1					1	0.48
Montoya	1		4		4						6	2	17	8.17
Mt. Lion Hamlet								1					1	0.48
Old Town	1	8	13	2	13	1	1	16	4	3	3	5	70	33.65
Perrault			2			1		3	2				8	3.85
Powe Ruin								2					2	0.96
Simon Ranch							2	1	1		1		5	2.40
Walsh	4		17		6			2			3	5	37	17.79
W.S. Ranch						1		2					3	1.44
Z:5:42								1					1	0.48
Total	6	8	38	2	38	4	7	44	12	17	35	12	208	
Percent	2.88	3.85	18.27	0.96	11.06	1.92	3.37	21.15	5.77	8.17	16.83	5.77		

discussed below, the Main Playas Red group became a catch-all group for ceramic samples with a certain chemical composition. The dumping of non-Playas ceramics within the Main Playas Red group potentially led to errors in interpreting the emerging INAA dataset. While the conclusions drawn from the initial analysis of the Playas INAA dataset differ somewhat from current assessments, they were not entirely false or erroneous.

As mentioned above, the 208 samples used in the current study were all typed as ceramics belonging to the Playas ceramic series. The current sample contains no less than 12 different design styles (plain cordmarked, plain corrugated, plain incised, plain incised rubbed, plainware, red cordmarked, red corrugated, red incised, red smoothed corrugated, red tooled, redware, and plain tooled). Of these, the red-slipped varieties comprise over half of the sample (n=119 or 58 percent) (Table 10.2). The next most numerous variety within the Playas series consists of unslipped Playas incised and Playas plainware sherds (n= 38 or 18 percent and n=23 or 11 percent respectively).

As noted previously, these samples were collected from 27 sites dispersed across much of the Mogollon region (Figure 10.1, Table 10.2). Sites in the Mimbres Valley comprise the majority of the sample (n=160 or 77 percent) with smaller frequencies coming from sites located near the modern city of El Paso, sites along the Rio Grande in New Mexico and Texas, sites along the Gila and San Francisco Rivers, sites in the Eastern Mimbres area, and Casas Grandes in the Mexican state of Chihuahua (Table 10.2).

As part of NAA, concentrations of 34 elements (sodium, aluminium, potassium, calcium, scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, zinc, arsenic, rubidium, strontium, zirconium, antimony, cesium, barium, lanthanum, cerium, neodymium, promethium, samarium, europium, terbium, dysprosium, ytterbium, lutetium, hafnium, tantalum, thorium, and uranium) are commonly collected. However, for some samples elemental concentrations fall below the detection limits of NAA. For the present study, concentrations for potassium, calcium, nickel, arsenic, strontium, antimony, terbium, and uranium were excluded from analysis for this reason. Analysis of the data resulting from the current sample was pooled with the data from previous analyses of samples classified as Playas ceramic types.

Analysis of the resulting dataset was conducted with the assistance of Jeff Speakman at the Center for Applied Isotope Studies at the University of Georgia. Running somewhat counter to the methodology outlined in the literature (e.g. Clark 2006; Duff 1999; Neff 2002) analysis of the dataset proceeded from rather simple bivariate analyses to more complicated multivariate statistical procedures. During the initial stages of group identification, samples were compared across a matrix of bivariate plots. Individual clusters of samples were pulled from the dataset based on the separation from other samples on specific elemental concentrations. The emerging compositional group was then compared again to the whole dataset. Multivariate statistical procedures (e.g. principal component analysis and discriminant canonical analysis) were then conducted, and the emerging compositional group was compared to the rest of the dataset based on principal component and canonical scores. If individual specimens appeared to have a different group membership, then the sample was reassigned and the process started over.

Once compositional groups were defined in this manner, probabilities of group membership were calculated using Mahalanobis distances from each of the compositional groups' centroids. Again, if the group membership of a specific sample changed during this process, the entire process was started over beginning with the examination of bivariate plots depicting the elemental concentrations outlined above.

A total of 11 compositional groups were established in this manner, some of which corresponded to compositional groups established by Speakman in his analysis of Mimbres and Jornada Mogollon INAA samples (Speakman 2013). Speakman's analysis had identified four compositional macro-groups within the Mimbres/Jornada data set (Macro-Group A, Macro-Group B, Macro-Group C, and Macro-Group D). These macro groups are primarily differentiated based on their thorium concentrations with Macro-Group A containing thorium concentrations greater than 30 parts-per-million (ppm), Macro-Group B containing thorium concentrations of between 12 and 30 ppm, and Macro-Group C containing thorium concentrations of less than 12 ppm (Speakman

2013). Speakman (2013) notes that Macro-Group D is differentiated from the other macro-groups based on the presence of higher tantalum concentrations. Speakman (2013) notes further that Macro Groups A, B, and C contain samples that were classified as Mimbres types (e.g. Plain Mogollon Brownware, Mimbres Black-on-white, Mimbres Polychrome) and are believed to have been produced in the larger Mimbres Mogollon region. Conversely, Macro Group D generally contains samples that represent Jornada Mogollon types (e.g. El Paso Bichrome, El Paso Polychrome, Jornada Brown, etc.) that are believed to be produced in the Jornada Mogollon area. Distinct compositional groups can be separated out from these macro groups based on the concentrations of the different elements outlined above. Speakman (2013) has been able to identify in excess of 45 distinct compositional groups for the Mimbres/Jornada INAA data set.

Three of the compositional groups recognized during the current study were previously established by Creel and colleagues (2002) in their analysis of Black Mountain phase ceramics. These three groups (Main Playas Red, Playas Red 1, and Playas Red 2) were found to represent valid compositional groups during the current analysis. However, the Main Playas Red group established for the analysis conducted during the 2000 study of Black Mountain Phase ceramics (Creel et al. 2002) can now be subdivided into five distinct compositional groups (Playas Red 3, Playas Red 4, Mimbres-4c, Mimbres-5a, and Mimbres-49a) three of which correspond to groups established by Speakman (2013) in his analysis of the Mimbres/Jornada INAA datasets (i.e. Mimbres-4c, Mimbres-5a, and Mimbres-49a). While some samples occupying the multidimensional space established as the Main Playas Red compositional groups were assignable to compositional groups established by Speakman, others occupying this same space could not be assigned to Speakman's provisional groups with any amount of confidence. These samples were assigned to a group labeled "Main Playas Red Unassigned" though it is believed that additional samples of Playas ceramics will lead to the definition of new compositional groups within the larger Main Playas Red grouping. Additionally, the Mimbres-10 compositional group established by Speakman (2013) was also found to represent the likely compositional group for some of the Playas ceramics used in the current study.

In addition to the nine compositional groups outlined above (Mimbres 4c, Mimbres-5a, Mimbres-10, Mimbres-49a, Playas Red 1, Playas Red 2, Playas Red 3, Playas Red 4, and Main Playas Red Unassigned), two other groups were established during the current analysis. These two groups, Playas Red 5 and Playas Red 6, are both composed of a small number of samples (n=3 and n=2, respectively) but are distinct enough to warrant separate compositional groups.

Results

The results of the present study are presented in Table 10.3, Table 10.4, Table 10.5, Appendix D, Appendix E, and Appendix F. These tables depict the number of samples attributable to specific source groups, the number of samples from each site attributable to each compositional group, the number of samples from each room/room-suite from Old Town, Walsh, and Montoya attributable to each compositional group, measures of central tendency for each element of the different compositional groups, and group assignments for each sample used in the sample respectively.

Inter-site Variability

There appears to be some variation in the distribution of these compositional groups across sites from which the samples were collected. Specifically, the proportion of Mimbres-10 group materials at WS Ranch is greater than that present at Agape Acres, Montoya, Old Town, Walsh ($p = 0.0175$, $p = 0.0158$, $p = 0.0011$, and $p = 0.0219$ respectively; Fisher's Exact Test). This difference is due to the fact that the majority of samples recovered from WS Ranch were characterized as originating from Mimbres-10 compositional group materials. Similarly, the sample collected from Old Town was found to differ from those collected from Cameron Creek and LA 15062 ($p = 0.0411$ and $p = 0.0278$ respectively, Fisher's Exact Test). These differences were due to the fact that

Table 10.3: Results of analyses described above showing the number of samples from the Playas INAA datasets assigned to each of the established compositional groups.

Compositional Group	Count	Percent
Playas Red 1	57	27.40
Playas Red 2	35	16.83
Playas Red 3	5	2.40
Playas Red 4	8	3.85
Playas Red 5	3	1.44
Playas Red 6	2	0.96
Mimbres 49a	20	9.62
Mimbres 5a	8	3.85
Mimbres 4c	10	4.81
Mimbres 10	7	3.37
Main Playas Red Unassigned	30	14.42
Unassigned	23	11.06

Table 10.4: Results of analyses described above showing the number of samples from each site that were assigned to each of the established compositional groups.

	Compositional Group													
Site	**Mimbres 10**	**Mimbres 49a**	**Mimbres 4c**	**Mimbres 5a**	**Playas Red 4**	**Main Playas Red Unassigned**	**Playas Red 1**	**Playas Red 2**	**Playas Red 3**	**Playas Red 5**	**Playas Red 6**	**Unassigned**	**Total**	**Percent**
41CU688												1	1	0.48
41EP5488												1	1	0.48
41PS3				2									2	0.96
41PS5												2	2	0.96
41PS15						2						1	3	1.44
Acequia Seca			1		1	1	1	2				1	7	3.37
Agape Acres		5		1		3		1	1		1	4	16	7.69
Cameron Creek	1					2							3	1.44
Casas Grandes						1				3		2	6	2.88
Dam Site								2	1				3	1.44
FB6884								2					2	0.96
Hot Wells						2		2				1	5	2.40
Hueco Tanks CA5								1					1	0.48
Hueco Tanks SB4								1					1	0.48
Hueco Tanks SB6								1	1				2	0.96
LA15062	1							1					2	0.96
LA18342		1				2	1					2	6	2.88
Lizzard Terrace								1					1	0.48
Montoya		3	2	1			8		2			1	17	8.17
Mt. Lion Hamlet					1								1	0.48
Old Town		3	1	2	5	7	39	10				3	70	33.65
Perrault		1	1	1		5							8	3.85
Powe Ruin	1											1	2	0.96
Simon Ranch		1		1		1		2					5	2.40
Walsh	2	6	5		1	4	7	9			1	2	37	17.79
W.S. Ranch	2											1	3	1.44
Z:5:42							1						1	0.48
Total	7	20	10	8	8	30	57	35	5	3	2	23	208	
Percent	3.37	9.62	4.81	3.85	3.85	14.42	27.40	16.83	2.40	1.44	0.96	11.06		

Table 10.5: Results of analyses described above showing the number of samples from each room/room-suite of the three tested sites that were assigned to each of the established compositional groups.

Site/Room(s)	Mimbres10	Mimbres 49a	Mimbres4c	Mimbres5a	Playas Red 4	Main Playas Red Unassigned	Playas Red 1	Playas Red 2	Playas Red 3	Playas Red 5	Playas Red 6	Unassigned	Total	Percent
	Compositional Group													
Walsh Room 10	1	3					3	3					10	9.80
Walsh Room 12	1		1		1	1		3				1	8	7.84
Walsh Room 18		1	3				1	2			1	1	9	8.82
Walsh Room 22		2	1			3	3	1					10	9.80
Montoya Room 4		1	1	1			3		2			1	9	8.82
Montoya Room 5		2	1				5						8	7.84
Old Town Rooms C1/C2		1				1	7	1					10	9.80
Old Town Room C10						1	3	2				1	7	6.86
Old Town Room C11						1	7						8	7.84
Old Town Rooms C23/C28		1		1	1	1	1	3				1	9	8.82
Old Town Rooms C27/C34			1		1	2	3	2				1	10	9.80
Misc. Floor Feature							3	1					4	3.92
Total	2	11	8	2	3	10	39	18	2	0	1	6	102	
Percent	1.96	10.78	7.84	1.96	2.94	9.80	38.24	17.65	1.96	0.00	0.98	5.88		

no samples from Old Town were characterized as belonging to this source group despite the heavy sampling that has been conducted on Playas series ceramics recovered from the site.

Old Town was also found to contain proportionally fewer samples characterized as belonging to the Mimbres-49a compositional group when compared to Agape Acres and Walsh ($p = 0.0131$ and $p = 0.0355$ respectively, Fisher's Exact Test).

While relatively few samples from Old Town could be assigned to these compositional groups, there are numerous Old Town members in the Playas Red 1 compositional group. The proportion of samples from the site attributed to this group differed significantly from Acequia Seca, Agape Acres, Casas Grandes, Hot Well, Perrault, Simon Ranch, and Walsh. The majority of these differences were significant at the 95% confidence interval though the probabilities that this sample differed from those collected from Agape Acres and Walsh were significant at the 99.9% confidence interval.

The differences between Old Town and these sites were primarily due to the fact that roughly 50 percent of the Playas assemblage submitted for chemical characterization from Old Town was characterized as originating from Playas Red 1 compositional group materials. As will be discussed below, this pattern is the result of the fact that Playas Red 1 ceramics were likely manufactured at Old Town during the Black Mountain phase.

FB6884 and the Dam Site were found to contain relatively higher proportions of samples characterized as originating from Playas Red 2 source materials when compared to Agape Acres, Casas Grandes, LA 18342, Montoya, Old Town, and Perrault. The majority of these differences were significant at the 95% confidence interval except for that present between FB6884 and Montoya which was significant at the 99% percent confidence interval. These data suggest that the Playas samples from these sites were collected from different sampling populations. Thus, the relative proportion of Playas Red 2 ceramics at FB6884 and the Dam site is not a chance occurrence when compared to the proportion of Playas ceramics manufactured from Playas Red 2 source materials the Mimbres area and areas surrounding Casas Grandes. Similarly, the proportion of samples recovered from Montoya that were attributed to this compositional group were found to differ significantly from both Simon Ranch and Walsh ($p = 0.0433$ and $p = 0.0234$ respectively, Fisher's Exact Test) due to the fact that Montoya has no Playas Red 2 members.

Only three samples were attributed to the Playas Red 5 compositional group all or which originated from Casas Grandes. Thus half of the samples recovered from this site were assigned to this compositional group. Based on these data, it appears that vessels manufactured from Playas Red 5 materials were not distributed outside of the areas surrounding Casas Grandes.

Intra-site Variability

Except for Old Town, the existing sample did not have provenience information suitable for intra-site analyses. Thus, the additional 102 samples described previously were chosen in order to address potential variability among room suites within and between the Old Town, Walsh, and Montoya sites.

The results of these analyses are presented in Table 10.5. As Table 10.5 demonstrates, there is considerable variability with respect to the proportion of samples from different rooms that were attributed to different compositional groups. However, when statistical tests were carried out, only the distribution of Playas Red 1 members were shown to differ significantly between different rooms' floor assemblages. Specifically it was found that the absence of Playas Red 1 compositional group differed significantly from Montoya room 5, Old Town room C1/C2, room C11 at Old Town, and Old Town room C23/C28 ($p = 0.0128$, $p = 0.0038$, $p = 0.0007$, and $p = 0.0407$ respectively; Fisher's Exact Test). Similarly the low proportion of Playas samples attributed to this source group recovered from Walsh room 18 was found to differ significantly from Montoya room 5, Old Town room C1/C2, room C11 at Old Town, and Old Town room C23/C28 ($p = 0.0407$, $p = 0.0143$, $p = 0.0030$, and $p = 0.0143$ respectively; Fisher's Exact Test). The other differences noted between room assemblages were the result of the relatively high proportion of samples submitted from Old Town room C11 that were attributed to the Playas Red 1 compositional group. Aside from the differences outlined above, the proportion of Playas ceramics from this room that were assigned to the Playas Red 1 compositional group differed significantly from Walsh room 18, Walsh room 22, Montoya room 4, Old Town room C23/C28, and room C27/C34 at Old Town. The majority of these samples were significant at the 95% percent confidence interval except for that present between Old Town room C11 and Old Town room C23/C28 which was significant at the 99% percent confidence interval.

PRODUCTION

Establishing likely production locales for ceramics within the Playas series has become a collaborative effort on the part of many researchers. However, the majority of this work has been conducted by Jeff Speakman and Darrell Creel in their efforts to detect patterns within the larger Mimbres/Jornada INAA dataset. Specifically, the interpretations concerning the likely production locales for Playas ceramic samples attributed to Mimbres compositional groups (e.g. Mimbres-4c, Mimbres-5a, Mimbres-10, and Mimbres-49a) are primarily based on the results of their work (Creel and Speakman 2012; Creel et al. 2012; Speakman 2013). The basic interpretations rest on assumptions associated with the "provenience postulate" and the "criterion of abundance" (Bishop et al. 1982:301; Weigand et al. 1977:24). Together the "provenience postulate" and the "criterion of abundance" hypothesize that 1) distinct compositional groups can be ascertained based on the fact that there will be less variation within a group than between groups, and 2) that likely production locales can be approximated based on the higher frequency of distinct compositional groups closer to their origin (Bishop et al. 1982:301).

While the provenience postulate allows compositional groups to be discerned based on statistical analyses, the criterion of abundance allows for the discrimination of likely production locales for these groups. Possible production locales were identified for the current analyses by the higher relative frequencies of a given compositional group at a specific site and, in some cases, on the basis of raw clay members. Thus, sites with a high frequency of a particular compositional group were chosen as the likely production locale for ceramic samples belonging to that compositional group. In certain instances, however, these general principals were not exclusively followed.

For example, Old Town samples comprise approximately 14 percent of the samples assigned to the Mimbres-11 compositional group (n = 10). Other sites such as Swarts and Pruitt Ranch contribute a similar proportion of samples to the group (ca. 12% each). Based on the "criterion of abundance" postulation alone, we would hypothesize that the areas surrounding Old Town were the likely production locales for wares manufactured from Mimbres-11 compositional group materials. However, predominantly Classic period ceramics (e.g. Mimbres Black-on-white Style II and Style III wares) were manufactured from Mimbres-11 compositional group materials. This is problematic due to the fact that other lines of evidence suggest that pottery production ceased in the lower portions of the Mimbres valley sometime during the Late Pithouse period (Speakman 2013).

In this and similar instances, a more thorough analysis of the samples within each compositional group was conducted to determine if there were temporal shifts in production locales. These analyses were primarily conducted on different styles of Mimbres Black-on-white ceramics (e.g. Style II and Style III) and were used in tandem with environmental reconstructions for the larger Mimbres area (Creel 2006b; Minnis 1985).

As can be imagined with any large sample, inferring likely production locales for ceramics based on the bulk chemical composition is sometimes a tenuous endeavor. In some instances there are high proportions of ceramics attributable to multiple sites. In these circumstances, it could be argued that either the general area surrounding the sites in question contains a clay resource that is homogenous and rather large in areal extent or, could represent the existence of exchange relationships between a site with access to the clay resource(s) in question and another site that lacks this access (see Figures 10.3 – 10.5 below). The difference between these interpretations primarily centers on the spatial proximity of the sites with a high proportion of ceramics with similar bulk chemical compositions. If these sites are relatively close to one another it could indicate that the areas surrounding these sites represent the most probable production area for ceramics belonging to that compositional group. If the sites are spaced further apart from one another, this pattern is most often interpreted as representing the presence of exchange networks between the producing site and the consuming site. The alternative to this explanation, that one can have ceramics manufactured 50 kilometers apart from one another with similar chemical compositions, would appear to contradict the provenance postulate as well as Tobler's first law of geography which states "everything is related to everything else, but near things are more related than distant things" (Tobler 1970:236). In these situations, if it can be determined that the extent or scale of the raw material's availability does not cover this vast of an area, then socioeconomic processes (i.e. exchange, different means of organizing production, etc.) are likely responsible for the observed pattern.

The area's environmental reconstructions were used as an aid to interpret these patterns. These reconstructions show that the inhabitants of southern Mimbres area, specifically the occupants of Old Town, had to go further to acquire construction timbers through time (Creel 2006a:89-90). Coupled with data showing that the abundance of riparian tree species appears to have become denuded through time, this inference has led researchers to hypothesize that much of the available fuels necessary to fire pottery in some portions of the Mimbres area were likely exhausted by the beginning of the Classic period (Creel et al. 2010; Minnis 1985). This interpretation is somewhat substantiated by the apparent lack of pottery production at Old Town, and arguably other sites in the southern Mimbres area, by the beginning of the Classic period. All of the Mimbres Black-on-white Style II samples and nearly all of the Mimbres Black-on-white Style III samples from Old Town were likely produced elsewhere (Creel et al. 2010; Speakman 2013) (See Figures 10.3 – 10.5).

As stated previously, earlier analyses of portions of the current dataset undertaken by Creel and colleagues (2002) identified three compositional groups to which most Playas samples could be assigned. They postulated that all of these compositional groups were likely manufactured somewhere in the Mimbres Valley but were unable to refine this assessment further due in part to the relatively small sample sizes and the lack of correspondence between these compositional groups and clay samples submitted for chemical characterization (Creel et al. 2002:43). They did however note that the majority of samples assigned to Playas Red Subgroup 1 were recovered from Old Town and that this "suggests manufacture in or perhaps near the Old Town site" (Creel et al. 2002:43).

While this may appear to contradict the statements espoused later (e.g. Creel and Speakman 2012; Creel et al. 2010; Speakman 2013) concerning the end of pottery production in the southern portions of the Mimbres Valley by the Classic period, it should be noted that some of the data used to substantiate these claims are not relevant to ceramic technology. Specifically, while construction timbers may have been obtained from increasingly distant elevation bands/ecological zones through time, this may not have been so for fuels used in the firing of pottery. In fact, we know precious little about the manner in which ceramics were fired in the Mimbres area. It has been assumed that “pottery firing was done in open kilns” where “ceramics are stacked in an open area and surrounded by wood fuel” (Shafer 2003:177). These “kilns” are speculated to have been “rectangular or circular depressions” that measured “six feet long or four meters in diameter” (Brody 2004:111). This assumption is based on ethnographic analogy and the fact that formal firing facilities such as pit kilns have not been encountered in the Mimbres area (Brody 2004:111). Unfortunately, no open kilns have been identified at Mimbres sites, likely due in part to the fact that so little extramural excavation has been done. Thus we are uncertain if fuel used in ceramic manufacture followed the same pattern recognized for architectural timbers.

The data pertaining to the decrease in riparian tree species comes from charcoal recovered from excavated sites in the Mimbres valley (Minnis 1985:88-93). These data show that the percent of charcoal derived from riparian tree species is inversely correlated with population. Thus, as population increased along the Mimbres valley, the proportion of charcoal derived from riparian tree species decreases. This culminates during the Classic period when the fuel wood and construction wood charcoal data indicate a “significant reduction in arboreal floodplain vegetation” (Minnis 1985:90). However, this pattern appears to reverse between the Classic period and the Black Mountain phase when charcoal from riparian species reaches its greatest proportion since the beginning of the Early Pithouse period. Minnis (1985) attributes this pattern of increasing use of riparian species to the decrease in the area’s population during this time period and the subsequent decreasing demand for fuel wood and construction timbers in the region. It should be noted, however, that the Black Mountain phase sample analyzed by Minnis (1985) consisted solely of samples collected from one site: the Martin site (LA 18921 / Z:1:6). Thus, these patterns may not be representative of other sites in different areas of the Mimbres valley.

Based on this information, Creel and colleagues (Creel and Speakman 2010; Creel et al. 2012) are likely correct in their assumption that fuels adequate for the firing of pottery were likely denuded, if not exhausted, in areas surrounding Old Town by the Classic period. Because of this, ceramic production may well have ceased there, leading the inhabitants to import ceramic vessels during this time period. However, this pattern of decreasing riparian species in charcoal samples appears to change during the Black Mountain phase, potentially indicating that adequate fuels would have been present to produce ceramic vessels on site once again. Indeed, sufficient numbers of cottonwood trees could easily have grown in the lower valley by that time to provide fuel for modest ceramic production.

These patterns influence how ceramic production is interpreted with respect to the compositional groups outlined above. They specifically influence how production is interpreted with respect to the groups present in the Main Playas Red group that overlap with those established by Speakman (2013) in his analysis of the Mimbres INAA dataset.

Main Playas Red

As stated above, the Main Playas Red compositional group somewhat unintentionally became a catch all category that assumed considerable variability. During the course of my analyses it became apparent that there was considerable overlap between this larger compositional group and Mimbres compositional groups. Because of this, some Playas INAA samples were assigned to Mimbres INAA compositional groups. To begin assessing production processes associated with these samples, the larger datasets pertaining to the overall composition of these groups was used. These data were drawn from Speakman's analyses of the Mimbres INAA dataset (Speakman 2013). Like Speakman (2013) and others (Creel et al. 2012), I use the percentage of samples from a specific archaeological site that were assigned to a compositional group to begin addressing the likely production locales of Playas ceramics (Figures 10.2 – 10.14). These different production locales will be discussed in further detail, but suffice it to say here that while this method follows the criterion of abundance established by Bishop and colleagues (1982), how well these models present an accurate picture of actual

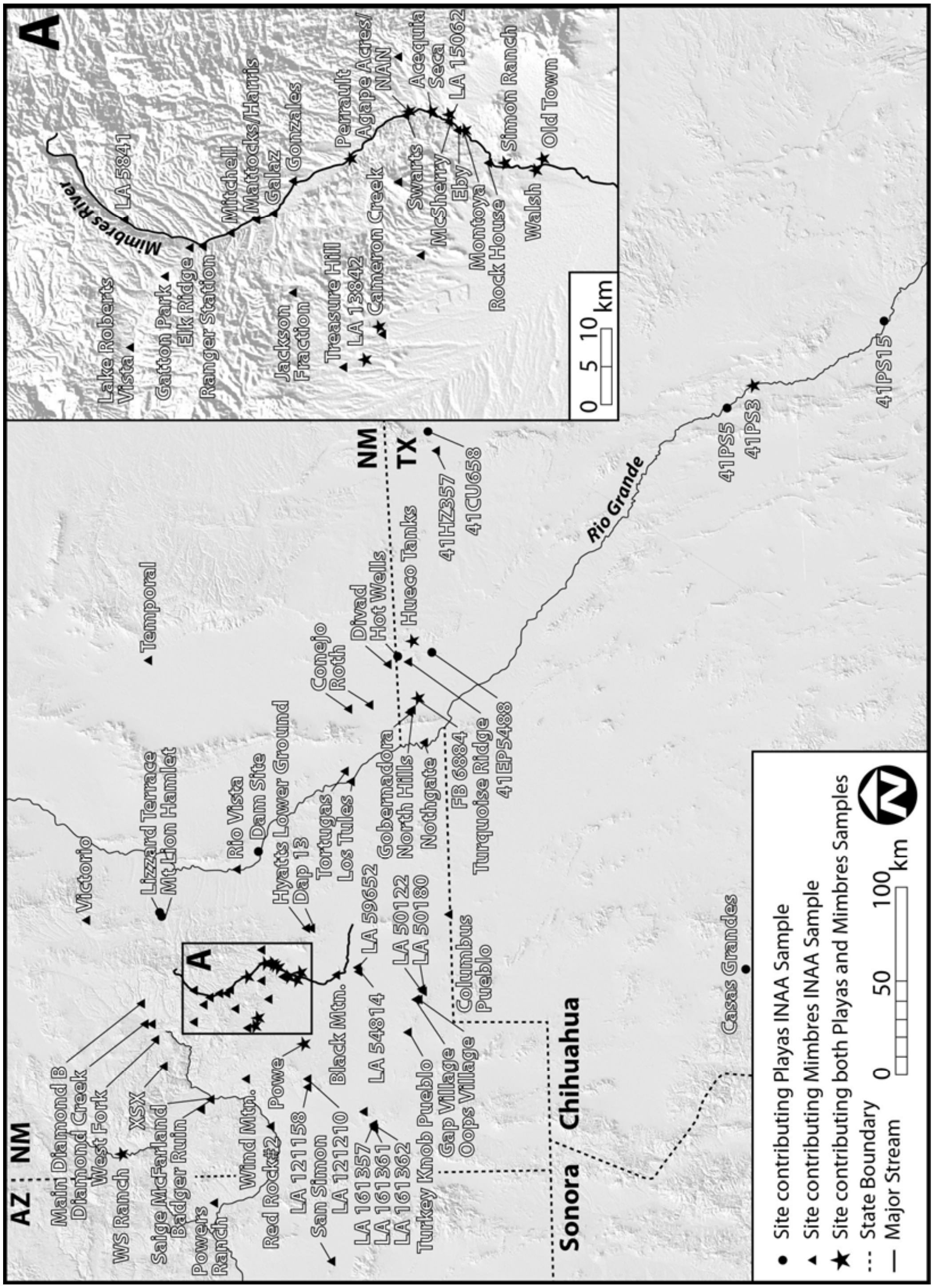

Figure 10.2: Sites used in analysis of production zones for Playas INAA samples assigned to Playas compositional groups as well as Mimbres-4c, Mimbres-5a, Mimbres-10, and Mimbres-49a compositional groups (Speakman 2013).

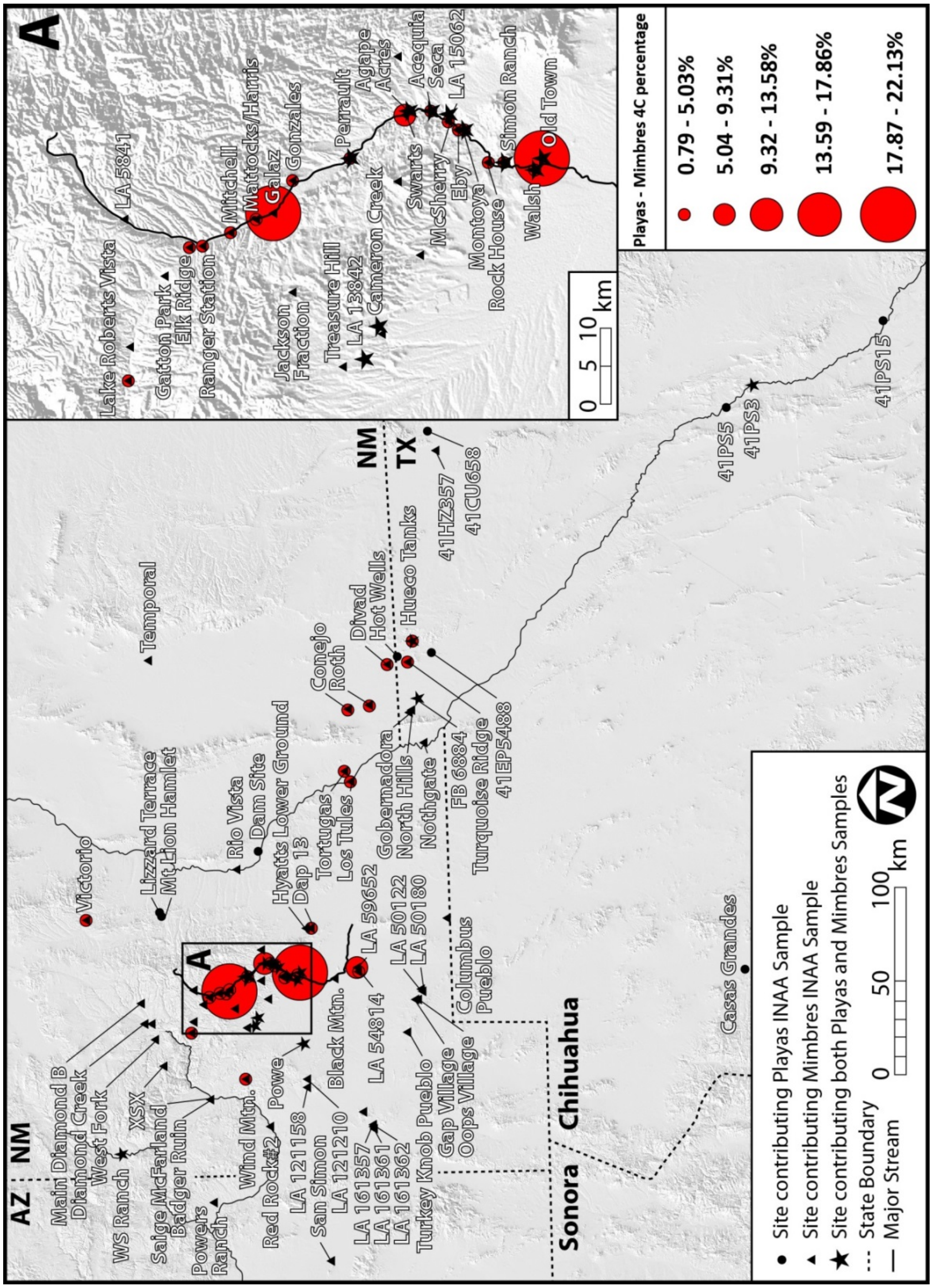

Figure 10.3: Depiction of percentages of Mimbres-4c compositional group at sites containing samples assigned to this group. Speakman (2008, 2012) and Creel (2008, 2012) have established areas around the Galaz Ruin as the likely production locale for this compositional group.

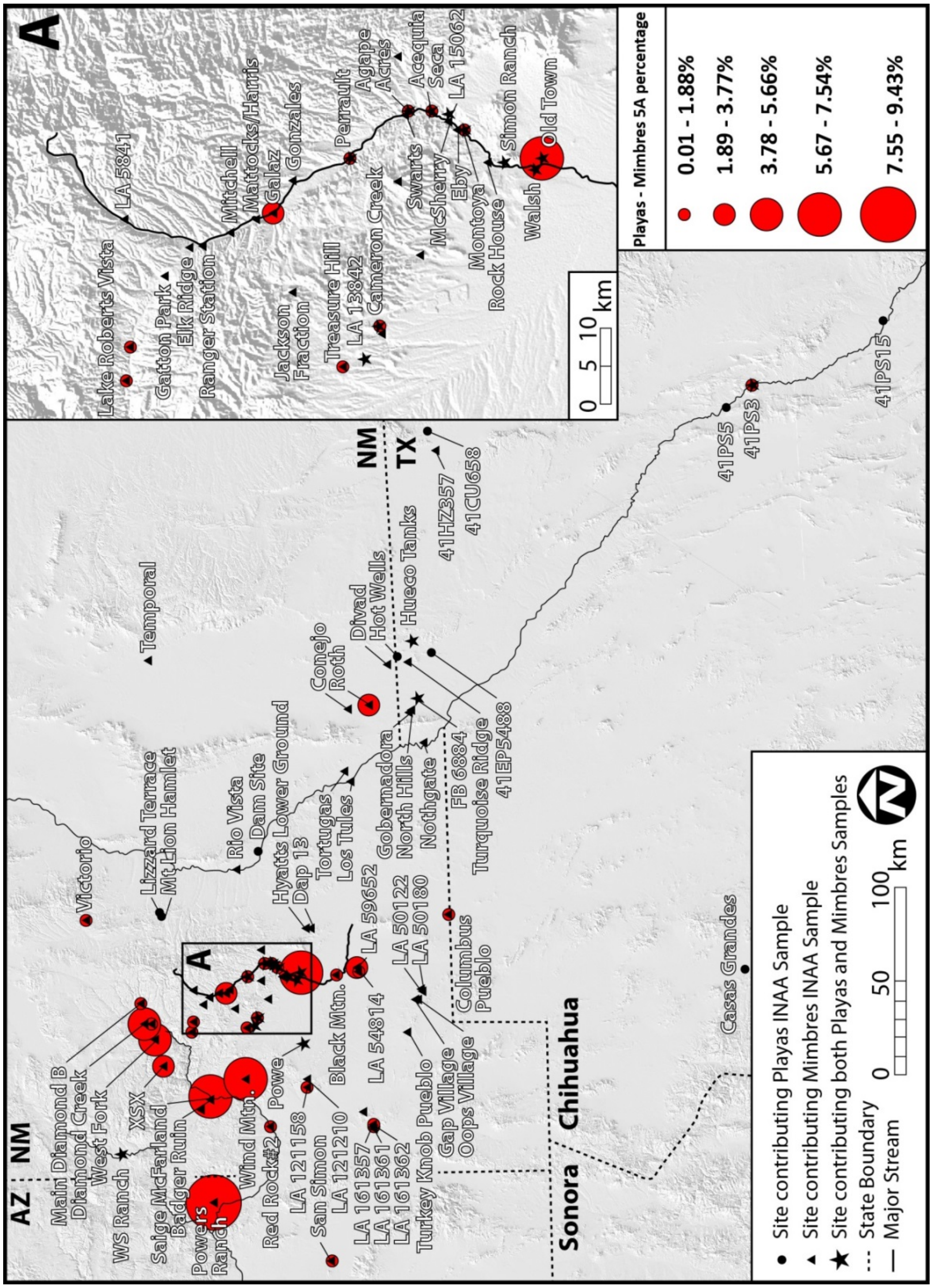

Figure 10.4: Depiction of percentages of Mimbres-5a compositional group at sites containing samples assigned to this group. Speakman (2008, 2012) and Creel (2008, 2012) have established areas around the West Fork Ruin as the likely production locale for this compositional group.

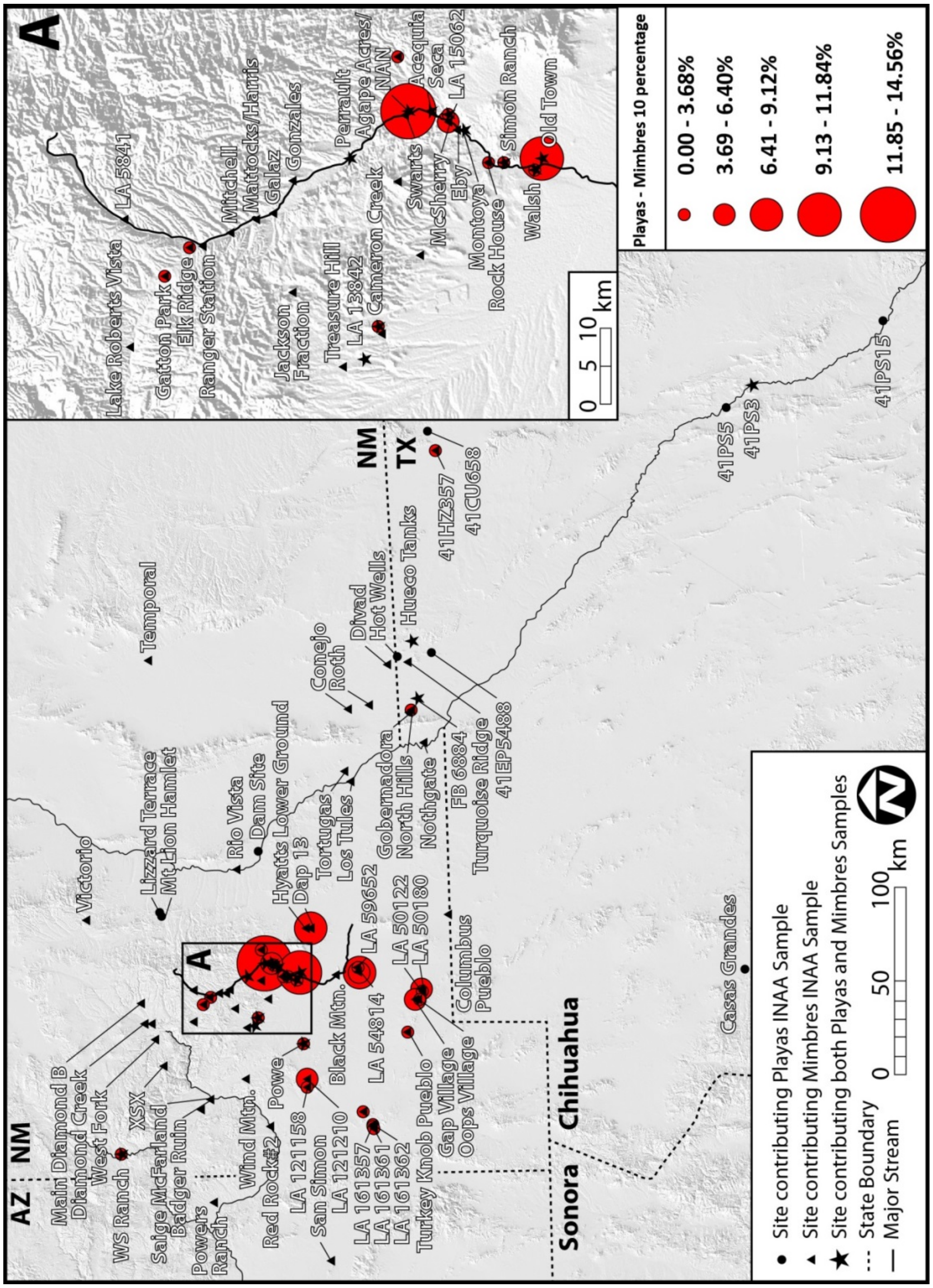

Figure 10.5: Depiction of percentages of Mimbres-10 compositional group at sites containing samples assigned to this group. Speakman (2008, 2012) and Creel (2008, 2012) have established areas around the alluvial fans around the Burro Mountains as the likely production locale for this compositional group.

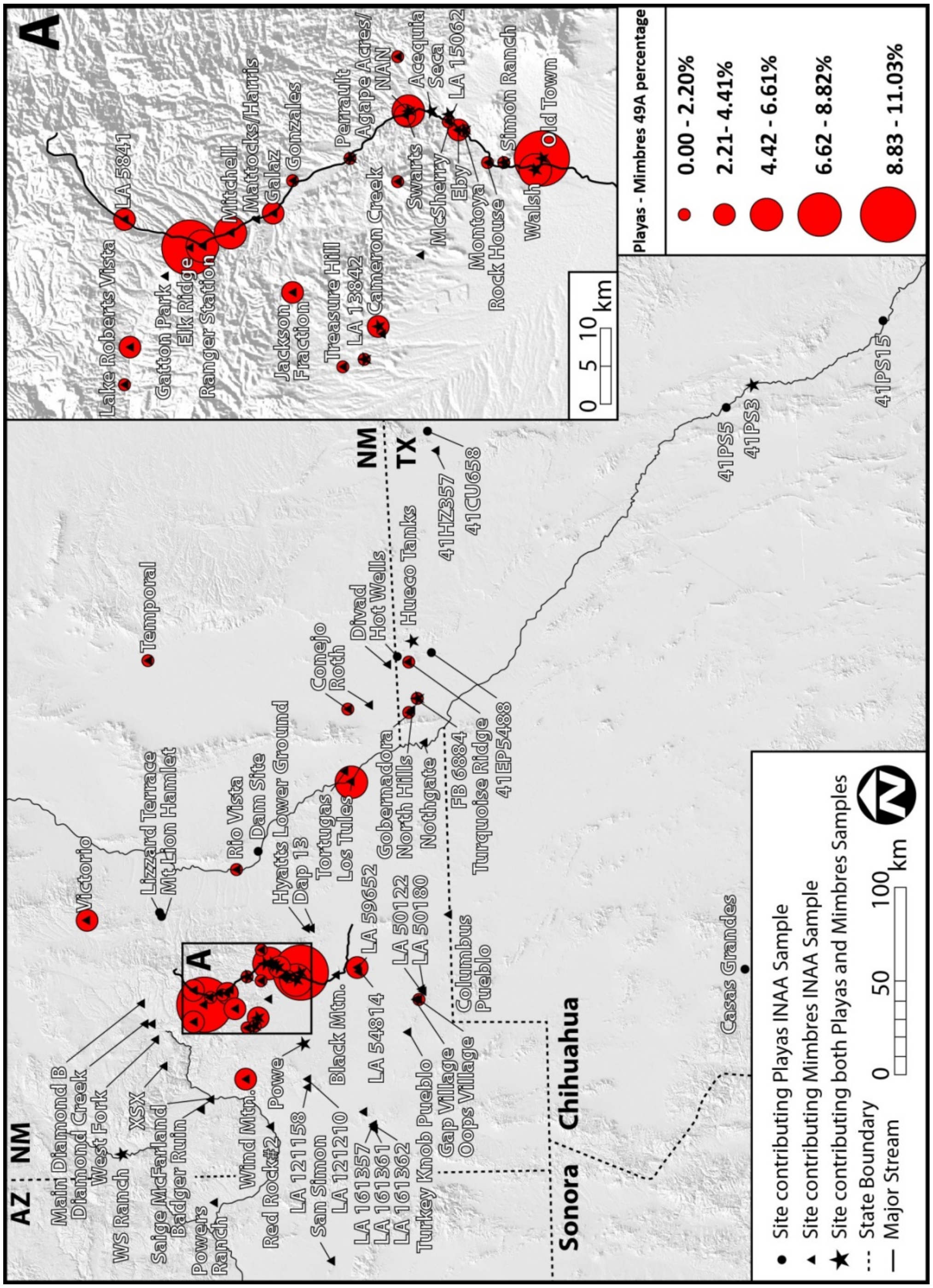

Figure 10.6: Depiction of percentages of Mimbres-49a compositional group at sites containing samples assigned to this group. Speakman (2008, 2012) and Creel (2008, 2012) have established areas around the Elk Ridge Ruin as the likely production locale for this compositional group.

