PIT HOUSE ARCHITECTURE IN THE PUERCO VALLEY AD 600-900:
FORM, FUNCTION, AND CULTURAL IDENTITY

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Form, Function, and Cultural Identity**

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A final copy of this thesis has been examined by the signators, and we find that both the content and the form meet acceptable presentation standards of scholarly work in Anthropology.

Abstract

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Pit House Architecture in the Puerco Valley AD 600-900: Form, Function, and Cultural Identity

Thesis Directed by Professor Catherine M. Cameron

During the early Pueblo period (AD 600-900), farmers built increasingly permanent settlements in the Puerco Valley. In addition, population increased significantly after AD 750, most likely due to combined processes of in situ population growth and immigration. This thesis explores how Puerco Valley inhabitants negotiated cultural identity through pit house architecture. In some cases, groups maintained hard boundaries between their architectural traditions and the traditions of neighboring groups. In other cases, architecture does not appear to have been as important a facet of cultural identity. By the late AD 800s, the Puerco Valley appears to be a socially complex landscape of farmsteads and villages, each drawing inspiration from the architectural traditions of different surrounding regions.

Dedication

For Frank H. H. Roberts and Earl Morris, who contributed so much to early Pueblo research.

Acknowledgements

A great number of people made the work in this thesis possible. I would first like to thank my committee—Drs. Cameron, Wilshusen, and Gutierrez—for all their assistance along the way. Dr. Cameron always had edits for me in a timely fashion. Dr. Wilshusen is the proverbial giant on whose shoulders all pit house research in the northern Southwest stands; he saved me a great deal of time and energy, and pushed this thesis beyond what it might have been. I benefited greatly from conversations in the office of Dr. Gutierrez, even if those conversations most commonly veered towards Central Mexico!

Many people helped me zero in on a region and a topic that was important to current research, and provided me with important data. Greg Schachner pushed me towards the Puerco Valley, and allowed me to tag along on a re-survey of Twin Butte, in Petrified Forest National Park. Dennis Gilpin provided a great deal of insight on the Little Colorado region. Special thanks to Matt Peeples for introducing me to Gower's coefficient, and for providing me with early drafts of chapters he was working on. Without input from these three archaeologists, this project could not have been possible.

A number of institutions and personnel were also enormously helpful during the course of my research. Jason Theuer, at the time archaeologist at Petrified Forest National Park, gave me access to the PEFO survey database and the in-progress overview and assessment volume, a great aid in my research. The Museum of Northern Arizona and its staff (Jennifer Glennon in particular) were indispensible, allowing me to camp out near the records room while I combed the files for BMIII and PI sites. (MNA also deserves recognition for allowing me to camp out in my truck behind the maintenance building!) Scott Kuhr at the Office of Navajo and Hopi Indian Relocation, in Flagstaff, gave me free reign to explore their files from a number of important projects on the Chambers-Sanders Trust Lands.

Grants from the University of Colorado and the Alice Hamilton fund made it possible for me to travel to Arizona during the summer of 2010 to gather data for this thesis, and provided assistance that allowed me to present my research at various professional conferences.

Final thanks are due to Harold Baillie for showing me how to use Adobe Illustrator, and all the guys at 735 Concord deserve recognition for putting up with me while I finished this project.

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Chapter 1: Introduction

During the early Pueblo period (AD 600-900), several distinct groups of people coexisted within the Puerco Valley of eastern Arizona and far western New Mexico. The area is part of the larger Little Colorado region and over time became an important population center occupying a location at the edge of several archaeological culture areas. Although the Puerco Valley never approached the population or number of settlements and large villages found in other regions such as the Northern San Juan it nonetheless presents an opportunity to study the dynamic histories of early agricultural settlements in the northern Southwest. In particular, the Puerco Valley is a place in which to study how groups of people from diverse cultural backgrounds expressed identity through architectural style.

The Puerco Valley is best characterized as a region that had low population density but was home to multiple cultural groups. Immigration and frequent population movement within the valley contributed to a diverse social environment that encouraged the negotiation of identity. Domestic architecture was one domain in which groups in the Puerco Valley consciously and unconsciously asserted their cultural affiliation. Throughout the AD 600-900 interval valley inhabitants constructed ever more permanent settlements utilizing increasingly elaborate architectural styles. As architecture became more substantial it also provided more opportunities for the builders to express their cultural identity. Some cultural groups maintained distinct architectural traditions that differentiated them from other valley residents. Others participated in traditions with broadly defined boundaries, reflecting complex relationships between the builders of these houses and other people in the Puerco Valley.