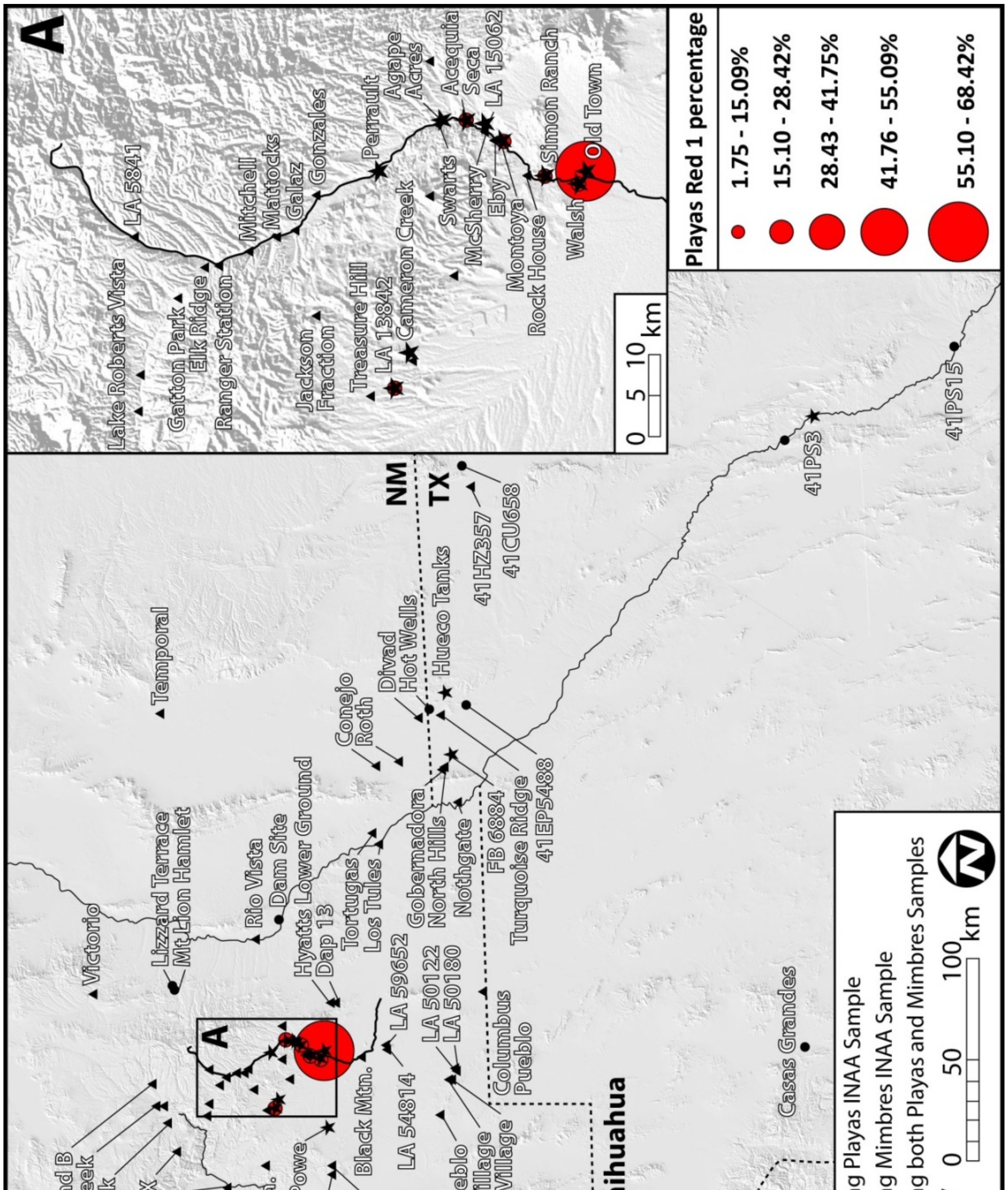

Figure 10.7: Depiction of percentages of the Playas Red 1 compositional group at sites containing samples assigned to this group. Based on these data and the data presented above, Old Town appears to represent a likely production locale for ceramics assigned to this compositional group.

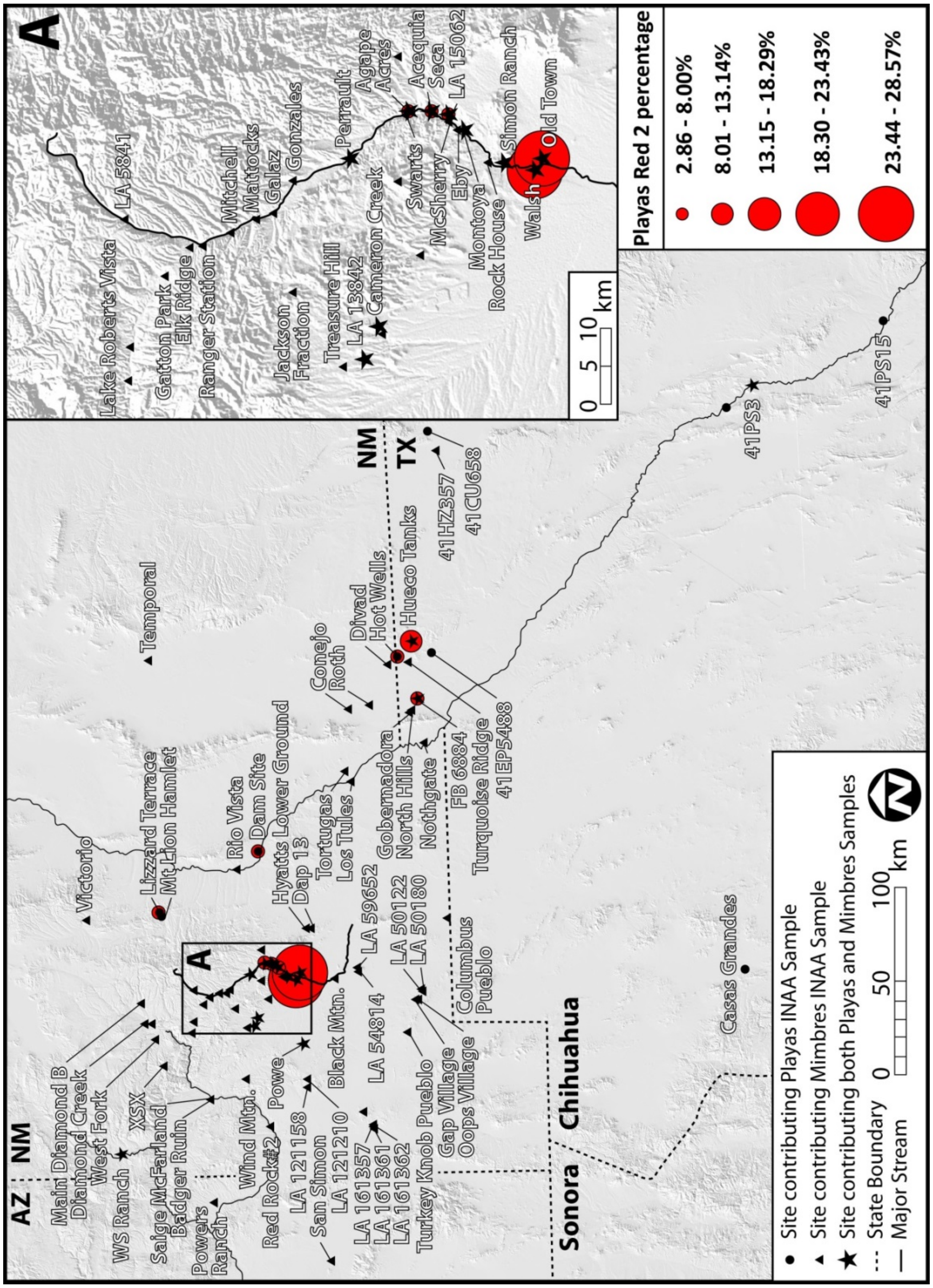

Figure 10.8: Depiction of percentages of the Playas Red 2 compositional group at sites containing samples assigned to this group. Based on these data and the data presented above, the Hueco Tanks area is the likely production locale for ceramics assigned to this compositional group.

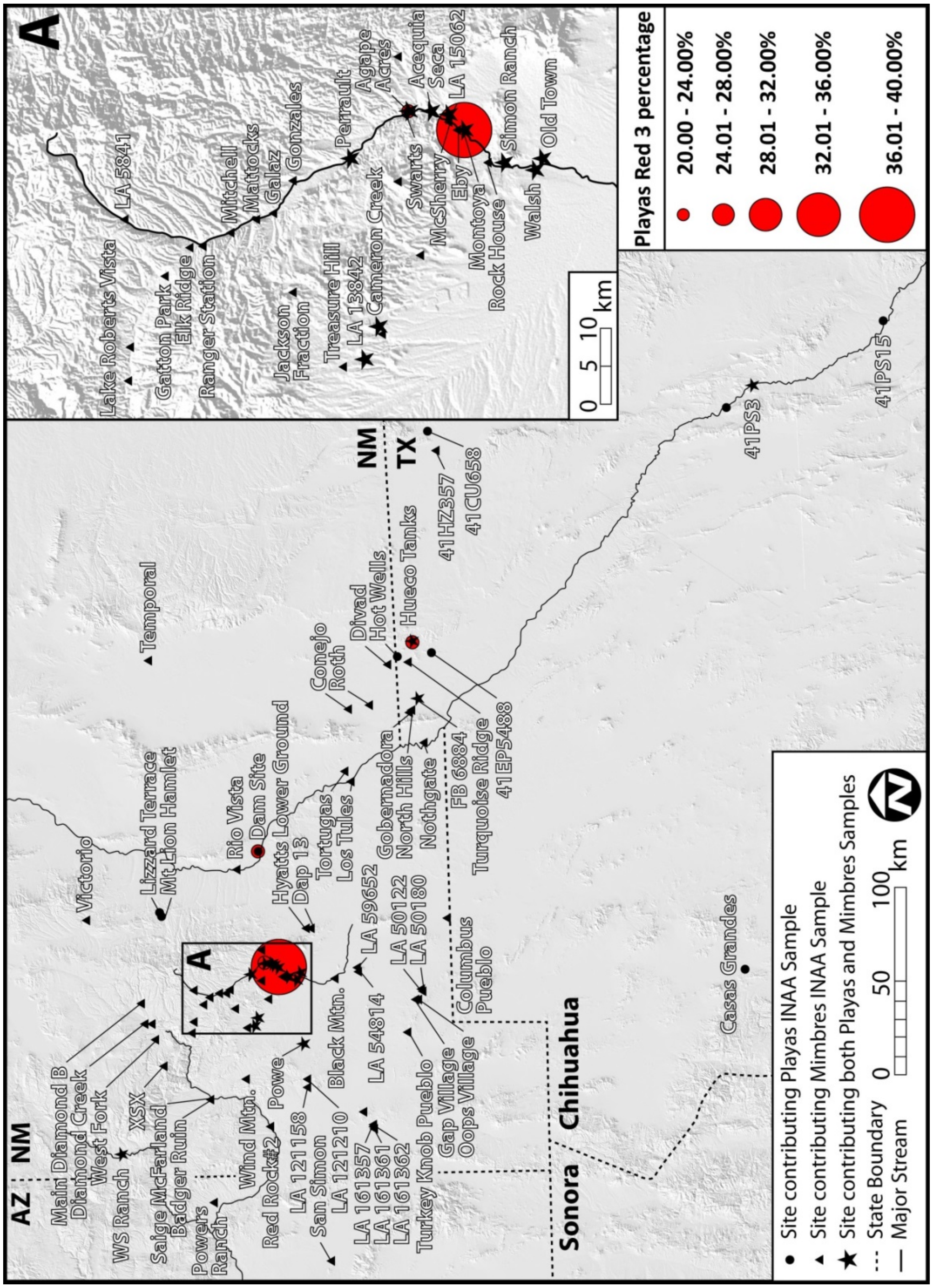

Figure 10.9: Depiction of percentages of the Playas Red 3 compositional group at sites containing samples assigned to this group. Based on these data and the data presented above, the Montoya site area appears to represent a likely production locale for ceramics assigned to this compositional group.

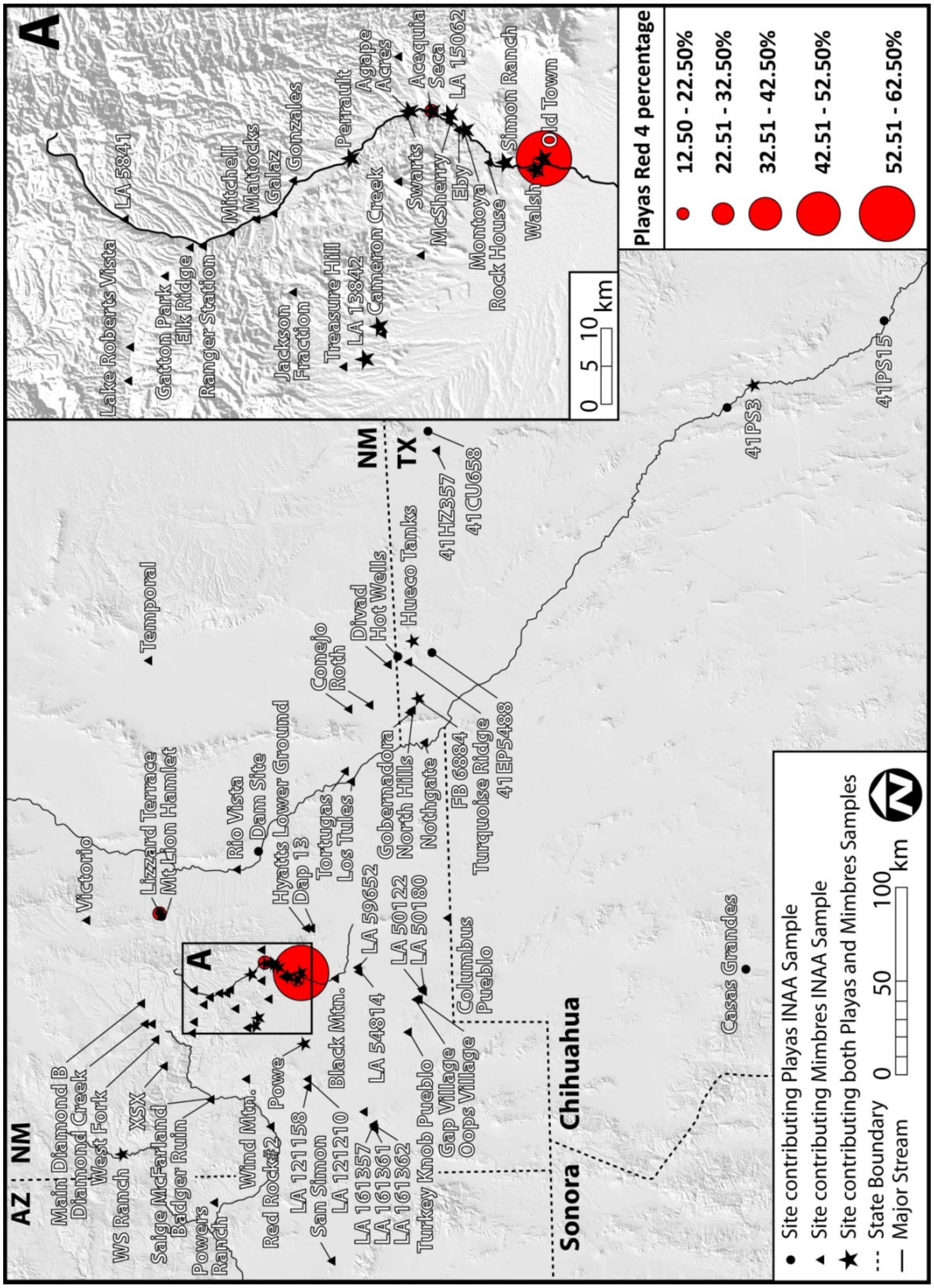

Figure 10.10: Depiction of percentages of the Playas Red 4 compositional group at sites containing samples assigned to this group. Based on these data and the data presented above, the Old Town area appears to represent a likely production locale for ceramics assigned to this compositional group.

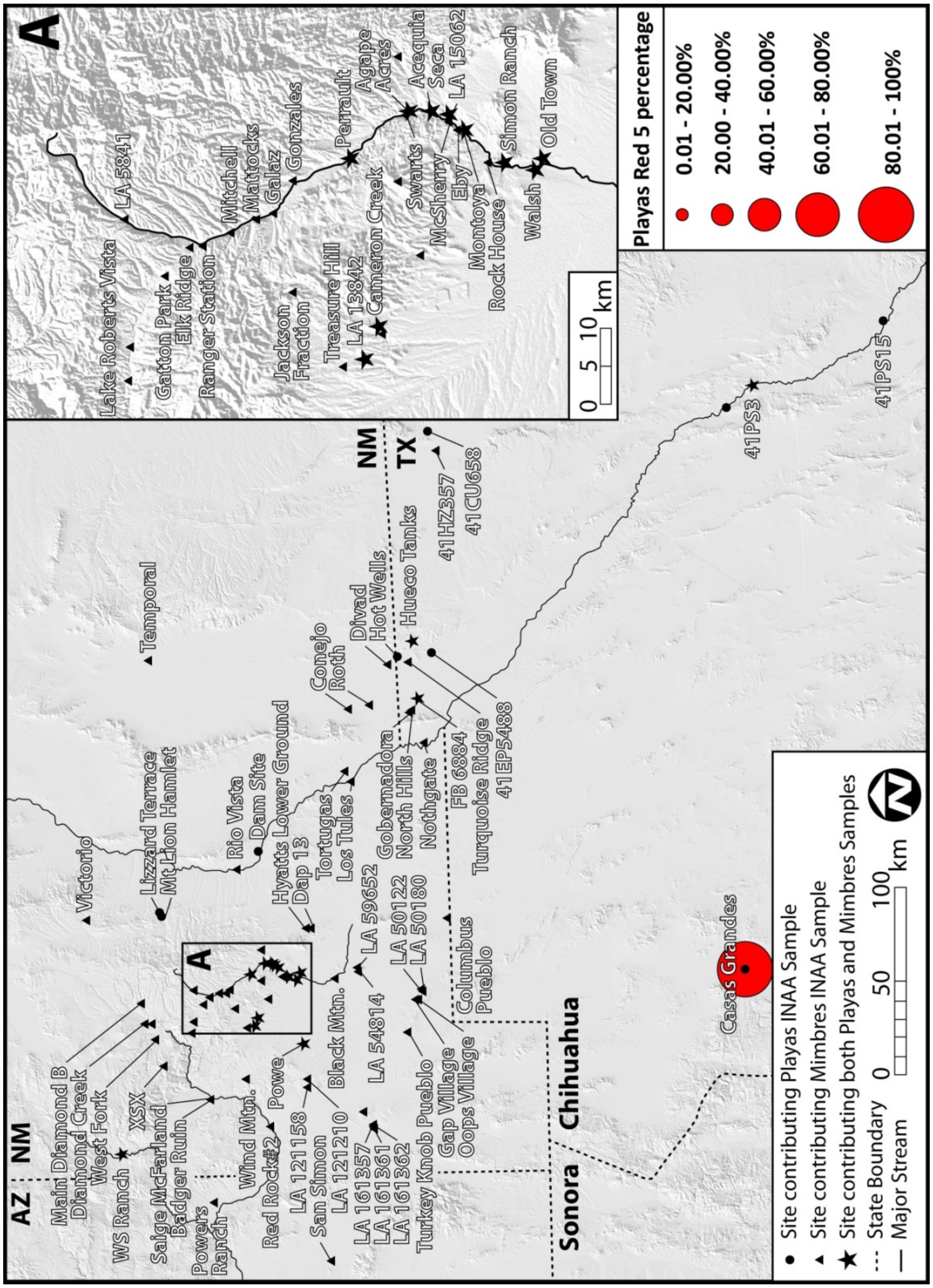

Figure 10.11: Depiction of percentages of the Playas Red 5 compositional group at sites containing samples assigned to this group. Based on these data and the data presented above, the Casas Grandes area appears to represent a likely production locale for ceramics assigned to this compositional group.

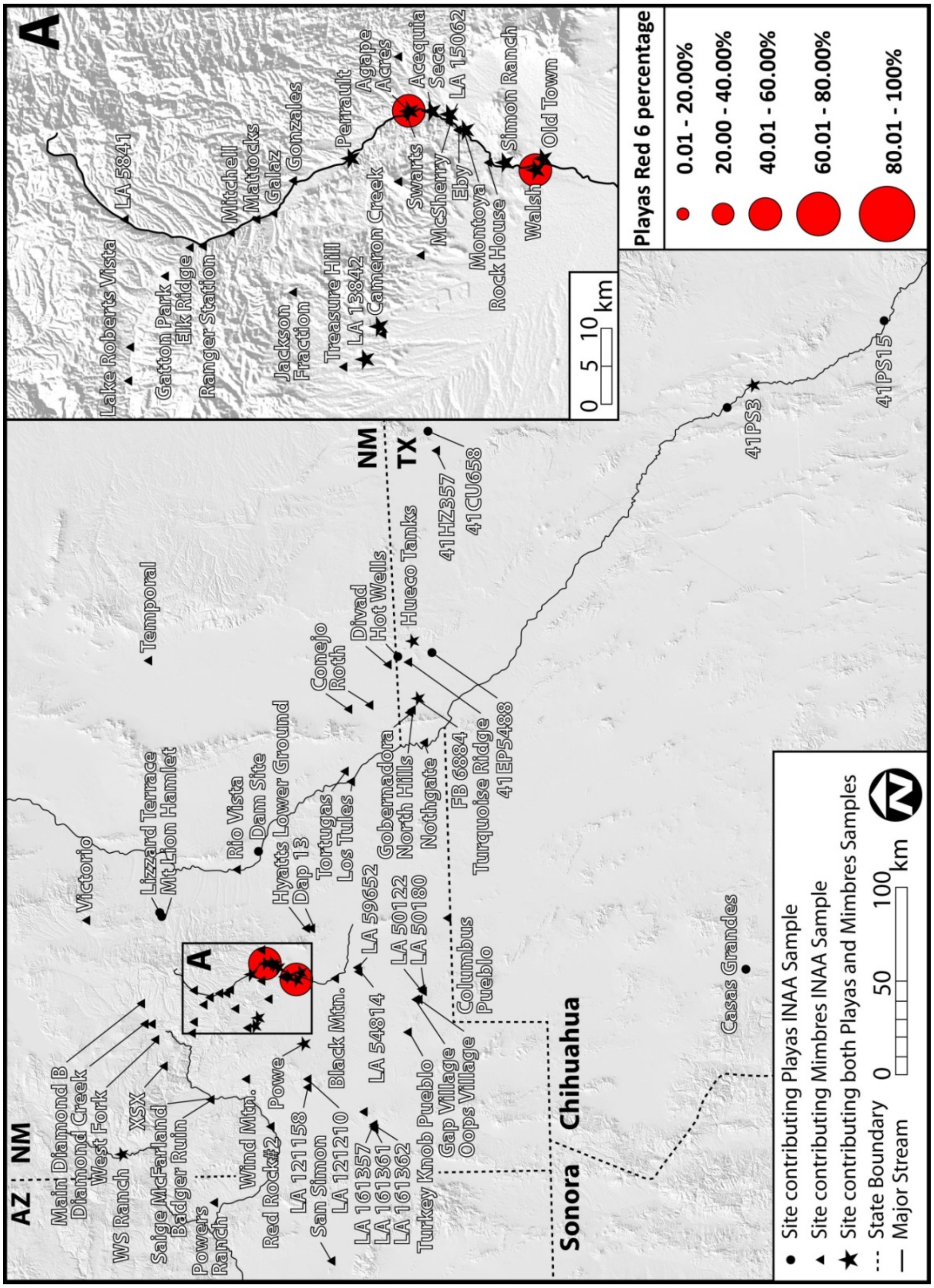

Figure 10.12: Depiction of percentages of the Playas Red 6 compositional group at sites containing samples assigned to this group. Because only two samples were assigned to this group a likely production locale cannot be ascertained.

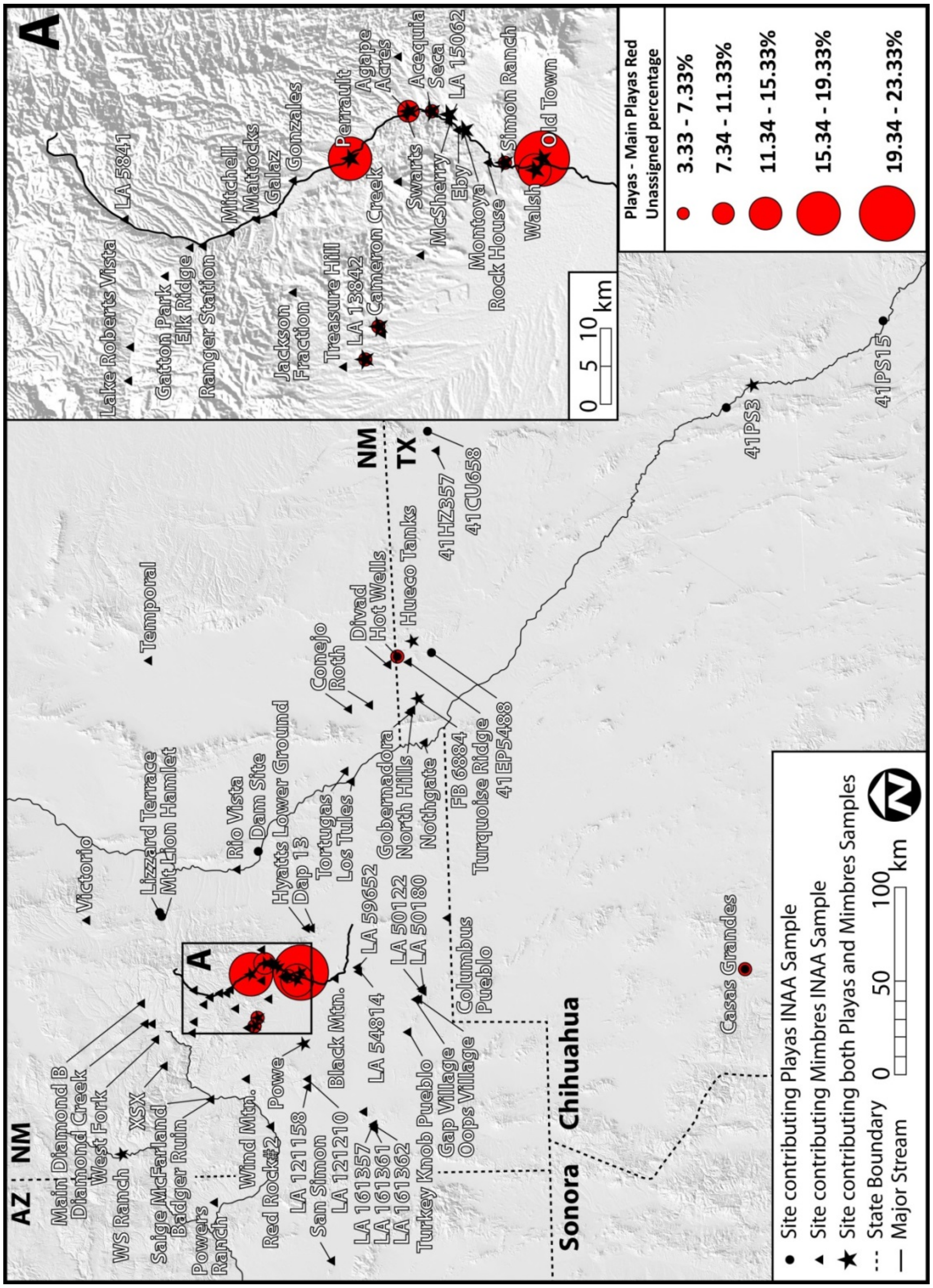

Figure 10.13: Depiction of percentages of the Main Playas Red Unassigned compositional group at sites containing samples assigned to this group. Samples assigned to this group likely represent multiple production locales though too few samples have been submitted to refine and differentiate this group.

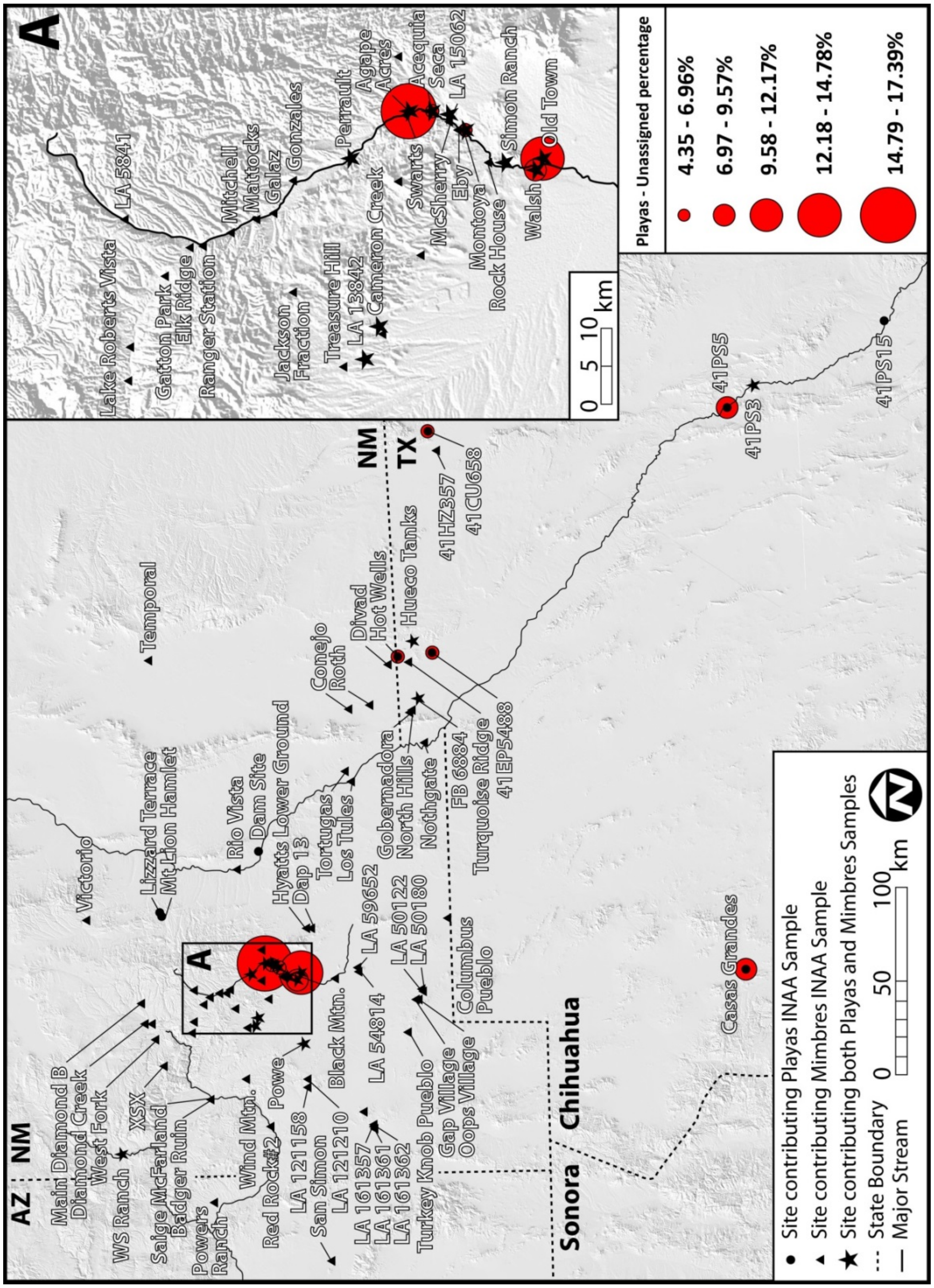

Figure 10.14: Depiction of percentages of the Unassigned samples at sites. The unassigned samples likely represent multiple production locales though too few samples have been submitted to refine and differentiate this group.

production practices is debatable. As will be discussed below, Speakman (2013) uses a slightly different method to determine production areas though his method still rests upon the relative proportion of samples assigned to a given compositional group. As it stands, my method gives primacy to the contribution a site makes to a given compositional group, and Speakman's method gives primacy to the contribution the compositional group makes to the totality of the sampled site's assemblage.

As shown in Figure 10.2, samples from over 75 sites in southwestern New Mexico, western Texas, and northern Chihuahua were used to discriminate production locales for Playas Ceramics. While only 27 sites have had Playas ceramics submitted for chemical characterization (Table 10.4), these other sites were used because non-Playas ceramics from them had been submitted for chemical characterization and some of the Playas samples were statistically valid members of groups established for these non-Playas samples. Specifically, some Playas samples are members of Mimbres groups 4c, 5a, 10, and 49a.

Main Playas Red: Mimbres 4c

A total of 10 Playas INAA samples were assigned to the Mimbres 4c compositional group established by Speakman (2013) and others (Creel and Speakman 2010; Creel et al. 2012). This compositional group was established on compositional similarities with 119 samples submitted from 28 sites. The vast majority of these samples were Mimbres Black-on- white sherds of various styles (ca. 64%). The majority of the members were recovered from Galaz and Old Town (ca. 24% and 22% respectively) (Figure 10.3). Because many of the members were types manufactured during the Classic period, it is believed that Old Town was not the likely production center and that sites to the north were producing pottery belonging to this compositional group. This assessment is based on the environmental reconstructions outlined above that potentially indicates that the fuel necessary to fire pottery was likely depleted in areas surrounding Old Town by this time (Creel 2006a; Minnis 1985).

Based on the above data, it seems likely that the Galaz area was the likely production locale for ceramics attributed to the Mimbres 4c compositional group (Figure 10.3). However, Speakman (2013) notes that the area surrounding the Harris site a few miles above Galaz was the likely production center for this compositional group.

This difference in possible production locales is primarily due to the manner in which they are determined. If the proportion of samples present from a site in a specific compositional group is used to establish that group's likely production locale, then heavily sampled sites are usually shown to be the likely production center because the law of averages dictates that the majority of samples will be selected from them. Because many of the Mimbres compositional groups contain specimens from heavily sampled sites (e.g. Swarts, Galaz, NAN Ranch, Old Town, Cameron Creek, Eby, Elk Ridge, and LA 59652) these sites are often inferred to be the area of production for that compositional group. For example, there is substantial evidence to suggest that ceramic production ceased at Old Town during the Classic Period. However, because Old Town has contributed a substantial number of NAA samples, the proportion of samples attributed to some compositional groups would indicate that it was the likely area of production for some compositional groups associated with Mimbres Black-on-white Style III pottery production. To remedy this situation, Speakman (2013) used the "percentage of the number of samples, from a given site, that were assigned to the group in question" to determine likely production locales.

While Galaz and Old Town contributed the majority of samples present in the Mimbres 4c compositional group (ca, 24% and 22% respectively) the percentage of samples from these sites attributed to this group are in some cases substantially less (ca. 22% and 9% respectively). The Harris site contains the greatest proportion of samples attributed to this compositional group (ca. 28%). Because of this, Speakman (2013:115-116) claims the areas surrounding this site as the likely "point of origin" for this compositional group. Furthermore, because many of the members were of types first produced during the Pithouse periods, Speakman (2013:115) asserts that this group "represents primarily early pottery production in the valley."

From the point of view of the Playas ceramics attributed to this compositional group, it is likely that production of ceramics using clays derived from this compositional group was not centered on the Harris site. Instead, it is likely that production was centered at one of the larger Classic period villages in the area: Mattocks, Galaz, and/or LA 18926/Z:1:65 (Anyon and LeBlanc 1984; LeBlanc 1977, 1980a). Both Mattocks and Galaz had a small post-Classic occupation, and the Mimbres Foundation survey form notes that LA 18926/Z:1:65 contained a 25 room Classic period structure and a 60 room Black Mountain phase structure. However, no samples have been submitted for chemical characterization from LA 18926/Z:1:65 so the possibility that it was the producing locale cannot be evaluated at this time.

All of the Playas samples in this compositional group are from Mimbres valley sites, with many being from the southern portion. If production was indeed centered on sites surrounding Galaz and Mattocks, then this would suggest that wares in this group were distributed primarily south in the Mimbres valley.

Main Playas Red: Mimbres 5a

A total of eight Playas INAA samples were assigned to the Mimbres compositional group 5a established by Speakman (2013) and others (Creel and Speakman 2010; Creel et al. 2012). This compositional group has 98 samples from 36 sites (Speakman 2013:118) (Figure 10.4). The Mimbres 5c assemblage is primarily composed of later ceramic types (e.g. Mimbres Black-on-white Style III, Playas Red, Reserve Smudged, etc.) though earlier types are also present. Speakman (2013:118-119) postulates that either the Power's Ranch site in Arizona is the likely production center for this compositional group or that there is a homogenizing agent along the Gila River that produces clays with a similar chemical composition from the West Fork ruin west to Power's Ranch.

From the perspective of Playas ceramics, these same production areas are the likely source of pottery attributed to this compositional group. While few post-Classic period sites are known in areas above 6000 feet in elevation (such as at the headwaters of the Gila River), the areas surrounding Cliff and further downstream along the Gila River were densely occupied during the Cliff/Salado phase, though relatively few Black Mountain phase sites have been encountered in the area (Nelson and Anyon 1996; Nelson and LeBlanc 1986; LeBlanc and Nelson 1976). The production of Playas series ceramics in this area could indicate that production was taking place during the Terminal Classic period/late Reserve phase though it could also indicate that Playas series ceramics were being manufactured during the Cliff/Salado phase. In general, further sampling is needed from sites in this area to more adequately discern the probable production locales of ceramics manufactured from Mimbres-5a group materials.

Main Playas Red: Mimbres 10

As depicted in Table 10.4, seven Playas samples were assigned to Speakman's (2013) Mimbres-10 compositional group. This group was originally classified based on 102 samples, most of which were plain and textured Mogollon brownwares. While the sites with the highest proportion of samples attributable to this compositional group were NAN Ranch and Old Town (ca. 14% and 9% respectively, reflecting at least in part the much more extensive sampling of these kinds of pottery at those sites), Speakman (2013) and Creel (Creel and Speakman 2010; Creel et al. 2012) believe that areas where primary/residual clays form from granitic parent materials are the likely source of this compositional group (Figure 10.5).

Based on the proportion of samples attributed to this source from individual sites and one clay member, production is believed to have occurred in the Burro Mountains near the Power and Beargrass sites (LA 121158 and LA 121210). However, other sites such as DAP 13 and Oops Village also contain a relatively high proportion of samples whose chemical composition is similar. These are all areas (the Burro Mountains, the Cedar Mountains, and the Cookes Range) where Precambrian and Cambrian granites are exposed and where clays derived from this parent material could have been obtained. Speakman (2013:91) believes that further sampling from areas where granites are exposed may allow this group to be further subdivided. For the time being however, this compositional group appears to encompass a fairly "broad geographic region" along the alluvial fans of mountain ranges in the southern Mimbres area (Figure 10.5).

These possible production locales are also suitable from the perspective of the Playas INAA samples. Of the seven samples attributed to this compositional group one came from Cameron Creek, one came from the Powe site, two originated from WS Ranch, and two from Walsh (Figures 10.2 and 10.5). All of these sites are near areas where Precambrian and Cambrian granites are exposed on the surface or are close enough to these areas that they could have been acquired through exchange with producing households/communities. Further, while the majority of non-Playas ceramics composing this compositional group represented utilitarian, or non-decorated ceramics, the Playas sample contained only decorated varieties (e.g. slipped and textured wares).

Main Playas Red: Mimbres 49a

A total of 20 Playas samples were assigned to the Mimbres-49a group as established by Speakman (2013). This compositional group was initially established based on similar chemical composition of 133 samples derived from 37 sites (Speakman 2013:169). Many types representing the full chronological sequence for the latter parts of the Mogollon culture area are members though the majority of the samples were typed as Mimbres Black-on-white Style III (Speakman 2013). Speakman postulates that the Elk Ridge site is the likely production area for this compositional group though he also acknowledges that production could have taken place in the southern portions of the Mimbres Valley around Old Town and/or NAN Ranch (Speakman 2013:170) (Figure 10.6). This was based on the proportion of samples recovered from these sites that were attributed to this compositional group as well as the fact that clay raw materials collected from the vicinity of Elk Ridge, NAN Ranch, and Old Town all had a high probability of membership within this compositional group.

Speakman (2013:170) notes that efforts were made "to subdivide Mimbres-49a so that (1) the non-Elk Ridge clays could be shown to be different or (2) that there were indeed two discreet groups present with one representing pottery production in the Upper

Valley and a second group that would represent pottery production elsewhere." These efforts were ultimately unsuccessful despite the fact that cesium concentrations appear to separate two fairly distinct groups.

The 20 Playas samples attributed to the Mimbres 49a compositional group originated from seven sites in the mid-to-lower Mimbres Valley and around the Arenas Valley (Agape Acres, LA 18342, Montoya, Old Town, Perrault, Simon Ranch, and Walsh). Just over 50 percent of the sample came from Agape Acres and Walsh, suggesting a likely southern production source. It is possible that areas around Elk Ridge contained a substantial Black Mountain phase component though few sites dating to this time period have been found in the vicinity. Perhaps the closest post-Classic site, LA 18926/Z:1:65, is located roughly six kilometers southeast of Elk Ridge and roughly two kilometers northwest of Mattocks (see above). Because this site has not yet been sampled for INAA, we cannot say if the patterns observed by Speakman correspond with patterns present in the post-Classic dataset. While I believe that Speakman is correct, I think that increased sampling of post-Classic occupations in the vicinity of Elk Ridge will increase the validity of this area as the likely production zone for at least a portion of the Mimbres-49a compositional group. These samples could also aid in discriminating different subdivisions within the larger Mimbres 49a compositional group.

Main Playas Red: Playas Red 4

One newly defined group within the larger Main Playas Red group had no corollary to another established compositional group; this group was designated Playas Red 4 and has eight members (Table 10.4). The majority were recovered from Old Town (n = 5, or ca. 63%) though samples belonging to this compositional group were also recovered from Acequia Seca, Mt. Lion Hamlet, and Walsh (n = 1 each, or ca. 13%).

Establishing the likely production areas for Playas ceramics is somewhat complicated by sampling. As with ceramics used to establish the Mimbres compositional groups (Speakman 2013), specific sites with Playas ceramics have been heavily sampled when compared to other sites in the area. Specifically, the samples taken from Agape

Acres, Montoya, Old Town, and Walsh compose approximately 67 percent of the entire Playas INAA sample (Table 10.4). Because of this, the manner in which I differentiate potential production areas is heavily biased towards these sites. However, this situation would not be improved using Speakman's (2013) methods because the other sites contributing samples all contributed fewer than ten, the minimum number used by Speakman in his production area determinations.

In the absence of additional samples and data to the contrary, it would appear that the area surrounding the Old Town site represents the likely production area for this compositional group (Figure 10.10). However, if we were to use Speakman's methodology but ignore his conditions correcting for small sample sizes, then the areas surounding Mt. Lion Hamlet or Acequia Seca would be the most likely production zones. Only one Playas sample was submitted from Mt. Lion Hamlet and it is a member of the Playas Red 4 compositional group. Similarly, one of the seven Playas samples submitted from Acequia Seca was assigned to this compositional group. Thus, 100 percent of the sample originating from Mt. Lion Hamlet and around 14 percent of the sample submitted from Acequia Seca originated from clays belonging to this compositional group. Both of these percentages exceed those for the Old Town assemblage as well as the Walsh assemblage (ca. 7% and 3% respectively).

Main Playas Red: Unassigned

A total of 30 samples were assigned to the Main Playas Red Unassigned compositional group (Table 10.4). The Main Playas Red Unassigned group contains those samples that occupy the same multidimensional space as the original Main Playas Red group but were not assignable to any of the newly established compositional groups within this larger grouping. As such, they likely represent samples that can be assigned to additional compositional groups once sampling becomes adequate enough to discern them. The percentage of samples attributed to this "residual" compositional group by site is presented in Figure 10.13. The proportion of samples in this compositional group from heavily sampled sites like Old Town, Agape Acres, and Walsh is to be expected. It is interesting that five of the eight samples submitted from Perrault were assigned to this group. It is likely that these samples represent another compositional group that could not be separated from this group with the current sample.

Playas Red 1

A total of 57 Playas samples were assigned to the Playas Red 1 compositional group, one of the early groups established for Playas ceramics (Creel et al. 2002). At that time, it was believed that Old Town was the likely production site for this compositional group, and further analyses have substantiated this claim. As shown in Table 10.4 and Figure 10.7, the majority of samples in this compositional group originate from Old Town (n = 39 or ca. 68%). Likewise, Playas Red 1 samples constitute the highest proportion of samples within the Old Town Playas NAA assemblage (ca. 56%). This proportion represents the highest of all site assemblages that contain samples attributed to this compositional group. In addition, the sample of potters clay from Black Mountain phase room C2 at Old Town is a member of this group, thus providing important evidence that pottery in this group was made at Old Town. Thus, regardless of the method used to determine production zones, the Old Town area is the likely center of production for the Playas Red 1 compositional group.

While most of the Old Town members of this group are from the Black Mountain phase component there, all but one of the nine Playas samples from Terminal Classic contexts are members of Playas Red 1. This indicates that production of Playas ceramics at Old Town actually began very late in the Classic period. But, if true, this would appear to contradict the hypotheses of Creel and Speakman that fuel was sufficiently depleted in the Old Town area by the Classic period as to preclude ceramic production. Alternatively, it is possible that fuel sources had recovered enough by very late Classic times to permit a modest level of ceramic production.

Playas Red 2

As shown in Table 10.4, 32 samples were assigned to the Playas Red 2 compositional group. This group was also one of those that was established during the initial attempts to make sense of the Playas INAA dataset (Creel et al. 2002). Based on the percentage of samples from each site that were attributed to this compositional group, the Old Town/ Walsh area appears to represent the likely production zone for this compositional group (ca. 29% and 26% respectively; these two sites are very close to one another) (Figure 10.8). Even when the percentages of each compositional group within an individual site's Playas sample are tabulated, Walsh still remains as a possible production locale with roughly 24 percent of its assemblage attributed to this compositional group. Among sites that have been modestly sampled (>5 samples), this is second only to Acequia Seca where the Playas Red 2 compositional group constitutes approximately 29% of the site's Playas INAA assemblage. However, the high proportion of samples from sites surrounding the modern city of El Paso, Texas (i.e. Hueco Tanks, Hot Wells, and FB 6884) that are attributed to this compositional group could indicate that this area represents the group's likely production zone. Again, though, sampling is an issue that unfortunately cannot be resolved for the current study.

Playas Red 3

A total of five samples were assigned to the Playas Red 3 group (Table 10.4). These were from four sites: Agape Acres, the Dam site, Hueco Tanks, and Montoya. Proportionally, the sample from Montoya constitutes roughly 40 percent of the sample and is depicted in Figure 10.9 as the likely area of production. Only two sites had more than three members. Because of this, these sites have a high proportion of samples in this compositional group (ca. 33% and 25% for the Dam site and Hueco Tanks). If these sites are eliminated from consideration based on sampling issues, then Montoya remain as the most likely production area with approximately 12 percent of its sample being assigned to the Playas Red 3 group.

Playas Red 5

Three Playas samples were assigned to this compositional group (Table 10.4). All three samples originated from one site, Casas Grandes. Based on this information, the

Casas Grandes area is the likely production zone for this compositional group (Figure 10.11).

Playas Red 6

As shown in Table 10.4, only two samples were assigned to the Playas Red 6 group. Because this sample is so small and originates from more than one site, inferring a likely production area for this compositional group cannot be reasonably inferred. The distribution of this sample by percentage is depicted in Figure 10.12.

Playas Unassigned

Only 23 samples used in the current study could not be assigned to any of the established groups. Relatively speaking, this is a small proportion of the overall assemblage (ca. 11%) and is fairly well distributed across sites. The provenience of unassigned samples is depicted in Figure 10.14. As Figure 10.14 and Table 10.4 show the majority of samples classified as "unassigned" originated from Agape Acres, Old Town, and Walsh (ca. 17%, 13%, and 9% respectively). This is to be expected given the fact that these sites are the most heavily sampled. However, the composition of each site's Playas sample shows that unassigned specimens tend to constitute the majority of poorly sampled sites' assemblages. This is especially so for sites in Texas and Chihuahua (i.e. Hot Wells, 41-EP-5488, 41-CU-658, 41-PS-5, and Casas Grandes. In these areas, it is likely that increased sampling will demonstrate that these unassigned samples will be assigned to newly established compositional groups.

ORGANIZATION OF MIMBRES POTTERY PRODUCTION

As mentioned in the previous chapter, certain lines of evidence suggest that pottery production was organized differentially in the Mimbres area during the Late Pithouse and Classic periods. Specifically, data pertaining to the context, concentration, scale, and intensity of pottery production during these time periods indicate that production was either organized as household or community specialization. These two methods of organizing production are differentiated by the scale at which goods are distributed from their production source with household specialization being geared towards local consumption and community specialization being geared towards regional consumption. To further refine this notion, the area was divided into production zones similar to Speakman's (2013) assessment of Mimbres pottery production (Figure 10.15). The distribution of different types of pottery from their production area into these different geographic zones was measured to assess if certain types of pottery manufactured from materials associated with distinct compositional groups were regionally distributed. These analyses were conducted in order to assess if the patterns recognized for Playas ceramics were similar to those present for earlier types of pottery in the area. Again, I believe that if new social groups entered the area that this would be reflected in the social processes responsible for the production of items commonly used to differentiate the Classic period from the Black Mountain phase.

It should be noted that the sample used in this analysis was not systematically selected and is heavily biased towards Mimbres Black-on-white Style II and Style III ceramics. These factors necessarily limit my ability to accurately characterize how production was organized during the Late Pithouse and Classic Periods, especially for early types.

The production/geographic zones used in the following analysis differ from those established by Speakman (2013) in his analysis of the Mimbres NAA data. Probably the main difference between the production zones used in my analysis was the consolidation of the multiple production areas established by Speakman (2013) in the Mimbres River valley into one production zone. I collapsed these multiple production areas into a single unit due to the difficulty in separating areas that would demonstrate regionally distributed goods. Inevitably there would be instances where ceramics manufactured at a site would be considered to be regionally distributed even though they traveled only one or two kilometers from their area of production. Similarly, I expanded the Burro Mountain production area to encompass the areas surrounding Wind Mountain and the Power site. The Deming production area was expanded, and a production area was added to the

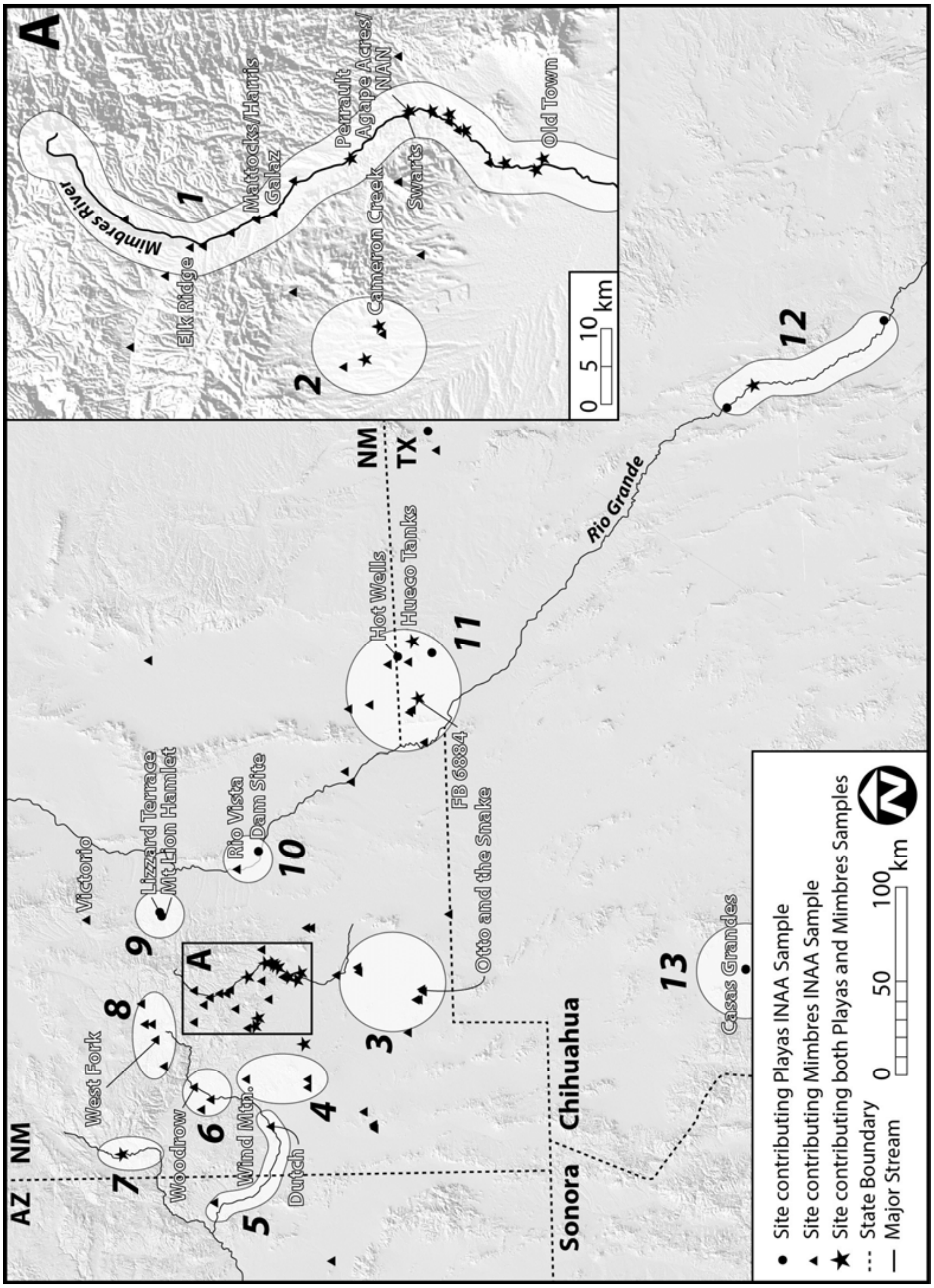

Figure 10.15: Mimbres pottery production zones (numbered polygons). Individual sites identified by Speakman (2013) as likely production zones for specific compositional groups are labeled. See Speakman (2013) for a discussion of these groups.

Jornada area. These areas were expanded primarily to assess the movement of pottery produced in other zones into these areas.

To facilitate analysis, the distribution of specific compositional groups within these different zones was evaluated by calculation of diversity scores (Table 10.7). It was hoped that my analyses could be conducted in a manner similar to Clark's (2006) assessment of Chupadero Black-on-white pottery production. However, after tabulating the data presented in Table 10.7, it became apparent that applying Clark's methodology to the Mimbres INAA dataset would be difficult primarily due to the number of types manufactured from clays of similar bulk chemical composition, the diverse distribution of these wares, and the fact that production was a widespread phenomenon. Like Clark (2006), my analysis hoped to gain insights into how production was organized for the various compositional groups established by Speakman (2013). To accomplish this, I calculated diversity scores for each of the compositional groups outlined in Table 10.7.

The formula used in these calculations is presented in Chapter 8. This calculation takes into account both the distribution of each compositional group within each geographic zone presented in Figure 10.15 as well as how evenly/proportionally ceramics from these groups are distributed amongst the geographic areas. The results of these calculations are presented in Figure 10.16.

The diversity score data as well as data pertaining to the general distribution of different compositional groups (Table 10.7; Speakman 2013) and the ceramic type composition of these groups were all used to better characterize the organization of ceramic production in the Mimbres area during the Pithouse and Classic periods. To get at different distributional patterns, the compositional group distribution maps presented in Speakman (2013) as well as the data presented in Table 10.7 were used. Following Costin's (1991) distinction between individual specialization and community specialization, the distribution of different compositional groups was analyzed so that the patterns could be characterized as exhibiting local or regional distribution patterns. Visual inspection of the distribution patterns presented in Speakman's (2013) analysis of

Table 10.7: Proportion of ceramics attributed to specific compositional groups recovered from different production zones. Data taken from Speakman (2013).

	Arenas Valley (2)	Burro Mtns. (4)	Deming (3)	Eastern Mimbres (9)	Jornada (11)	Gila Forks (8)	Middle Gila (5)	Mimbres (1)	Rio Grande (10)	Upper Gila (6)	No. of Samples
M-1	0.09		0.02	0.16	0.18	0.01		0.47	0.07	0.01	163
M-2a	0.08		0.01	0.00	0.18	0.01		0.68	0.04		217
M-2b					0.50			0.50			18
M-2c					0.43			0.43	0.14		7
M-3			0.02		0.05	0.72		0.21		0.01	102
M-4a	0.09		0.02	0.02	0.06	0.02		0.79		0.00	249
M-4b	0.10	0.01	0.04	0.01	0.03	0.03		0.79			113
M-4c		0.01	0.09		0.12			0.79			113
M-5a	0.05	0.10	0.05		0.05	0.19	0.23	0.13		0.19	78
M-5b			0.10			0.79		0.10			68
M-5c					1.00						4
M-7a			1.00								45
M-7b			0.89		0.11						9
M-8	0.05	0.01		0.04	0.05	0.01		0.83			75
M-9	0.17		0.06			0.28		0.50			18
M-10	0.03	0.06	0.45		0.01		0.01	0.43			77
M-11	0.04	0.03	0.03		0.12			0.78			73
M-13					1.00						3
M-21	0.09	0.07	0.03		0.05	0.14	0.09	0.22		0.32	157
M-22	0.12	0.09	0.03			0.29	0.06	0.09		0.32	34
M-23				0.05	0.71				0.24		21
M-24	0.03	0.37	0.08		0.03	0.08		0.30		0.10	60
M-27			0.80							0.20	5
M-28											0
M-41	0.02		0.07		0.24			0.66			41
M-42	0.10			0.05				0.80	0.05		20
M-43	1.00										4
M-44	0.67	0.11	0.11		0.11						9
M-46			0.25					0.75			4
M-47		0.04	0.32		0.14		0.04	0.46			28
M-48			1.00								7
M-49a	0.06	0.07	0.07		0.14			0.64	0.01		70
M-49b					0.33				0.67		3

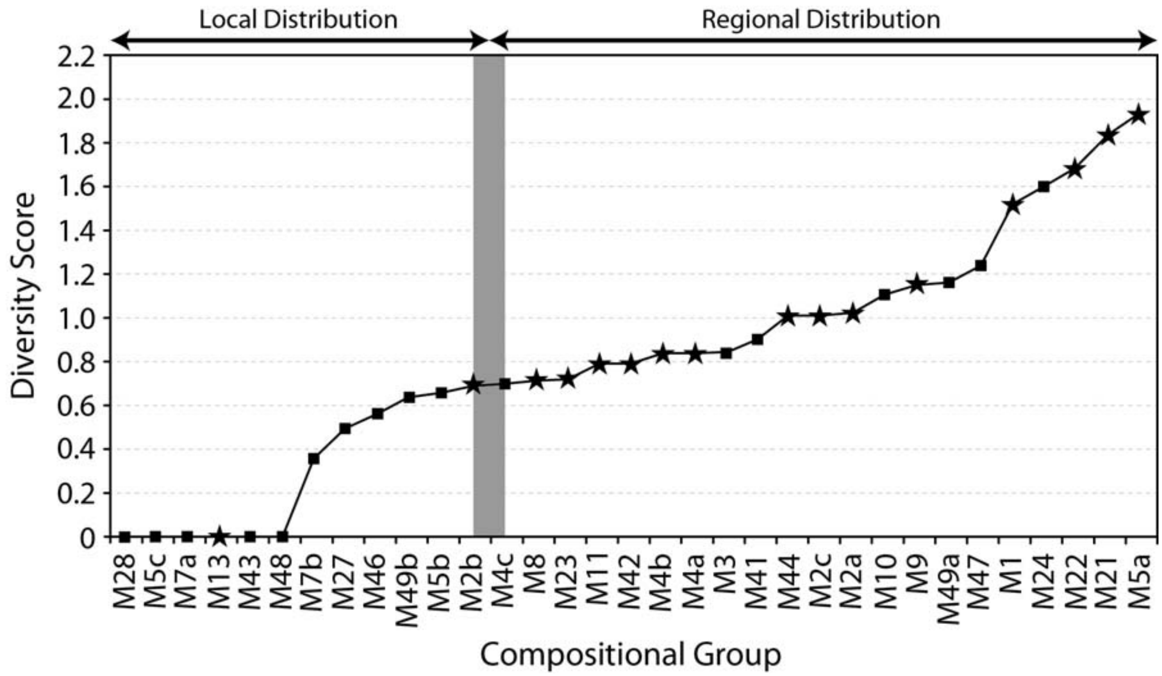

Figure 10.16: Depiction of diversity scores associated with each compositional group. These scores were based on the distribution of ceramics manufactured from specific compositional groups within each of the geographic/production zones depicted in Figure 10.15. Stars represent those compositional groups whose samples are primarily composed of Mimbres Black-on-white Style III ceramics.

likely production zones demonstrated that some compositional groups appear to be more widely distributed than others. The data in Table 10.7 were used to more objectively characterize the distribution patterns associated with different Mimbres compositional groups. Ceramics were interpreted as being locally distributed if they were present in only one of the production zones depicted in Figure 10.15. Generally, if such a pattern were present, these compositional groups would be shown to have a diversity score of zero in Figure 10.16. Mimbres compositional groups 5c, 7a, 28, 43, and 48 were all distributed in such a manner. Similarly, a compositional group was said to have been distributed locally if the members were only present in a few geographical/production zones, usually less than four, with the majority being present in only one. Mimbres compositional groups 5b, 7b, 13, 27, 46, and 49b met these criteria. Wares produced from these compositional groups' materials were usually distributed in geographic zones adjacent to their production zone. Of these groups, only the Mimbres-5b group contains more than 10 members and was also the only group whose materials were distributed to rather distant geographic zones (e.g. the Gila Forks area down to Deming). These materials were not present in sufficient quantities in geographic zones other than their production area to increase the diversity score above the threshold for regional distribution. I believe that other mechanisms such as down-the-line-exchange could account for the presence of these materials in relatively distant geographic areas.

Conversely, compositional groups were interpreted as being regionally distributed if they were present in relatively high proportions, usually greater than ten percent, at multiple geographic/production zones. The remaining 22 compositional groups were interpreted as having a regional distribution (Table 10.8, Figure 10.16).

As can be discerned from the information contained in Table 10.7 and Figure 10.16, the majority of compositional groups interpreted as being locally distributed contain a relatively small number of specimens. This could thus be a result of sampling; however, I believe that these patterns point to other aspects of the organization of ceramic production in the Mimbres area. Specifically, the reason that these locally distributed compositional groups were poorly sampled is because they are primarily composed of ceramic styles which were produced earlier than the Mimbres Black-on-white style III ceramics that have been more commonly sampled for INAA analysis. As shown in Table 10.8, the majority of compositional groups whose samples consisted primarily of Mimbres Black-on-white Style III ceramics tend to exhibit a regional distribution (14 of 16 or ca. 88%) and compositional groups composed primarily of other ceramic types tend to exhibit a local consumption distribution (10 of 17 or ca. 59%).

This pattern suggest that Mimbres Black-on-white Style III ceramics tended to be distributed on a regional level while other ceramic types in the Mimbres sequence tended to be distributed on the local level. Statistical tests demonstrate that this pattern is likely not the result of chance ($p = 0.0104$, Fisher's Exact Test) and indicates that the

Table 10.8: Dominant ceramic type, production area, and distribution of samples associated with Speakman's (2013) Mimbres compositional groups.

Comp. Group	No. of Samples	Dominant Type/Design Style	Site/Area of Production	Distribution
M-1	176	Mimbres B/W Style III	Eastern Mimbres	Regional
M-2a	245	Mimbres B/W Style III	Swarts	Regional
M-2b	20	Mimbres B/W Style III	Swarts	Regional
M-2c	10	Mimbres B/W Style III	Swarts	Regional
M-3	103	Unslipped Whiteware, Mimbres Design	Upper Gila	Regional
M-4a	280	Mimbres B/W Style III	Galaz	Regional
M-4b	129	Mimbres B/W Style III	Perrault	Regional
M-4c	119	Mimbres B/W Style II and earlier	Harris	Local
M-5a	98	Mimbres B/W Style III	Dutch	Regional
M-5b	73	Mogollon Brownwares	West Fork	Local
M-5c	4	Corrugated	Gobernadora	Local
M-7a	49	Mogollon Brownwares	Deming	Local
M-7b	7	Mogollon Brownwares	Deming	Local
M-8	85	Mimbres B/W Style III	Mattocks	Regional
M-9	21	Mimbres B/W Style III	Upper Gila	Regional
M-10	102	Corrugated	Multiple	Local
M-11	84	Mimbres B/W Style III	Perrault	Regional
M-13	4	Mimbres B/W Style III	Jornada	Local
M-21	182	Mimbres B/W Style III	Woodrow	Regional
M-22	35	Mimbres B/W Style III	Woodrow	Regional
M-23	30	Mimbres B/W Style III	Rio Grande	Regional
M-24	74	Mogollon R/B, Three Circle R/W	Wind Mtn.	Local
M-27	6	Mimbres B/W Style I-III	Otto and the Snake	Local
M-28	4	Mimbres B/W Style I	Victorio	Local
M-41	47	Mimbres B/W Style I and II	NAN Ranch	Regional
M-42	18	Mimbres B/W Style III	Lower Mimbres	Regional
M-43	3	Mimbres Polychrome	Cameron Creek	Local
M-44	9	Mimbres B/W Style III	Cameron Creek	Regional
M-46	4	Mogollon R/B, Three Circle R/W	Old Town	Local
M-47	33	Mogollon Brownwares	NAN Ranch	Regional
M-48	7	Mogollon Brownwares	Deming	Local
M-49a	133	Entire ceramic sequence	Elk Ridge	Regional
M-49b	5	Mimbres B/W Style I	Elk Ridge	Local

production of Mimbres Black-on-white Style III ceramics was organized differently when compared to the region's other ceramic wares. This pattern would only be accentuated by the fact that some of the non-Style III ceramics that were clearly interpreted as being regionally distributed (e.g. Mimbres-3, Mimbres-41, Mimbres-10, Mimbres-49a, Mimbres-47, and Mimbres-24) can have their distributions explained by other processes. Specifically, ceramics attributed to the Mimbres 3 compositional group were classified as non- Style III though they were primarily composed of unslipped whitewares with Style III designs. Thus, the production of these ceramics was likely organized in a manner comparable to other Mimbres Black-on-white Style III ceramics. Similarly, Speakman (2013) notes that his Mimbres 10 compositional group likely represents production at multiple locations where primary clays form from granitic parent materials. In the current analysis this compositional group is treated as if it represented a single production location. Thus the production and distribution of the group's predominantly corrugated vessels could be more restricted than current evidence supports. Finally, Mimbres group 49a is composed of ceramics belonging to the region's entire ceramic sequence. While some non-Style III ceramics may have been locally distributed, the distribution of the Style III samples in the group could be responsible for the group's regional distribution interpretation.

While the above analyses treat all compositional groups as primarily containing sherds of a single type, they do serve to allow the reader a sense of the overall distribution of materials produced from particular compositional groups. Additional analyses were conducted that investigated the patterning of compositional groups for different types within the Mimbres sequence.

Alma Series Ceramics

A total of 151 ceramic samples classified as Alma series ceramics (e.g. Alma Rough, Alma Plain, and Alma Scored) have been submitted for chemical characterization. Of these 118 have been assigned to compositional groups established by Speakman (2013). The distribution of these 118 samples was more intensively analyzed to discern the manner in which their production was organized. These 118 samples were collected from 22 different sites distributed across five production zones and were assigned to 14 compositional groups. Alma series ceramics manufactured from clays belonging to compositional groups that originate in the Upper Gila, Mimbres, and Burro Mountain production zones are commonly found at sites in the Deming area. While certain Mimbres compositional groups (e.g. 5a, 5b, 7a, 7b, 48, and 49b) were predominantly distributed locally, Alma series ceramics manufactured from clays derived from other Mimbres compositional groups (e.g. 3, 4a, 4c, 10, 24, 41, 47, and 49a) appear on the surface to have been more regionally distributed. However, other mechanisms such as simple down-the-line exchange could account for this distribution.

In general, the majority of the samples used in the analysis were recovered from areas close to their production zone. Roughly 56 percent of samples were assigned to compositional groups whose production zone was the same as that from which they were recovered. If one were to believe that one of the potential sources for the Mimbres-10 source materials may exist in the various ranges in the Deming area (e.g. Florida Mountains, Cedar Mountains, etc.) this increases the proportion of samples representing local production to 72 percent for Alma series ceramics.

Complicating these patterns is a heavy bias towards samples recovered from the Deming area. Roughly 82 percent of the Alma sample used in this analysis originated from sites within and around the Deming Plain. There is only one other compositional group zone with a representative sample that contains samples in high proportion that originated from that compositional group's production zone. This compositional group is Mimbres 5b which was likely produced in the areas surrounding the West Fork ruin in the Gila Forks production zone. Nearly all Alma series samples submitted for chemical characterization from this zone were produced locally (10 of 13, or ca. 77 percent).

In previous analyses, and in analyses that follow, I use diversity scores based on the proportional distribution of ceramic types across production/geographic zones associated with specific compositional groups to determine how different ceramic types were distributed from their production area. For my analyses of these diversity scores, a score of above 0.70 serves as the value that separates production geared towards local consumption from production geared towards regional distribution. This value is somewhat arbitrary but generally separates ceramics manufactured from distinct compositional groups distributed across three or more geographic zones in some quantity (ca. 10 percent in two or more zones other than the geographic zone where the compositional group originates).

Unfortunately, the data available for the ceramics in the Alma series does not lend itself to this sort of analysis. This is due to the fact that most of the established production areas associated with different compositional groups have not been sampled. Thus, while the calculated diversity scores associated with the different compositional groups would give a measure of that group's distribution across sampled contexts, it would not provide a measure of that distribution from the compositional group's production zone.

Based on the available data, I feel that ceramics within the Alma series were likely produced for local consumption and thus had their production organized as household specialization. Those samples assigned to compositional groups that originate outside of those located in the Deming and Gila Forks production zones could have their distribution explained by processes other than production geared towards regional consumption. The small number of Alma series ceramic samples from areas other than the Deming and Gila Forks area is likely the main cause for my recognition of possible regional distribution. Only eight Alma series samples (ca. 7 percent) have been submitted for characterization outside of these production zones. All of these samples were assigned to compositional groups and production zones that were the same as the areas from which the samples originated.

Mimbres Corrugated

A total of 183 Mimbres corrugated sherds have been submitted for chemical characterization, 118 of which were assigned to 14 compositional groups. These 118 samples originated from 26 different sites distributed across seven production zones. The patterns present with Mimbres corrugated ceramics are a little easier to interpret than the Alma series (Figure 10.17). Of the Mimbres corrugated samples assigned to groups, roughly 35 percent were assigned to the Mimbres-10 compositional group. Most of these originated from sites in the Deming area as well as sites in the Mimbres valley. Because the Mimbres-10 compositional group may have been produced at multiple locations, it is possible that production took place in the Deming area as well as the Mimbres Valley. The rest of the Mimbres corrugated samples assigned to specific compositional groups rarely left the production zone associated with these compositional groups. This indicates that production of Mimbres Corrugated vessels was targeted towards local consumption and was thus organized as household specialization.

The one exception to this is those samples of Mimbres corrugated that were assigned to the Mimbres-47 compositional group. While the majority were obtained from sites within the production zone where the Mimbres-47 compositional group originates (n = 10 or ca. 67 percent), a fair number of samples (n = 4 or ca. 27 percent) were obtained from sites in the Jornada area. The distribution pattern for this compositional group potentially suggests that production of Mimbres corrugated ceramics manufactured from clays originating from this group was organized as community specialization. However, the small number of samples attributed to this compositional group as a whole does not allow for a concrete determination of the organization of production.

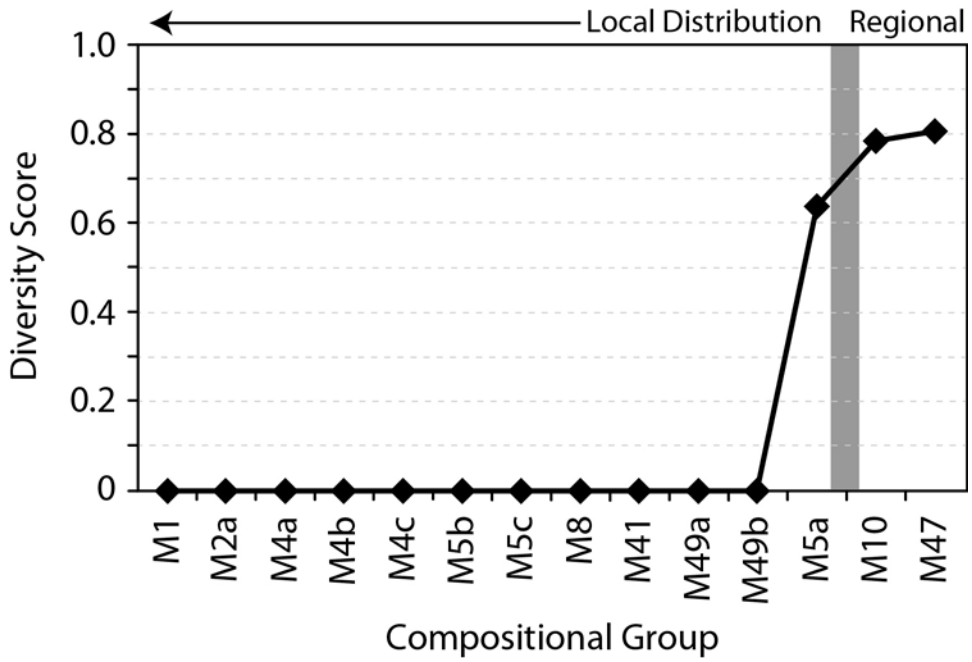

Figure 10.17: Diversity scores for Mimbres corrugated ceramics associated with different compositional groups.

Mogollon Red-on-brown

A total of 51 Mogollon Red-on-brown samples have been submitted for chemical characterization [this does not include 21 Mogollon Red-on-brown samples recovered from the Canada Alamosa project that are awaiting group assignments (Creel 2014, personal communication)]. A total of 41 were assigned to six compositional groups. These 41 samples originated from six different sites located in four different production zones. The majority of the Mogollon Red-on-brown samples were assigned to the Mimbres-24 compositional group (n = 28 or ca. 68 percent). Of these, roughly half (n = 13) were recovered from the Wind Mountain site which is located in production zone associated with the compositional group. Thus, these were locally produced. Twelve of the samples assigned to the Mimbres-24 compositional group originated from sites located in the Mimbres production zone. Because of this, and the fact that the remaining two samples assigned to this compositional group originated from a site in the Deming production zone (LA 50180), the production of Mogollon Red-on-brown ceramics originating from the Burro Mountain production zone was likely organized as community specialization.

Based on available data, the production of Mogollon Red-on-brown ceramics assigned to the other compositional groups was likely organized as household specialization (Figure 10.18). It should be noted that the remaining sample is small and there is only one other compositional group that contains more than two samples. These limited data indicate that while some potters in the Cookes Range, Deming, and Mimbres valley production zones appear to have organized production to meet local demands, other potters in the Burro Mountain production zone organized their production to meet regional demands.

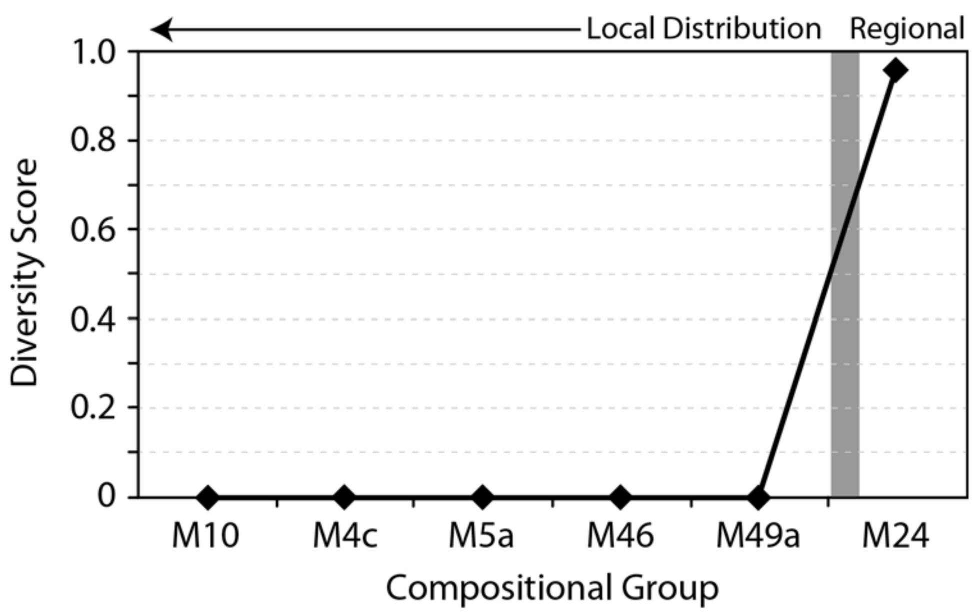

Figure 10.18: Diversity scores for Mogollon Red-on-brown ceramics associated with different compositional groups.

Three Circle Red-on-white

To date, there have been 51 Three Circle Red-on-white samples submitted for chemical characterization. Of these, 43 were assigned to compositional groups. These samples were recovered from seven sites located in four geographic zones and have been assigned to 11 compositional groups. Of these compositional groups, the Mimbres-24 group contains the most samples (n = 19 or ca. 44 percent). The majority of these samples originated from the Wind Mountain site (n = 13) though smaller amounts originated from sites in the Mimbres valley (n = 5) and the areas surrounding Deming (n =1). Despite the relatively high diversity of geographic zones represented by Mimbres-24 members, the high proportion of samples recovered from sites in the Burro Mountain geographic zone causes the diversity score associated with this compositional group to indicate a local distribution (Figure 10.19).

The compositional group with the highest diversity score for Three Circle Red-on-white ceramics is Mimbres-46. Only three samples of this type were assigned to this compositional group. Three Circle Red-on-white ceramics in this group are found in only two geographic zones: the Mimbres valley and areas surrounding Deming. While the Mimbres-46 group was determined to have the highest diversity score of all the compositional groups to which Three Circle Red-on-white ceramics were assigned, this score is based on an extremely small sample. Thus the proportions used to calculate the value are by nature high for the two geographic zones containing group Mimbres-46 ceramics. Despite this relatively high diversity score, it still falls below the threshold I use to separate production organized for regional consumption from local consumption. Thus, based on available data, I believe that Three Circle Red-on-white ceramics were likely produced for local consumption and represent production organized as household specialization.

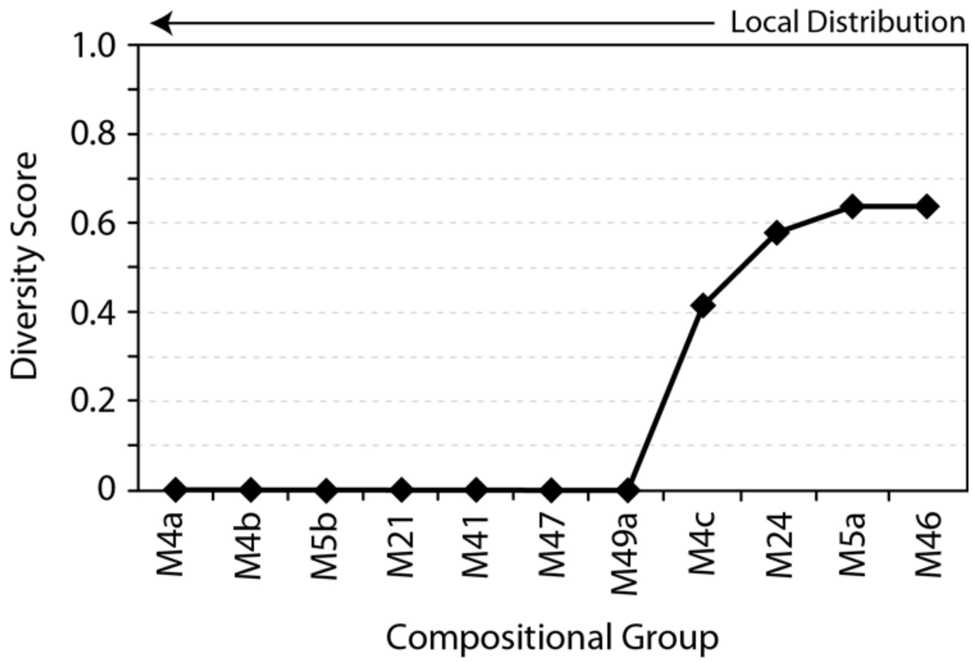

Figure 10.19: Diversity scores for Three Circle Red-on-white ceramics associated with different compositional groups.

Mimbres Black-on-white Style I

There have been 178 Mimbres Black-on-white Style I ceramic samples submitted for INAA. Of these, 132 were assigned to compositional groups. These samples were recovered from 26 sites located in 11 geographic zones and have been assigned to 20 compositional groups (Figure 10.20). The majority were assigned to the Mimbres-4c compositional group (n = 34 or ca. 26 percent), and most are from sites within the Mimbres-4c production zone (n = 24 or ca. 71 percent). The remaining samples originated from sites located in four other geographic zones. This diversity score associated with this distribution indicates that Mimbres group 4c is one of seven to which Mimbres Black-on-white Style I ceramic samples were assigned that was distributed on a regional level (Figure 10.20).

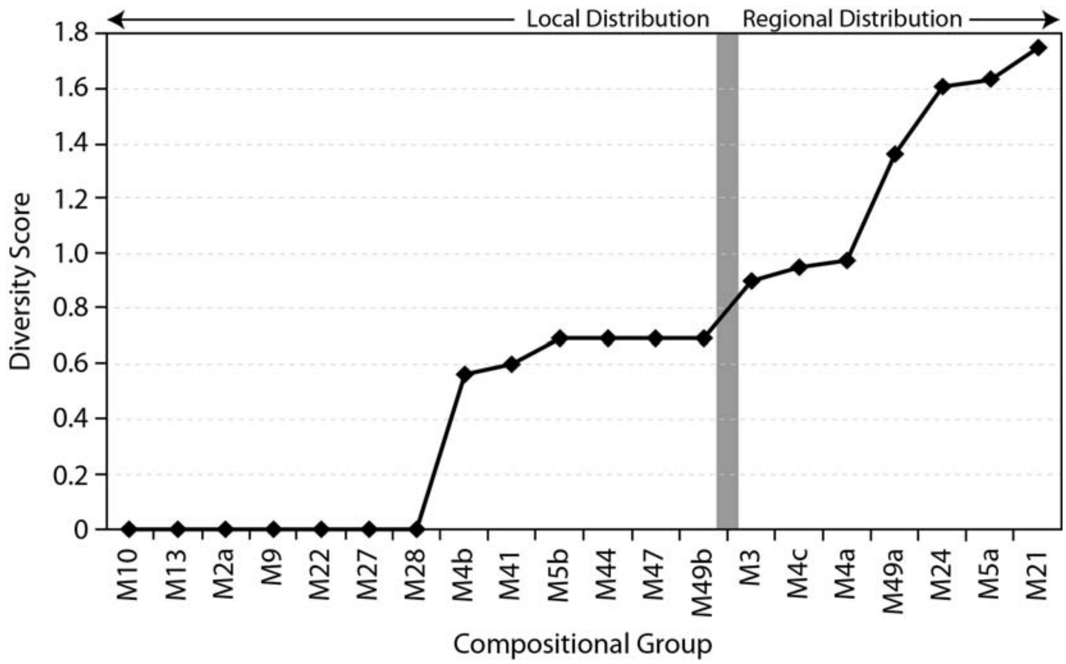

Figure 10.20: Diversity scores for Mimbres Black-on-white Style I ceramics associated with different compositional groups.

The other compositional groups exhibiting a regional distribution of Mimbres Black-on-white Style I ceramics are Mimbres groups 3, 4a, 5a, 21, 24 and 49a (Figure 10.20). While a relatively small number of Mimbres Black-on-white Style I samples were assigned to each of these compositional groups (≤ 16 samples each), these samples originated from sites dispersed across six geographic zones.

The remaining compositional groups with Mimbres Black-on-white Style I members contained, on average, only two samples each (range of one to seven). These samples generally tended to originate from sites in the same geographic zone as the compositional group's production area. For these reasons, the production of Mimbres Black-on-white Style I ceramics assigned to these compositional groups was determined to represent production for local distribution (Figure 10.20).

Mimbres Black-on-white Style II

A total of 272 Mimbres Black-on-white Style II ceramic samples have been submitted for chemical characterization. Of these, 203 were assigned to compositional groups. These samples were collected from 43 sites located in 13 geographic zones and have been assigned to 20 compositional groups (Figure 10.21). The majority were assigned to Mimbres-21 compositional group (n = 60 or ca. 30 percent), and many originated from sites within the Mimbres-21 production zone (n = 22 or ca. 37 percent). The remaining members originated from sites located in five other geographic zones. The diversity score associated with this distribution indicates that Mimbres group 21 is one of nine with Mimbres Black-on-white Style II members whose production was geared towards regional distribution (Figure 10.21).

The other compositional groups exhibiting a regional distribution of Mimbres Black-on-white Style I ceramics are Mimbres groups 2a, 49a, 1, 23, 22, 4a, 3, and 5a (Figure 10.21). Of these, only Mimbres group 4a contains a modest sample (n = 23 or ca. 11 percent), the remaining groups having substantially fewer Mimbres Black-on-white Style I members. The majority of the samples assigned to Mimbres group 4c originated from sites within the same geographic zone as the compositional group's production area (n = 14 or ca. 60 percent). The remaining Mimbres Black-on-white Style II samples assigned to the Mimbres 4a group originated from sites located in four other geographic zones.

The other compositional groups exhibiting a regional distribution all contain a relatively small number of Mimbres Black-on-white Style II samples (≤ 12 samples each). Samples attributed to these compositional groups were generally collected from sites located in at least three geographic zones other than the compositional groups' production zones.

The remaining compositional groups to which Mimbres Black-on-white Style II samples have been assigned all contained on average only six samples a piece (range of one to 20). These samples generally tended to originate from sites in the same geographic zone as the compositional groups' production areas. For these reasons, the

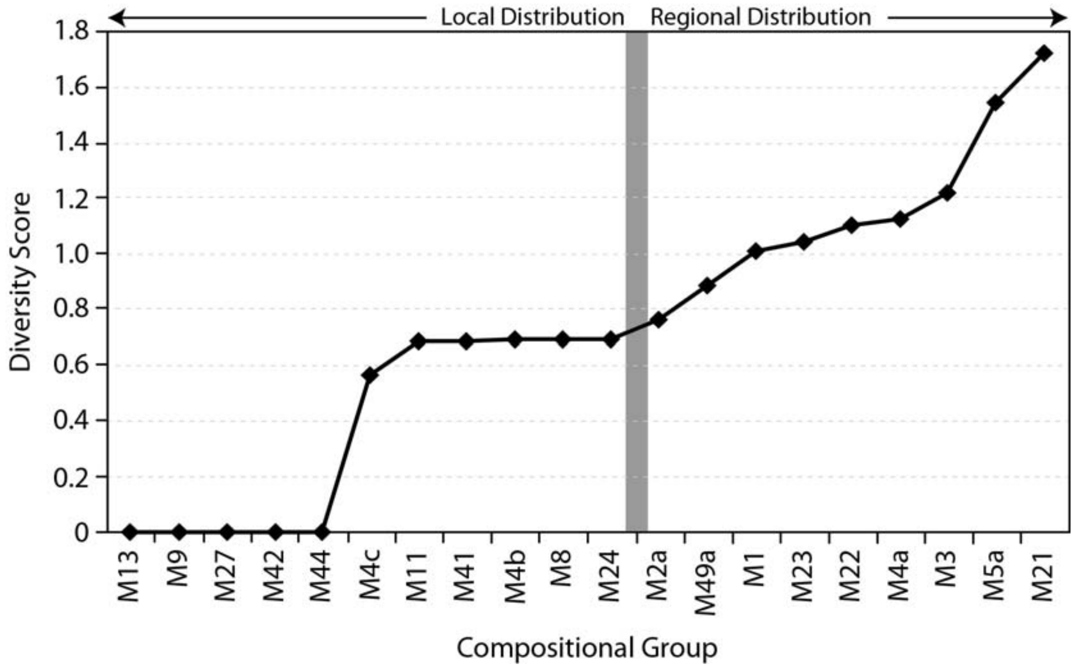

Figure 10.21: Diversity scores for Mimbres Black-on-white Style II ceramics associated with different compositional groups.

production of Mimbres Black-on-white Style I ceramics assigned to these compositional groups was determined to represent production for local distribution (Figure 10.21).

Mimbres Black-on-white Style III

A total of 1398 Mimbres Black-on-white Style III ceramic samples have been submitted for chemical characterization. Of these, 1114 were assigned to compositional groups established by Speakman (2013). These samples were collected from 74 different sites in 15 different geographic zones and were assigned to 25 compositional groups (Figure 10.22). The compositional groups with the highest number of samples were the Mimbres-4a (n = 196 or ca. 18 percent), Mimbres-2a (n = 189 or ca. 17 percent), Mimbres-1 (n = 182 or ca. 16 percent), and Mimbres-21 (n = 110 or ca. 10 percent) compositional groups. Samples attributed to these groups were primarily collected from sites in the same geographical area as the compositional groups' production zones.

The one exception to this is the Mimbres-1 compositional group where only 14 percent of the Style III assemblage assigned to this group originated from sites in the Eastern Mimbres area. Roughly 41 percent of Style III samples assigned to this group originated from sites in the Mimbres geographic zone. While Speakman (2013) believes that the Mimbres-1 compositional group was produced in the communities on the eastern slopes of the Black Range, the high proportion of samples assigned to this compositional group that were recovered from sites in the Mimbres valley suggests that production took place there and that Mimbres-1 wares were intensively consumed by social groups in the Eastern Mimbres area.

Despite this discrepancy, ceramics in these compositional groups tended to be dispersed between at least six other geographic zones. These patterns suggest a strong pattern for the regional distribution of Style III ceramics manufactured from these compositional groups' materials (Figure 10.22).

A total of 11 other compositional groups (Mimbres-2b, 4b, 49a, 2c, 24, 11, 42, 22, 9, 23, and 5a) also exhibited evidence for the regional distribution of Mimbres Black-on-white Style III ceramics produced from their materials. While the number of samples assigned to these groups each consisted of less than 10 percent of the 1114 samples assigned to distinct compositional groups, they tended to be from sites located in four different geographic zones.

The remaining compositional groups containing Mimbres Black-on-white Style III ceramic samples were found to be locally distributed (e.g. Mimbres-5b, 27, 41, 43, 44, 49b, 4c, 8, 3, and 10) (Figure 10.22). These groups on average contained only 13 samples the majority of which were collected from sites in the same geographic zone as that compositional group's production area.

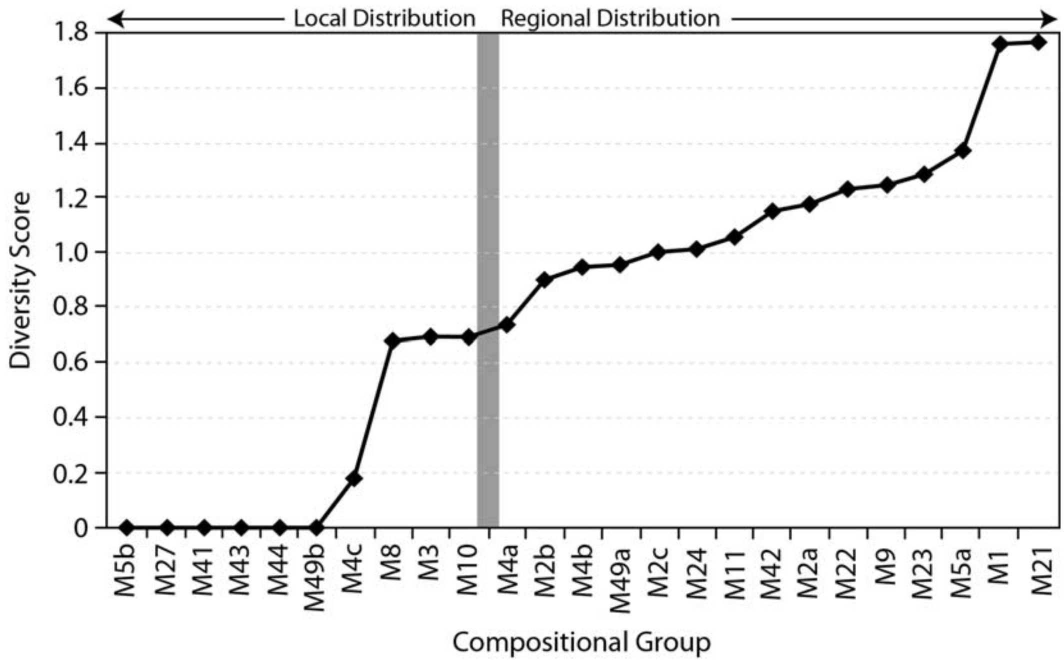

Figure 10.22: Diversity scores for Mimbres Black-on-white Style III ceramics associated with different compositional groups.

Mimbres Polychrome

A total of 42 Mimbres Polychrome ceramic samples have been submitted for chemical characterization. Of these, 35 have been assigned to compositional groups. These samples were collected from eight sites distributed across three geographic zones and were assigned to 10 compositional groups. The compositional groups with the highest number of samples are the Mimbres-2a and Mimbres-4b compositional groups (n = 8 and n = 9 respectively). The majority of these samples were collected from sites in the same geographic zone as these groups' production areas. Of all of the compositional groups containing Mimbres Polychrome samples, only Mimbres-4b contains a single ceramic sample which was recovered from a site outside of the group's production zone. Thus, based on the available data, it appears that Mimbres Polychrome production was organized for local distribution (Figures 10.23).