The primary goal of this thesis is to explore the social meanings behind the distribution of architectural styles in the early Pueblo period Puerco Valley. Using evidence from 153 pit houses excavated at twenty-three sites over the past eighty years, I examine the complex interplay of architectural form and cultural identity that is the result of 300 years of population movement and culture change. During this time period the people of the Puerco Valley lived primarily in semi-subterranean pit houses (Figure 1). I use the choices these people made in pit house construction—such as roofing style and interior partitioning—to assess how Puerco Valley inhabitants expressed cultural identity. Identity is a dynamic construction continually reinforced and amended through daily practice. The house plays a key role in the expression of identity because more than any other item of material culture the house orders, constrains, and enables daily activities (Rapoport 1969; Parker Pearson and Richards 1994b). Moreover, the house is a highly visible aspect of material culture within a settlement, and therefore one that is well positioned to reflect the identity of the inhabitants.

In the following pages I introduce a few key concepts and outline the direction the remainder of this thesis will go. First, I give an explanation of what I mean by the term "early Pueblo period" and describe the area of study—the Puerco Valley. Then, after a brief description of what constitutes a pit house, I explain the theoretical inspiration behind my analysis of pit house architecture. Literature concerning vernacular architecture informs the research detailed in future chapters. "Vernacular architecture" is a term often applied to houses built by non-industrial groups, using locally available materials, and almost universally constructed by the people destined to live in them. Vernacular houses are subject to certain constraints imposed by the environment and materials availability, although these constraints are less intense than might be presumed (Rapoport 1969:26). Perhaps more important in the design of vernacular architecture are considerations of structural longevity and maintainability made by the builders (McGuire and Schiffer 1983). The requirements of the structure within the inhabitants' day-to-day and long-term strategies, tempered with a few limitations dictated by the environment, influences the appearance of a vernacular house to a great degree. Vernacular architecture is frequently considered be the result of "traditional" practices of construction, meaning that houses are the more permanent reminder of methods and techniques passed from generation to generation by oral transmission (Oliver 1989).