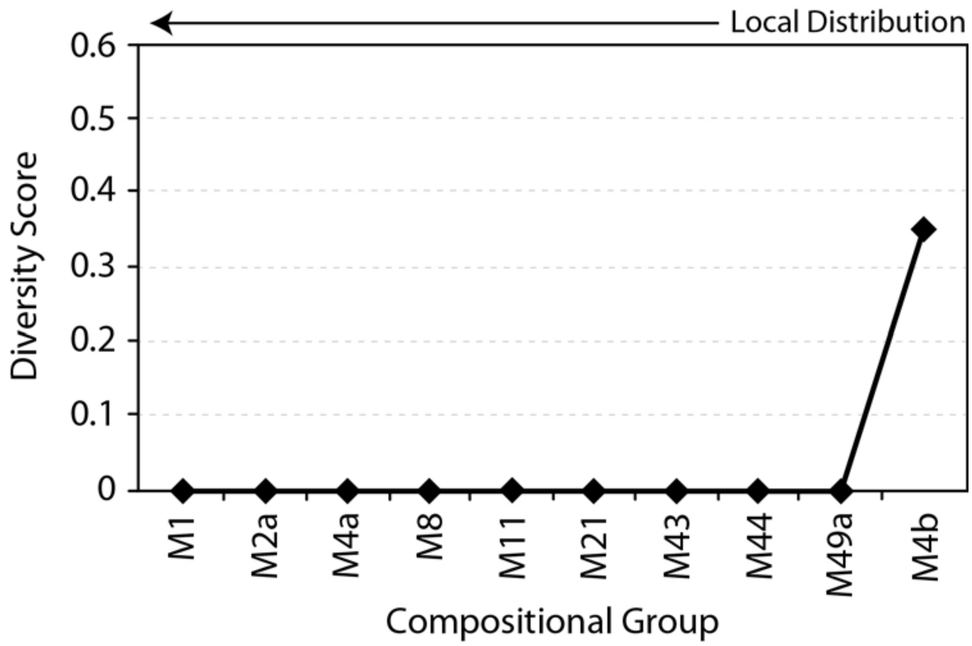

Figure 10.23: Diversity scores for Mimbres Polychrome ceramics associated with different compositional groups.

Summary of the Organization of "Mimbres" Pottery Production

The data presented above are interpreted as indicating that ceramic production was organized as both individual/household specialization as well as community specialization during the Pithouse and Classic periods. Both of the methods of organizing production probably utilized an independent kin-based labor force to produce ceramics on a part-time basis. They differ however in the perceived concentration of production. The first method of organizing production involved the production of utilitarian brownwares and early decorated ceramic types (e.g. Mogollon Red-on-brown and Three Circle Red-on-white). Based on the distribution of these ceramic types, it is believed that their production was commonly organized as individual/household specialization where commodities were produced for local consumption. In contrast, the production of Mimbres Black-on-white ceramics became increasingly organized as community specialization through time. In this system, production tends to be more restricted with the ratio of producers to consumers becoming greater than that of individual/household specialization. Because production is more restricted and production must accommodate an increased demand, commodities produced in a community specialization system tend to be more widely distributed than items produced for local consumption.

It should be noted that certain aspects of vessel form could contribute to the patterns outlined above. As researchers have noted (e.g. Hodder 1974:179-182; Rice 2005: 198) the overall size and/or the perceived value of the commodity often influences the areal extent over which the commodity is exchanged. With regard to Mimbres Black-on-white bowls, their relatively small size and the fact that they could be nested, or stacked for transport, possibly contributes to their more expansive distribution when compared to other vessel forms that lack these characteristics. This is especially so for vessels which are relatively large and bulky such as Mimbres Corrugated jars. Usually these large, bulky containers are less widely distributed than their smaller counterparts. However, there are examples from the larger Mogollon area that demonstrate similar wares were often exchanged over rather large distances (e.g. El Paso Polychrome jars).

The distribution of non-Mimbres Black-on-white pottery (e.g. Three Circle Red-on-white, Mogollon Red-on-brown, etc.) demonstrates that production was organized differently for these different wares. This is in spite of the fact that earlier decorated types were equally suited for more efficient distribution when compared to larger ceramic vessels such as Mimbres Corrugated jars.

THE ORGANIZATION OF PLAYAS POTTERY PRODUCTION

As was the case for "Mimbres" pottery production, what we know of Playas pottery production rests more on the absence of evidence than it does on direct evidence. There is currently no evidence to suggest that the type of socio-political differentiation needed for attached production existed during the Black Mountain phase. To be certain, there is some variability in the treatment of the dead during this time period, though this variability does not suggest that some individuals exerted more decision-making authority. There does appear to be an increase in secondary cremation interments during the Black Mountain phase when compared to the Classic period (see Chapter 11). However, flexed subfloor inhumations with killed pottery vessels are also common in the Black Mountain phase just as in the Classic period. Mimbres archaeologists are currently uncertain as to whether these differences in the treatment of individuals at death correspond to other forms of socio-political differentiation.

Like preceding periods, no features indicative of pottery production have been found during excavations at Black Mountain phase sites. While we are uncertain as to whether pottery manufacturing tools are common at all Black Mountain phase sites, they were relatively common at the Black Mountain phase component at Old Town. Similarly, a lump of potter's clay was encountered in Room C2 at Old Town (assigned to Playas Red 1 compositional group). Coupled with compositional data, this suggests that pottery production was occurring at Old Town during the Black Mountain phase. Furthermore, while there are many sampling issues that need to be taken into consideration with the Playas INAA data, the available data suggest that Playas pottery production was dispersed throughout the larger Mogollon area.

Again, the scale of Playas pottery production in the Mimbres area during the Black Mountain phase also probably mirrors that of earlier time periods and was composed of individuals or members of the same household who shared other productive tasks. There is no evidence to suggest that larger-scale social groupings were responsible for production. A number of vessels have shown up on the black market which show that children likely helped in some, if not all, of the steps in the ceramic operational sequence (Figure 10.24). These vessels show a considerable amount of variation in the execution of design elements as well as in vessel construction, indicating that children assisted in the production process and that practicing potters aided to scaffold certain activities in the production process (partially constructing a vessel to be decorated by a child, framing the design area, etc.). To the best of my knowledge however, no such vessels have been reported from systematically excavated contexts nor is it known if any derive from Mimbres area sites.

Figure 10.24: Example of Playas Incised vessel for sale on the black market that contains evidence of the tutelage of children in the pottery manufacture process. This vessel demonstrates that the initial forming of the vessel was potentially conducted by a more competent practitioner. The crudeness of the rim could indicate that a less competent practitioner aided in this part of vessel formation. The relatively crude execution of the incised designs indicates that a child’s hand was likely responsible for the vessel’s surface decoration.

Like the Mimbres ceramics described above, the intensity of Playas pottery production also seems to have been based on part-time specialization. Contrary to the situation present during the Classic period, pottery appears to have been produced during the Black Mountain phase in the southern portions of the Mimbres Valley. Indeed, Minnis (1985) shows that the proportion of riparian species present in charcoal samples recovered from Black Mountain phase contexts mirrors that of Pithouse period contexts. This potentially suggests that, with the decreased population between the Classic period and the Black Mountain phase (and thus the decreased demand for fuel wood), the fuels necessary to fire pottery were again available in the form of fast growing riparian trees, having rebounded to near pre-Classic period conditions or at least to a level sufficient for modest ceramic production. With fuels available to meet local demand, increasing pottery production in other areas of the Mimbres valley to meet the demand of the southern Mimbres Valley would not prove to be an efficient option. While this condition changed from the Classic period to the Black Mountain phase, the other conditions affecting the intensity of Playas pottery production (i.e. risk and scheduling) would have likely seen little change.

The data presented above indicates that Playas pottery production was organized as either individual/household specialization or community specialization. For Playas ceramics, the efficiency associated with the intensity of production is not useful in discerning which groups organized their production in a particular manner. In order to determine if social groups making Playas pottery organized their production as individual or community specialization, the distribution of compositional groups across geographic regions was analyzed via diversity scores calculated in the same manner as described previously (Table 10.9) (Figure 10.25). The resulting data demonstrate that the majority of compositional groups were locally distributed (n = 7). Playas ceramics assigned to compositional groups Playas Red 2, Playas Red 3, and Mimbres 10 were, however, more widely distributed.

These data appear to indicate that the vast majority of Playas ceramics were locally distributed and thus had their production organized as household specialization.

Table 10.9: Proportion of ceramics attributed to specific compositional groups recovered from different production zones. The number next to the production area corresponds to the area depicted in Figure 10.15.

	Arenas (2)	Burros (4)	Casas Grandes (13)	E. Mimbres (9)	Jornada (11)	Mimbres (1)	Rio Grande (10)	S. Rio Grande (12)	San Francisco (7)	No. of Samples
M10	0.14	0.14				0.43			0.29	7
M49a	0.05					0.95				20
M4c						1				10
M5a						0.75		0.25		8
PR4				0.13		0.88				8
PR1	0.02					0.98				57
PR2				0.03	0.2	0.71	0.06			35
PR3					0.2	0.6	0.2			5
PR5			1							3
PR6						1				2

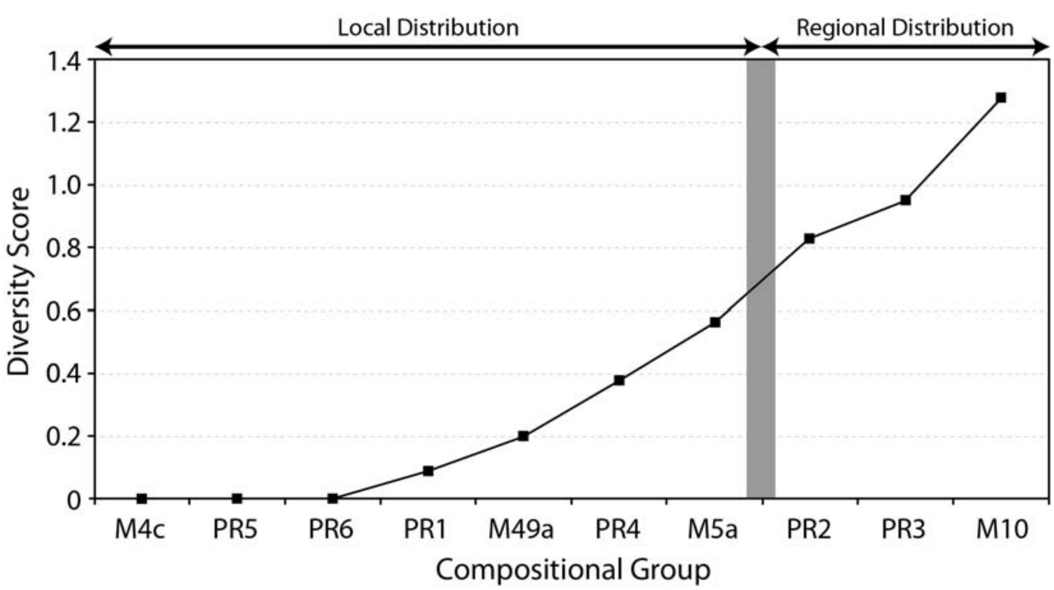

Figure 10.25: Depiction of diversity scores associated with each compositional group. These scores were based on the distribution of Playas ceramics manufactured from specific compositional groups within each of the geographic/production zones depicted in Figure 10.15.

The few Playas compositional groups that were more widely distributed could have had their production organized as community specialization, but the current sample does not allow me to make this assertion with confidence. Similarly, the Playas ceramics attributed to Mimbres 10 could have been produced at multiple locations where primary clays derived from granitic parent material are present. Thus, the distribution of this group is probably more restricted than current evidence supports. Additional sampling is likely to show that this compositional group can be separated into more groups with distributions likely centered around the individual ranges where primary granitic clays are exposed.

When these data are compared to the data presented for the organization of Mimbres ceramic production, interesting patterns emerge. As stated previously, there appear to be two methods of organizing Mimbres pottery production that are primarily differentiated based on the distribution of the wares produced. For the most part, utilitarian wares and early decorated ceramics (e.g. non Black-on-white ceramics) were primarily distributed locally. When Mimbres Black-on-white pottery begins being produced, we see ceramics more frequently distributed outside of their zone of production. The number of compositional groups associated with Mimbres Black-on-white Style I-III pottery production that are distributed on a regional level increases through time (Figure 10.26). While the majority of compositional groups associated with Style III pottery production are distributed on a regional level, a little less half still exhibit a local distribution pattern, suggesting that only some communities of practice organized their production to meet regional demands. This somewhat changes with Playas series pottery production. For ceramics in this series, the majority of wares are distributed locally. Only 30 percent of the compositional groups from which Playas series ceramics were manufactures were distributed on a regional level. The proportion of compositional groups exhibiting local and regional distribution characteristics does not differ significantly from those associated with earlier pottery types. This suggests that Playas series ceramic production was organized on a similar scale to those commonly associated with the Mimbres occupation of the area.

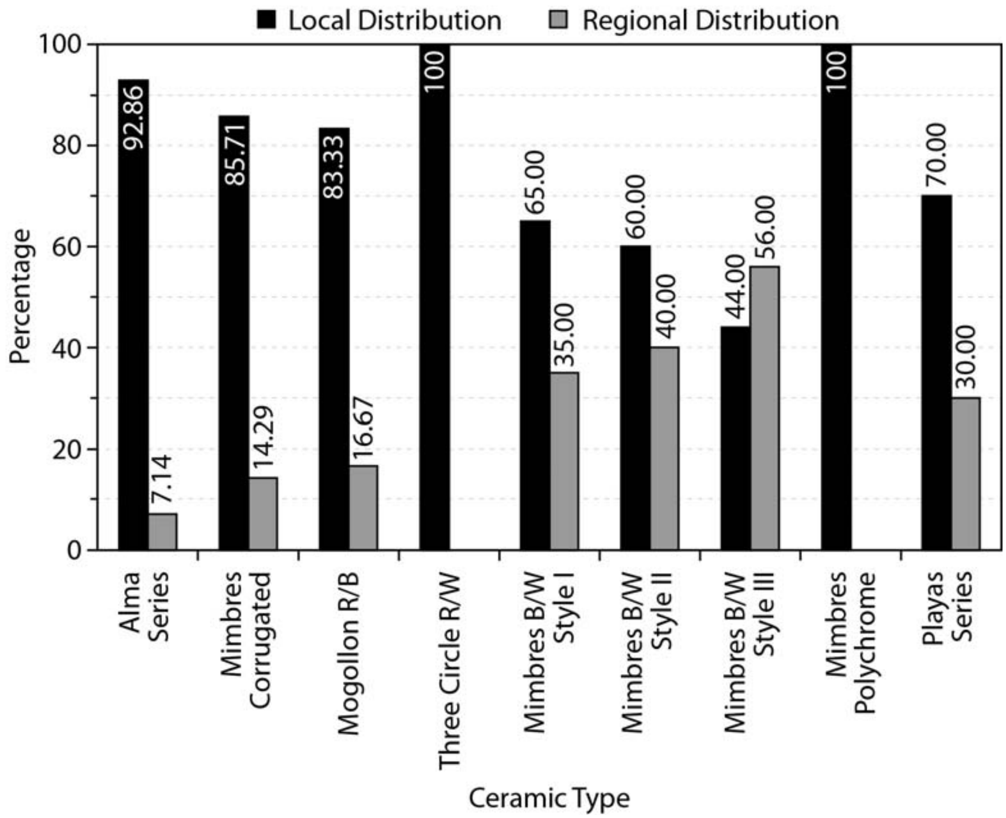

Figure 10.26: Proportion of compositional groups associated with different ceramic types that exhibit either local or regional distribution characteristics.

SUMMARY

The above data indicate that there are at least nine compositional groups relating to production of Playas ceramics. Many of the compositional groups were likely produced at sites in the Mimbres valley (i.e. Playas Red 1, Playas Red 3, Playas Red 4, Playas Red 6, Mimbres-4c, and Mimbres-49a). Likewise, the available data suggests that production was not limited to the Mimbres valley proper, but production of Playas ceramics also took place in the Jornada area (Playas Red 2), in the areas surrounding Casas Grandes (Playas Red 5), in areas around the upper portions of the Gila River (Mimbres-5a), and at multiple locations such as the Burro Mountains (Mimbres-10) where primary clays form in situ from granitic parent materials. All of these areas had Black Mountain phase occupations. The fact that some Playas series ceramics were manufactured from raw materials that shared similar bulk chemical composition with compositional groups established for Mimbres Black-on-white ceramics suggests some form of continuity of practices associated with ceramic technology in the region.

At the inter-site level, there is considerable variability in the distribution of compositional group members. While some of these differences correspond to the fact that some sites are likely production centers for the compositional groups most prevalent in their assemblage (e.g. Playas Red 1 at Old Town, Playas Red 2 at the Dam site and FB6884, and Playas Red 5 at Casas Grandes), other patterns speak to the existence of far-flung distribution networks.

While there is substantial variability between sites with respect to compositional group representation, there is less significant variability between excavated rooms within the Montoya, Walsh, and Old Town sites. Part of this is likely due to the fact that what variability is present within Playas ceramic assemblages recovered from floor contexts is evenly distributed throughout sampling strata so that statistically significant differences between strata are not recognized. This is demonstrated in Figure 10.27 that depicts the diversity and evenness scores associated with each room's Playas NAA samples. As this figure shows, while different rooms contain samples attributed to a diverse distribution of Playas compositional groups (diversity), the distribution of these samples among different compositional groups is similar for many of the excavated rooms (evenness).

These data suggest that the inhabitants of different rooms at Montoya, Old Town and Walsh tended to obtain their Playas ceramics from multiple areas. However, the residents of rooms C1, C2, and C11 at Old Town and room 5 at Montoya seem to have obtained all of their Playas vessels locally as indicated by exclusive Playas Red 1 group membership of samples.

Data concerning the organization of production of Playas ceramics indicate that production likely took place as household specialization. While some of the source groups appear to indicate that wares were distributed on a regional scale and production

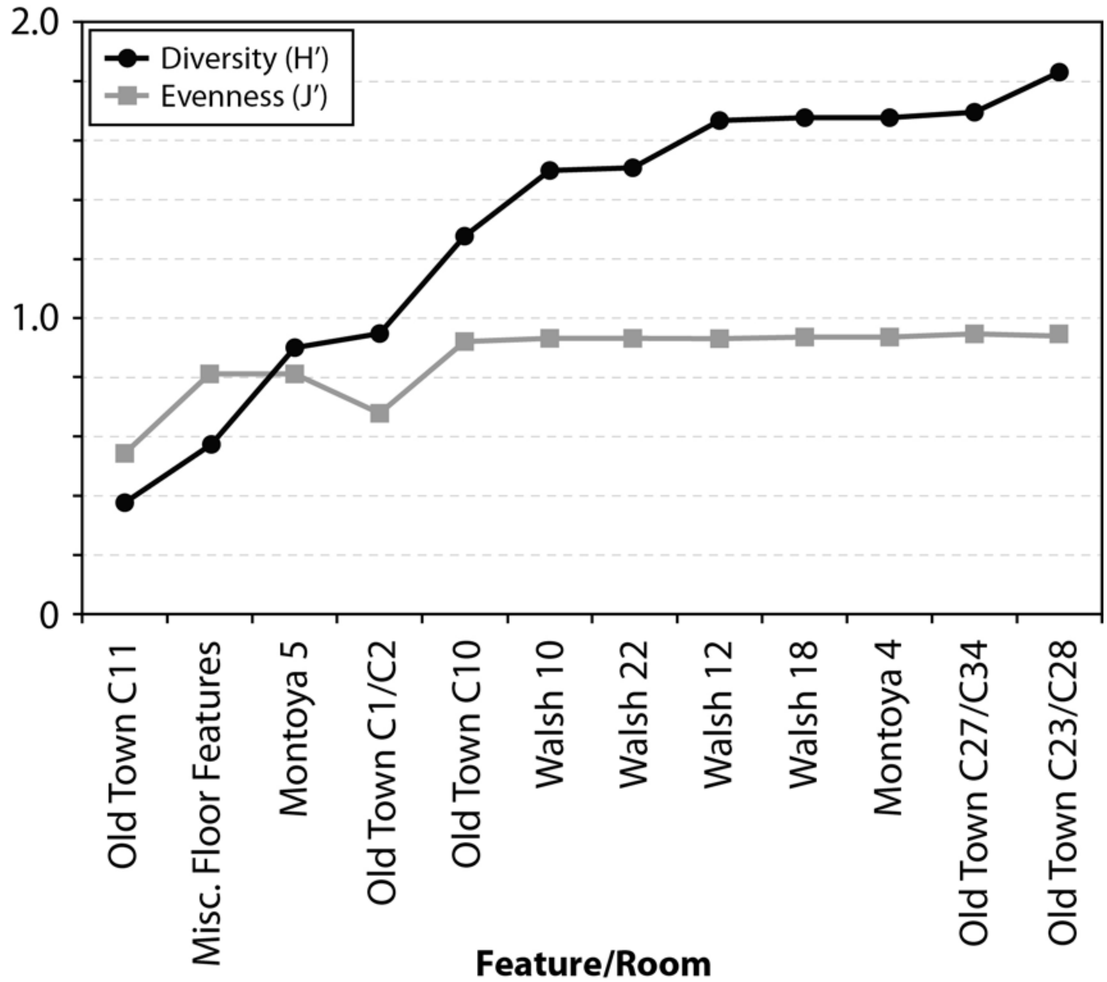

Figure 10.27: Diversity and evenness scores associated with the proportion of different compositional groups present in different excavated rooms' Playas series ceramic assemblages.

thus organized at the community level, this may not necessarily be the case. For instance, while the Playas Red 3 compositional group appears to exhibit a regional distribution, it contains only five samples. Sites with members in this group were fairly widely distributed, so the diversity score associated with this group are higher than those for other groups (Figure 10.25). However, assigning a likely production area for this compositional group is effectively impossible due to the fact that it has so few members.

Further sampling would likely show that this group is less widely distributed than currently portrayed and would also help to further refine efforts to determine its actual area of production. Similarly, Playas ceramics assigned to the Mimbres-10 compositional group likely represent multiple production areas where primary clays are formed in situ from granitic parent materials (Speakman 2013). Thus, the distribution of members of potential sub-groups of the Mimbres-10 compositional group are likely to be less variable.

Accordingly, it appears that the only regionally distributed Playas compositional group is Playas Red 2. I believe that this difference in distributional patterns is primarily related to the fact that ceramic production in the Jornada area was organized differently during this time period. While there is considerable variability in the bulk chemical composition of El Paso Brownwares, Bichromes, and Polychromes, current evidence suggests that the majority of these ceramics were produced in the area around the modern city of El Paso (Miller and Ferguson 2010; Miller and Graves 2012). These wares were widely distributed across the southern southwest and it is likely that most of the El Paso series compositional groups were regionally distributed. Thus, during the time period when Playas ceramics were produced, the inhabitants of the Jornada area had already organized their production at the community level. It would thus make sense that the production of other ceramic types in the same area would also be organized along similar lines.

Taken as a whole, these data suggest that individual households were responsible for the production and distribution/consumption patterns present with respect to Playas series ceramics. The patterning of different compositional groups suggest similarities with the production of earlier decorated and utilitarian wares whose production was primarily organized as individual/household specialization.

Chapter 11: Mortuary Practices

One of the more telling characteristics of the Mimbres Mogollon is their practice of subfloor interment of deceased individuals. These individuals were frequently buried with a killed vessel placed over their head. This pattern persisted from the later part of the Late Pithouse period through the Classic. While this burial practice occurred at Walsh and Montoya, the increased frequency of cremation came to characterize the burial customs of post-Classic occupants of the area.

As has been recognized by multiple researchers (Creel 1989, 1999b; Hegmon et al. 1999; Shafer 1999a, 2006a) this burial pattern continues into the Black Mountain phase and is perhaps the strongest evidence for continuity between Classic period and Black Mountain phase peoples. In the following section I describe the burials that have been recovered from Black Mountain phase components in the Mimbres area. I then conduct analyses to determine how these patterns correspond to patterns present in other areas of the larger Mimbres region.

BLACK MOUNTAIN PHASE BURIALS

The only sites in the Mimbres area that have had systematic excavations in Black Mountain phase contexts and that have yielded human interments are the Walsh, Montoya, and Old Town sites. There were 18 interments at Walsh, five at Montoya, and a minimum of five at Old Town. Other Black Mountain phase interments, both inhumations and secondary cremations, have been found in other sites; but the unsystematic nature of their excavation precludes a meaningful assessment of the mortuary behavior at those sites.

Old Town

Two inhumations and one cremation were recovered while excavating Room C27/C34. Feature C34-3 represented the burial of an adult female. The feature was first noticed as a dark oval stain in the floor of Room C34. The individual was in a tightly flexed position with her head positioned to the south and pelvis to the north. Her head had been placed on a small rhyolite slab at the time of interment. No associated funerary objects were found in association with the individual, but only a portion of the fill surrounding the individual was removed. Based on long bone measurements, this individual was approximately 164.7 centimeters (5 feet 4 inches) in stature.

Feature C34-18 represents the burial of an adult male who, based on long bone measurements, was around 167.1 centimeters in stature (5 feet 5 inches). The feature was first recognized as a distinct oval adobe patch in the floor of Room C34. Underneath this adobe patch were a series of rhyolite slabs that had been placed over the individual (placement of stone coverings was a Classic period characteristic at the NAN Ranch site). The individual was interred in a semi-flexed position and was oriented along a northwest/southeast alignment with his head to the northwest. A plain Playas incised bowl was placed over the individual's head. This vessel had been killed prior to being placed over the head of the individual. The vessel had a rim diameter of approximately 26 centimeters and had an exterior incised herringbone pattern. The base of the vessel exhibited evidence of a spiral corrugation pattern (Figure 11.1). In that portion of the fill excavated, a single Olivella shell bead, a Mimbres Black-on-white Style I rim sherd, a plain Mogollon brownware body sherd, and a few flakes and animal bones were found, all but perhaps the bead being incidental inclusions.

Feature C34-17 represents the disturbed remains of an adult female who was likely interred in the northeast corner of Room C34. Some of these remains were exposed on the surface within a looter's spoil pile adjacent to the excavated pit in the northeast corner of the room. Because the remains were disturbed, no efforts were taken to further define their original burial context. Based on limited analysis of the remains exposed on the surface, it is believed that the individual measured approximately 157.3 centimeters in stature (5 feet 2 inches tall).

An infant burial was encountered while conducting subfloor testing of Room C1 (Creel 2006a:267). A small smudged brownware bowl was associated with the infant. This vessel had been killed prior to being interred with the individual. Unfortunately the skeletal remains of the infant were too fragmentary for additional analysis. Similarly, a disturbed pit in Room C2 contained cranial fragments of an adolescent. Additional disarticulated human remains were found elsewhere in the Black Mountain phase portion of the site, suggesting that more individuals had been buried there. However, because this portion of the site also contained a Late Pithouse period occupation, it was not possible to assign the remains to that as opposed to the Black Mountain phase occupation with any confidence.

Figure 11.1: Playas Incised bowl found in association with Feature C34-18; illustration derived from photo taken at the time of excavation because the skeletal remains and associated vessel were reinterred the day of excavation.

Feature C31 represents the remains of a secondary cremation in a Playas Red Incised jar. The cremation was encountered while trenching the west wall of Room C27/C34. The individual was interred beneath the floor of Room C27 and was placed in such a manner that the rhyolite slab cap of the cremation vessel touched the floor of Room C27/C34 and the vessel's base touched the floor of Room C35, an earlier Black Mountain phase room. The cremated remains were not analyzed past their initial identification due to the terms of the ARPA permit for the Old Town excavations in 2006. Because of this, it is unknown if the individual was interred with any additional funerary objects.

Walsh and Montoya Sites

Black Mountain Phase burials were encountered by the Mimbres Foundation during their testing of Walsh and Montoya. Most burials were found beneath the floors of excavated rooms though one intrusive burial at Montoya was found resting in room fill. A total of five burials were recovered from Montoya. Four of these were inhumations and one was a cremation. Of the four inhumations, two were interred with killed vessels, one with a killed El Paso Polychrome bowl, the other with a killed Chupadero Black-on-white bowl. The cremation was placed inside a Playas Incised jar which was covered with a Playas bowl (Ravesloot 1979).

A total of 18 burials were recovered from Walsh. Of these, all but three were inhumations (Ravesloot 1979). Five inhumations were interred with vessels covering their head, only one of which was killed. One was buried with a St. John's Polychrome bowl as associated funerary object. This vessel was incomplete and found shattered in pieces throughout the burial's fill (Anyon 2014, personal communication). Of the remaining nine burials only one, an individual buried with bone beads, contained grave goods. The remaining eight inhumations were interred without any preserved funerary objects. Two of the three cremations were placed in Playas jars, but the third was apparently interred in a pit without a preserved container (Ravesloot 1979).

Based on the data presented for these Black Mountain phase burials, roughly 14 percent of the burials encountered within the Black Mountain phase components at Old Town, Walsh, and Montoya were cremations that were interred within a vessel (n = 4). One cremated individual (ca. 4% of all burials) was simply interred within a pit at Walsh. In total, roughly 18 percent of burials from excavated Black Mountain phase sites were cremations. Approximately 36 percent (n = 10) of the inhumations encountered at these sites were interred with ceramic vessels. There were 11 inhumations (ca. 39% of all burials) that were interred without grave goods. Two individuals (ca. 7% of all burials) were interred with beads of various sorts. In total, approximately 82 percent (n = 23) of the Black Mountain phase burials at these sites were flexed subfloor inhumations.

REGIONAL MORTUARY PRACTICES

Previous researchers have noted that cremations appear to become a more popular means of disposing of the deceased through time (Creel 1989; LeBlanc and Whalen 1980). On a regional scale this appears to be the case. As depicted in Tables 11.1 through 11.3, the proportion of cremations generally increases from the Classic period through to the Black Mountain phase. However, while this general trend appears to be common throughout the region, there are subtle differences present between different geographic areas (Figure 11.2).

In particular, cremations are most common in the areas surrounding the Gila River around Cliff, New Mexico (Table 11.3). In this area cremations account for approximately 24 percent of all burials encountered at excavated sites during the Late Pithouse period. This proportion jumps to approximately 41 percent during the Classic period and reaches its peak during the Cliff/Salado phase where cremations account for nearly 60 percent of all burials in the area. To date, no Black Mountain phase sites have been excavated in the area so it is impossible to discern how burial patterns during this time period correspond to those of the Classic period and Cliff/Salado phase.

Table 11.1: Number of cremations and inhumations present within different temporal components at specified sites in the Mimbres valley. The abbreviations at the top of the table represent the temporal occupation the burials were associated with (LP = Late Pithouse period, CL = Classic period, BM = Black Mountain phase, C/S = Cliff/Salado phase). Information compiled from Creel (1989), LeBlanc and Anyon (1979), and Wheat (1981).

	LP		CL		BM		C/S		Unknown	
Site	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation
Bradsby				13						
Disert							1			
Eby				129						
Galaz	2	119	13	744	6	33			3	
Harris	2	48								
Mattocks		2	4	315		1				5
Montoya					1	4				
NAN Ranch	7	34	4	137						
Old Town		8	1	58	1	4			3	37
Perrault		2	2	22		1			1	
Rock House		3	2	2						
Swarts	2	75	3	932	1	2				
Three Circle		159								
Upton									1	80
Walsh					3	15				
Total	13	450	29	2352	12	60	1	0	8	122

Table 11.2: Number of cremations and inhumations present within different temporal components at specified sites near Silver City. The abbreviations at the top of the table represent the temporal occupation the burials were associated with (LP = Late Pithouse period, CL = Classic period, BM = Black Mountain phase, C/S = Cliff/Salado phase). Information compiled from Creel (1989), Turnbow (2000), and Woosley and McIntyre (1996).

	LP		CL		BM		C/S		Unknown	
Sits	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation
Beargrass	1	5								
Cameron Creek									2	602
LA 18342					3	5			1	
McDonald					1					
Powe					5					
Treasure Hill		5	1	99						12
Watson Site 92									1	
Wind Mountain	2	115		4						
Woodward			1							
Total	3	125	2	103	9	5	0	0	4	614

Table 11.3: Number of cremations and inhumations present within different temporal components at specified sites in the Gila area. The abbreviations at the top of the table represent the temporal occupation the burials were associated with (LP = Late Pithouse period, CL = Classic period, BM = Black Mountain phase, C/S = Cliff/Salado phase). Information compiled from Creel (1989), Hammack et al. (1966), Lekson (1990, 2002), and Wallace (1998).

	LP		CL		BM		C/S		Unknown	
Site	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation	Cremation	Inhumation
Dinwiddie				2						1
Dutch							8	28		
Heron			2	2						
Lee	5	11								
Mogollon Village	1	8								
Ormand							35		4	18
Red Rock										
Saige-McFarland			3	6					1	
Talbert			2							
Villa Real II								1		
Total	6	19	7	10	0	0	43	29	5	19

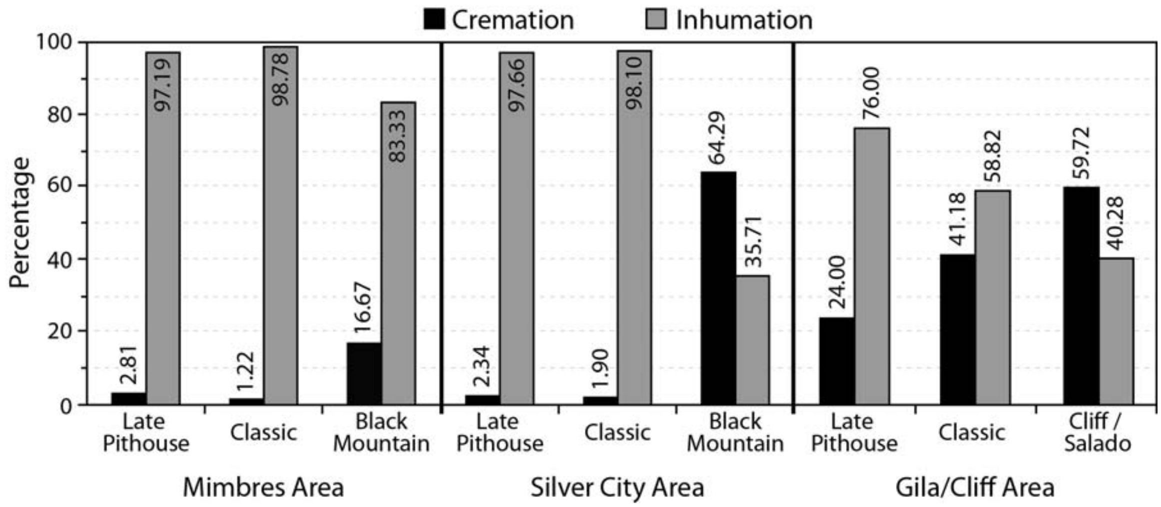

Figure 11.2: Proportion of cremations and inhumations recovered from components dating to each time period in the specified geographic area. Information based on data presented in Tables 11.1 – 11.3.

These patterns in the Gila/Cliff area stand in stark contrast to those present in the Mimbres valley and areas surrounding Silver City. In the Mimbres valley and Silver City area cremations are encountered in contexts dating to the Late Pithouse period, Classic period, and Black Mountain phase. During the Late Pithouse period in both areas, cremations account for only about three percent of all burials (Tables 11.1 and 11.2). This drops to two percent during the Classic period. During the Black Mountain phase cremations account for roughly 17 percent of all burials in the Mimbres area and approximately 64 percent of burials in areas surrounding Silver City. Limited Cliff/Salado phase burials have been encountered in these areas and the one cremation present at Disert was described by Nelson and LeBlanc (1986:43) as an "anomalous feature which may have been a burial pit." The pit was lined with flat cobbles and contained charcoal, ash and bone fragments. While the feature is included here as a cremation, it represents the only known Cliff/Salado phase burial. As such, it does not provide adequate means to measure patterns for the time period in the Mimbres area.

These general trends suggest that cremations increase from the Late Pithouse period through the Cliff/Salado phase. While this increase is rather abrupt during the

Black Mountain phase in the Mimbres area and the Silver City area, it is likely more gradual in the Cliff/Gila area. Here, disposing of the dead by cremation was a rather common practice during the preceding Classic and Late Pithouse periods. While burial data for the Black Mountain phase is lacking for the Gila/Cliff area, there is a proportional increase in cremation burials through time.

SUMMARY

The above data provide new information on the burials recovered from excavations within the Black Mountain phase component at Old Town. These data describe two subfloor inhumations, a subfloor cremation, and a disturbed burial present in Room C27/C34. When coupled with data pertaining to other burials within the Mimbres, Silver City, and Gila/Cliff areas, this information mirrors the known pattern of increasing cremation burials through time.

As Creel (1989:325) notes, cremations were uncommon in the Mimbres area throughout much of the late prehistoric period. Where they are present, they tend to be located in "special areas of the community" (Creel 1989:325). All of the cremations associated with the Cliff/Salado occupation at Ormand Village were found in an extramural cemetery (Wallace 1998). Had the edge of this cemetery not been on the edge of the US 180 right-of-way we may have never known it existed. Because few projects tend to focus on extramural areas, the data relating to burial practices is limited by the heavy bias towards excavating within roomblocks. These areas are those where inhumations are most prevalent. The only other projects that have conducted a modest amount of testing in extramural areas have also found evidence of cremations (Shafer 1991d, 2003; Woosley and McIntyre 1996).

When one examines Tables 11.1 – 11.3 for potential patterns it becomes readily apparent that the sample is biased towards excavation in roomblocks and that burials recovered from certain sites are not likely representative of the mortuary patterns of its inhabitants (e.g. Dutch Ruin and Ormand Village; Table 11.3).

Despite this, cremations appear to be present in all of the areas outlined above during the Late Pithouse period, Classic period, Black Mountain phase, and Cliff/Salado phase. At present all we can say is that their presence appears to increase over time. It is of interest to note that in the Mimbres area the placement of cremations appears to change through time. Earlier cremations are commonly found in extramural areas while later cremations are, more often than not, subfloor interments. Unfortunately, we know relatively little about the social processes responsible for their apparent differential treatment upon death.

As other researchers have noted, the practice of interring individuals beneath the floor of structures with killed vessels placed over their head also persists through the Classic period/Black Mountain phase divide. This pattern is perhaps the strongest evidence supporting claims of continuity between populations occupying the area during these time periods. While we need better sampling of all areas during Black Mountain phase, the Mimbres area likely contains the most representative of those available for the time period. Here, while cremations do occur more frequently, the majority of burials represent subfloor interments, a fair number of which contain killed vessels that were placed over the head of the individual at the time of their interment.

Chapter 12: Concluding Thoughts

The Black Mountain phase (ca. A.D. 1150-1300) has represented one of the more nebulous cultural divisions in southwestern archaeology. This has resulted from the paucity of investigation of sites dating to this time period in the Mimbres area as well as the fact that this time period is one of substantial variability throughout much of the Southwest. Much of this variability resulted from cultural groups responding to changed social and ecological conditions partially brought about by a series of worsening climatic events beginning around A.D. 1130. Dendroclimatological data shows that precipitation began to decrease around this time (Figures 5.7 and 5.8). This reduction in precipitation lasted until around A.D. 1150, the commonly cited beginning date of the Black Mountain phase. However, as Creel (2006b) notes, while this period of decreased precipitation was severe in the Mimbres area, it was worse elsewhere in the Southwest. Thus, while the inhabitants of the Mimbres area may have thought times were bad, they were even worse in surrounding areas.

It is during this period of relative climatic instability that new patterns begin to emerge in the Mimbres area that evidence a break from earlier time periods. Specifically, it is during this time period that architecture and settlement patterns change, Mimbres Black-on-white ceramics cease being produced, new ceramics begin entering the area, and some shifts in mortuary practices occur. Some of these patterns mirror those in areas to the south and east while others appear to be unique to the Mimbres area.

Because of these differences, archaeologists with the Mimbres Foundation hypothesized that the valley had been substantially depopulated by the Mimbres people and repopulated by different ethnic groups. Subsequent interpretations of these patterns have used the presence or absence of particular traits to argue for either the abandonment of the valley during the Classic period to Black Mountain phase transition or continuity between populations of both time periods. However, few researchers have investigated the patterning of socioeconomic structures between time periods. This was mostly a result of the lack of data pertaining to the Black Mountain phase.

It was under these circumstances that additional excavations were conducted within the Black Mountain phase component at Old Town. The previous chapters have documented the materials recovered from these excavations with perhaps one of the most crucial findings of the excavations being the room suites of C23/C28 and C27/C34. As Shafer (2006:31) lamented concerning the state of knowledge of Black Mountain phase occupations, "more details about room function, room variability, doors and connecting rooms, wall bonding patterns, and aggregation" were needed to make meaningful comparisons of social organization between the Classic and Postclassic periods. To date, the Black Mountain phase room suites at Old Town are the only ones excavated in the Mimbres area (acknowledging the fact that contemporaneous room suites in the eastern Mimbres area have been excavated but referred to as Reorganization period).

The C23/C28 and C27/C34 room suites serve as my primary units of comparison while investigating inter-site and intra-site patterns. My analyses mainly focused on three classes of data: architecture, lithic technology, and ceramic technology. These artifact classes were chosen because they are the most ubiquitous at sites throughout time in the area and because they offer insights into the communities of practice associated with their organization. My working premise was to investigate the technological organization associated with these artifact classes to see if there were shifts in organizational strategies between the Classic period and the Black Mountain phase. I believe that this provides better information pertaining to the continuity and/or discontinuity of populations during these periods rather than their end products alone.

My analyses dealing with architectural patterns between periods primarily demonstrated that while individual room size tended to increase through time, the size of room suites tended to remain constant between periods. This is of interest because Shafer (1982) has interpreted these architectural units as representing households during the Classic period. The redundancy of features within these architectural units suggests that similar practices were carried out in their confines. If similar practices were being carried out in Classic period households as compared to Black Mountain phase households, then this would suggest that similar social groupings occupied these spaces.

Shafer (1982:35) notes that "in order to define room clusters, two criteria must be met: first, it must be shown that the rooms were connected by doorways and second, that the room cluster was constructed during one building episode." To date, only Room C23/C28 contains direct evidence of a doorway connecting two defined spaces within the Black Mountain phase component at Old Town (Figure 6.5). Room C27/C34 contained an alcove created by a short wall segment running parallel to the structure's western wall (Figure 6.4). No evidence of a similar wall segment originating from the north wall of Room C34 was encountered within this room suite. Thus, the two rooms were not technically separated by a doorway. Feature C27 bears some similarity in size and placement to the "bed platforms" present at sites in the Casas Grandes area (Di Peso et al. 1974:4:238; Whalen and Minnis 2009:82). Di Peso and colleagues (1974:4:238) believe these spaces were constructed to support sleeping quarters. However, Whalen and Minnis (2009:82) believe that they primarily served as additional storage space for the room's inhabitants. While the exact function of Room C27 is uncertain, the redundancy of features between both C23/C28 and C27/C34 suggests that similar practices were carried out within their confines.

The fact that rooms C23/C28 share their east and west walls in common suggests they were constructed at the same time (Figures 6.5 and 12.1). Similarly, rooms C27/C34 share a common south wall suggesting that they too were constructed at the same time. Based on the wall bonding and abutment sequence for areas surrounding these two room suites, it appears that many rooms surrounding rooms C10, C23, C27, C28, and C34 were erected as a single construction episode.

As shown in Figure 12.1, the wall bond-abutment sequence for this portion of the site suggests that rooms C10, C23/C28, and rooms to the west were constructed simultaneously. The east and west walls of rooms C23/C28 were added sometime thereafter as were additional cross-walls separating different unexcavated rooms to the west of the C23/C28 room suite. Room C25 was tested by a single 1x1 meter unit to determine the depth of deposits in the area as well as look for evidence for a north/south running wall segment adjacent to the west wall of Room C27/C34. Because of the

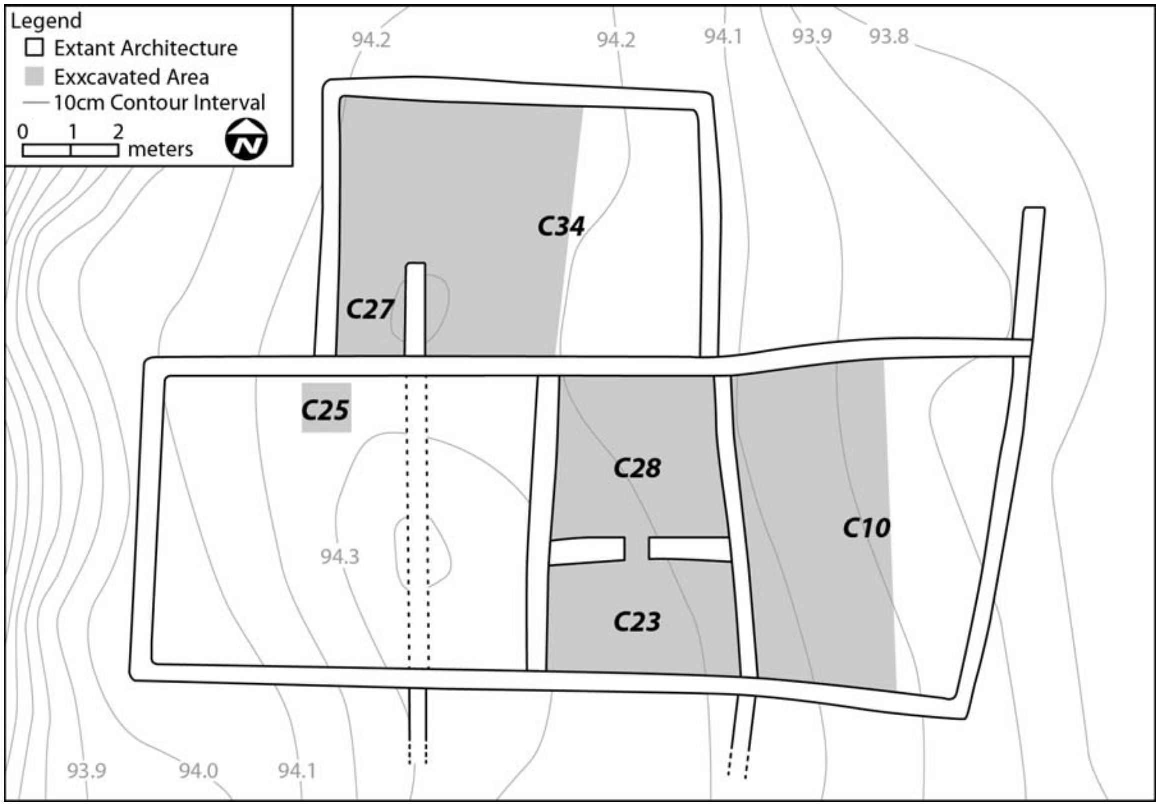

Figure 12.1: Wall bonding and abutment sequence for areas surrounding rooms C10, C23, C27, C28 and C34.

limited exposure of this room, it was not included in the analyses used in this dissertation. Room C27/C34 was later added on to this initial construction episode.

The presence of a long bonded wall surrounding rooms C10, C23/C28, and other rooms to the west suggest that these rooms were constructed at roughly the same time and Room C27/C34 was constructed sometime thereafter. While data pertaining to the function of Room C10 and those west of Room C23/C28 are lacking, fact that these rooms all share common walls suggests that they were constructed by the same social group. If additional rooms with features similar to those present in Room C23/C28 were encountered in the rooms to the east, this could suggest the presence of a corporate group similar to those present in the Mimbres area during the Late Pithouse and Classic periods (Creel 2006c; Shafer 2006).

The data pertaining to the lithic assemblage recovered from the Black Mountain phase component at Old Town demonstrates that lithic technology was organized to accentuate two design strategies during the Black Mountain phase. These two design strategies, generalized and specialized designs, are respectively correlated with the informal and formal tool assemblages. From an inter-site perspective, current evidence suggests that the inhabitants of different villages made use of lithic resources as they were present in the local environment from the Late Pithouse period through the Black Mountain phase. The exception to this is with formal tools manufactured with a specialized design strategy. These formal tools tended to be manufactured from fine grained materials and very few later style projectile points were manufactured from the coarse-grained raw materials most abundant in the area. However, the pattern with respect to informal tools manufactured with a generalized design strategy demonstrates that utilization of crystalline materials increases through time while flakes struck from cryptocrystalline materials decreases through time.

On a general level the informal tools manufactured with a generalized design strategy were produced from materials that were predictable in their distribution. These tools were used to capture resources that were likewise predictable in the spatial and temporal characteristics. The informal tools recovered from excavated rooms within the Black Mountain phase component at Old Town exhibited little evidence of production investment and experienced little use in relation to their maximum potential use. Formal tools manufactured with a specialized design strategy showed more evidence of production investment. The debitage present in Black Mountain phase rooms at Old Town demonstrate that fine-grained cores were likely more thoroughly reduced than their coarse-grained counterparts. Fine-grained debitage tended to be smaller, exhibited more evidence of platform preparation, and retained less cortex than coarse-grained flakes. These data coupled with fact that the majority of projectile points recovered from the site were manufactured from fine-grained materials suggests that fine-grained materials were more commonly used for the production of relatively diverse array of tool forms. These tools were used to obtain a limited set of resources which were less predictable in their spatial distribution and temporal availability.

Statistical analyses demonstrated that there were relatively few significant differences between the informal tool assemblages recovered from excavated rooms within the Black Mountain phase component at Old Town. The majority of statistically significant differences which were present concerned attributes present on flakes struck from the raw materials most abundant in the immediate surroundings of the site: andesite/basalt and rhyolite. These data demonstrate that while all sites likely exploited the lithic landscape similarly, reduction strategies differed from household to household. Since I view these attributes as being indicative of situated practices influenced by the structural elements associated with lithic technology, I believe that the rules and resources drawn upon in the organization of lithic technology were likely transmitted and reproduced at the household level. While comparative data is somewhat lacking for the Classic period, the patterns present in raw material exploitation through time suggest that the organization of lithic technology was similarly structured at Classic period sites.

With respect to the formal tool assemblage manufactured with a specialized design strategy, the available data suggests that these tools were manufactured primarily from fine-grained materials. The majority of these tools represent projectile points that are most commonly manufactured from obsidian. The utilization of obsidian in projectile point manufacture increases through time and reaches its apex during the Classic period where arrow points are almost exclusively manufactured from obsidian originating in the Antelope Creek and Mule Mountain source areas of the Mule Creek source group. This pattern continues, more or less, into the Black Mountain phase where Mule Creek Antelope Creek and Mule Creek Mule Mountain obsidian are the most common within the sourced obsidian assemblage collected from Area C at Old Town.

Debitage patterns suggest that projectile points were entering the area primarily as finished products. Again, this pattern is heightened during the Classic period where the ratio of obsidian projectile points to obsidian cortical flakes is nearly 5 to 1. Based on the low diversity of projectile point styles/types common to this time period, it is possible that communities near the Mule Mountain and Antelope Creek source areas of the Mule Creek source group were producing distinct arrow points, namely Swarts and Cosgrove arrow points, during the Classic period.

I believe that this pattern reflects regional patterns associated with the experimentation of bow-and-arrow technology that was introduced into the region during the early Late Pithouse period. As time progressed, and the structures established during the period of experimentation became more ingrained in society, transmission of the social structures associated with projectile point technology moved from guided variation to conformist transmission (Eerkens et al. 2005). This is evidenced by the decrease in the number of point types present in the area from the Late Pithouse period into the Classic period as well as the decreasing diversity of obsidian sources utilized in the manufacture of projectile points.

The patterns present with respect to obsidian source utilization suggest that sites north of Old Town tended to utilize the Mule Creek obsidian source distribution network from the Late Pithouse through the Black Mountain phase. Sites south of Old Town primarily used the obsidian circulation network responsible for the distribution of Antelope Wells and Sierra Fresnal source materials. The predominance of Mule Creek source materials at Old Town suggests there are other mechanisms responsible for its distribution other than proximity to source. In an earlier study of obsidian distribution patterns, my colleagues and I interpreted the ubiquity of Mule Creek source material at sites as distant as Old Town as representing the presence of "related socio-ideological practices" (Taliaferro et al. 2010). The persistent utilization of these source distribution networks suggests that these socio-ideological practices continued into the Black Mountain phase. The presence of these source materials at other Black Mountain phase sites such as Walsh demonstrates that these materials and the social mechanisms responsible for its circulation remained fairly widespread throughout much of the 12th century (Putsavage 2014: personal communication).

Present data do not allow me to discern obsidian distribution at a smaller analytical scale. I believe the distribution network was regional in scale. However, I am uncertain if these materials were circulated by individual household participation in the exchange system or if larger formal communities were responsible for the distribution of these materials within individual sites. As such, the community of practice associated with the production, distribution, and consumption of Mule Creek source materials is believed to have been regional in scale and persistent through time.

Data pertaining to the ceramic assemblages collected from excavated rooms in the Black Mountain phase occupation at Old Town also shows considerable structural similarities to preceding periods. This is especially so for vessel form and inferred function. Data from NAN Ranch demonstrates that jars are commonly associated with domestic contexts and tended to be used for a less varied set of practices when compared to bowls which are present in a more varied set of contexts and used for a more diverse range of practices (Lyle 1996; Shafer 2003). These same patterns were found to be present within the assemblages recovered from excavated Black Mountain phase rooms at Old Town.

There are other patterns present within the larger dataset that are common to both the Terminal Classic and Black Mountain phase component at Old Town. Specifically, ceramics in the Playas series appear to be more common in Terminal Classic period contexts when compared to what I argue are later Black Mountain phase contexts where El Paso Polychrome ceramics are more common. These later Black Mountain phase contexts are rooms C10, C23/C28, and C27/C34 and presumably the contemporaneous rooms built in the same construction episode, as described previously (Figure 12.1). I attribute these differences to temporal trends in ceramic production and consumption practices. However, as I allude to above, this later Black Mountain phase occupation/building episode could represent a corporate group. If further investigations substantiate this claim, these patterns could merely reflect differing household practices associated with production and distribution.

Regardless of the scenario pertaining to the variability in the proportion of El Paso Polychrome and Playas ceramics in these contexts, ceramics in the Playas series are arguably the only common Black Mountain phase wares that were locally produced. Compositional analyses demonstrate that there are at least 11 compositional groups from which these ceramics were manufactured. The parameters associated with the organization of production for these compositional groups demonstrate that most had their production organized as individual/household specialization. This mirrors patterns for those ceramics produced earlier in the Mimbres sequence. This is especially so for non-Mimbres Black-on-white wares. The organization of production for Mimbres Black-on-white pottery exhibits a pattern of increasing production organized at the community level. This pattern culminates during the production of Mimbres Black-on-white Style III wares that are predominantly organized as community specialization where goods are distributed on a regional scale.

Finally, the data pertaining to mortuary practices through time indicate that there is a difference between the Classic period and the Black Mountain phase in the proportion of deceased individuals disposed of through cremation. The data show an increase in cremation during the Black Mountain phase compared to Late Pithouse and Classic period burials which are predominantly subfloor inhumations. While most interpretations of these patterns approach the data from a regional scale, the current analyses shows that occurrences taking place at smaller scales (e.g. watersheds within the region) are variable. Specifically, the temporal patterns in the Mimbres area show an increase in cremated burials during the Black Mountain phase. However, there are still many interments that represent subfloor inhumations, many of which are interred with killed vessels placed over their head. These subfloor inhumations greatly outnumber cremations in the area during the Black Mountain phase by a ratio of 5:1. Patterns present in the Gila Drainage show a proportional increase in the practice of cremation over time. This suggests that previous patterns of treatment of the dead were merely intensified. The data for the areas surrounding Silver City (Arenas Valley drainage) are not as robust as for the Mimbres valley but nonetheless suggest a substantial increase in the practice of cremation from the Classic period through the Black Mountain phase.

It should be noted, however, that these patterns are heavily biased by sampling designs with nearly all excavations in the three areas targeting intermural deposits. As multiple researchers have demonstrated (Shafer 2003, 1991d; Creel 1989) cremation deposits are most commonly found in extramural areas. Thus, it is likely that the practice of disposing of the dead by means of cremation was far more common than current evidence suggests. If more excavations targeted extramural areas, it is likely that more cremation burials would be encountered.

Taken as a whole these data suggest that there are far more similarities between the Classic Period and the Black Mountain phase than previously recognized. Early investigations into the patterning of features and artifact classes between the two time periods relied on the presence or absence of particular traits to argue for or against the continuity of Classic period and Black Mountain phase populations. The data presented in this dissertation instead investigated the social processes responsible for the presence of particular traits during the Black Mountain phase and made attempts to compare these to those present during the Classic Period. Based on these data, I feel that there are definite patterns that indicate the continuity of populations between these time periods.

The research contained within this dissertation makes contributions to anthropology and archaeology on a number of levels. At a general level, the main contribution of this research lies in the theoretical and methodological perspectives used to investigate issues associated with abandonment. Often, researchers approach this issue by analyzing the presence or absence of specific traits of material culture within the known repertoire of a given socio-cultural group. I have argued that it is instead more productive to investigate the structural principles responsible for presence of these traits within the material culture repertoire of a particular social group. As has been demonstrated, the structural principles associated with the organization of different technologies saw little change from the Classic period through the Black Mountain phase. I believe that is a result of similar sets of rules and resources being drawn upon in the performance of situated practices associated with lithic technology and ceramic technology during these time periods.

From a methodological standpoint, my analyses pertaining to the organization of production should prove useful to researchers trying to make sense of ceramic compositional data. Since production is similarly organized for different technologies in middle-range societies, the use of diversity scores to differentiate household and community production is useful way to approach these issues when formal production features are absent. The utility of this approach is substantiated by my analyses of the organization of production for Mimbres ceramics. Earlier analyses of these data relied primarily on discerning the likely production areas for different compositional groups. My analyses add to these studies by further characterizing how production was likely organized for ceramics dating from the Late Pithouse period through the Black Mountain phase.

While the methodological and theoretical perspectives used to organize my arguments are applicable to a broad set of researchers, the actual data presented in this dissertation will be of use to a more limited set of researchers. Be this as it may, these data are still useful to multiple groups interested in the archaeology of the southern Southwest. Perhaps the main contribution of the data contained within this dissertation is making data from a Black Mountain phase occupation available for other researchers. As has been noted throughout this work, only two Black Mountain phase sites were tested by the Mimbres Foundation (Walsh and Montoya) and test excavations have recently been conducted at the Black Mountain type site (LA 49). Only preliminary descriptions of these testing endeavors have been made available (LeBlanc 1980a; Putsavage 2010, 2013; Ravesloot 1979). As the reader is aware, only general patterns concerning variability in the ceramic and lithic assemblages recovered from Old Town are presented in this dissertation. However, individual data for every piece of debitage, ceramic sherd, and INAA sample recovered from the 2006 and 2007 testing seasons are available at the Laboratory of Anthropology within the Museum of Indian Arts and Culture in Sante Fe, New Mexico. These data sets and the interpretations derived from them will be useful to researchers interested in the social dynamics of prehistoric groups inhabiting the southern Southwest during the 12th and 13th centuries.

Other, non-Mimbres, southwestern researchers will probably find the information pertaining to the Playas INAA data the most useful in their analyses. This pottery type is found throughout a rather large area of the southern Southwest and, based on the analyses contained herein, was likely produced at many locations throughout the region. To my knowledge, the sample analyzed within this dissertation represents the largest sample of Playas ceramics submitted for chemical characterization. Further analyses of Playas series ceramics will likely be able to differentiate additional groups and associated production locales. These additional analyses will also prove useful in refining my distribution patterns for the compositional groups established as part of the analyses contained in this document.

Finally, while the work contained within this dissertation makes substantial contributions to Southwestern archaeology and archaeology in general, much work still needs to be done to adequately address the issues surrounding the Black Mountain phase in the Mimbres area. Perhaps the most glaring deficiency in the research dating to this time period is the lack of precise chronometric control to ground interpretations to time periods of interest. While I hate to advocate the destruction of sites by excavation, the only way to remedy this deficiency is through further testing of sites that are likely to contain well preserved deposits with adequate datable materials. Such sites are out there, though may be difficult to identify due to historic and modern land-use practices. Perhaps one of the most likely known sites to contain such information is Agape Acres. This Black Mountain phase site is located near the Swarts ruin and is buried by roughly 30 centimeters of alluvial overburden that formed when the areas surrounding the site were overgrazed by livestock near the beginning of the 20th century.

Excavation as this and similar sites would allow for more thorough analysis of temporal patterns associated with the Black Mountain phase as well as allow one to adequately address the discontinuous continuity model proposed by Shafer (1999a, 1999b, 2003, 2006). As stated previously, this model hypothesizes that the Mimbres valley was largely abandoned sometime between A.D. 1130-1180 and was then repopulated by groups related to the Classic period inhabitants of the area thereafter. Unfortunately, this hypothesis is impossible to address given current data.

Such information would also prove useful in investigating the occurrences taking place during the transition from the Black Mountain phase to the Cliff/Salado phase. Like the patterns taking place during Classic period to Black Mountain phase transition, the patterns present between the Black Mountain phase and Cliff/Salado phase have seen relatively little investigation. The Mimbres Foundation hypothesized that the Mimbres valley was again abandoned after the Black Mountain phase and was repopulated by groups with a fully developed Salado adaptation (LeBlanc 1980a; LeBlanc and Nelson 1976; Nelson and LeBlanc 1986; Nelson and Anyon 1996). The Mimbres Foundation tested what they believed were the only three Cliff/Salado phase site in the Mimbres valley: Disert, Janss, and Stailey (Nelson and LeBlanc 1986). However, the fact that many of the Black Mountain phase sites identified by the Mimbres Foundation contain post-A.D. 1300 ceramic types potentially indicates that either these sites are Cliff/Salado phase components or demonstrates that these Black Mountain phase sites continued to be occupied into the 14th century.

The data pertaining to lithic technology and debitage analyses (Chapter 7) potentially demonstrates that the Cliff/Salado phase occupants of the Mimbres valley organized their lithic technology differently from the area's earlier inhabitants. Their overwhelming preference for chalcedony demonstrates a significant break from preceding periods. Based on this information, it appears that the groups inhabiting Disert, Janss, and Stailey made use of the surrounding landscape in a vastly different manner than the earlier Mimbres occupations. While this data potentially points to ethnically distinct groups occupying the area during this time period, additional work is needed to discern if there were other contemporaneous occupations that shared structural characteristics with earlier occupations. If there was a contemporaneous Salado occupation that evidenced continuity with Mimbres groups as well as a Salado presence that represented an immigration of people from the Salado heartland, it would be interesting to discern how these groups interacted with one another.

Sites like Black Mountain (LA 49) would potentially prove useful in addressing these issues. This site contains a Black Mountain phase occupation separated from a later Cliff/Salado phase occupation by only a marginal distance (<100m). Putsavage (2013) notes that one of the Black Mountain phase rooms contained a roof beam with a cutting date of A.D. 1266. If one assumes a minimum 40 year use life for structures (Blake et al. 1986), this would potentially indicate that portions of the Black Mountain phase pueblo and the Salado phase pueblo at the site could have been occupied contemporaneously. However, as always, more work is needed to address these complex issues.

In conclusion, the research I have conducted investigating the technological organization associated with artifact classes and architectural practices during the Black Mountain phase has shown that there is more continuity between the Black Mountain phase and Mimbres Classic period populations than previously perceived. While previous research has focused on the presence or absence of specific traits between these two time periods, my dissertation approaches the question of cultural continuity by evaluating the social processes responsible for shifts in organizational strategies. This strategy allows for a more nuanced comparison of the situated practices taking place during these time periods. Data pertaining to the architectural patterns, ceramic and lithic assemblages, and mortuary practices present at the Black Mountain phase occupation of Old Town demonstrate that a similar set of rules and resources being drawn upon in the performance of situated practices during the Classic period and Black Mountain phase. Based on these data, I feel that there are definite patterns that indicate the continuity of populations between the Classic period and Black Mountain phase.

At the broadest level, it is my hope that this dissertation has shown that archeologists and anthropologists are in a unique position to understand how structural principles associated with the organization of different technologies do or do not demonstrate substantial change between different time periods. Because we often tend to view the presence or absence of material items as evidence for the abrupt halt to one set of practices and the beginning of a new one, we often overlook the situated practices that instruct how material culture is produced and reproduced. Material culture may indeed look different, but does technological organization change as well? This is not only a question for future researchers studying the Black Mountain phase in the Mimbres region, but for anyone who is interested in understanding why, how, and when cultures change, past or present.

Appendix A: Mimbres Foundation Black Mountain Phase Site Descriptions

The following section presents a series of site descriptions for Black Mountain phase sites located during the Mimbres Foundation's survey of the Mimbres area. The information contained within this Appendix was taken from original field notes and ceramic tallies (Appendix B) collected by the Mimbres Foundation and provided courtesy of Steven LeBlanc (1979a, 1979b).

The site descriptions are broken down into three broad categories: Black Mountain phase sites identified by the Mimbres Foundation, Multi-component sites with an identified Black Mountain phase occupation, and Classic Period sites whose ceramic assemblages indicated a later occupation. As the reader will observe in these sections, the ceramic tallies associated with these sites often indicate that a later Cliff/Salado phase occupation was also present. For example, Playas and Chupadero Black-on-white ceramics are often found on these sites in association with Chihuahuan Polychrome and Gila Polychrome ceramics. In most instances this would be interpreted as representing a Cliff/Salado phase site as opposed to Black Mountain phase occupation.

However, as discussed in Chapter 12, and elsewhere, chronometric control for all excavations that have taken place at Black Mountain phase components is poor. To date, there are only 10 archaeomagnetic dates, two radiocarbon dates, and one tree-ring date that have come from Black Mountain phase occupations (see Chapter 5 and Chapter 12). Some of archaeomagnetic dates recovered from Black Mountain phase features indicate that certain features were last used in the late 1100s/early 1200s. Others possibly indicate that some features could have been in use during the early 1300s. The two radiocarbon samples collected form Walsh potentially indicate that occupation began around A.D. 1180 and ended sometime around A.D. 1330. These assessments are based on the early and late one-sigma ranges associated with the samples (sample A-1942 one-sigma range: A.D. 1175 – A.D. 1290; sample A-1943 one-sigma range: A.D. 1259 – A.D. 1326 and A.D. 1343 – A.D. 1394). These date ranges are similar to the two-sigma range of the two samples' pooled mean (pooled mean two-sigma range: A.D. 1181 – A.D. 1320 and A.D.

1350 – 1391). Based on these data, it is possible that Black Mountain phase sites were still occupied during the first decades of the 14th century. If this is indeed the case, then the presence of Ramos Polychrome and Gila Polychrome ceramics at Black Mountain phase sites is to somewhat be expected and is not necessarily indicative of a Cliff/Salado phase occupations.

Cliff/Salado phase occupations in the Mimbres area are similarly poorly dated. A total of 11 archaeomagnetic samples were collected from the excavations conducted at Disert, Janss, and Stailey (Nelson and LeBlanc 1986). Of these, only five samples produced dates (see Nelson and LeBlanc 1986, Table 5.1). The majority of these datable samples indicated that features from which the samples originated were last used sometime between A.D. 1240 and 1480 with an average date of around A.D. 1350. Similarly, only one radiocarbon sample was submitted for dating. This sample produced a radiocarbon date of 500 ± 60 years which produces a one-sigma calibrated date range of A.D. 1326-1343 and A.D. 1394-1451 with the latter date range likely containing the actual dated event. Based on these data, the Mimbres Foundation stipulated that the Cliff/Salado phase occupations of the Mimbres valley represent "a brief occupation during the late 1300s, possibly spanning into the early 1400s" (Nelson and LeBlanc 1986:108).

These interpretations of the dating of the different phases are presented to demonstrate that our commonly held notions are not as firmly established as we may think. The dating of the end of the Black Mountain phase at approximately A.D. 1300 and the beginning of Cliff/Salado phase occupation of the area at this same time should be treated as hypotheses in need of further testing. With this in mind, the presence of ceramic types traditionally interpreted as those dating to Cliff/Salado phase at Black Mountain phase settlements could indicate that either these sites were misinterpreted and actually represent Cliff/Salado phase occupations, or could indicate that the Black Mountain phase extends into the time periods when these ceramic types first began being produced (the early to mid-1300s) (Neuzil and Lyons 2005).

For the first two of my broad site categories, the assessment of a Black Mountain phase occupation was actually made by the Mimbres Foundation. For instance, Z:5:8 (LA 2654) and Z:1:6 (LA 18921) were referred to as a "Black Mountain pueblo" and a "Classic and Black Mountain pueblo" respectively in the Foundation's field notes (LeBlanc 1979a). I chose to reproduce these assessments rather than reassign a later temporal affiliation to similar sites primarily because the Mimbres Foundation had a better idea of the overall site assemblage and the chronological control issues outlined above. While collections were made at nearly every site, the notes do not describe the sampling strategy implemented for each site. Thus, there is no way to know if these samples are actually representative of the entire site's assemblage or if they reflect some form of sampling bias (e.g. individuals collecting polychrome sherds every time they encounter them regardless of possible sampling strata).

The last broad category, "Non-Black Mountain phase sites with ceramics commonly associated with the Black Mountain phase," is primarily composed of sites described as dating to the Classic period by the Mimbres Foundations that contain small amounts of Black Mountain phase ceramics. This was the only category where I make an assessment of a site's temporal affiliation. While I don't directly state that these sites represent Black Mountain phase occupations, I imply that they contain either Terminal Classic period or Black Mountain phase occupations.

BLACK MOUNTAIN PHASE SITES IDENTIFIED DURING THE MIMBRES FOUNDATION'S SURVEY

Site Z:5:8 (LA 2654) was originally referred to as a "Black Mountain pueblo" (LeBlanc 1979a). The site represents the remains of a Black Mountain phase pueblo located adjacent to the Mimbres River. The site is believed to contain at least four rooms arranged as a single room block. Of the 31 sherds collected from the site, only six were decorated. Of these six, five represented sherds commonly associated with the Black Mountain phase (Chupadero Black-on-white), though the presence of a Gila Polychrome sherd at the site could point to a later occupation.

Site Z:5:12 (LA 15023) was originally referred to as a "Black Mountain site" by the Mimbres Foundation (LeBlanc 1979a). The site was described as consisting of the remains of two isolated Black Mountain phase one-room structures. The rooms are spaced 18 meters apart from one another and are both located adjacent to the Mimbres River. A total of 124 ceramics sherds were collected from the site and of these only 19 were decorated. Of these 19 decorated sherds only two were types that were produced during the Post-Classic periods. These two types [Ramos Polychrome (ca. A.D. 1250-1450) and Gila Polychrome (ca. A.D. 1300-1450)] point to a post-A.D. 1300 occupation of the site (Neuzil and Lyons 2005).

Site Z:5:13 (LA 15024) was originally referred to as a "Black Mountain site" (LeBlanc 1979a). The site represents the remains of a small Black Mountain phase pueblo that likely contained five rooms arranged in three small room blocks. A total of 335 ceramics sherds were collected from the site of which 237 were decorated. Of these decorated ceramics, 219 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:5:14a (LA 1113) is more commonly referred to as the Old Town site and was described by the Mimbres Foundation as a "Black Mountain pueblo" (LeBlanc 1979a). The site is multi component consisting of a large Pithouse period occupation, a large Classic period occupation, and a large Black Mountain phase occupation. The Mimbres Foundation noted that Z:5:14a lies roughly 150 meters south of Z:5:14, the large Classic period pueblo associated with the site. The site description notes that the Black Mountain phase occupation consisted of a single rectangular room block that contained approximately 35 rooms. A total of 137 ceramic sherds were collected from this portion of the site of which only 59 were decorated. Of these decorated sherds, 15 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:5:15 (LA 15025) was originally described as a "Black Mountain pueblo" by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of a Black Mountain phase pueblo that possibly contained as many as 18 rooms arranged in a single room block. A total of 62 ceramic sherds were collected from the site of which 39 were decorated. Of these 39 decorated sherds, 21 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome). Mimbres Foundation archaeologists noted that some rooms within the pueblo incorporated large flat slabs into their wall sections. These flat slabs were laid horizontal to the ground surface and were separated by cobbles and adobe, a construction type "unique for the area."

Site Z:5:19 (LA 15029) was originally described as a "Black Mountain pueblo" by the Mimbres Foundation (LeBlanc 1979a). The site consists of the remains of a Black Mountain phase pueblo that is estimated to have contained as many as 21 rooms. A total of 231 ceramic sherds were collected from the site of which 62 were decorated. Of these 62 decorated ceramic sherds, 56 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome). More recent site visitations have noted that Gila Polychrome pottery is also present at the site (Creel 2014, personal communication). The presence of this pottery type could point to a later Cliff/Salado phase occupation of the site

Site Z:5:38 (LA 14979) was described as a "Black Mountain site" by the Mimbres Foundation. The site represents the remains of an isolated Black Mountain phase room located along the first bench above the Mimbres River. A total of four ceramic sherds were collected from the site all of which were decorated and classified as types commonly associated with the Black Mountain phase (Playas and Chupadero Black-on-white).

Site Z:5:40 (LA 14981) was described as a "Black Mountain sherd and lithic scatter" by the Mimbres Foundation (LeBlanc 1979a), and as the description implies, the site represents the remains of a Black Mountain phase artifact scatter. A total of 164 ceramic sherds were collected from the site and of these 32 were decorated. Of these decorated ceramics 17 were classified as belonging to an "Other Redware" category. These sherds are the only sherds that could potentially represent types commonly associated with the Black Mountain phase.

Site Z:5:41 (LA 14982) was originally described by the Mimbres Foundation as a "Black Mountain site" (LeBlanc 1979a). The site represents the remains of an isolated Black Mountain phase room. A total of 18 ceramics sherds were collected from the site and of these seven were decorated. No sherds from the ceramic assemblage were classified as type commonly associated with the Black Mountain phase.

Site Z:5:42 (LA 14983) was originally described by the Mimbres Foundation as a "Black Mountain pueblo" (LeBlanc 1979a). The site is commonly referred to as the Levee site as well as the Simon site or Simon Ranch. The site has been severely disturbed by modern land stabilization activities though Mimbres Foundation archaeologists believed that the site likely contained as many as 15 rooms. A total of 115 ceramics were recovered from the site of which 20 were decorated. All of these decorated ceramics represent types commonly associated with the Black Mountain phase (Chupadero Black-on-white and El Paso Polychrome) though the presence of Gila Polychrome ceramics in the assemblage could indicate a later occupation of the site. While the Mimbres Foundation survey form states that this site represents a "Black Mountain pueblo," subsequent interpretations of the site demonstrate that it is likely a Cliff/Salado phase occupation (Creel 2014, personal communication).

Site Z:5:68 (LA 19165) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of a Black Mountain phase artifact scatter. A total of 171 ceramic sherds were collected from the site of which 97 were decorated. Of these decorated ceramics 94 sherds were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:5:80 (LA 15044) is commonly referred to as the Walsh site and is located 1.5 kilometers northwest of Old Town on a bench overlooking the Mimbres River. The site was originally described by the Mimbres Foundation as a "Black Mountain pueblo" (LeBlanc 1979a). The site represents the remains of a 50 room pueblo arranged in three room blocks that enclose a plaza area. A total of 1097 ceramic sherds were collected from the site of which 533 were decorated. Of these decorated ceramics, 472 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome). The site was tested by the Mimbres Foundation in 1976 and again in 1977 and is discussed in more detail in Chapter 5.

Site Z:5:81 (LA 15045) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of a Black Mountain phase artifact scatter. A total of 108 ceramic sherds were collected from the site though no counts of individual types present in the assemblage were found. It is noted however that ceramics classified as belonging to the Mimbres Foundation’s “Other Redware” and “Playas” categories were present at the site.

Site Z:5:89 (LA 15053) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of a Black Mountain phase artifact scatter. A total of 73 ceramic sherds were collected from the site of which 38 were decorated. Of these decorated ceramics, 34 were classified as type commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:5:90 (LA 15054) was originally described as a “Black Mountain pueblo” by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of Black Mountain phase pueblo that contained as many as nine rooms arranged in a single rectangular room block. A total of 1214 ceramic sherds were collected from the site of which 55 were decorated. Of these decorated ceramics, 42 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:5:97 (LA 15061) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of a Black Mountain phase artifact scatter. However, a cobble concentration present on the site possibly suggests that a small room block was present. A total of 18 ceramics were collected from the site of which 14 were decorated. None of the decorated ceramics were classified as types commonly associated with the Black Mountain phase.

Site Z:5:99 (LA 19186) was originally described as a “Black Mountain rock circle site with bedrock mortars” by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of two semi-circular features and an associated artifact scatter that were interpreted as dating to the Black Mountain phase. The features abut one another and are on either side of a large boulder which contains a single bedrock mortar. Six ceramic sherds were collected from the site and all were plainwares.

Site Z:5:105 (LA 15068) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of a Black Mountain phase artifact scatter. A total of 1098 ceramic sherds were collected from the site of which only 15 were decorated. Of these decorated ceramics 12 were classified as Playas, a type commonly associated with the Black Mountain phase .

Site Z:5:108 (LA 15071) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter that was interpreted by Mimbres Foundation archaeologists as dating to the Black Mountain phase. No ceramics were collected from the site.

Site Z:5:110 (LA 15073) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of a Black Mountain phase artifact scatter. A total of 1271 ceramic sherds were collected from the site of which 80 were decorated. Of these decorated sherds 25 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:5:112 (LA 15075) is commonly referred to as the Montoya site and was originally described by the Mimbres Foundation as a “Black Mountain pueblo” (LeBlanc 1979a). The site represents the remains of a Black Mountain phase pueblo that likely contained an estimated 35 rooms arranged in two room blocks. A total of 1317 ceramic sherds were collected from the site of which 138 were decorated. Of these decorated sherds 135 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome). The Mimbres Foundation tested the site in 1976 and the results are discussed in more detail in Chapter 5.

Site Z:5:115 (LA 19168) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. No ceramics were collected from the site.

Site Z:5:131 (no record on file with the Laboratory of Anthropology) represents the remains of a large Black Mountain phase pueblo. The site had been bulldozed when the Mimbres Foundation visited but based on the dispersal of artifacts and the presence of distinct mounds was interpreted to contain roughly 120 rooms that were arranged in multiple room blocks. No ceramics were collected from the site.

Site Z:9:1 (LA 49) is commonly referred to as the Black Mountain site and was originally described by the Mimbres Foundation as a "Black Mountain pueblo" (LeBlanc 1979a). The site represents the remains of a large Black Mountain phase pueblo that contained approximately 200 rooms arranged in four room blocks. Mimbres Foundation archaeologists noted that site had been extensively looted and that "very little of the site remains." A total of 641 sherds were collected from the site of which 244 were decorated. Of these decorated ceramics 223 represents types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome); the presence of Ramos Polychrome and Gila Polychrome is here presumed to relate to the later Cliff phase occupation.

Site Z:9:2 (LA 18808) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter that was interpreted as dating to the Black Mountain phase. A total of 212 sherds were collected from the site of which only seven were decorated. Of these decorated ceramics only six were classified as belonging to an

“Other Redware” category. These sherds are the only sherds that could potentially represent types commonly associated with the Black Mountain phase.

Site Z:9:3 (LA 18813) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents an artifact scatter that was interpreted as dating to the Black Mountain phase. A total of 13 ceramic sherds were collected from the site, though none of the collected sherds were decorated.

Site Z:9:4 (LA 19093) was originally described by the Mimbres Foundation as a “Black Mountain pueblo” (LeBlanc 1979a). The site represents the remains of a Black Mountain phase pueblo that likely contained as many as 20 rooms. A total of 58 ceramic sherds were collected from the site of which only six were decorated. All of these decorated ceramics were classified as belonging to an “Other Redware” category. These sherds are the only sherds that could potentially represent types commonly associated with the Black Mountain phase.

Site Z:9:5 (LA 19094) was described as a “Black Mountain pueblo” by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of a Black Mountain phase pueblo that likely contained as many as 100 rooms. The site has been severely damaged by pot hunting which made it difficult to interpret how these rooms were arranged, but it is believed that at least two room blocks were present at the site. Three clusters of bedrock mortars are also present at the site. A total of 1368 sherds were collected from the site of which 85 were decorated. All of these decorated ceramics were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome) though the presence of Ramos Polychrome and Gila Polychrome ceramics could point to a later occupation.

Site Z:9:6 (LA 19095) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter that were interpreted as dating to the Black Mountain phase. A total of 61 ceramic sherds were collected from the site of which only one was decorated. This decorated ceramic sherd was classified as belonging to an "Other Redware" category. This was the only sherd that could potentially represent a type commonly associated with the Black Mountain phase.

Site Z:9:9 (LA 19098) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter that were interpreted as dating to the Black Mountain phase. A total of 241 ceramic sherds were collected from the site of which only one was decorated. This decorated ceramic sherd was classified as belonging to an "Other Redware" category. This was the only sherd that could potentially represent types commonly associated with the Black Mountain phase.

Site Z:9:15 (LA 19103) was originally described by the Mimbres Foundation as a "Black Mountain pueblo" (LeBlanc 1979a). The site represents the remains of a Black Mountain phase pueblo that is estimated to have contained three rooms arranged as a single room block. Two clusters of bedrock mortars were also encountered at the site. A total of 122 ceramics were collected from the site of which only four were decorated. Of these decorated ceramics all were classified as types commonly associated with the Black Mountain phase (El Paso Polychrome).

Site Z:9:18 (LA 19106) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter that was interpreted as dating to the Black Mountain phase. A total of 60 ceramic sherds were collected from the site of which 35 were decorated. All of these decorated sherds were classified as types commonly associated with the Black Mountain phase (Playas) though the presence of Gila Polychrome could potentially point to a later occupation.

Site Z:9:19 (LA 19107) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 198 ceramic sherds were collected from the site of which 74 were decorated. Of these 74 decorated sherds a total of 73 were classified as types commonly associated with the Black Mountain phase (Playas and El Paso Polychrome) though the presence of Ramos Polychrome ceramics could point to a later occupation.

Site Z:9:20 (LA 19108) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 1121 ceramic sherds were collected from the site of which 34 were decorated. Of these decorated ceramics 33 were classified as types commonly associated with the Black Mountain phase (Playas and El Paso Polychrome) though the presence of Gila Polychrome ceramics could point to a later occupation.

Site Z:9:21 (LA 19109) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 1061 ceramic sherds were collected from the site of which 15 were decorated. Of these decorated ceramics, 13 were classified as types commonly associated with the Black Mountain phase (Playas and El Paso Polychrome) though the presence of Ramos Polychrome ceramics could point to a later occupation.

Site Z:9:22 (LA 19110) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 1118 ceramic sherds were collected from the site of which 27 were decorated. All of the decorated ceramics collected were classified as types commonly associated with the Black Mountain phase (Playas and El Paso Polychrome).

Site Z:9:26 (LA 18809) was described by the Mimbres Foundation as a “Black Mountain sherd and lithic scatter” (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 1043 ceramic sherds were collected from the site of which 27 were decorated. Of these 27 decorated ceramics only 13 were classified as types commonly associated with the Black Mountain phase (Playas and El Paso Polychrome).

Site Z:9:27 (LA 18810) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 1012 ceramic sherds were collected from the site of which only one was decorated. This decorated ceramic sherd was classified as belonging to an "Other Redware" category. This was the only sherd that could potentially represent types commonly associated with the Black Mountain phase.

Site Z:9:28 (no record on file with the Laboratory of Anthropology) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of a large artifact scatter interpreted as dating to the Black Mountain phase. A total of 1252 ceramic sherds were collected from the site of which 157 were decorated. All of these decorated ceramics were classified as types commonly associated with the Black Mountain phase (Playas and El Paso Polychrome).

Site Z:9:29 (LA 18812) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 1137 ceramic sherds were collected from the site of which 52 were decorated. All of the decorated ceramics collected from the site were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:9:35 (LA 18815) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 1072 ceramic sherds were collected from the site of which only one was decorated. This decorated sherd was classified as a type commonly associated with the Black Mountain phase (Playas).

Site Z:10:1 (LA 18866) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 60 ceramics sherds were collected from the site of which 35 were decorated. Of these decorated ceramics, 33 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome) though the presence of Gila Polychrome ceramics could point to a later occupation.

Site Z:14:1 (LA 18835) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 201 ceramic sherds were collected from the site of which only 12 were decorated. All of the decorated ceramics collected from the site were classified as types commonly associated with the Black Mountain phase (El Paso Polychrome).

Site Z:14:5 (LA 18838) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 24 ceramic sherds were collected from the site of which only two were decorated. Both of these decorated ceramics were classified as types commonly associated with the Black Mountain phase (Playas).

Site Z:14:7 (LA 18840) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 1176 ceramic sherds were collected from the site of which 97 were decorated. Of these 97 decorated ceramics, 92 were classified as types commonly associated with the Black Mountain phase (Playas and El Paso Polycrhome). Mimbres Foundation archaeologists note that the site was tested in 1976 to gain further insight into site function during the Black Mountain phase. This testing demonstrated that Black Mountain phase deposits extended from 20 to 70 centimeters below modern ground surface and that no features were present at the site. The site is believed to have served as a temporary logistical camp where hunting and mesquite gathering took place.

Site Z:14:12 (LA 18845) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter that is interpreted as dating to the Black Mountain phase. A total of 26 ceramics sherds were recovered from the site of which 21 were decorated. None of the decorated ceramics recovered from the site were classified as types commonly associated with the Black Mountain phase.

Site Z:14:21 (no record on file with the Laboratory of Anthropology) was originally described as a "Black Mountain pueblo" by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of a large Black Mountain phase pueblo that likely contained as many as 114 rooms potentially arranged in five room blocks. A total of 1272 ceramic sherds were collected from the site of which 47 were decorated. Of these decorated ceramics 39 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome) though the presence of Gila Polychrome ceramics could point to a later occupation.

Site Z:14:22 (LA 18857) was described as a "Black Mountain pueblo" by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of a Black Mountain phase pueblo that is estimated to have contained approximately 100 rooms. Mimbres Foundation archaeologists note that the majority of the pueblo had been bulldozed by the time the site was visited. A total of 174 ceramic sherds were collected from the site of which 91 were decorated. Of these 91 decorated sherds, 70 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:14:23 (LA 18858) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase as well as a cluster of 25 bedrock mortars associated with the site. A total of 114 ceramic sherds were collected from the site of which 63 were decorated. Of these decorated ceramics 61 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome) though the presence of Ramos Polychrome ceramics could point to a later occupation.

Site Z:14:24 (LA 18859) was described by the Mimbres Foundation as a "Black Mountain sherd and lithic scatter" (LeBlanc 1979a), and as the description implies, the site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase. A total of 41 ceramic sherds were collected from the site of which 29 were decorated. Of these decorated ceramics 22 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:14:25 (LA 18860) was originally described by the Mimbres Foundation as a "Black Mountain checkdam site" (LeBlanc 1979a). The site represents the remains of an artifact scatter interpreted as dating to the Black Mountain phase as well as a possible check-dam located along an erosional channel to the east of the scatter. A total of 96 ceramic sherds were collected from the site of which 29 were decorated. Of these decorated ceramics only 5 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Multi-component sites with Black Mountain phase occupations identified during the Mimbres Foundation's survey

Site Z:1:6 (LA 18921) was originally described by the Mimbres Foundation as a "Classic Mimbres and Black Mountain pueblo" (LeBlanc 1979a). The site represents the remains of a Classic period and Black Mountain phase pueblo located adjacent to the Mimbres River. The site is believed to contain 12 rooms which were first occupied during the Classic period and then reoccupied during the Black Mountain phase. 207 ceramic sherds were collected from the site of which only 109 were decorated. Of these decorated sherds, 37 represented types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:1:31 (LA 18891) is commonly referred to as the Perrault site and was originally described by the Mimbres Foundation as a "Late Pithouse, Classic Mimbres, and Black Mountain site" (LeBlanc 1979a). The site represents the remains of a substantial Late Pithouse period occupation, a Classic period pueblo, and a Black Mountain phase occupation. Because the site had been severely vandalized by pot hunters, no accurate assessment of the actual size of each component could be ascertained. However, Mimbres Foundation archaeologists estimate that the Classic period pueblo present at the site likely contained approximately 72 rooms some of which may have been reoccupied during the Black Mountain phase. A total of 236 ceramic sherds were collected from the site of which 149 were decorated. Of these 149 decorated ceramics, 30 were classified as types commonly associated with the Black Mountain phase (Playas).

Site Z:1:65 (LA 18926) was originally described by the Mimbres Foundation as a "Classic Mimbres and Black Mountain pueblo" (LeBlanc 1979a). The site potentially represents the remains of a Classic period and Black Mountain phase pueblo. Mimbres Foundation archaeologists note that the landform upon which the site rests is extremely flat and that the low rises associated with the site's artifact scatter represent room blocks. It is believed that the Classic period component of the site likely contained a pueblo with as many as 25 rooms while the Black Mountain phase occupation potentially contained a structure with at least 60 rooms. A total of 248 ceramic sherds were collected from the site of which 133 were decorated. Of these decorated ceramics 72 were classified as types commonly associated with the Black Mountain phase (Playas and Chupadero Black-on-white).

Site Z:5:17 (LA 15027) is commonly referred to as the Baca site and was described by the Mimbres Foundation as a "Classic Mimbres and Black Mountain pueblo" (LeBlanc 1979a). While the site had been severely disturbed by vandalism before the Mimbres Foundation visited the site, the amount of cobble wall debris present on the site led researchers to conclude that the site likely contained a sizeable pueblo of roughly 60 rooms during the Classic period. Mimbres Foundation archaeologists note that site also contained a more "restricted" Black Mountain phase pueblo, but no estimate of pueblo size could be made due to the disturbed nature of the site. A total of 547 ceramic sherds were collected from the site of which 343 were decorated. Of these decorated ceramics 24 were classified as belonging to an "Other Red" type. These "Other Red" ceramics potentially represent the only type commonly associated with the Black Mountain phase.

Zite Z:5:20 (LA 15030) is commonly referred to as the Upton site or Prewitt Ranch and was described by the Mimbres Foundation as a "Late Pithouse, Classic Mimbres, and Black Mountain site" (LeBlanc 1979a). The site contained a sizeable Late Pithouse period component that likely contained as many as 90 pithouses. The site's Classic period pueblo likely contained 90 rooms arranged in five room blocks. Based on the presence of vertical cobbles and tuff slabs indicating wall footings, Mimbres Foundation archaeologists believe that there was a Black Mountain phase occupation present at the site. The exact nature and extent of this occupation is unknown. A total of 1500 ceramic sherds were collected from the site of which 1121 were decorated. Of these decorated ceramics only nine were classified as belonging to an "Other Red" category. These "Other Red" ceramics represent the only type present at the site which could be associated with the Black Mountain phase.

Site Z:5:47 (LA 14988) was originally described by the Mimbres Foundation as a "Classic Mimbres and Black Mountain sherd and lithic scatter" (LeBlanc 1979a). As the description implies, the site represents the remains of an artifact that was interpreted as dating to the Classic period and the Black Mountain phase. A small isolated structure could at one time have been present at the site though looter activity has disturbed any clear indication of such a feature. A total nine ceramic sherds were collected from the site of which eight were decorated. None of these decorated ceramics were classified as types commonly associated with the Black Mountain phase.

Site Z:5:60 (LA 15002) is commonly referred to as the Swarts ruin as was described by the Mimbres Foundation as a "Late Pithouse, Classic Mimbres, and Black Mountain site" (LeBlanc 1979a). The site represents the remains of a sizeable pithouse period occupation, a large Classic period pueblo, and a Black Mountain phase occupation. It is estimated that there are roughly 16 pithouses associated with site and the Classic period pueblo contained as many as 125 rooms arranged in two roomblocks. The exact nature and extent of the Black Mountain phase occupation at the site is unknown. A total of 712 ceramic sherds were collected from the site of which 433 were decorated. Of these decorated ceramics 52 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:9:24 (LA 19112) was originally described by the Mimbres Foundation as a "Classic Mimbres and Black Mountain sherd and lithic scatter" (LeBlanc 1979a). As the description implies, represents the remains of an artifact scatter that was interpreted as dating to the Classic period and the Black Mountain phase. A total of 126 ceramic sherds were collected from the site of which 15 were decorated. Of these decorated ceramics 12 were classified as types commonly associated with the Black Mountain phase (El Paso Polychrome) though the presence of Ramos Polychrome ceramics could point to a later occupation.

Site Z:9:25 (LA 18808) was originally described by the Mimbres Foundation as a "Classic Mimbres and Black Mountain sherd and lithic scatter" (LeBlanc 1979a). As the description implies, represents the remains of an artifact scatter interpreted as dating to the Classic period and the Black Mountain phase. A total of 90 ceramic sherds were collected from the site of which 48 were decorated. Of these decorated ceramics 15 were classified as types commonly associated with the Black Mountain phase (Playas).

Site Z:9:36 (LA 18865) was originally described by the Mimbres Foundation as a "Late Pithouse, Classic Mimbres, and Black Mountain site" (LeBlanc 1979a). The site represents the remains of a Late Pithouse period occupation, a Classic period occupation, as well as a Black Mountain phase occupation. The Late Pithouse period occupation is believed to have been a temporary seasonal camp though no clear evidence of pithouse architecture was encountered at the site. A series of cobble wall alignments marks the Classic period component of the site. It is believed that a room consisting of four rooms was constructed at the site and was occupied during both the Classic period and the Black Mountain phase. A total of 158 ceramic sherds were collected from the site of which 28 were decorated. Of these decorated ceramics 24 were typed as being representative of an "Other Red" category. These ceramics represent the only decorated type collected from the site which is commonly associated with the Black Mountain phae.

Site Y:8:4 (LA 19137) was originally described by the Mimbres Foundation as a "Classic Mimbres and Black Mountain sherd and lithic scatter" (LeBlanc 1979a). As the description implies, represents the remains of an artifact scatter interpreted as dating to the Classic period and the Black Mountain phase. A total of 44 ceramic sherds were collected from the site of which seven were decorated. Of these decorated ceramics only one was classified as a type commonly associated with the Black Mountain phase (Playas).

Site Y:8:9 (LA 19142) was described as a "Classic Mimbres and Black Mountain pueblo" by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of a Classic period pueblo that likely contained 12 rooms arranged in a single room block. A series of four rock alignments interpreted as check-dams are also present on the site. It is believed that the site's 12 room Classic period pueblo was reoccupied during the Black Mountain phase. A total of 67 ceramic sherds were collected from the site of which 35 were decorated. Of these decorated ceramics only three were classified as type commonly associated with the Black Mountain phase (Playas and Chupadero Black-on-white).

Non-Black Mountain phase site that contained ceramics commonly associated with the Black Mountain phase

Site Z:1:10 (LA 18872) was originally described as a "Classic Mimbres pueblo" by the Mimbres Foundation and represents the remains of a Classic period pueblo that likely contained 12 rooms arranged as a single room block (LeBlanc 1979a). A total of 24 ceramics were recovered from the site of which 12 were decorated. Of these 12 decorated ceramics eight were classified as types commonly associated with the Black Mountain phase (Chupadero Black-on-white).

Site Z:1:36 (LA 18893) was originally described as a "Classic Mimbres pueblo" by the Mimbres Foundation and represents the remains of a Classic period pueblo that contained approximately eight rooms arranged in a single room block. A total of 157 ceramics were collected from the site of which 92 were decorated. Of these decorated ceramics only one was classified as a type commonly associated with the Black Mountain phase (Playas).

Site Z:1:46 (LA 18903) is commonly referred to as the Wheaton-Smith site and was originally described by the Mimbres Foundation as a "Late Pithouse and Classic Mimbres site" (LeBlanc 1979a). The site was tested by the Mimbres Foundation in 1976 and again in 1977. The site represents the remains of both a Late Pithouse period occupation as well as a Classic period occupation. The site's Late Pithouse period component contained 12 pithouses which could have been arranged in two distinct groupings. The Classic period component of the site consisted of a 25 room pueblo arranged in two room blocks. A total of 251 ceramic sherds were recovered from the site of which 155 were decorated. Of these decorated ceramics 24 were classified as types commonly associated with the Black Mountain phase (Playas).

Site Z:1:84 (LA 18944) was originally described as a "Classic Mimbres pueblo" by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of a Classic period pueblo that likely contained approximately 17 rooms. A total of 50 ceramic sherds were collected from the site of which 38 were decorated. Of these decorated ceramics six were classified as types commonly associated with the Black Mountain phase (Playas and Chupadero Black-on-white).

Site Z:1:126 (LA 18984) is commonly referred to as the Ernestine site and was described by the Mimbres Foundation as a "Classic Period pueblo" (LeBlanc 1979a). The site was tested by the Mimbres Foundation in 1977 and represents the remains of Classic period pueblo that likely contained 68 rooms arranged in three room blocks. A total of 143 ceramic sherds were collected from the site of which 73 were decorated. Of these decorated ceramics only three were classified as types commonly associated with the Black Mountain phase (El Paso Polychrome).

Site Z:1:131 (LA 19187) was originally described as a "Classic Period site" by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of an isolated one room Classic period structure. A total of 24 ceramic sherds were collected from the site of which six were decorated. Of these decorated ceramics two were classified as types commonly associated with the Black Mountain phase (El Paso Polychrome).

Site Z:1:145 (LA 19002) was originally described as a "Classic Mimbres site" by the Mimbres Foundation represents the remains of a Classic period pueblo that contained approximately nine rooms (LeBlanc 1979a). A total of 18 ceramics sherds were collected from the site of which eight were decorated. Of these decorated ceramics only one was classified as a type commonly associated with the Black Mountain phase (Chupadero Black-on-white).

Site Z:5:18 (LA 15028) was originally described as a "Classic Mimbres pueblo" by the Mimbres Foundation (LeBlanc 1979a). The site had been completely destroyed by looting activities when the Mimbres Foundation visited the site but, based on the size of the artifact scatter associated with the site, was interpreted as representing a Classic period pueblo containing approximately seven rooms. A total of 11 ceramic sherds were collected from the site of which 10 were decorated. Of these eight were classified as a type commonly associated with the Black Mountain phase (El Paso Polychrome).

Site Z:5:51 (LA 14992) was originally described by the Mimbres Foundation as a "Late Pithouse and Classic Mimbres site" and represents the remains of a Late Pithouse period occupation as well as a Classic period occupation. The Late Pithouse period component contains two pithouses spaced 15 meters apart while the Classic period component consists of two surface rooms spaced 10 meters apart. Ten cobble mounds were also present at the site though their temporal affiliation is unknown. A total of 39 ceramic sherds were collected from the site of which six were decorated. Of these decorated ceramics five were classified as types commonly associated with the Black Mountain phase (Playas and Chupadero Black-on-white).

Site Z:5:52 (LA 14993) was described by the Mimbres Foundation as a "Classic Mimbres Pueblo" and represents the remains of a Classic period pueblo that likely contained roughly nine rooms arranged as single room block. A circular depression, potentially representing a pithouse, was also encountered at the site. A total of 15 ceramic sherds were collected from the site of which 10 were decorated. Of these decorated ceramics six were classified as types commonly associated with the Black Mountain phase (Playas and Chupadero Black-on-white).

Site Z:5:58 (LA 14999) was originally interpreted as an "Early Pithouse site" by the Mimbres Foundation. The site is located on a bench overlooking the Mimbres River near Donahue Canyon. The site contains two pithouse depressions and, based on the site's location, likely represents an Early Pithouse period occupation. A total of 214 ceramic sherds were collected from the site of which 98 were decorated. All of these decorated ceramics were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome).

Site Z:5:61 (LA 15003) was originally described by the Mimbres Foundation as a "Classic Mimbres site" and represents the remains of a Classic period pueblo that likely contained four rooms arranged as a single room block (LeBlanc 1979a). A total of 42 ceramic sherds were collected from the site of which 18 were decorated. Of these decorated ceramics four were classified as types commonly associated with the Black Mountain phase (Playas).

Site Z:5:77 (LA 15041) was originally described as a "Classic Mimbres site" by the Mimbres Foundation and represents the remains of an isolated Classic period room (LeBlanc 1979a). A total of 51 ceramic sherds were collected from the site of which 12 were decorated. Of these decorated ceramics nine were classified as a type commonly associated with the Black Mountain phase (Playas).

Site Z:5:85 (LA 15050) is commonly referred to as the McSherry site and was originally described by the Mimbres Foundation as a "Late Pithouse and Classic Mimbres site" (LeBlanc 1979a). The Late Pithouse period component contains an estimated 16 pithouse depressions which was superimposed by a later Classic period pueblo containing 50 rooms. A total of 745 ceramic sherds were collected from the site of which 473 were decorated. Of these 473 decorated ceramics only five were classified as a type commonly associated with the Black Mountain phase (Playas).

No description of sites Z:9:99, Z:10:3, Z:13:20 (LA 18833), Z:13:21 (LA 19188), Z:13:22 (LA 19189), and Z:13:25 (LA 19192) were present in the notes on file at the Peabody Museum though tallies of the ceramics collected from these sites potentially indicates usage of the areas upon which these sites are located by Terminal Classic and/or Black Mountain phase peoples. A total of seven ceramic sherds were collected from site Z:9:99 of which one was decorated. This sherd was classified as a type commonly associated with the Black Mountain phase (Playas). A total of 531 ceramic sherds were collected from site Z:10:3 of which 238 were decorated. Of these 238 decorated ceramics 209 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome) though Ramos Polychrome and Gila Polychrome ceramics were also present. A total of 1224 ceramic sherds were collected from site Z:13:20 (LA 18833) of which only 51 were decorated. Of these 51 decorated ceramics 40 were classified as types commonly associated with the Black Mountain phase (Playas, Chupadero Black-on-white, and El Paso Polychrome). A total of 195 ceramic sherds were collected from site Z:13:21 (LA 19188) of which 132 were decorated. Of these decorated ceramics only two were classified as types commonly associated with the Black Mountain phase (Playas, and Chupadero Black-on-white). A total of 86 ceramic sherds were collected from site Z:13:22 (LA 19189) of which nine were decorated. Of these decorated ceramics only one was classified as a type commonly associated with the Black Mountain phase (Playas). Finally, 13 ceramic sherds were collected from site Z:13:25 (LA 19192) of which six were decorated. All of these decorated ceramics were classified as types commonly associated with the Black Mountain phase (Playas).

Site Z:14:13 (LA 18846) was originally described by the Mimbres Foundation as a "sherd and lithic scatter" and represents the remains of an artifact scatter of unknown temporal and cultural affiliation (LeBlanc 1979a). A total of 59 ceramic sherds were collected from the site of which 12 were decorated. Of these decorated ceramics two were classified as types commonly associated with the Black Mountain phase (Playas).

Site Z:14:20 (LA 1114) is commonly referred to as the Carr site and was described as a “Classic Mimbres site” by the Mimbres Foundation (LeBlanc 1979a). The site represents the remains of a substantial Classic period pueblo likely containing 126 rooms some of which contained wall segments constructed of adobe. A total of 320 ceramic sherds were collected from the site of which 76 were decorated. Of these decorated ceramics only one was classified as a type commonly associated with the Black Mountain phase (El Paso Polychrome).

Site Y:4:21 (no record on file with the Laboratory of Anthropology) was originally described by the Mimbres Foundation as a “Classic Mimbres pueblo” and represent the remains of a Classic period pueblo that contain an unknown number of rooms arranged as a single room block. A total of 41 ceramic sherds were collected from the site of which 15 were decorated. Of these decorated ceramics three were classified as types commonly associated with the Black Mountain phase (Chupadero Black-on-white).

Site Y:8:28 (LA 19161) was originally described by the Mimbres Foundation as a “sherd and lithic scatter” and represents the remains of an artifact scatter of unknown temporal and cultural affiliation (LeBlanc 1979a). Only one decorated ceramic was collected from the site which was classified as a type commonly associated with the Black Mountain phase (Chupadero Black-on-white).

Appendix B: Ceramic Tallies for Sites Discussed in Appendix A

The data contained within the following tables are based on samples collected and analyzed by the Mimbres Foundation during their survey of the Mimbres valley. All data presented in the tables accompanied the original site descriptions and were provided courtesy of Steven LeBlanc (1979a, 1979b). Table B.1 describes the fields present in Table B.2. Table B.2 represents the actual data collected by the Mimbres Foundation.

Table B1: Field descriptions and additional notation of data presented in Table B2.

Field	Description
LA No.	Site number assigned by the Laboratory of Anthropology.
MF No.	The site number assigned by the Mimbres Foundation.
Phase	Temporal designation assigned by the Mimbres Foundation: LP = Late Pithouse Period, CL = Classic Period, BM = Black Mountain Phase, and SL = Salado phase.
Rooms	The number of rooms determined to be present at structural sites. Sites with no or zero values were interpreted as artifact scatters by the Mimbres Foundation.
No. Ceramics	The number of ceramics collected from the site.
No. P-CL Cer.	The number of Post-Classic period decorated ceramics collected from the site.
P-CL Types	The Post-Classic period types present in the assemblages collected from sites: O = Other Red, P = Playas, C = Chupadero Black-on-white, E = El Paso Polychrome, G = Gila Polychrome, and R = Ramos Polychrome.
**	No records on file with the Laboratory of Anthropology.
*	"Other Red" represents the only decorated type collected from the site despite being interpreted as a Black Mountain phase site.

Table B2: Description of sites and ceramic counts recovered from sites recorded by the Mimbres Foundation.

LA No.	MF No.	Phase	Rooms	No. Cer.	No. Post-CL Cer.	O	P	C	E	G	R
**	Y:4:21	CL	6	41	3			3			
19137	Y:8:4	CL-BM	0	44	1		1				
19142	Y:8:9	CL-BM	10	67	3		2	1			
19161	Y:8:28		0	1	1			1			
18921	Z:1:6	CL-BM	12	207	37	9	16	10	2		
18872	Z:1:10	CL	12	24	8	6		2			
18891	Z:1:31	LP-CL-BM	72	236	30	28	2				
18893	Z:1:36	CL	8	157	1		1				
18903	Z:1:46	LP-CL	25	251	24	21	3				
18926	Z:1:65	CL-BM	60	248	72	40	18	14			
18936	Z:1:75	EP	1	208	1			1			
18944	Z:1:84	CL	17	50	6		5	1			
18984	Z:1:126	CL	68	143	3	1		2			
19187	Z:1:131	CL	1	24	2	1			1		
19002	Z:1:145	CL	9	18	1			1			
18866	Z:10:1	BM	0	60	33	8	1	13	10	1	
**	Z:10:3			531	209	36	21	28	112	3	9
18833	Z:13:20			1224	40	3	3	11	17	2	4
19188	Z:13:21			195	2		1	1			
19189	Z:13:22			86	1		1				
19192	Z:13:25			13	6	2	4				
18835	Z:14:1	BM	0	201	12				12		
18838	Z:14:5	BM	0	24	2		2				
18840	Z:14:7	BM	0	1176	92	40	50		2		
18845	Z:14:12	BM	0	26	0						
18846	Z:14:13		0	59	11	9	2				
1114	Z:14:20	CL	126	320	1				1		
**	Z:14:21	BM	114	1272	39	17	9	6	2	5	
18857	Z:14:22	BM	100	174	70	24	31	1	14		
18858	Z:14:23	BM	0	114	61	13	24	9	12		3
18859	Z:14:24	BM	0	41	22	9	9	2	2		
18860	Z:14:25	BM	0	96	5	1	2	1	1		
2645	Z:5:8	BM	4	31	5			3		2	
15023	Z:5:12	BM	2	124	2					1	1
15024	Z:5:13	BM	5	335	219	101	84	2	32		
1113	Z:5:14	LP-CL-BM	125	812	3			1	2		
1113	Z:5:14a	BM	100	137	15	7	3	4	1		
15025	Z:5:15	BM	18	62	21	9	8	3	1		
15027*	Z:5:17	CL-BM	60	547	24	24					
15028	Z:5:18	CL	7	11	8				8		
15029	Z:5:19	BM	21	231	56	28	8	2	18		
15030*	Z:5:20	LP-CL-BM	90	1500	9	9					

Table B2 (continued): Description of sites and ceramic counts recovered from sites recorded by the Mimbres Foundation.

LA No.	MF No.	Phase	Rooms	No. Cer.	No. Post-CL Cer.	O	P	C	E	G	R
14979	Z:5:38	BM	1	4	4	1	1	2			
14981*	Z:5:40	BM	0	164	17	17					
14982	Z:5:41	BM	1	18	0						
14983	Z:5:42	BM	15	115	20			1	16	3	
14988	Z:5:47	CL-BM	0	9	0						
14992	Z:5:51	LP-CL	2	39	5	1	2	2			
14993	Z:5:52	CL	9	15	6	1	3	2			
14999	Z:5:58	EP	2	214	98	58	32	3	5		
15002	Z:5:60	LP-CL-BM	125	712	52	48	1	1	2		
15002	Z:5:60	LP-CL-BM	125	300	55	29	15	5	6		
15003	Z:5:61	CL	4	42	4	3	1				
19165	Z:5:68	BM	0	171	94	61	31	1	1		
15041	Z:5:77	CL	1	51	9		9				
15044	Z:5:80	BM	50	1097	472	159	178	12	112		11
15045	Z:5:81	BM	0	108	0						
15050	Z:5:85	LP-CL	50	745	5		5				
15053	Z:5:89	BM	0	73	34	19	7	1	7		
15054	Z:5:90	BM	9	1214	42		20	11	11		
15061	Z:5:97	BM	0	18	0						
19186	Z:5:99	BM	2	6	0						
15068	Z:5:105	BM	0	1098	12	2	10				
15071	Z:5:108	BM	0		0						
15073	Z:5:110	BM	0	1271	25	9	12	3	1		
15075	Z:5:112	BM	35	1317	135	51	63	1	20		
19168	Z:5:115	BM	0		0						
**	Z:5:131	BM	120		0						
49	Z:9:1	BM	200	641	223	78	69	24	43	3	6
49	Z:9:1	BM	200	30	30		12	6	10	2	
18808*	Z:9:2	BM	0	212	6	6					
18813	Z:9:3	BM	0	13	0						
19093*	Z:9:4	BM	20	58	6	6					
19094	Z:9:5	BM	100	1368	85	27	23	5	24	2	4
19095*	Z:9:6	BM	0	61	1	1					
19098*	Z:9:9	BM	0	241	1	1					
19103	Z:9:15	BM	3	122	4	3			1		
19105	Z:9:17	SL	100	2704	88	11		4	21	37	15
19105	Z:9:17	SL	100	2621	110		4	12	30	51	10
19106	Z:9:18	BM	0	60	35	7	27			1	
19107	Z:9:19	BM	0	198	73	28	37		7		1
19108	Z:9:20	BM	0	1121	33	10	17		5	1	
19109	Z:9:21	BM	0	1061	13	1	8		2		2
19110	Z:9:22	BM	0	1118	27	8	14		5		

Table B2 (continued): Description of sites and ceramic counts recovered from sites recorded by the Mimbres Foundation.

LA No.	MF No.	Phase	Rooms	No. Cer.	No. Post-CL Cer.	O	P	C	E	G	R
19112	Z:9:24	CL-BM	0	126	12	8			3		1
18808	Z:9:25	CL-BM	0	90	15	9	6				
18809	Z:9:26	BM	0	1043	27	14	12		1		
18810*	Z:9:27	BM	0	1012	1	1					
**	Z:9:28	BM	0	1252	157	76	74		7		
18812	Z:9:29	BM	0	1137	52	4	41	2	5		
18815	Z:9:35	BM	0	1072	1		1				
18865*	Z:9:36	LP-CL-BM	4	158	24	24					
**	Z:9:99			7	1		1				

Appendix C: Photographs of Playas INAA Samples Recovered from Old Town, Walsh, and Montoya

The following figures depict samples recovered from Walsh, Montoya, and Old Town. These figures depict only the 102 samples that I submitted for chemical characterization and do not depict the larger Playas sample submitted prior to 2011.

A total of 37 samples were submitted for chemical characterization from four rooms excavated at the Walsh site. Samples MST-2011-1 through MST-2011-9 and MST-2011-11 were recovered from the floor of Room 10. Samples MST-2011-10 and MST-2011-12 through MST-2011-18 were recovered from the floor of Room 12. Samples MST-2011-19 through MST-2011-27 were recovered from the floor of Room 18. Samples MST-2011-28 through MST-2011-32 were recovered from the floor of Room 22 and samples MST-2011-33 through MST-2011-37 were recovered from the room's roof deposits.

A total of 17 samples were submitted for chemical characterization from two rooms excavated at Montoya. Samples MST-2011-38 through MST-2011-41 were recovered from the floor of Room 5 and samples MST-2011-42 through MST-2011-44 were recovered from the room's roof deposits. Sample MST-2011-45 was recovered from fill above the roof of Room 5. Samples MST-2011-046 and MST-2011-54 were recovered from the floor of Room 4 and samples MST-2011-47 through MST-2011-53 were recovered from the room's roof deposits.

A total of 49 samples were submitted for chemical characterization from five rooms and two room suites at Old Town. Samples MST-2011-62 and MST-2011-75 were recovered form floor features within Room C1. Samples MST-2011-57, MST-2011-61, MST-2011-67, MST-2011-68, MST-2011-73, MST-2011-74, MST-2011-81, and MST-2011-83 were recovered from floor fill deposits associated with Room C2. Samples MST-2011-55, MST-2011-58, MST-2011-65, MST-2011-69, MST-2011-77, MST-2011-78, and MST-2011-82 were recovered from floor fill deposits associated with Room C10. Samples MST-2011-63, MST-2011-64, MST-2011-70, and MST-2011-76 were recovered from floor fill associated with Room C11 while samples MST-2011-56, MST-2011-59, MST-2011-71, and MST-2011-79 were recovered from floor features within the room. Sample MST-2011-72 was recovered from a floor feature associated with Feature C17. Samples MST-2011-60, MST-2011-66, and MST-2011-80 were recovered from miscellaneous floor features within the site's Black Mountain phase component. Samples MST-2011-84 through MST-2011-92 were recovered from roof and floor deposits associated with Room C23/C28. Finally, samples MST-2011-93 through MST-2011-102 were recovered form roof and floor deposits associated with Room C27/C34,

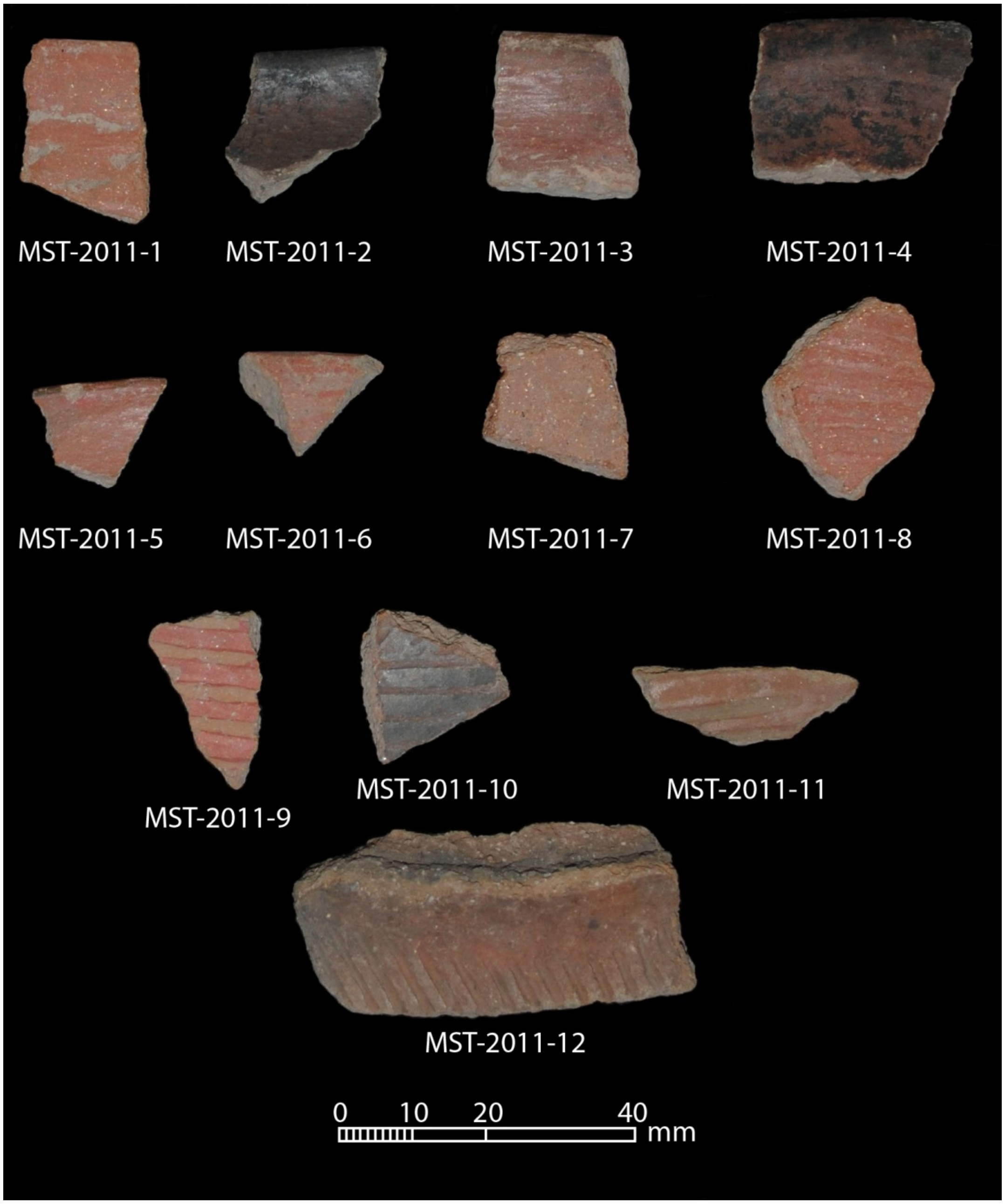

Figure C1: Photograph of exterior surfaces of Playas INAA samples recovered from Walsh.

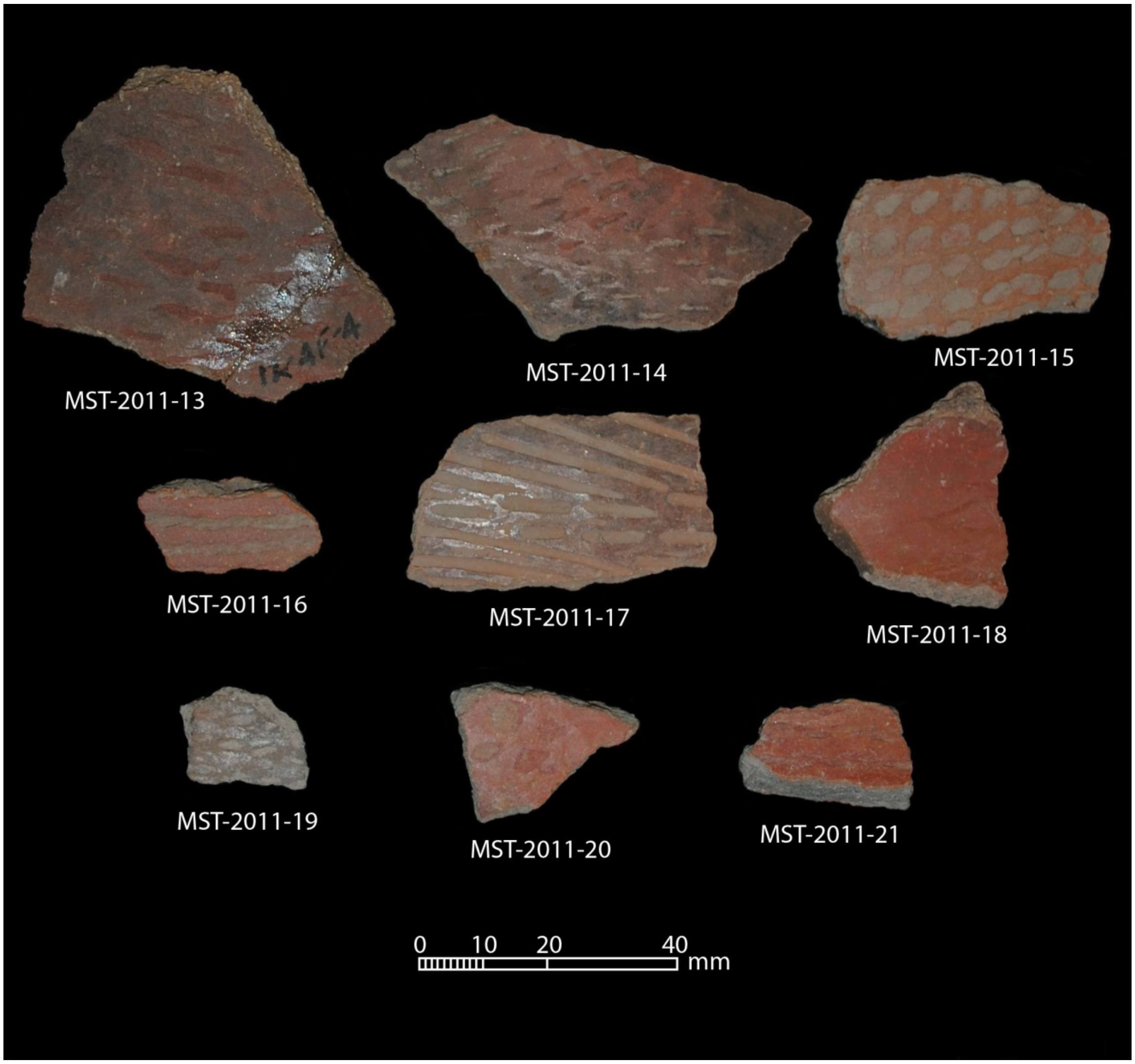

Figure C2: Photograph of exterior surfaces of Playas INAA samples recovered from Walsh.

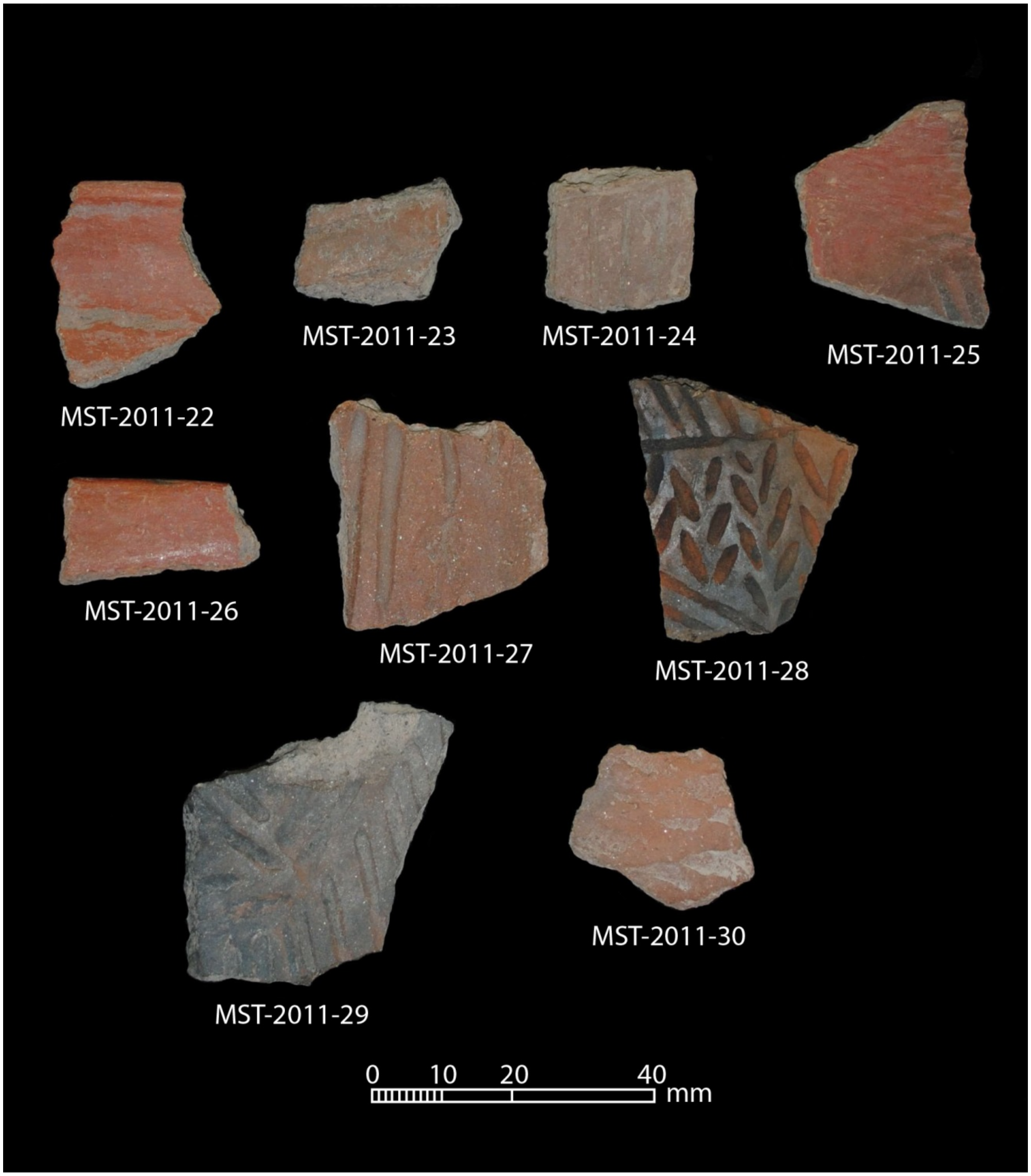

Figure C3: Photograph of exterior surfaces of Playas INAA samples recovered from Walsh.

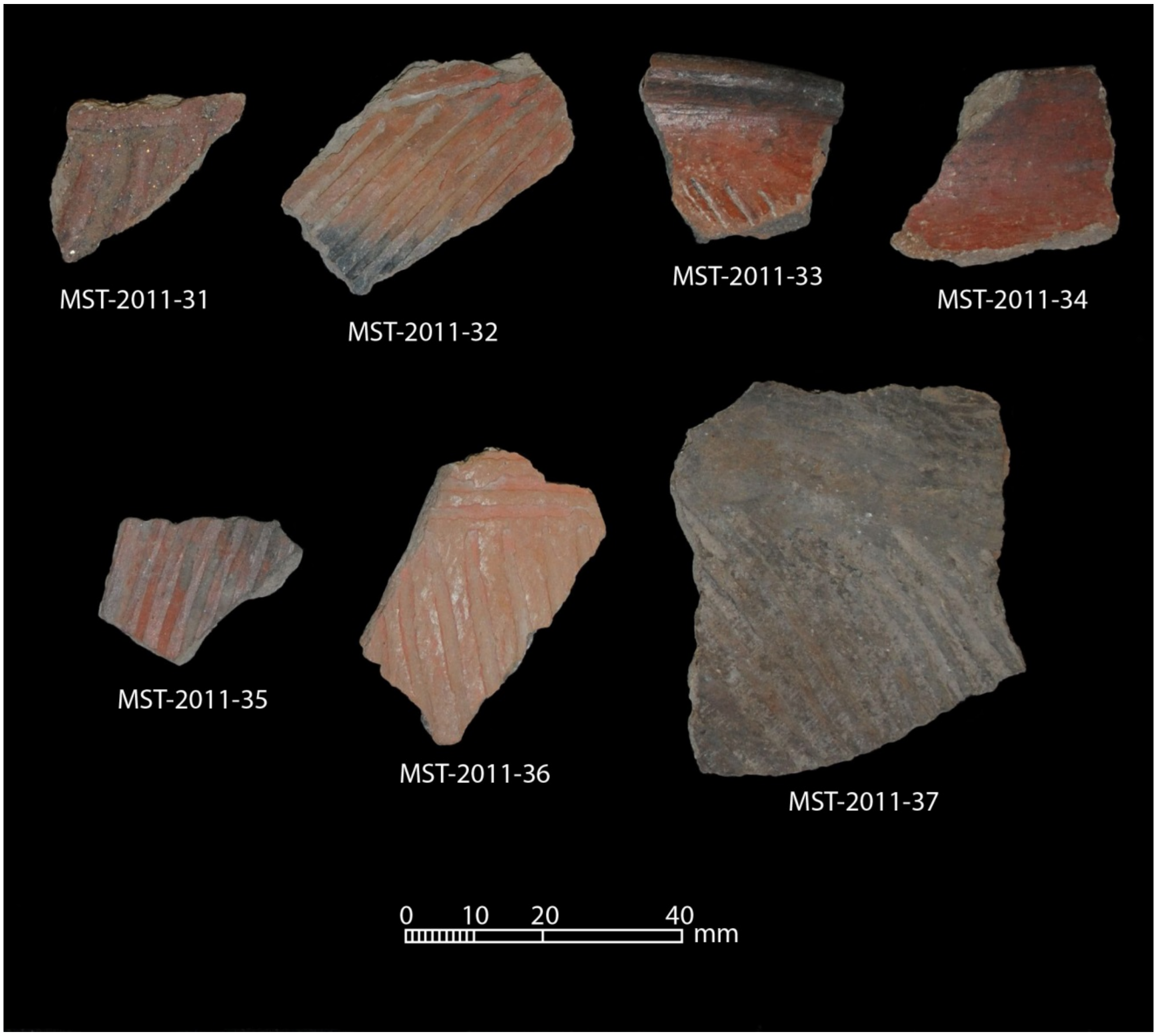

Figure C4: Photograph of exterior surfaces of Playas INAA samples recovered from Walsh.

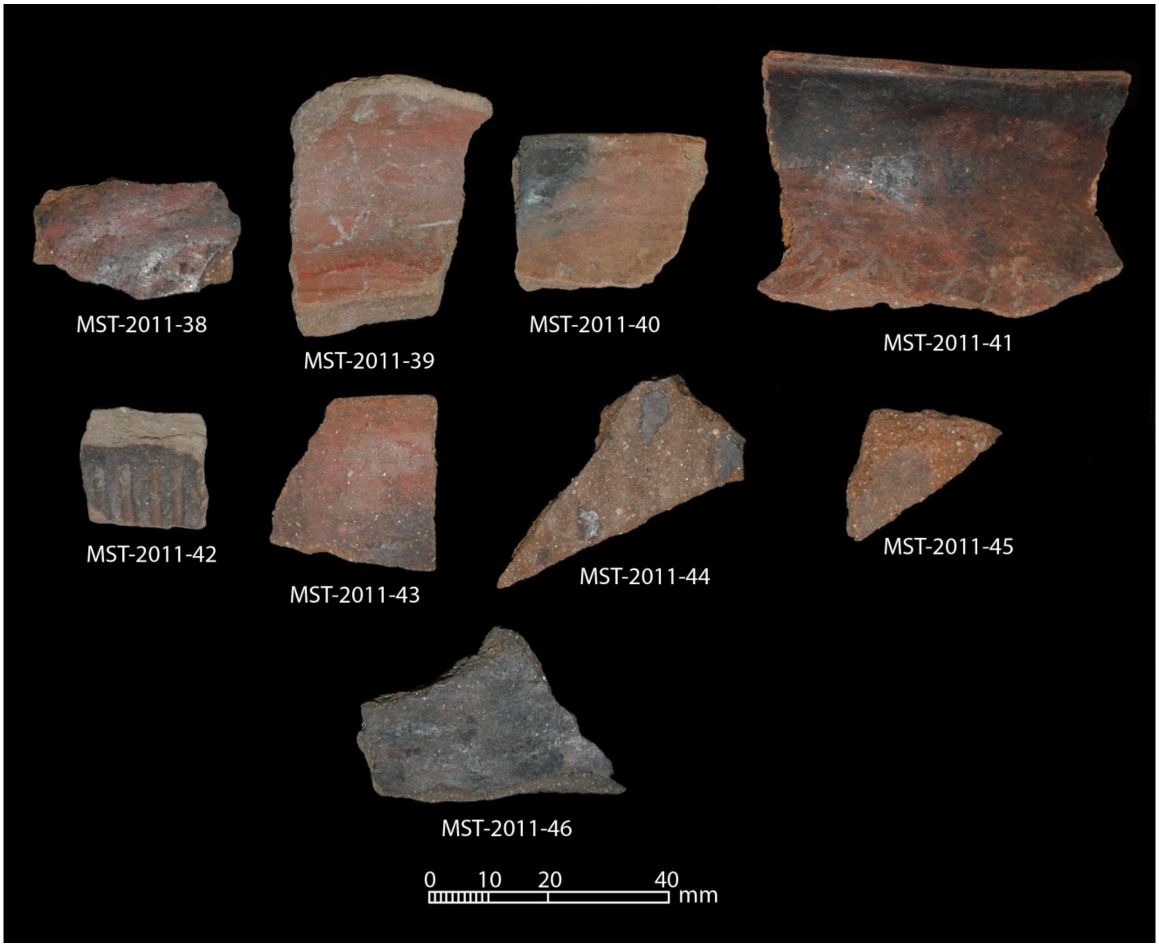

Figure C5: Photograph of exterior surfaces of Playas INAA samples recovered from Montoya.

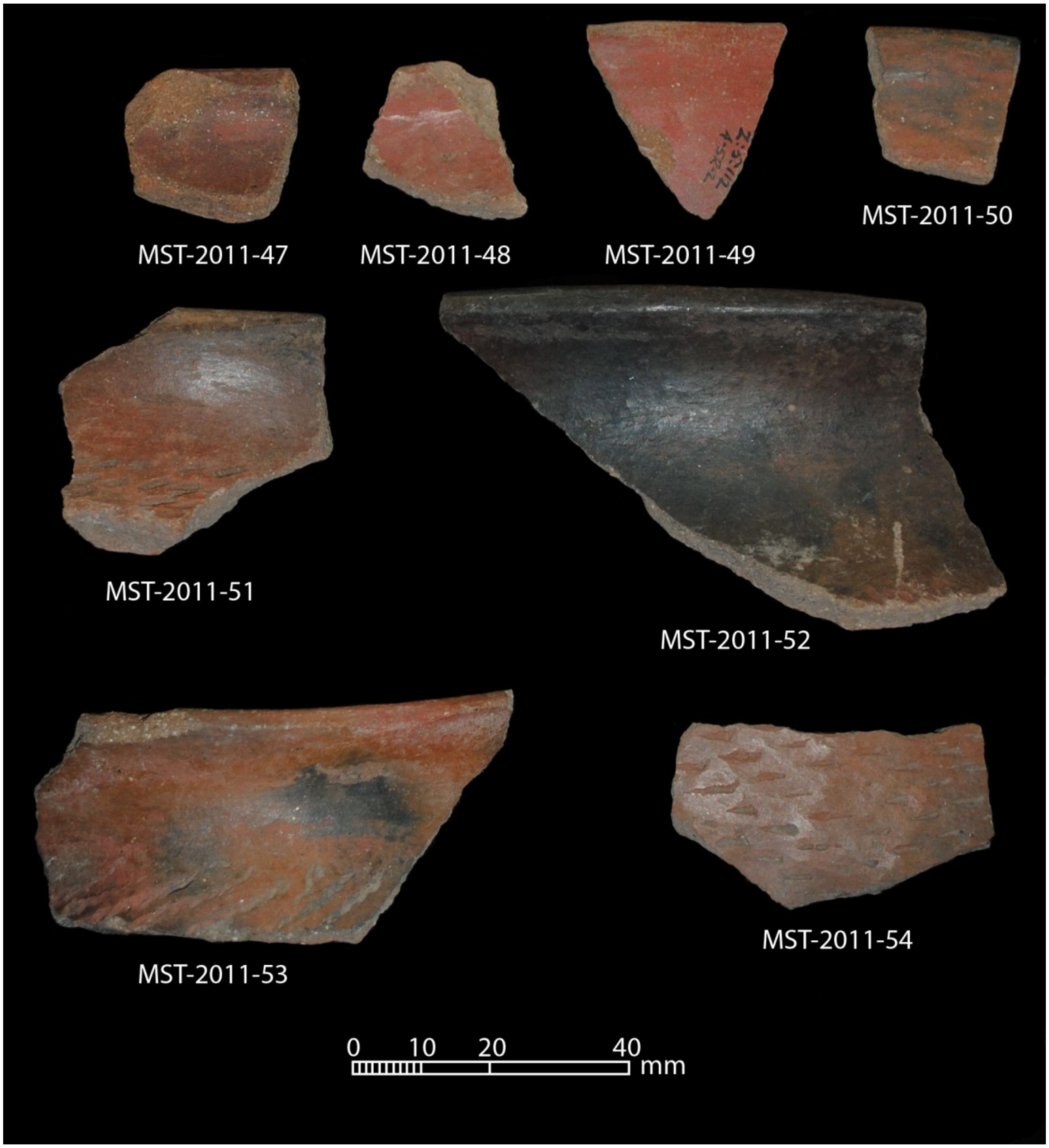

Figure C6: Photograph of exterior surfaces of Playas INAA samples recovered from Montoya.

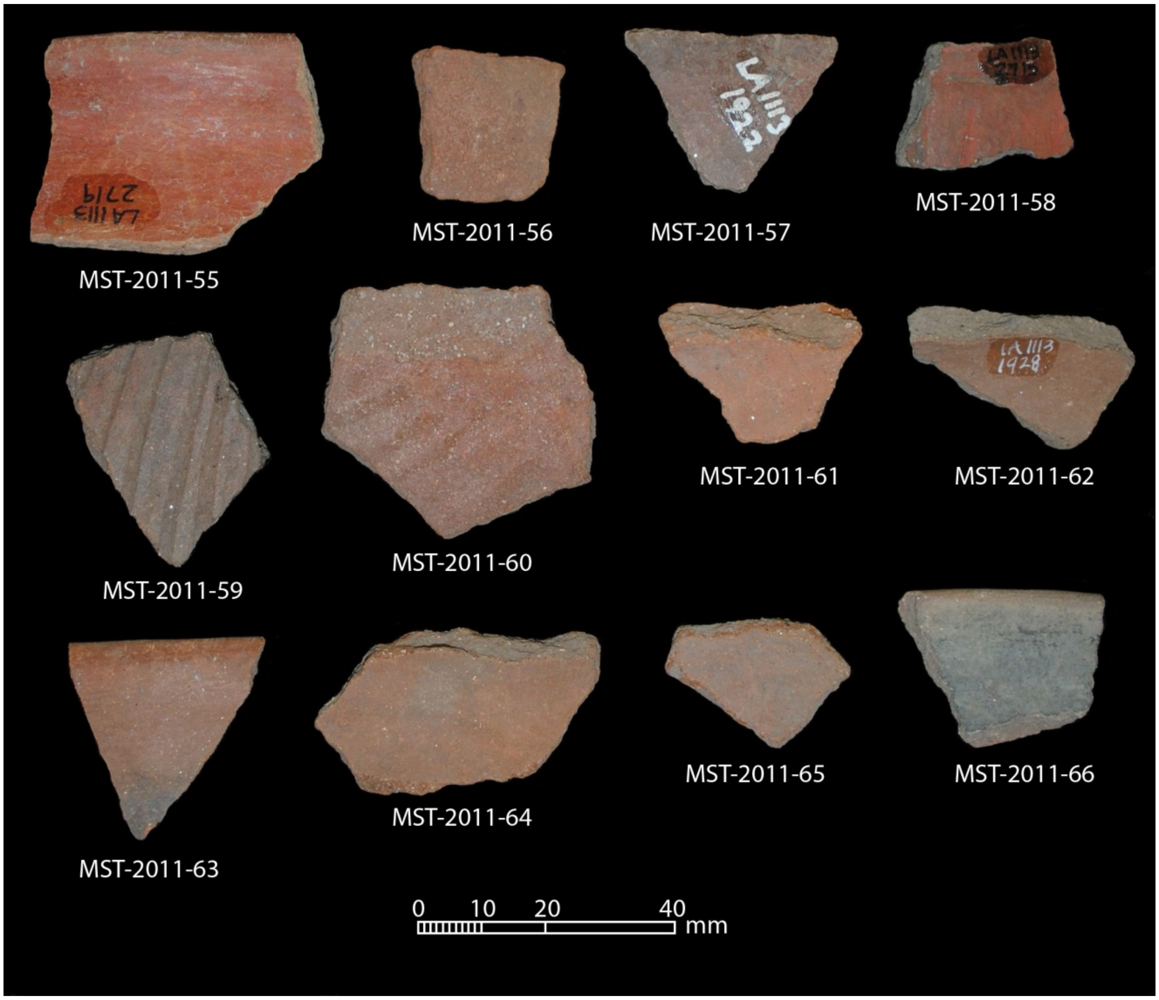

Figure C7: Photograph of exterior surfaces of Playas INAA samples recovered from Old Town.

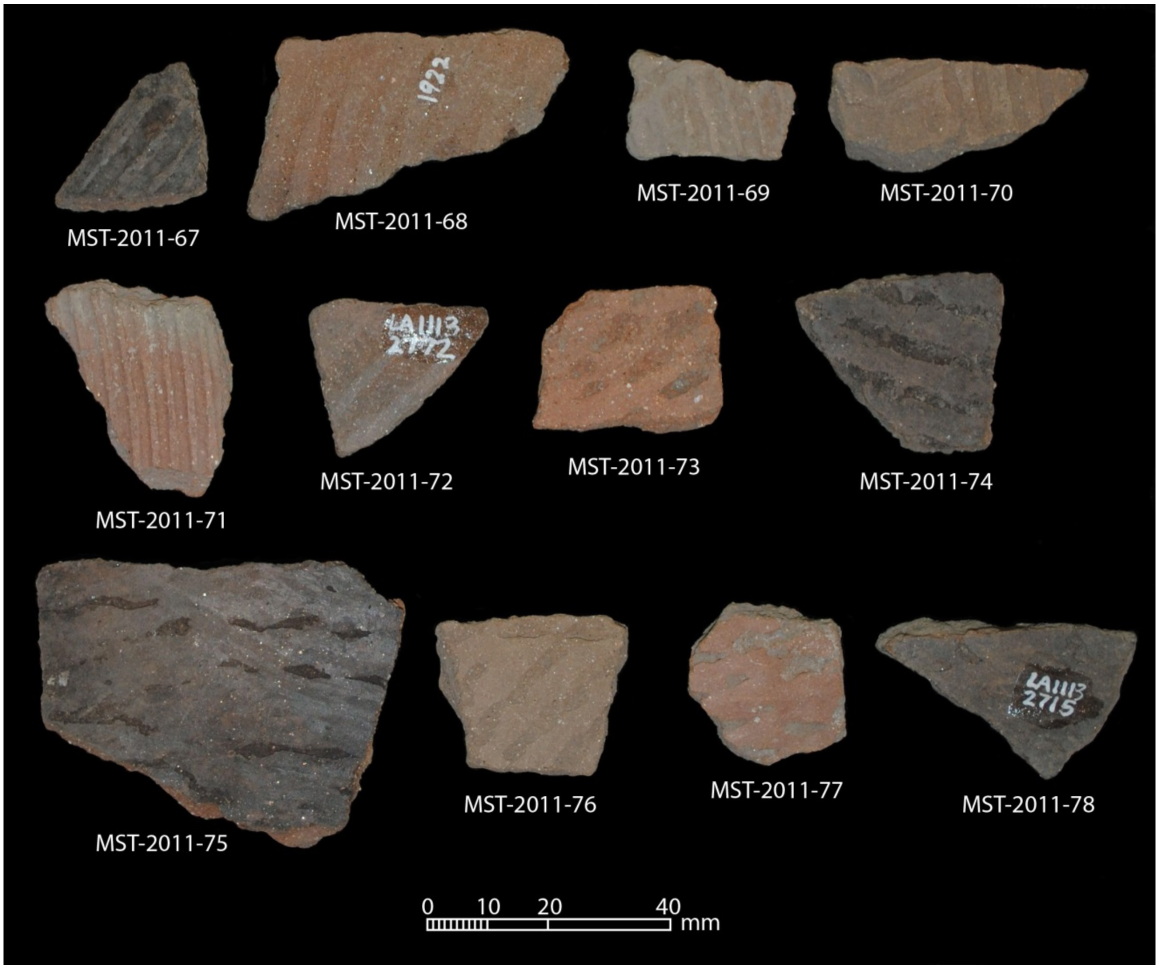

Figure C8: Photograph of exterior surfaces of Playas INAA samples recovered from Old Town.

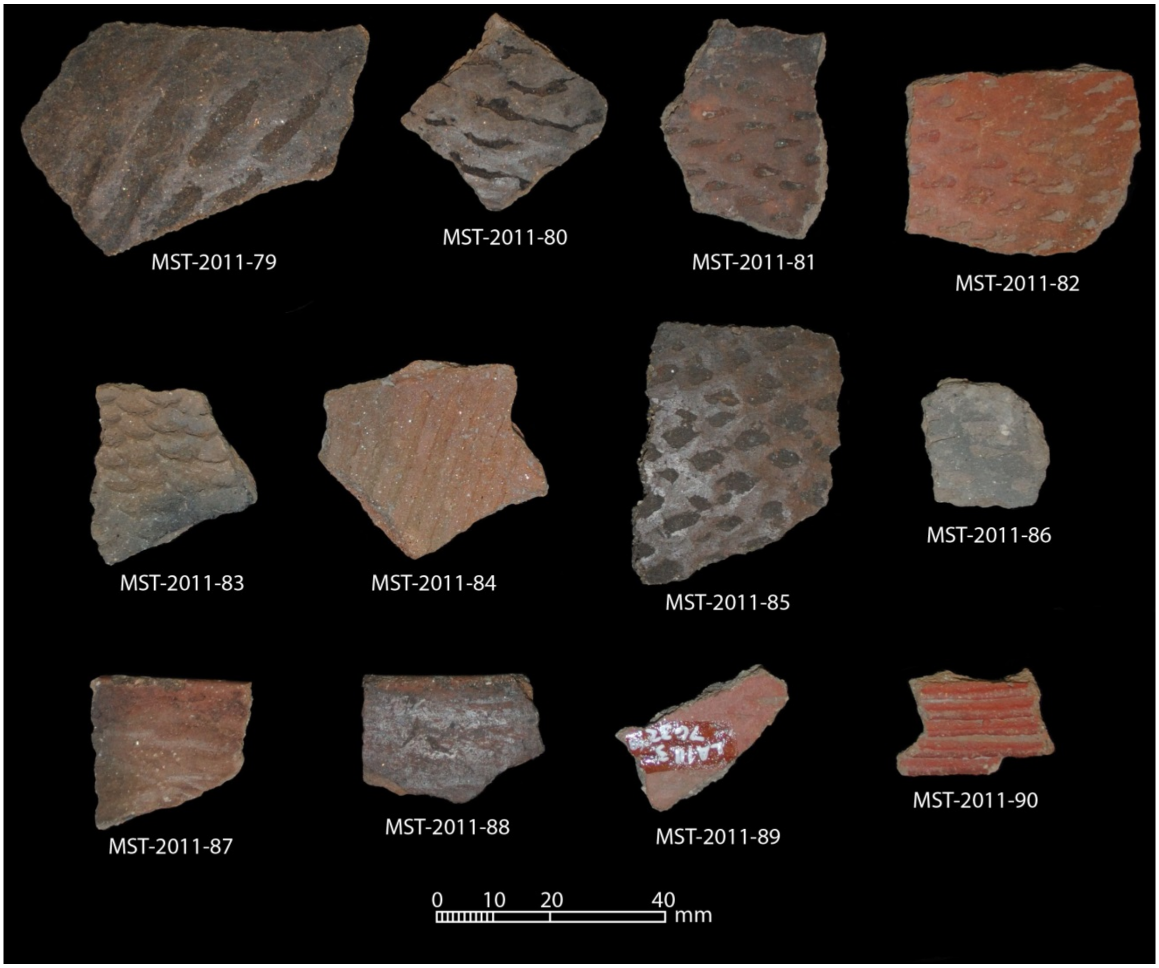

Figure C9: Photograph of exterior surfaces of Playas INAA samples recovered from Old Town.

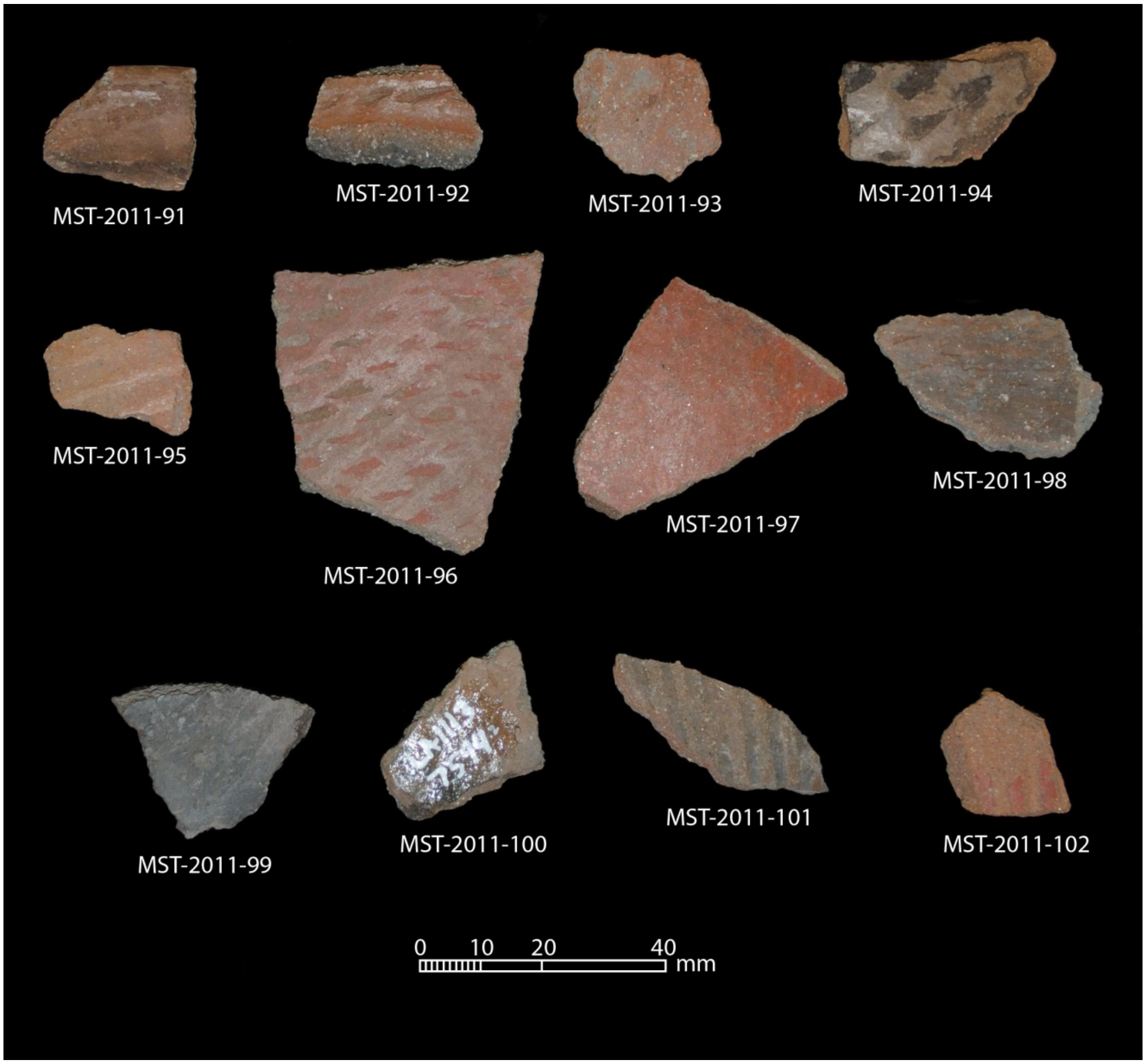

Figure C10: Photograph of exterior surfaces of Playas INAA samples recovered from Old Town.

Appendix D: Principal Component Analyses and Bivariate Plots of Playas Compositional Groups

As mentioned in Chapter 10, a total of 11 compositional groups were established for the Playas ceramics used in the current study. Three of these compositional groups (Main Playas Red, Playas Red 1, and Playas Red 2) were previously established by Creel and colleagues (2000) and five other compositional groups (Playas Red 3, Playas Red 4, Mimbres-4c, Mimbres-5a, and Mimbres-49a), some of which correspond to groups established by Speakman (2013), were found to occupy the same multidimensional space as the Main Playas Red group. Additionally, the Mimbres-10 compositional group established by Speakman (2008, 2012) was also found to represent the likely compositional group for some of the Playas ceramics used in the current study and two new groups, Playas Red 5 and Playas Red 6, were also established.

Contrary to the methodology used in establishing these 11 distinct compositional groups (see above), discussion of the groups will follow a top down approach beginning with multivariate statistical procedures and proceed to rather simple bivariate analyses. As can be seen in Figure D1, Figure D2, Figure D3, and Figure D4 separation of the Main Playas Red, Playas Red 1, Playas Red 2, Playas Red 5, Playas Red 6, and Playas ceramics within the Mimbres-10 compositional groups can be roughly ascertained by their position in multidimensional space as revealed by principal component analysis (PCA). Interpretations of the first 12 principal components are presented in Table D1 and Table D2. As these tables illustrate, the data set is rather complex and the majority (>90 percent) of the variance within the data are not explained by the first nine principal components (Table D1). Thus the first three principle components illustrated in Figure D1 and Figure D2 only account for 68 percent of the variation in the entire dataset with Principal Component 1 accounting for 43 percent of the data, Principal Component 2 accounting for roughly 15 percent of the variation, and Principal Component 3 accounting for roughly nine percent of the variation in the Playas INAA data set (Table D1). The eigenvectors of the first 12 principal components also illustrates the

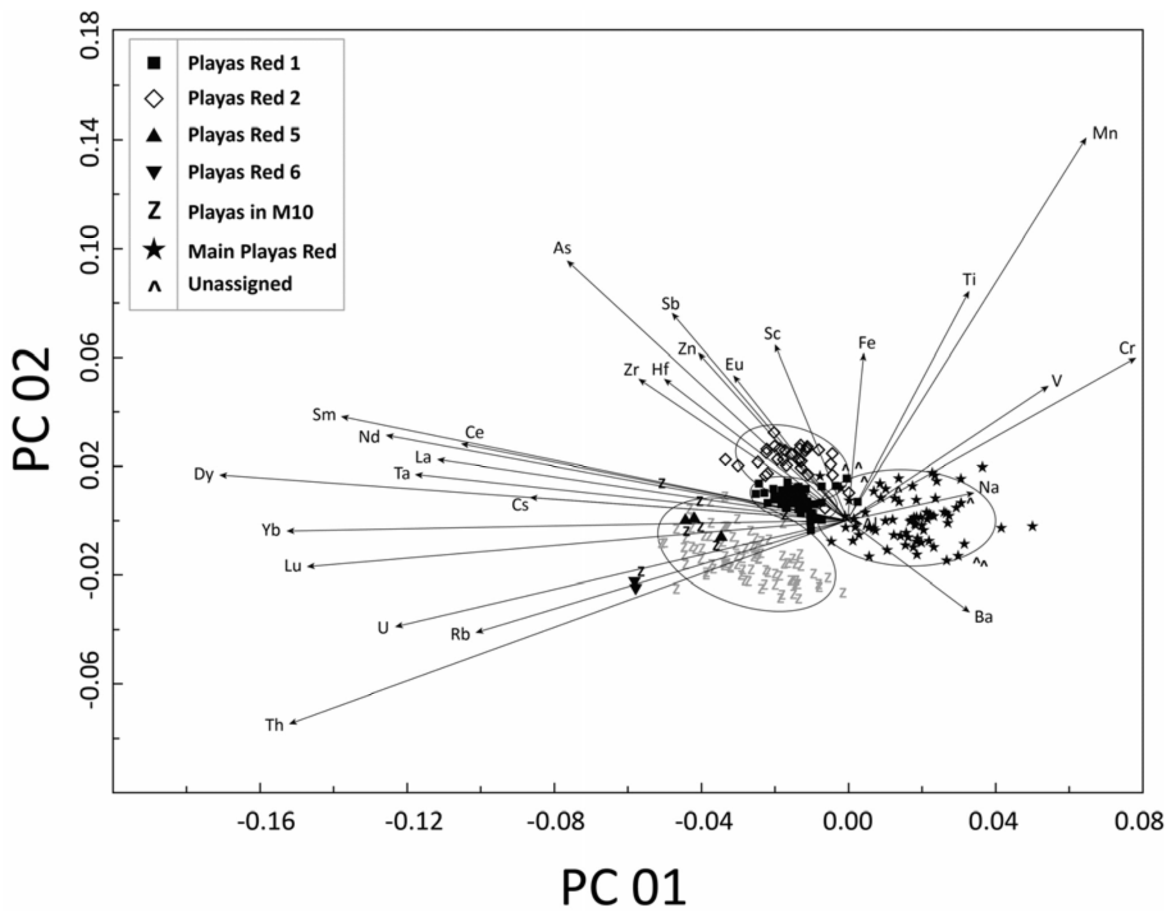

Figure D1: Bivariate plot of Principal Component 1 and Principal Component 2 showing separation of the Playas Red 1, Playas Red 2, Playas Red 5, Playas Red 6, Playas ceramic in the Mimbres-10, and Main Playas Red compositional groups. Ellipses represent 90 percent probability of group membership.

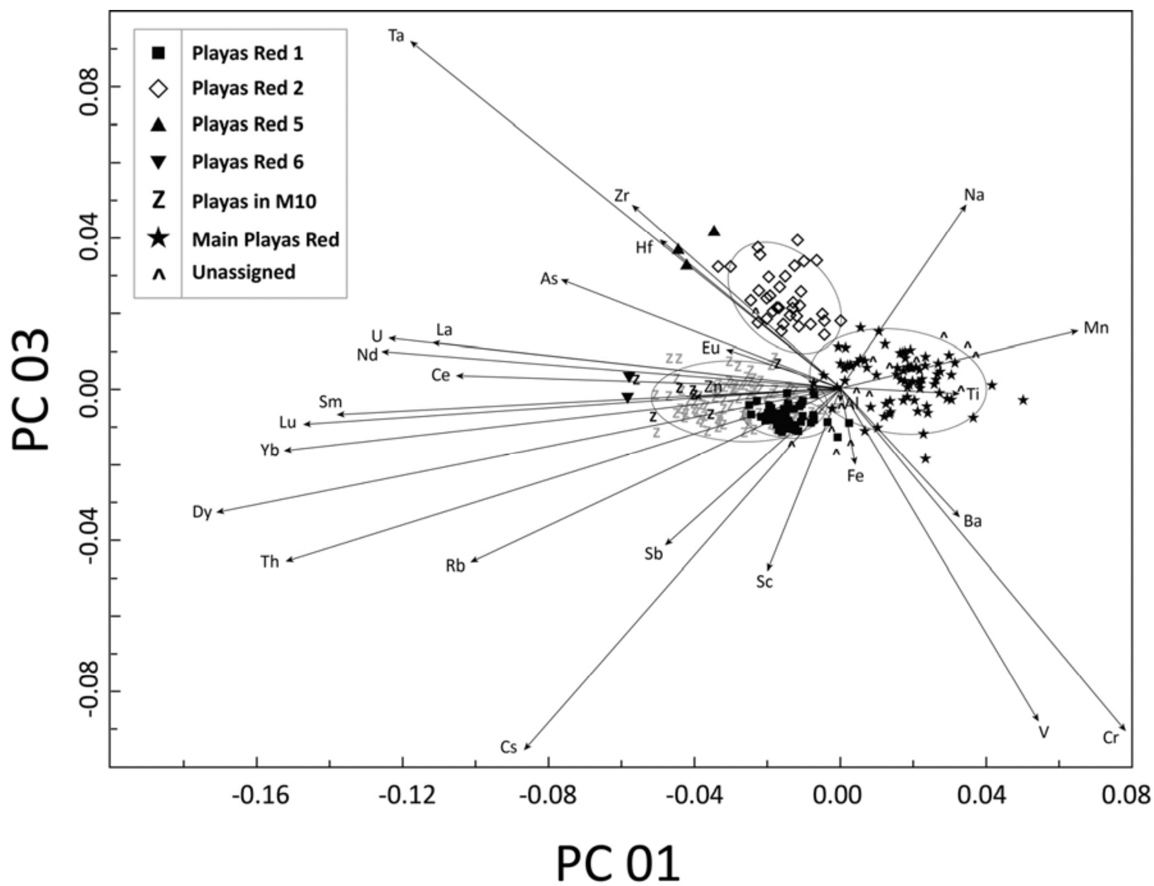

Figure D2: Bivariate plot of Principal Component 1 and Principal Component 3 showing separation of the Playas Red 1, Playas Red 2, Playas Red 5, Playas Red 6, Playas ceramic in the Mimbres-10, and Main Playas Red compositional groups. Ellipses represent 90 percent probability of group membership

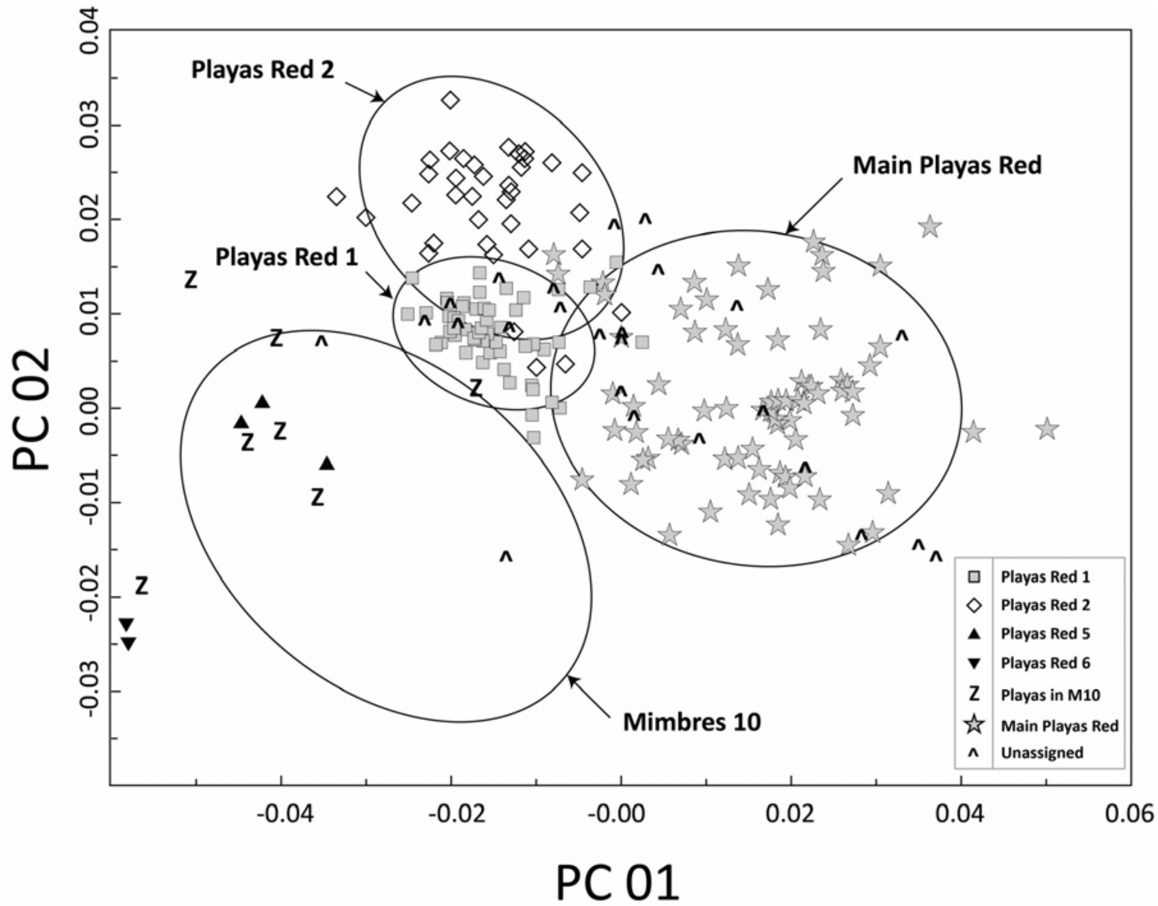

Figure D3: Bivariate plot of Principal Component 1 and Principal Component 2 showing separation of the Playas Red 1, Playas Red 2, Playas Red 5, Playas Red 6, Playas ceramic in the Mimbres-10, and Main Playas Red compositional groups. Ellipses represent 90 percent probability of group membership.

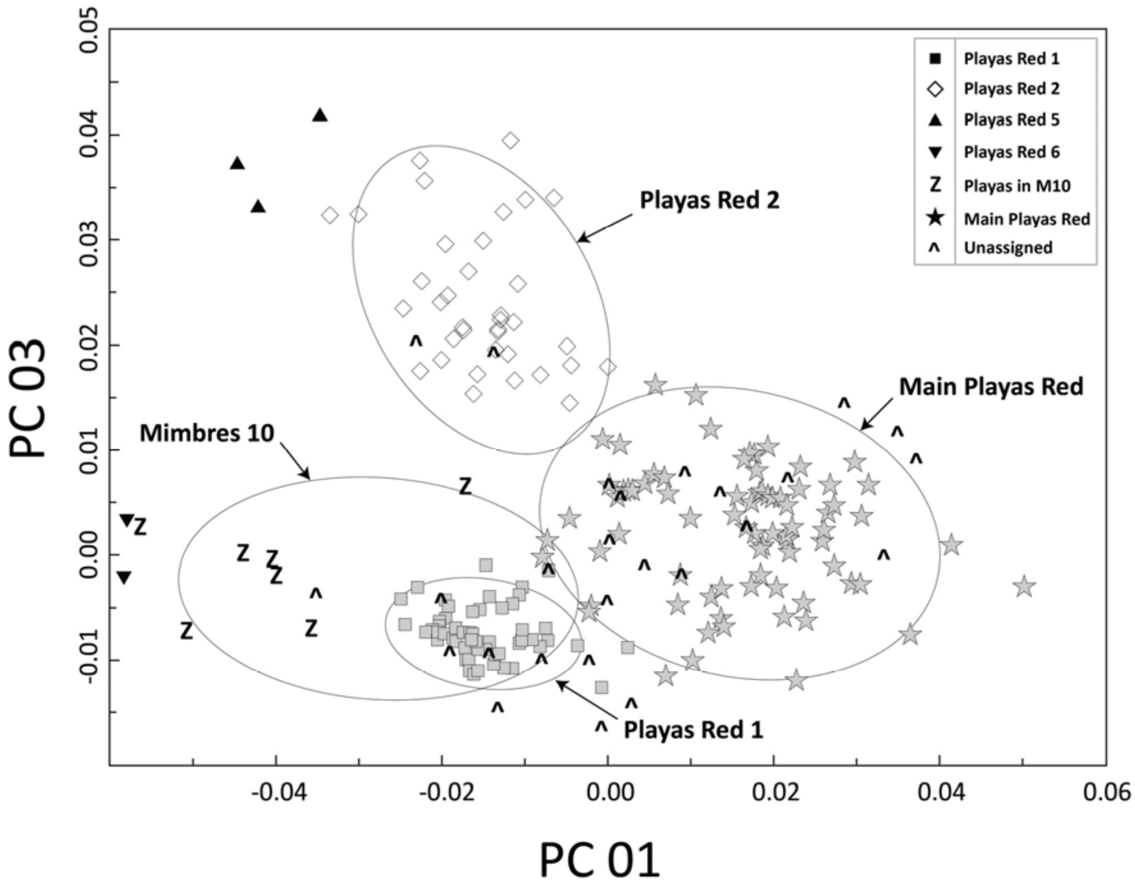

Figure D4: Bivariate plot of Principal Component 1 and Principal Component 3 showing separation of the Playas Red 1, Playas Red 2, Playas Red 5, Playas Red 6, Playas ceramic in the Mimbres-10, and Main Playas Red compositional groups. Ellipses represent 90 percent probability of group membership.

Table D1: Eigen values, percent of variance explained, and the cumulative percent of variance explained by the first 12 principal components within the Playas INAA dataset.

Principal Component	Eigenvalue	Percent Variance	Cumulative Percent Variance
1	0.237	43.476	43.476
2	0.083	15.321	58.798
3	0.053	9.709	68.506
4	0.034	6.163	74.670
5	0.020	3.671	78.341
6	0.018	3.270	81.611
7	0.015	2.772	84.383
8	0.013	2.404	86.787
9	0.012	2.244	89.031
10	0.011	2.005	91.036
11	0.008	1.546	92.581
12	0.007	1.362	93.943

Table D2: Principal Component Eigenvectors depicting contribution of different elements to the first 12 principal components established for the Playas INAA dataset.

Principal Component Eigenvectors

Element	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12
As	-0.1574	0.3314	0.1263	0.5956	0.0717	-0.2097	0.5401	0.0956	-0.2537	0.0931	-0.1670	0.1508
La	-0.2301	0.0777	0.0538	-0.2170	0.0159	0.1402	0.1445	-0.0605	0.0407	0.0696	0.0400	0.0056
Lu	-0.3027	-0.0586	-0.0403	-0.0183	-0.0185	-0.1786	-0.1114	-0.0877	-0.1959	-0.1637	-0.0553	-0.0274
Nd	-0.2587	0.1086	0.0433	-0.2181	-0.0270	0.2320	0.2266	-0.2159	0.0425	0.0514	-0.0484	-0.1012
Sm	-0.2838	0.1327	-0.0291	-0.2201	-0.0462	0.1249	0.1355	-0.0521	-0.0342	0.0854	-0.1198	0.0388
U	-0.2548	-0.1348	0.0588	-0.0560	-0.1032	-0.5638	-0.0578	0.0022	0.1871	0.6477	0.1068	-0.1589
Yb	-0.3135	-0.0136	-0.0708	-0.0298	-0.0043	-0.1403	-0.0952	-0.0638	-0.2208	-0.2472	-0.0897	0.0253
Ce	-0.2166	0.0965	0.0157	-0.2124	0.0691	0.0857	0.0550	-0.0180	0.0885	0.0312	-0.0750	0.0173
Cr	0.1607	0.2070	-0.3939	-0.1281	-0.3631	-0.3341	0.0143	-0.2384	-0.1228	-0.2362	-0.0233	-0.0701
Cs	-0.1784	0.2970	-0.4160	0.2350	0.0252	0.0576	-0.2131	-0.0888	0.3031	0.0949	0.2096	0.6672
Eu	-0.0644	0.1853	0.0458	-0.2280	-0.0732	0.1163	0.1958	-0.1426	0.0963	0.1674	0.1037	0.0765
Fe	0.0084	0.2136	-0.0869	-0.0534	0.0187	0.0741	-0.0200	0.2017	-0.1250	-0.0072	0.2200	-0.1091
Hf	-0.1016	0.1808	0.1723	-0.0718	-0.0828	-0.1153	-0.1421	0.4171	0.2041	-0.0215	-0.1639	0.0615
Rb	-0.2086	-0.1426	-0.1994	0.1177	0.2367	0.0253	-0.1277	0.1587	-0.0088	-0.0353	-0.0348	0.0382
Sb	-0.0987	0.2646	-0.1798	0.3916	0.0171	0.1552	-0.0832	-0.2505	0.5445	-0.0657	-0.1490	-0.5120
Sc	-0.0412	0.2243	-0.2094	-0.0520	-0.1338	0.1415	-0.0122	0.1542	-0.0537	0.1160	0.1373	-0.0643
Ta	-0.2423	0.0592	0.4006	0.1721	-0.1919	-0.1369	-0.1373	-0.2846	-0.0089	-0.3351	0.5794	-0.0438
Th	-0.3127	-0.2584	-0.1987	-0.0247	0.2032	-0.1371	-0.0386	0.2246	-0.0291	-0.0644	0.0376	-0.2714
Zn	-0.0841	0.2137	-0.0084	0.0967	0.0277	0.2721	-0.1602	0.2830	-0.2528	0.1973	0.4217	-0.1807
Zr	-0.1174	0.1809	0.2123	-0.0887	-0.0764	-0.1104	-0.0975	0.3940	0.2982	-0.2173	-0.1694	0.0449
Al	0.0000	-0.0104	-0.0146	-0.0211	-0.0377	0.0175	0.0537	-0.0047	-0.0041	-0.0006	0.1099	0.0423
Ba	0.0689	-0.1167	-0.1510	-0.1570	0.3070	-0.1630	0.5601	0.1425	0.3237	-0.2908	0.4120	-0.0058
Dy	-0.3518	0.0584	-0.1421	-0.1226	-0.0250	0.0679	0.0258	-0.0594	-0.1220	-0.1303	-0.1361	0.1309
Mn	0.1343	0.4926	0.0673	-0.1939	0.6864	-0.2579	-0.2757	-0.2131	-0.0806	0.0320	0.0023	0.0356
Na	0.0710	0.0373	0.2130	-0.1114	-0.0903	-0.1415	0.0325	-0.1168	0.1832	0.0459	-0.0364	0.1952
Ti	0.0672	0.2953	-0.0050	-0.0796	-0.2811	-0.0483	-0.0579	0.2344	0.0819	0.0524	0.0804	0.1106
V	0.1116	0.1715	-0.3826	-0.0848	-0.1316	-0.2324	0.0936	0.0989	-0.0886	0.0058	0.0344	-0.1357

complexity of the dataset (Table D2). As the data in Table D2 shows, Principal Component 1 is primarily composed of variation in concentrations of 11 of elements measured by means of INAA (lanthanum, lutetium, neodymium, samarium, uranium, ytterbium, cerium, rubidium, tantalum, thorium, and dysprosium), Principal Component 2 is primarily composed of variation in ten elemental concentrations (arsenic, chromium, cesium, iron, antimony, scandium, thorium, zinc, manganese, and titanium), Principal Component 3 is composed of variation in seven elemental concentrations (chromium, cesium, scandium, tantalum, zirconium, sodium, and vanadium), Principal Component 4 is composed of variation in eight elemental concentrations (arsenic, lanthanum, neodymium, samarium, cerium, cesium, europium, and antimony), and Principal Component 5 is composed of variation in six elemental concentrations (chromium, rubidium, thorium, barium, manganese, and titanium).

While PCA proved useful in depicting the separation between the Playas Red 1, Playas Red 2, Playas Red 5, Playas Red 6, Main Playas Red, and Mimbres-10 compositional groups, the separation of groups that occupy the same multidimensional space as the Main Playas Red compositional group is based primarily on bivariate analyses of elemental concentrations. Specifically, thorium concentrations are useful in separating the Mimbres-4c, Mimbres-5a, Mimbres-49a, Playas Red 3, and Playas Red 4 compositional groups from within the Main Playas Red compositional group. The separation of these groups is depicted in Figure D5, Figure D6, Figure D7, Figure D8, and Figure D9.

While thorium concentrations aid in the discrimination of distinct compositional groups occupying the same multidimensional space as the Main Playas Red group, they also aid in the separation of the Playas Red 5, Playas Red 6, and the Mimbres-10 compositional groups (Figure D9).

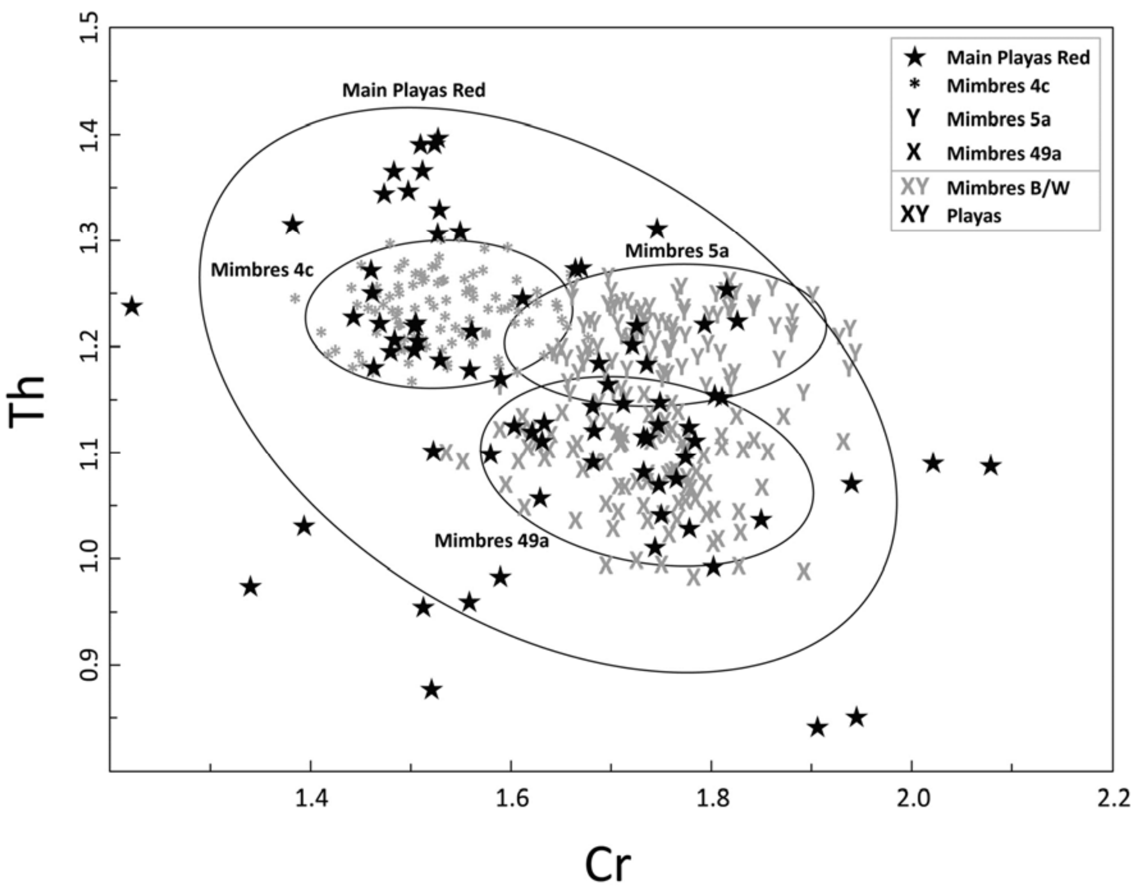

Figure D5: Bivariate plot of thorium and chromium concentrations for Playas ceramics grouped into the Main Playas Red compositional group established by Creel and colleagues (2000). Note the position of the Mimbres compositional groups 4c, 5a, and 49a established by Speakman (2008, 2012) in relation to the Main Playas Red group. Ellipses represent 90 percent probability of group membership.

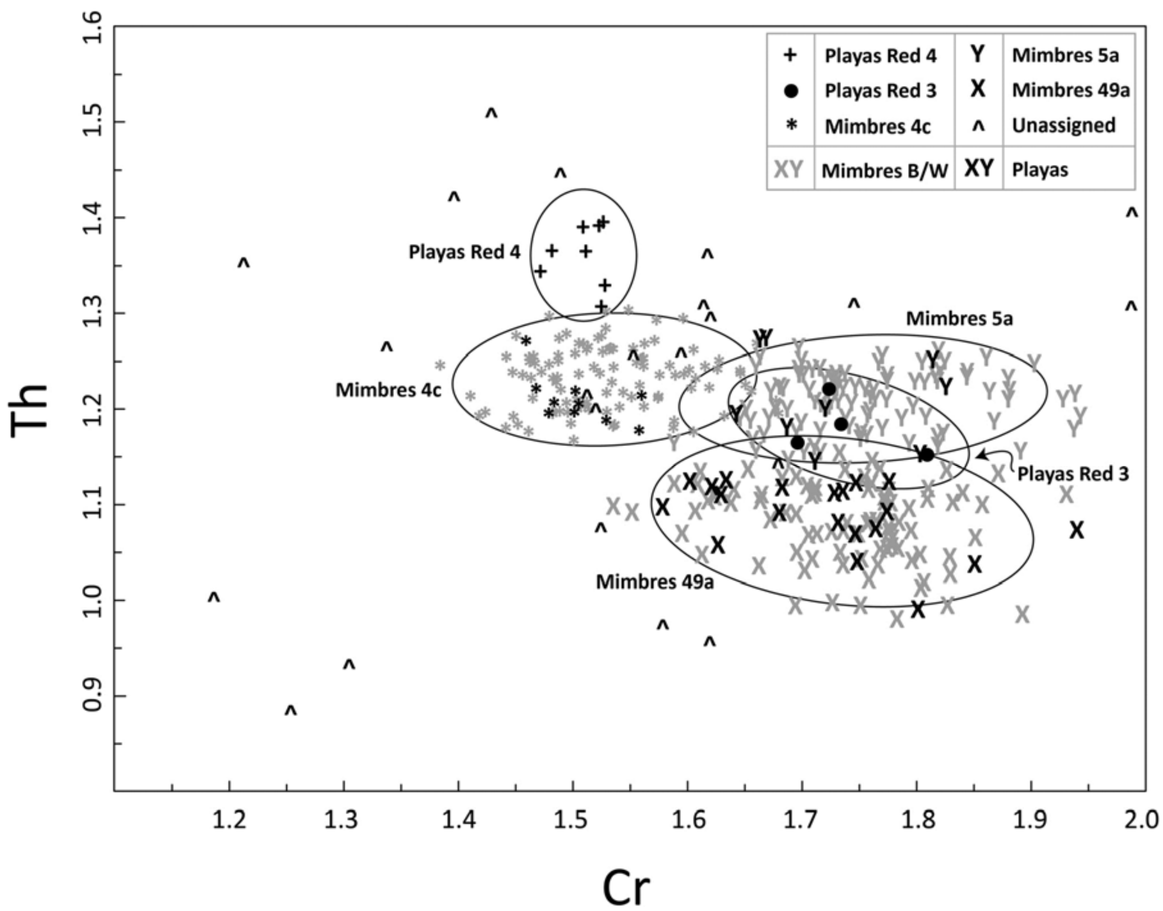

Figure D6: Bivariate plot of thorium and chromium concentrations for Playas ceramics groups established within the larger Main Playas Red compositional group. The figure includes Mimbres Black-on-white samples used by Speakman (2008, 2012) in his analysis of the Mimbres/Jornada INAA dataset. Ellipses represent 90 percent probability of group membership.

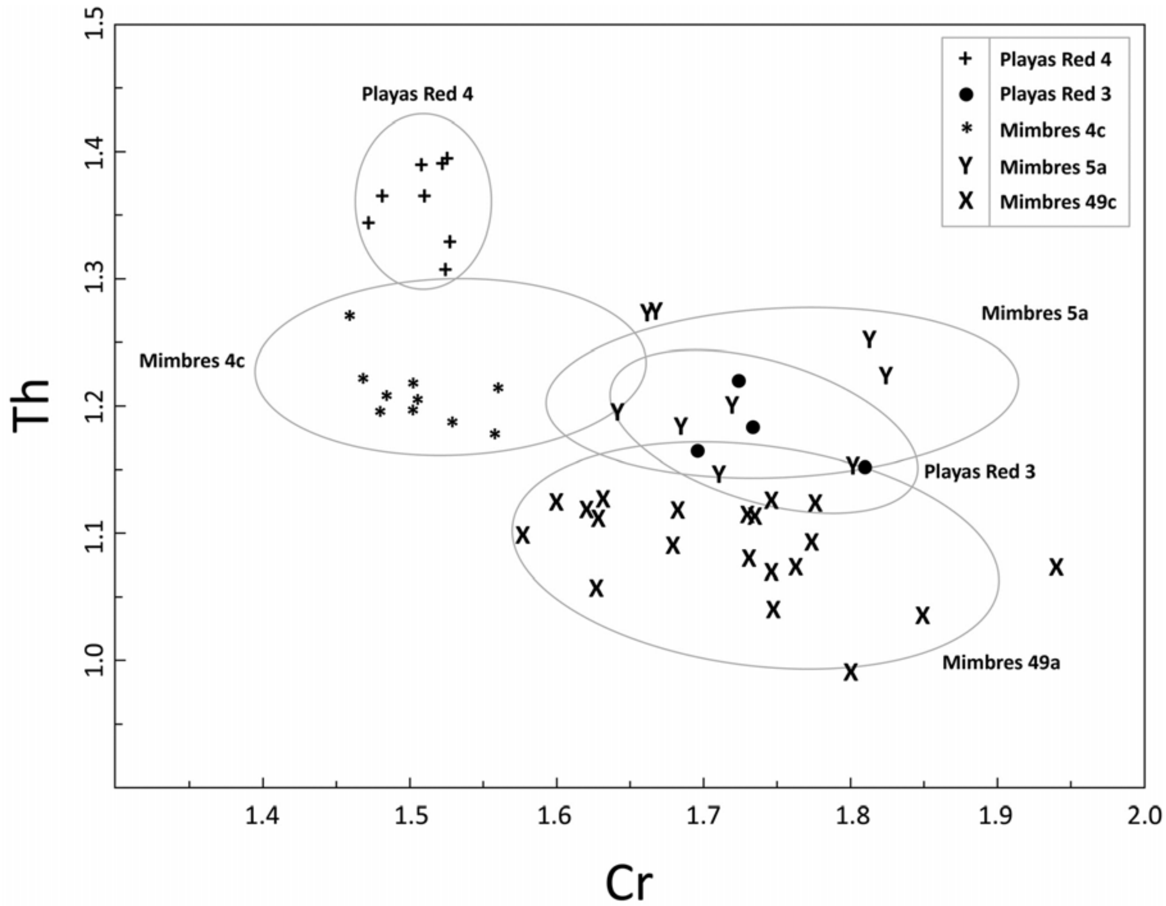

Figure D7: Bivariate plot of thorium and chromium concentrations for Playas ceramics groups established within the larger Main Playas Red compositional group. The Figure depicts only those Playas ceramics assigned to individual compositional groups and excludes the Mimbres Black-on-white sample used in Speakman's analysis (2008, 2012), though these samples were used in the construction of the Mimbres groups' confidence ellipses. Ellipses represent 90 percent probability of group membership.

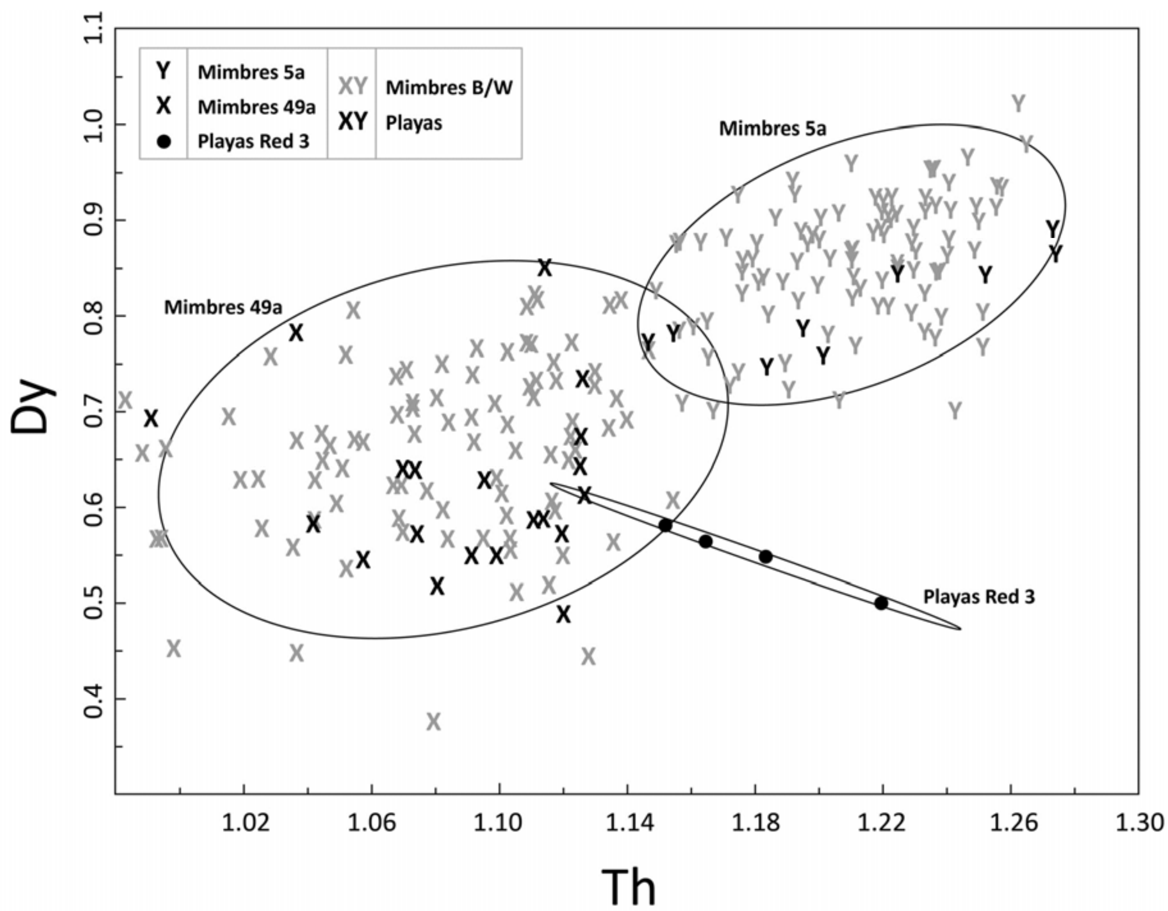

Figure D8: Bivariate plot of dysprosium and thorium concentrations for Playas and Mimbres Black-on-white ceramics grouped into the Mimbres-49a, Mimbres-5a, and Playas Red 3 compositional groups. Ellipses represent 90 percent probability of group membership.

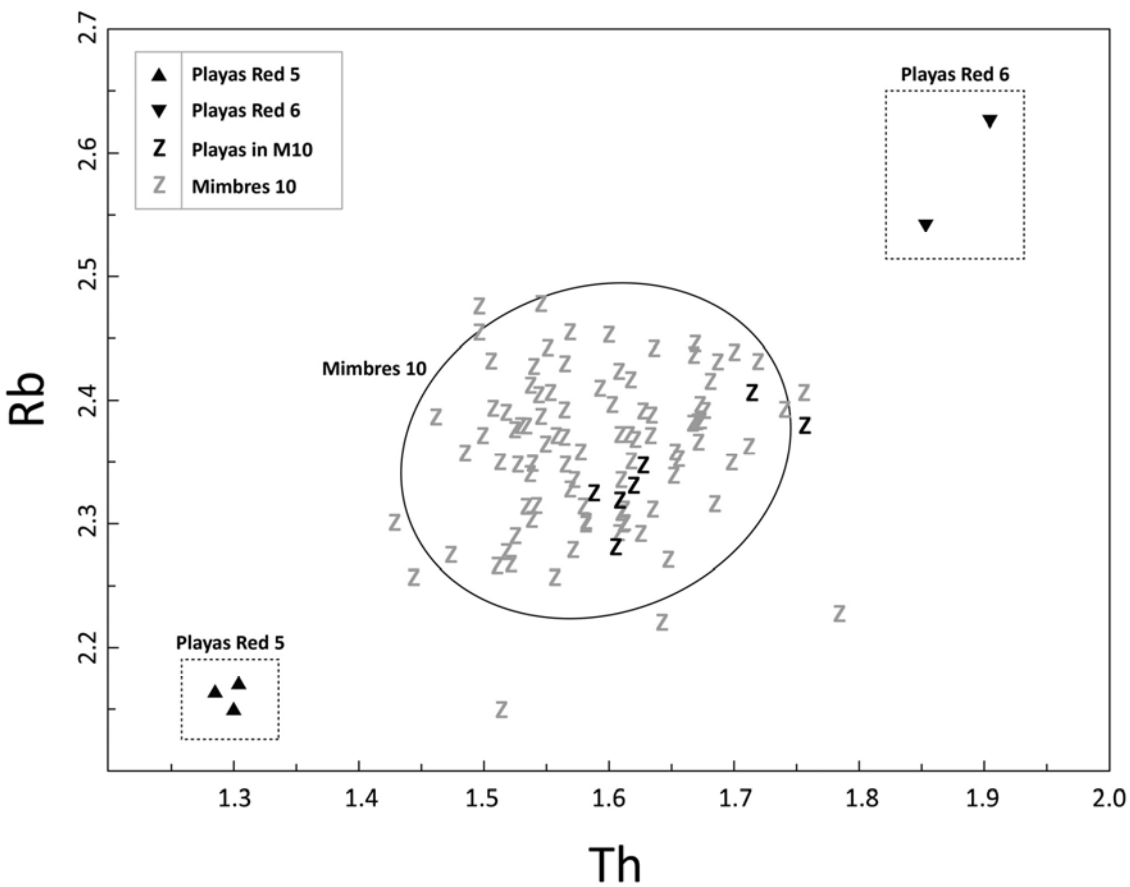

Figure D9: Bivariate plot of thorium and rubidium concentrations showing separation of Speakman's Mimbres-10 compositional group from the Playas Red 5 and Playas Red 6 provisional groups established during this study. The Mimbres-10 group also depicts Mimbres/Jornada Mogollon samples used in Speakman's (2008, 2012) analysis. Ellipses represent 90 percent probability of group membership. Both the Playas Red 5 and Playas Red 6 provisional groups do not contain enough members to establish a group centroid.

Finally, some of the Playas ceramic samples used in this study were not able to be assigned to any of the provisional groups established in this analysis (n=23) (Figure D10 and Figure D11). However, some samples did occupy the same multidimensional space as the Main Playas Red compositional group though were not assignable to any of the provisional groups either established as part of the current study or established as part of Speakman's analyses of the Mimbres/Jornada INAA dataset (Speakman 2008, 2012). These samples (n=30) were assigned to an unassigned group within the Main Playas Red group.

As mentioned earlier, the Main Playas Red group came to represent a catch-all group where samples which were not assignable to either the Playas Red 1 or Playas Red 2 compositional group were placed. While this group was initially established for this purpose, as more Playas and Mimbres samples were submitted for characterization by means of INAA, the Main Playas Red compositional group began to absorb more samples with a similar chemical signature. While this compositional group grew in size, no efforts were taken to determine if the ever-growing Main Playas Red group could be broken down into smaller distinct compositional groups. Similarly, when Speakman began his analysis of the Mimbres/Jornada INAA dataset the placement of his emerging compositional groups was never compared to the position of the Main Playas Red group in multidimensional space primarily because this group was composed of types whose production dates were later than those his research was focused on. Thus, the Main Playas Red compositional group does represent a reality though it can be separated into distinct compositional groups. Because of this, those samples which were not assignable to the Mimbres-4c, Mimbres-5a, Mimbres-49a, Playas Red 3, or Playas Red 4 compositional groups were assigned to the Main Playas Red Unassigned group.

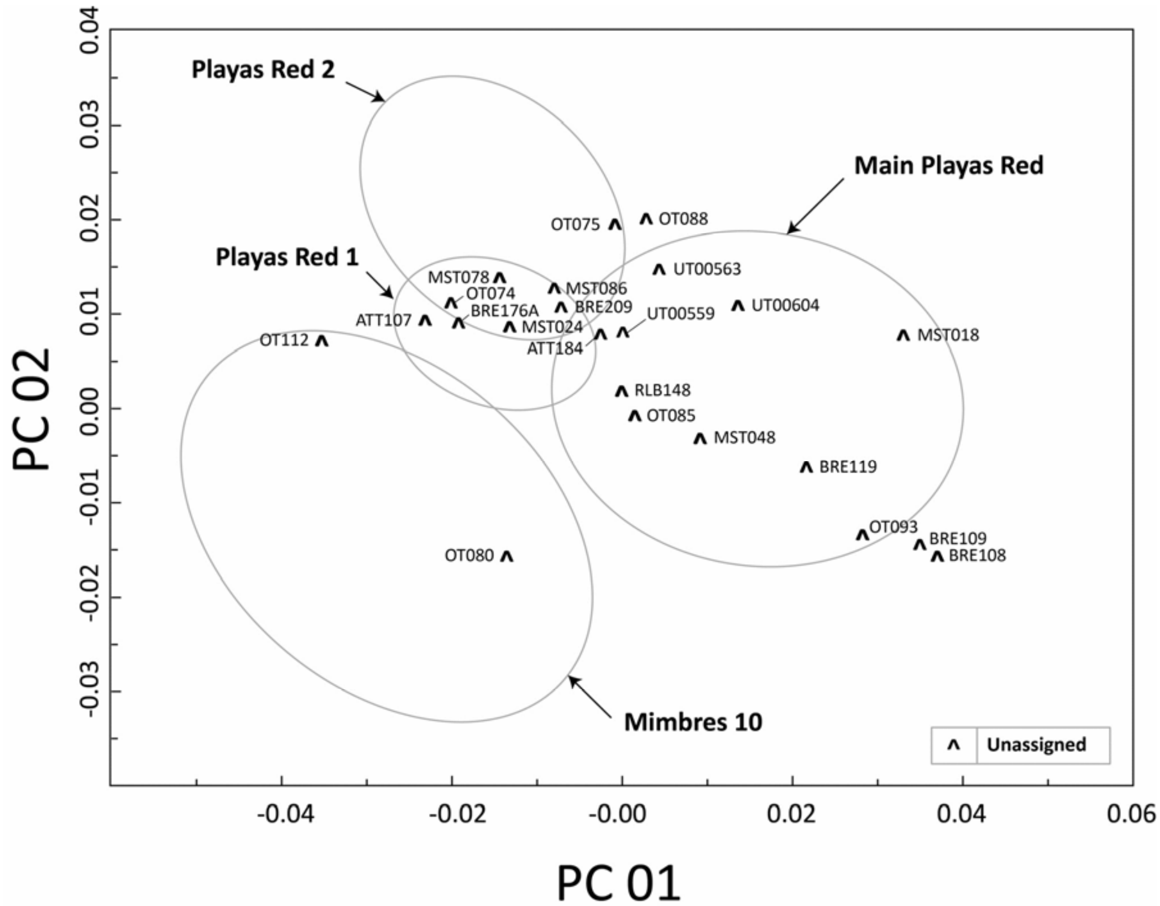

Figure D10: Bivariate plot of Principal Component 1 and Principal Component 2 showing unassigned samples in relation to specific compositional groups. Ellipses represent 90 percent probability of group membership.

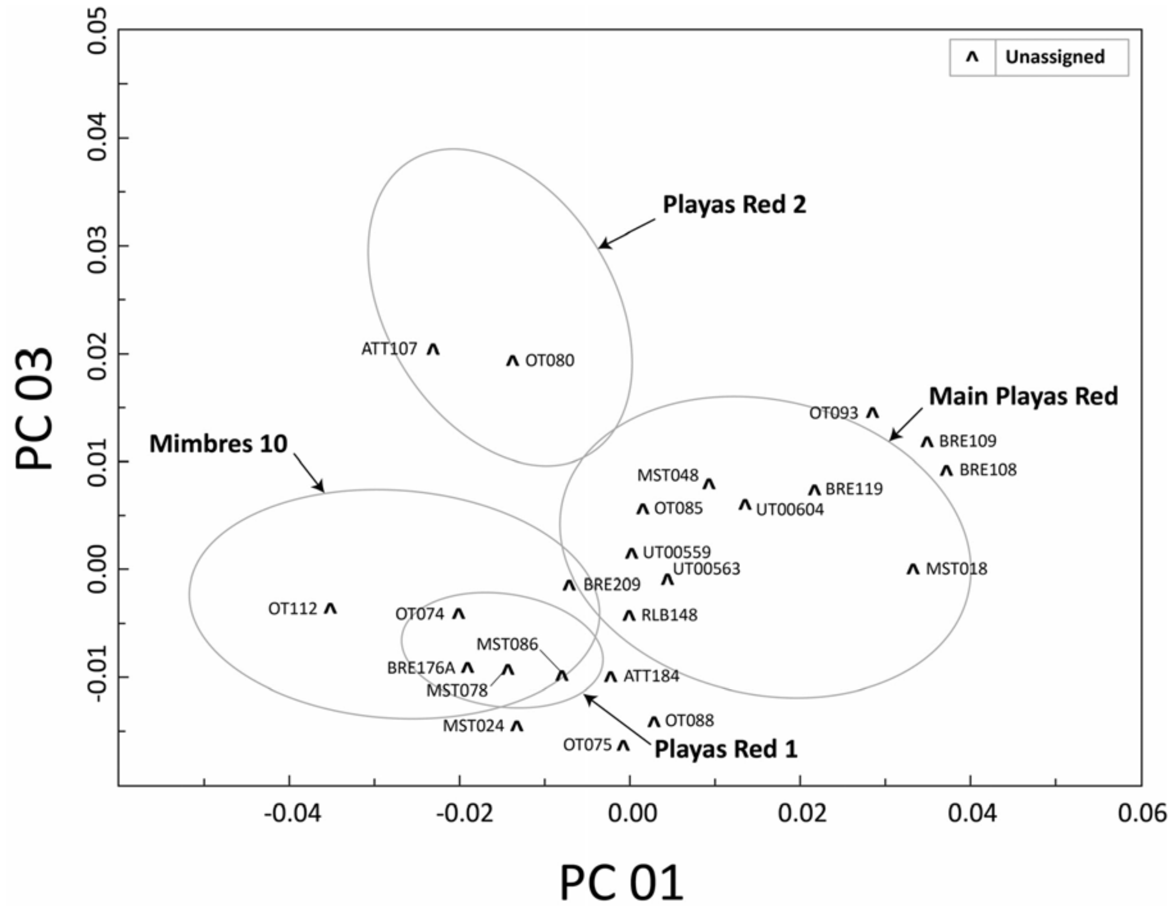

Figure D11: Bivariate plot of Principal Component 1 and Principal Component 3 showing unassigned samples in relation to specific compositional groups. Ellipses represent 90 percent probability of group membership.

Appendix E: Probabilities of Group Membership based on Mahalanobis Distance from Group Centroids

The data contained within the following tables depict the probability of group membership for individual samples within the larger Playas series INAA dataset. Table E1 presents the Mahalanobis distance calculations and posterior classifications for Playas Red 1 and Playas Red 2. These are the only two groups with sufficiently large sample sizes to jackknife the probability of group membership. The probabilities of group membership are based on Ba, Al, Zr, Zn, Th, Tb, Ta, Sc, Sb, Rb, Hf, Fe, Eu, Cs, Cr, Co, Ce, Yb, U, Sm, Nd, Lu, La, As, Dy, Mn, Na, Ti, and V concentrations. The main thing to note in this table is that samples assigned to Playas Red 1 have a low probability of membership in Playas Red 2 and vice versa.

Table E2 presents the Mahalanobis distance calculation for the remaining groups projected against Playas Red 1 and Playas Red 2. Again, the probabilities of group membership are based on Ba, Al, Zr, Zn, Th, Tb, Ta, Sc, Sb, Rb, Hf, Fe, Eu, Cs, Cr, Co, Ce, Yb, U, Sm, Nd, Lu, La, As, Dy, Mn, Na, Ti, and V concentrations. The main thing to notice in this table is that the probability of samples assigned to Mimbres-4c, Mimbres-5a, Mimbres-10, Mimbres-49a, Playas Red 3, Playas Red 4, Playas Red 5, and Playas Red 6 belonging to either the Playas Red 1 or Playas Red 2 compositional group is miniscule.

Table E1: Mahalanobis distance calculation and posterior classification for Playas Red 1 and Playas Red 2. Probabilities are jackknifed for specimens included in each group. Groups are 1: Playas Red 1, and 2: Playas Red 2.

The following specimens are in the file Playas Red 1

	Probabilities:			
ID. NO.	**PR1**	**PR2**	**From:**	**Into:**
BRE200A	16.316	0.001	1	1
OT076	2.512	0.001	1	1
MST038	86.42	0.004	1	1
MST041	72.103	0.003	1	1
MST043	19.702	0	1	1
MST044	39.876	0.001	1	1
MST045	44.154	0	1	1
MST046	29.05	0.012	1	1
MST047	22.007	0.001	1	1
MST053	97.613	0.002	1	1
BRE173	29.88	0.001	1	1
BRE174	0.946	0.001	1	1
BRE177	53.536	0.003	1	1
MST059	97.487	0.001	1	1
MST062	92.163	0.005	1	1
MST063	59.269	0.002	1	1
MST064	99.686	0.002	1	1
MST065	30.589	0.001	1	1
MST066	20.762	0	1	1
MST067	47.518	0.002	1	1
MST068	22.935	0.001	1	1
MST069	94.886	0.001	1	1
MST070	26.096	0.002	1	1
MST071	25.35	0.01	1	1
MST072	73.067	0.001	1	1
MST073	75.112	0	1	1
MST074	61.978	0.052	1	1
MST075	98.398	0	1	1
MST076	53.192	0.001	1	1
MST077	7.098	0.001	1	1
MST079	76.776	0.003	1	1
MST080	1.258	0.046	1	1
MST083	92.084	0	1	1
MST084	61.092	0.001	1	1
MST093	56.391	0.007	1	1
MST095	36.868	0.03	1	1
MST101	61.839	0.001	1	1

Table E1 (continued): Manalanobis distance calculation and posterior classification for Playas Red 1 and Playas Red 2. Probabilities are jackknifed for specimens included in each group. Groups are 1: Playas Red 1, and 2: Playas Red 2.

The following specimens are in the file Playas Red 1

	Probabilities:			
ID. NO.	**PR1**	**PR2**	**From:**	**Into:**
OT039	88.425	0.007	1	1
OT040	51.964	0.007	1	1
OT052	0.842	0.006	1	1
OT053	79.306	0.002	1	1
OT055	50.506	0.004	1	1
OT056	68.082	0.004	1	1
OT107	86.293	0.003	1	1
OT108	49.851	0.001	1	1
OT109	28.235	0.001	1	1
OT110	59.758	0.002	1	1
OTP09X	42.963	0.006	1	1
OTP11X	19.855	0.003	1	1
MST004	11.718	0.001	1	1
MST007	19.222	0.001	1	1
MST008	2.903	0	1	1
MST027	36.796	0.001	1	1
MST029	41.553	0.002	1	1
MST030	88.292	0.034	1	1
MST031	75.61	0.002	1	1
OT277	54.549	0.001	1	1

Table E1 (continued): Manalanobis distance calculation and posterior classification for Playas Red 1 and Playas Red 2. Probabilities are jackknifed for specimens included in each group. Groups are 1: Playas Red 1, and 2: Playas Red 2.

The following specimens are in the file Playas Red 2

	Probabilities:			
ID. No.	**PR1**	**PR2**	**From:**	**Into:**
BRE211	0	2.242	2	2
BRE213	0	38.513	2	2
BRE121	0	19.116	2	2
OT123	0	34.149	2	2
OT124	0	98.598	2	2
EP107	0	62.235	2	2
EP108	0	37.545	2	2
OT092	0	25.385	2	2
OT095	0	0.612	2	2
UT00417	0	28.705	2	2
UT00429	0	35.343	2	2
UT00432	0	35.365	2	2
OT546	0	91.055	2	2
OT144	0	96.639	2	2
MST058	0	51.228	2	2
MST060	0	0.152	2	2
MST081	0	98.343	2	2
MST082	0	40.717	2	2
MST085	0	80.38	2	2
MST089	0	88.696	2	2
MST092	0	0.03	2	2
MST096	0	98.671	2	2
MST099	0	10.394	2	2
OT036	0	11.794	2	2
OT540	0	10.666	2	2
OT541	0	65.683	2	2
MST001	0	88.038	2	2
MST003	0	2.395	2	2
MST005	0	12.905	2	2
MST010	0	92.134	2	2
MST013	0	34.859	2	2
MST015	0	78.653	2	2
MST020	0	86.395	2	2
MST022	0	8.487	2	2
MST028	0	70.708	2	2

Table E2: Mahalanobis distance calculation for different specimens projected against Playas Red 1 and Playas Red 2. Reference groups are 1: Playas Red 1, and 2: Playas Red 2.

The following specimens are in the file Main Playas Red: Mimbres-4c

	Probabilities:		
ID. No.	**PR1**	**PR2**	**BEST GP.**
BRE212	0	0	2
MST039	0	0	2
MST054	0	0	2
MST102	0	0	2
OT065	0	0	2
MST014	0	0	2
MST023	0	0	2
MST025	0	0	2
MST026	0	0	2
MST032	0	0	2

The following specimens are in the file Main Playas Red: Mimbres-5a

	Probabilities:		
ID. NO.	**PR1**	**PR2**	**BEST GP.**
UT00553	0	0	2
UT00554	0	0	2
RLB149	0	0	2
MST051	0	0	2
MST090	0	0	2
OT054	0	0	2
OT067	0	0	2
OT532	0	0	2

The following specimens are in the file Main Playas Red: Mimbres-10

	Probabilities:		
ID. NO.	**PR1**	**PR2**	**BEST GP.**
RLB170	0	0	2
OT545	0	0	2
OT111	0	0	2
MST011	0	0	2
MST016	0	0	2
OT086	0	0	2
OT087	0	0	2

Table E2 (continued): Mahalanobis distance calculation for different specimens projected against Playas Red 1 and Playas Red 2. Reference groups are 1: Playas Red 1, and 2: Playas Red 2.

The following specimens are in the file Main Playas Red: Mimbres-49a

	Probabilities:		
ID. NO.	**PR1**	**PR2**	**BEST GP.**
BRE117	0	0	2
BRE123	0	0	2
BRE131	0	0	2
RLB150	0	0	2
RLB152	0	0	2
OT126	0	0	2
MST040	0	0	2
MST042	0	0	2
MST052	0	0	2
MST061	0	0	2
MST088	0	0	2
MST100	0	0	2
OT068	0	0	2
OT543	0	0	2
MST002	0	0	2
MST006	0	0	2
MST009	0	0	2
MST021	0	0	2
MST035	0	0	2
MST036	0	0	2

The following specimens are in the file Main Playas Red: Playas Red 4

	Probabilities:		
ID. NO.	**PR1**	**PR2**	**BEST GP.**
BRE198	0	0	2
OT153	0	0	2
MST087	0	0	2
MST098	0	0	2
OT037	0	0	2
OT038	0	0	2
OTP08X	0	0	2
MST017	0	0	2

Table E2 (continued): Mahalanobis distance calculation for different specimens projected against Playas Red 1 and Playas Red 2. Reference groups are 1: Playas Red 1, and 2: Playas Red 2.

The following specimens are in the file Playas Red: Unassigned

	Probabilities:		
ID. NO.	**PR1**	**PR2**	**BEST GP.**
ATT107	0	0	2
ATT184	0	0	2
UT00559	0	0	2
UT00563	0	0	2
UT00604	0	0	2
BRE209	0	0	2
BRE108	0	0	2
BRE109	0	0	2
BRE119	0	0	2
RLB148	0	0	2
OT080	0	0	2
OT085	0	0	2
OT093	0	0	2
OT074	0	0	2
OT075	0	0	2
MST048	0	0	2
BRE176A	0	0	2
MST078	0	0	2
MST086	0	0	2
OT112	0	0	2
MST018	0	0	2
MST024	0	0	2
OT088	0	0	2

The following specimens are in the file Playas Red 5

	Probabilities:		
ID. NO.	**PR1**	**PR2**	**BEST GP.**
OT082	0	0	2
OT083	0	0	2
OT084	0	0	2

The following specimens are in the file Playas Red 6

	Probabilities:		
ID. NO.	**PR1**	**PR2**	**BEST GP.**
BRE111	0	0	2
MST019	0	0	2

Table E2 (continued): Mahalanobis distance calculation for different specimens projected against Playas Red 1 and Playas Red 2. Reference groups are 1: Playas Red 1, and 2: Playas Red 2.

The following specimens are in the file Main Playas Red: Unassigned

	Probabilities:		
ID. NO.	**PR1**	**PR2**	**BEST GP.**
UT00602	0	0	2
UT00603	0	0	2
BRE210	0	0	2
BRE113	0	0	2
BRE127	0	0	2
RLB151	0	0	2
RLB182	0	0	2
RLB187	0	0	2
OT081	0	0	2
OT094	0	0	2
OT096	0	0	2
OT073	0	0	2
OT127	0	0	2
BRE175	0	0	2
MST055	0	0	2
MST056	0	0	2
MST057	0	0	2
MST091	0	0	2
MST094	0	0	2
MST097	0	0	2
MVP0209	0	0	2
OT066	0	0	2
OT069	0	0	2
OTP07X	0	0	2
OTP10X	0	0	2
OT542	0	0	2
MST012	0	0	2
MST033	0	0	2
MST034	0	0	2
MST037	0	0	2

Appendix F: Descriptive Statistics for Elemental Concentrations Associated with Different Compositional Groups

The following tables present descriptive statistics for elemental concentrations associated with the different compositional groups associated with Playas series ceramics.

Table F1: Descriptive statistics for the Main Playas Red: Mimbres-4c compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	748.381	193.875	25.906	10	528.042	1121
Al	84731.905	2796.644	3.301	10	80107.4	88837
Zn	77.35	9.666	12.496	10	58.2	90.03
Zr	202.896	56.107	27.653	10	134.413	322.688
Th	16.233	0.989	6.094	10	15.069	18.672
Tb	0.738	0.06	8.151	10	0.643	0.869
Ta	1.231	0.106	8.588	10	1.107	1.43
Sc	7.745	0.643	8.306	10	7.044	8.998
Sb	0.451	0.084	18.669	10	0.343	0.602
Rb	131.868	11.402	8.646	10	113.096	147.949
Ca	13060.094	2148.719	16.453	9	9690.959	16358.511
Hf	7.888	1.16	14.711	10	5.936	9.451
Fe	29784.203	2970.69	9.974	10	25429.633	33605.3
Eu	1.214	0.12	9.915	10	1.062	1.423
Cs	4.272	0.718	16.815	10	3.58	5.712
Cr	32.023	2.618	8.176	10	28.735	36.26
Co	8.671	1.246	14.375	10	7.134	10.75
Ce	77.159	5.931	7.687	10	69.45	90.349
Yb	2.859	0.157	5.501	10	2.612	3.142
U	2.769	0.259	9.351	10	2.397	3.075
Sm	5.928	0.473	7.975	10	5.287	6.775
Nd	32.387	4.893	15.107	10	26.616	41.17
Lu	0.398	0.019	4.773	10	0.374	0.44
La	40.283	2.337	5.8	10	37.468	46.211
As	3.266	1.009	30.912	10	2.012	5.561
Dy	3.959	0.414	10.462	10	3.181	4.569
Mn	531.891	85.904	16.151	10	388.235	683.6
Na	17442.017	1611.866	9.241	10	15314.462	19735.746
Ti	3877.405	477.421	12.313	10	3158.341	4814.802
V	57.573	10.468	18.183	10	43.92	77.995

Table F2: Descriptive statistics for the Main Playas Red: Mimbres-5a compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	771.174	96.173	12.471	8	581.812	857.9
Al	81033.999	4316.57	5.327	8	73814.766	86624.7
Zn	85.352	9.433	11.052	8	71.8	102.065
Zr	231.454	47.351	20.458	8	149.15	285.77
Th	16.448	1.906	11.59	8	14.015	18.791
Tb	1.146	0.159	13.869	8	0.86	1.321
Ta	1.443	0.262	18.151	8	1.039	1.771
Sc	10.931	0.764	6.985	8	9.67	12.181
Sb	0.647	0.135	20.901	8	0.399	0.791
Rb	137.721	12.045	8.746	8	115.334	155
Ca	17303.048	6818.294	39.405	7	11791.574	29458.5
Hf	9.601	1.654	17.226	8	7.099	11.345
Fe	39035.847	3107.41	7.96	8	34938.8	43829.727
Eu	1.454	0.036	2.481	8	1.413	1.502
Cs	6.191	1.171	18.91	8	4.092	8.099
Cr	55.053	8.671	15.751	8	46.096	66.826
Co	12.19	1.255	10.295	8	10.857	14.587
Ce	91.464	7.114	7.778	8	83.094	103.222
Yb	4.327	0.854	19.74	8	2.878	5.44
U	3.436	1.247	36.295	8	2.197	5.72
Sm	8.62	0.898	10.419	8	7.445	9.508
Nd	41.098	4.253	10.35	8	37.098	49.339
Lu	0.572	0.082	14.285	8	0.437	0.663
La	46.277	2.464	5.324	8	41.709	48.583
As	5.26	3.332	63.352	7	1.944	10.422
Dy	6.553	0.848	12.948	8	5.56	7.818
Mn	695.44	95.167	13.684	8	502.07	803.2
Na	15068.463	1557.623	10.337	8	12723.8	16619.5
Ti	4679.989	532.021	11.368	8	3509.3	5155.639
V	82.64	11.776	14.25	8	57.7	98.8

Table F3: Descriptive statistics for the Main Playas Red: Mimbres-10 compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	740.042	118.105	15.959	7	539.72	872
Al	90024.503	7494.411	8.325	7	81629.344	102377.18
Zn	115.56	67.707	58.59	7	68.6	255.769
Zr	251.189	39.86	15.869	7	186.7	300.5
Th	44.577	6.941	15.571	7	38.691	57.017
Tb	2.581	0.756	29.303	7	1.4	3.593
Ta	2.141	0.399	18.659	7	1.437	2.563
Sc	10.28	1.462	14.218	7	8.329	13.182
Sb	0.443	0.093	20.995	7	0.314	0.605
Rb	219.869	21.197	9.641	7	190.8	254.4
Ca	8752.755	1301.266	14.867	6	6341.761	10270
Hf	9.757	2.066	21.176	7	6.567	12.313
Fe	34616.229	5674.41	16.392	7	27219.9	43373.023
Eu	1.892	0.362	19.116	7	1.341	2.333
Cs	7.773	1.966	25.289	7	4.29	10.964
Cr	30.052	5.001	16.641	7	19.923	34.086
Co	7.504	2.326	30.992	7	3.567	10.239
Ce	183.733	54.764	29.807	7	100.212	247.456
Yb	9.425	2.068	21.941	7	6.483	12.517
U	7.393	5.004	67.678	7	3.404	18.41
Sm	19.737	6.034	30.569	7	10.605	28.473
Nd	106.934	36.576	34.204	7	59.047	150.498
Lu	1.251	0.155	12.406	7	0.992	1.433
La	117.78	42.189	35.82	7	63.963	191.092
As	5.09	3.04	59.738	5	2.18	9.458
Dy	14.629	3.389	23.164	7	8.428	18.294
Mn	538.607	361.732	67.161	7	192.7	1281.15
Na	13664.081	3232.388	23.656	7	9016	18237.41
Ti	3167.391	867.588	27.391	7	1936.7	4653.721
V	59.527	12.978	21.803	7	45.2	81.909

Table F4: Descriptive statistics for the Main Playas Red: Mimbres-49a compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	797.149	131.395	16.483	20	525.524	1042
Al	83021.32	3434.827	4.137	20	75930.7	87645.063
Zn	84.674	21.473	25.359	20	53.2	148.9
Zr	185.929	24.11	12.967	20	152.207	238.9
Th	12.331	0.998	8.09	20	9.809	13.384
Tb	0.829	0.162	19.512	20	0.55	1.217
Ta	1.058	0.082	7.782	20	0.865	1.174
Sc	9.921	1.452	14.631	20	7.497	13.453
Sb	0.483	0.241	49.86	20	0.241	1.254
Rb	107.068	13.125	12.259	20	86.6	140.495
Ca	18417.085	6111.519	33.184	15	11923.838	38614.5
Hf	7.385	0.691	9.356	20	6.23	9.293
Fe	36427.77	4333.278	11.896	20	29287.557	45701.953
Eu	1.414	0.147	10.406	20	1.19	1.733
Cs	4.105	1.137	27.696	20	2.706	7.02
Cr	53.553	11.733	21.91	20	37.82	87.109
Co	12.228	2.802	22.911	20	9.232	19.525
Ce	76.281	9.591	12.573	20	61.256	101.432
Yb	2.828	0.346	12.249	20	2.205	3.634
U	2.328	0.501	21.534	20	1.58	3.44
Sm	6.643	0.908	13.671	20	5.422	9.062
Nd	36.588	7.713	21.082	20	28.211	62.637
Lu	0.394	0.05	12.705	20	0.311	0.523
La	40.888	3.445	8.426	20	34.963	48.004
As	3.029	1.209	39.928	20	1.186	5.679
Dy	4.287	0.977	22.794	20	3.102	7.111
Mn	591.766	125.263	21.168	20	411.928	865.7
Na	15633.86	2421.731	15.49	20	10537.502	18967.691
Ti	4324.757	824.655	19.068	20	2800.1	6414.976
V	74.588	13.756	18.442	20	52.3	98.9

Table F5: Descriptive statistics for the Main Playas Red: Playas Red 4 compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	829.272	107.965	13.019	8	632.428	955
Al	90538.249	4486.163	4.955	8	83067	94731.805
Zn	82.465	13.916	16.875	8	63.7	101.966
Zr	233.836	40.125	17.159	8	199.206	308
Th	22.999	1.657	7.203	8	20.282	24.814
Tb	0.925	0.066	7.113	8	0.83	1.029
Ta	1.585	0.063	3.972	8	1.481	1.676
Sc	8.902	0.566	6.361	8	8.139	9.644
Sb	0.477	0.121	25.46	8	0.35	0.751
Rb	137.99	7.659	5.551	8	130	152.275
Ca	14443.412	1040.207	7.202	7	13037.04	15708
Hf	9.493	1.433	15.099	8	7.777	11.304
Fe	36399.884	2126.815	5.843	8	32631.807	39829.7
Eu	1.268	0.045	3.575	8	1.205	1.328
Cs	4.371	0.678	15.504	8	3.66	5.822
Cr	32.331	1.558	4.818	8	29.641	33.724
Co	8.408	0.636	7.559	8	7.817	9.687
Ce	93.39	7.55	8.085	8	86.079	107.707
Yb	3.819	0.203	5.326	8	3.601	4.211
U	3.816	0.352	9.234	8	3.372	4.528
Sm	7.178	0.575	8.01	8	6.317	7.785
Nd	36.838	4.737	12.86	8	31.634	44.942
Lu	0.526	0.035	6.626	8	0.476	0.597
La	48.84	4.706	9.636	8	43.14	55.673
As	4.081	1.009	24.719	8	2.362	5.418
Dy	5.182	0.712	13.747	8	4.335	6.371
Mn	528.368	47.368	8.965	8	462.945	584.577
Na	18629.821	845.457	4.538	8	17680.2	20322.492
Ti	3974.527	493.804	12.424	8	3246.3	4631.383
V	74.378	9.512	12.789	8	64.61	92.582

Table F6: Descriptive statistics for the Playas Red 1 compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	665.066	89.233	13.417	57	463.6	849.231
Al	82992.095	3083.933	3.716	57	76097.141	89505.625
Zr	253.752	41.388	16.31	57	164.261	359.8
Zn	126.61	19.648	15.519	57	93.2	202.37
Th	25.041	3.336	13.321	57	16.574	32.343
Tb	1.801	0.314	17.431	57	1.223	2.92
Ta	1.197	0.225	18.785	57	0.76	2.2
Sc	15.21	0.985	6.478	57	12.967	17.653
Sb	0.721	0.089	12.401	57	0.512	1.06
Rb	204.039	16.34	8.008	57	156.119	238.6
Hf	10.424	1.628	15.62	57	7.34	13.873
Fe	42856.369	2571.163	5.999	57	35500.828	48437.152
Eu	1.614	0.14	8.689	57	1.307	1.952
Cs	8.153	0.778	9.546	57	6.511	10.576
Cr	30.364	2.893	9.528	57	24.333	39.734
Co	11.883	0.974	8.2	57	8.839	13.941
Ce	131.962	11.834	8.968	57	106.41	157.056
Yb	5.029	0.538	10.696	57	3.734	6.196
U	3.633	0.463	12.739	57	2.584	4.646
Sm	12.249	1.315	10.738	57	9.712	15.502
Nd	56.252	8.044	14.299	57	43.193	79.481
Lu	0.643	0.074	11.512	57	0.476	0.835
La	62.831	6.817	10.85	57	50.381	78.616
As	3.9	0.904	23.179	57	2.362	6.066
Dy	9.799	1.265	12.912	57	6.903	12.31
Mn	550.014	76.474	13.904	57	334.135	769.953
Na	11623.218	1073.642	9.237	57	9728.805	14268.775
Ti	4562.813	552.927	12.118	57	3600.469	5768.2
V	70.16	8.282	11.804	57	48.818	89.799

Table F7: Descriptive statistics for the Playas Red 2 compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	504.06	251.452	49.885	35	152.568	1183.6
Al	86036.961	6313.045	7.338	35	67579.7	94652.4
Zr	384.232	113.114	29.439	35	204.174	692.413
Zn	135.658	13.628	10.046	35	106.638	162
Th	12.097	1.489	12.31	35	9.057	16.388
Tb	1.561	0.278	17.777	35	1.13	2.54
Ta	4.183	0.994	23.752	35	2.823	7.827
Sc	11.893	1.107	9.312	35	9.379	14.114
Sb	0.787	0.298	37.905	35	0.485	2.287
Rb	106.92	12.211	11.42	35	67.664	130.6
Hf	13.731	3.743	27.263	35	7.627	23.413
Fe	38811.836	5773.998	14.877	35	32824.3	65302.781
Eu	2.27	0.487	21.45	35	1.684	4.698
Cs	4.548	0.629	13.838	35	2.712	6.215
Cr	25.319	6.188	24.442	35	14.354	33.826
Co	5.206	1.467	28.181	35	2.396	7.877
Ce	131.381	23.512	17.896	35	94.289	241.596
Yb	4.455	0.828	18.58	35	3.218	7.064
U	4.074	1.009	24.775	35	1.9	6.169
Sm	12.16	1.908	15.692	35	8.254	17.52
Nd	72.131	12.253	16.987	35	49.836	103.008
Lu	0.612	0.116	18.978	35	0.429	0.919
La	74.137	15.654	21.115	35	53.977	138.379
As	7.394	2.313	31.281	35	3.36	14.43
Dy	7.312	1.073	14.672	35	5.682	9.543
Mn	731.343	245.517	33.571	35	372.312	1276.7
Na	18143.13	2655.922	14.639	35	12602.1	23286.94
Ti	5210.027	1235.811	23.72	35	3975.1	10374.359
V	43.722	12.007	27.462	35	19.688	67.989

Table F8: Descriptive statistics for the Playas Red 3 compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	810.747	364.736	44.988	5	444.8	1380.9
Al	81427.425	5535.082	6.798	5	72978.5	88157.422
Zn	92.342	8.163	8.84	5	80.8	101.4
Zr	227.974	64.795	28.422	5	185.451	342.211
Th	14.268	2.197	15.399	5	10.69	16.589
Tb	0.916	0.236	25.716	5	0.752	1.32
Ta	1.727	1.181	68.396	5	1.153	3.84
Sc	10.002	1.019	10.19	5	8.354	10.93
Sb	0.394	0.121	30.726	5	0.301	0.606
Rb	110.041	10.512	9.553	5	95.9	119.8
Ca	18921.094	2896.191	15.307	4	16657.926	23171.1
Hf	9.2	2.617	28.451	5	7.535	13.842
Fe	37673.522	4990.707	13.247	5	32554.6	45283
Eu	1.496	0.297	19.857	5	1.284	1.977
Cs	3.824	0.29	7.574	5	3.4	4.16
Cr	49.282	14.566	29.556	5	25.162	64.406
Co	10.635	3.631	34.144	5	4.574	14.218
Ce	89.789	17.987	20.032	5	76.333	120.654
Yb	3.163	0.888	28.084	5	2.648	4.742
U	2.886	0.628	21.751	5	2.26	3.638
Sm	7.387	2.096	28.376	5	6.241	11.086
Nd	41.563	17.348	41.738	5	32.387	72.332
Lu	0.45	0.114	25.412	5	0.35	0.644
La	48.794	10.504	21.527	5	40.682	66.915
As	3.595	1.217	33.862	5	1.97	5.249
Dy	4.534	2.223	49.033	5	3.162	8.487
Mn	708.316	72.007	10.166	5	639.6	798.996
Na	16261.024	2150.119	13.223	5	12546.5	17778.7
Ti	4045.261	499.984	12.36	5	3266.2	4496.5
V	57.685	14.794	25.647	5	32.84	72.3

Table F9: Descriptive statistics for the Playas Red 5 compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	439.833	200.749	45.642	3	228.3	627.7
Al	77349.267	682.272	0.882	3	76566.8	77819.9
Zn	128.3	8.848	6.896	3	120.9	138.1
Zr	462.933	69.026	14.91	3	419.1	542.5
Th	19.781	0.47	2.376	3	19.251	20.148
Tb	1.933	0.307	15.903	3	1.58	2.14
Ta	4.068	0.178	4.386	3	3.882	4.238
Sc	5.322	0.111	2.079	3	5.196	5.402
Sb	0.446	0.098	21.93	3	0.357	0.551
Rb	144.933	3.482	2.402	3	141.1	147.9
Ca	7638.333	3807.799	49.851	3	5228.6	12028.2
Hf	18.875	1.676	8.88	3	17.835	20.809
Fe	33056.933	756.97	2.29	3	32190.8	33591.8
Eu	1.262	0.094	7.459	3	1.159	1.343
Cs	3.467	0.613	17.691	3	2.94	4.14
Cr	12.214	1.68	13.754	3	10.274	13.193
Co	1.754	0.466	26.543	3	1.313	2.241
Ce	182.313	40.116	22.004	3	143.497	223.613
Yb	9.337	0.469	5.024	3	8.895	9.829
U	3.983	0.295	7.402	3	3.65	4.21
Sm	18.327	3.47	18.931	3	14.408	21.006
Nd	86.388	18.254	21.131	3	66.047	101.344
Lu	1.231	0.066	5.379	3	1.164	1.296
La	96.485	16.037	16.621	3	77.969	105.962
As	6.071	1.227	20.208	3	5.047	7.431
Dy	14.121	2.296	16.257	3	11.519	15.861
Mn	345.933	46.287	13.38	3	293.8	382.2
Na	17975.4	1216.426	6.767	3	16726.4	19156.4
Ti	2504.767	140.959	5.628	3	2369.5	2650.8
V	16.867	6.749	40.011	3	9.7	23.1

Table F10: Descriptive statistics for the Playas Red 6 compositional group.

Element	Mean	St. Dev.	% St. Dev.	No. Obs.	Min.	Max.
Ba	528.285	54.751	10.364	2	489.57	567
Al	94116.449	149.128	0.158	2	94011	94221.898
Zn	196.774	3.178	1.615	2	194.527	199.021
Zr	212.424	63.808	30.038	2	167.304	257.543
Th	75.639	6.277	8.299	2	71.2	80.077
Tb	2.817	0.152	5.391	2	2.71	2.925
Ta	3.738	0.017	0.445	2	3.727	3.75
Sc	9.64	0.678	7.031	2	9.161	10.119
Sb	0.463	0.07	15.068	2	0.413	0.512
Rb	385.001	52.608	13.664	2	347.802	422.2
Ca	7915.668	.	.	1	7915.668	7915.668
Hf	7.558	0.895	11.837	2	6.926	8.191
Fe	28146.991	1833.258	6.513	2	26850.682	29443.3
Eu	1.437	0.034	2.338	2	1.413	1.46
Cs	7.157	0.725	10.129	2	6.645	7.67
Cr	14.248	0.821	5.765	2	13.667	14.829
Co	2.554	0.084	3.294	2	2.495	2.614
Ce	100.24	1.987	1.982	2	98.835	101.645
Yb	12.857	0.231	1.793	2	12.694	13.02
U	7.254	0.444	6.12	2	6.94	7.568
Sm	16.964	2.024	11.931	2	15.532	18.395
Nd	90.14	9.632	10.686	2	83.329	96.951
Lu	1.858	0.051	2.762	2	1.822	1.895
La	91.442	16.846	18.422	2	79.53	103.353
As	5.525	0.063	1.144	2	5.48	5.57
Dy	16.647	0.944	5.669	2	15.98	17.315
Mn	112.191	23.545	20.987	2	95.542	128.84
Na	5792.21	3537.457	61.073	2	3290.85	8293.569
Ti	2173.469	592.795	27.274	2	1754.3	2592.638
V	41.506	0.642	1.547	2	41.052	41.96

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