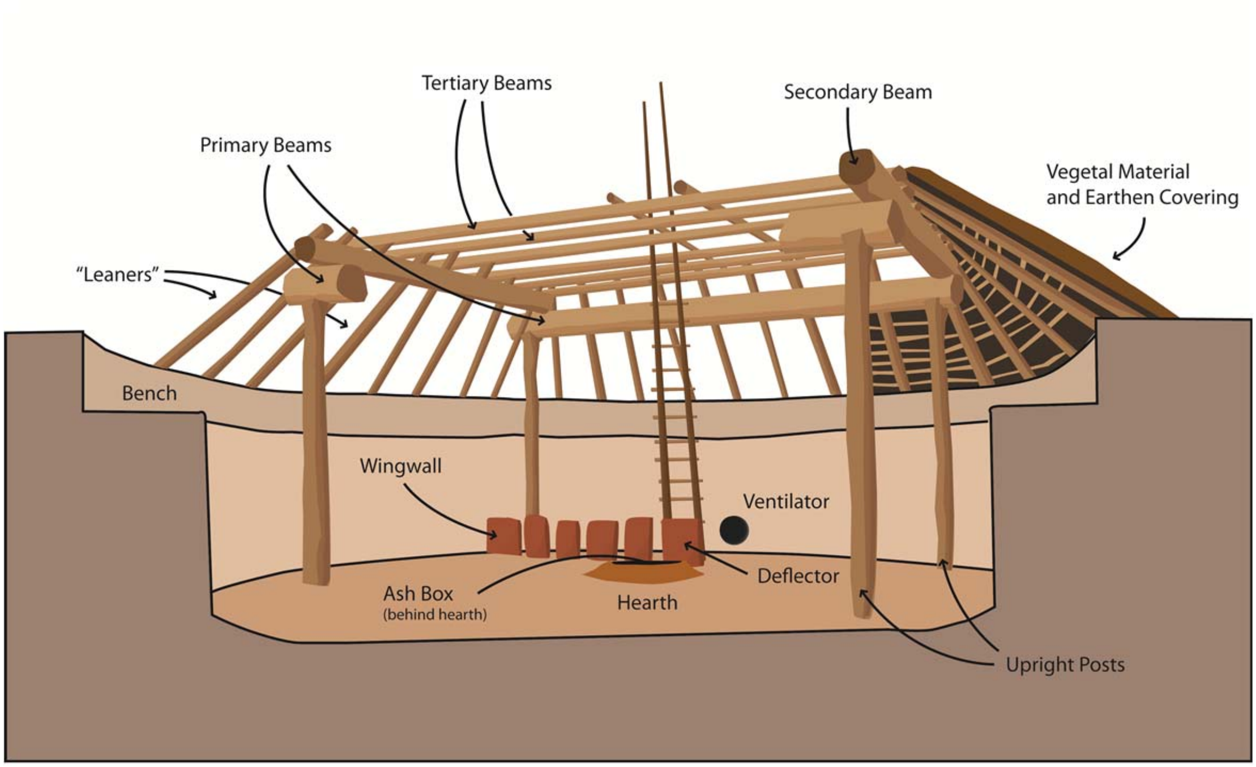

Figure 1: Reconstruction of an AD 800s Pit House. Adapted from Roberts (1939:109)

Understanding the implications of pit house architecture for the social world of the early Pueblo period Puerco Valley requires more than simply considering aspects of vernacular design;

it also requires a theory of how social identity is reflected in material culture. Numerous researchers have proposed that material culture style can reflect social and cultural distinctions (Wobst 1977; Sacket 1982; Wiessner 1983; Shennan 1989a; Stark 1998). Within the greater Southwest, archaeologists have focused attention low- and high-visibility architectural traits (Van Dyke 1998; Clark 2001) and technological style (Cameron 1998) to link architecture and group affiliation. These examples primarily investigate pueblo-style architecture, or adobe and masonry surface structures. Later in this chapter, I evaluate the applicability of the theory underlying those studies to pit structure architecture—a rather different medium that requires re-evaluating the concepts applied to surface architecture.

In the following pages, I described the cultural history and theoretical framework in which I situate my analysis of pit house architecture. Current knowledge of the early Pueblo period is the result of a long history of inquiry, not only in the Puerco Valley, but also in the whole northern Southwest. I briefly recount this history, describe the physical environment of the Puerco Valley, and explain what pit houses are and how they have been studied. In the final part of this chapter I present the steps taken in my analysis. I chose to first address descriptive aspects of Puerco Valley pit house architecture during the early Pueblo period—after examining the chronology of sites used in this study, I propose that the AD 600-900 interval can be divided into an Early Period (AD 600-750) and a Late Period (AD 750-900), and then discuss changes in the frequency of certain architectural features between these two periods. Next, I separate pit houses that may have had short intended uselives because they were only used seasonally from those that appear to have been occupied for longer periods of time. Structures intended for shorter use not only contain less information for the archaeologist because of their simple and ephemeral construction, I argue that the builders did not intend for them to reflect particular identities to the same extent as larger, more elaborate housing. Once this distinction has been established, I compare and contrast the architectural style of pit houses within the Puerco Valley, seeking spatial and temporal patterns that can provide information about the perception of cultural similarity and difference among the valley's inhabitants during the early Pueblo period. Finally, I expand my inquiry beyond the Puerco Valley to contextualize the architecture described in previous sections within the northern Southwest. This step is taken in recognition that migration played a key role in the course of Southwestern history (see articles in Cameron 1995; Bernardini 2005a; Cameron and Duff 2008; Wilshusen and Ortman 1999; Clark 2001; Lyons, Hill, and Clark 2008), and that my Puerco Valley study area (Figure 2, Figure 3) is a modern construct. Patterns that can only be partially observed at the level of the Puerco Valley will become more apparent at larger scales of inquiry.

The Early Pueblo Period

The early Pueblo period (AD 600-900) combines portions of two periods from the Pecos Classification: late Basketmaker III and Pueblo I. Prompted by a number of large projects that have vastly increased datasets and inspired by a growing concern for historical process in Southwest archaeology, the editors of a forthcoming volume—*Crucible of Pueblos: The early Pueblo period in the Northern Southwest*—chose this expanded time frame to represent the period in the northern Southwest when early agriculturalists began to build settlements of greater permanence and first coalesced into large aggregated villages (Wilshusen, Schachner, and Allison 2012). The volume highlights current research on the early Pueblo period across the northern Southwest, but also levels the challenge that to fully comprehend the dynamic social changes of this period will require expansive consideration of both time and geography. The

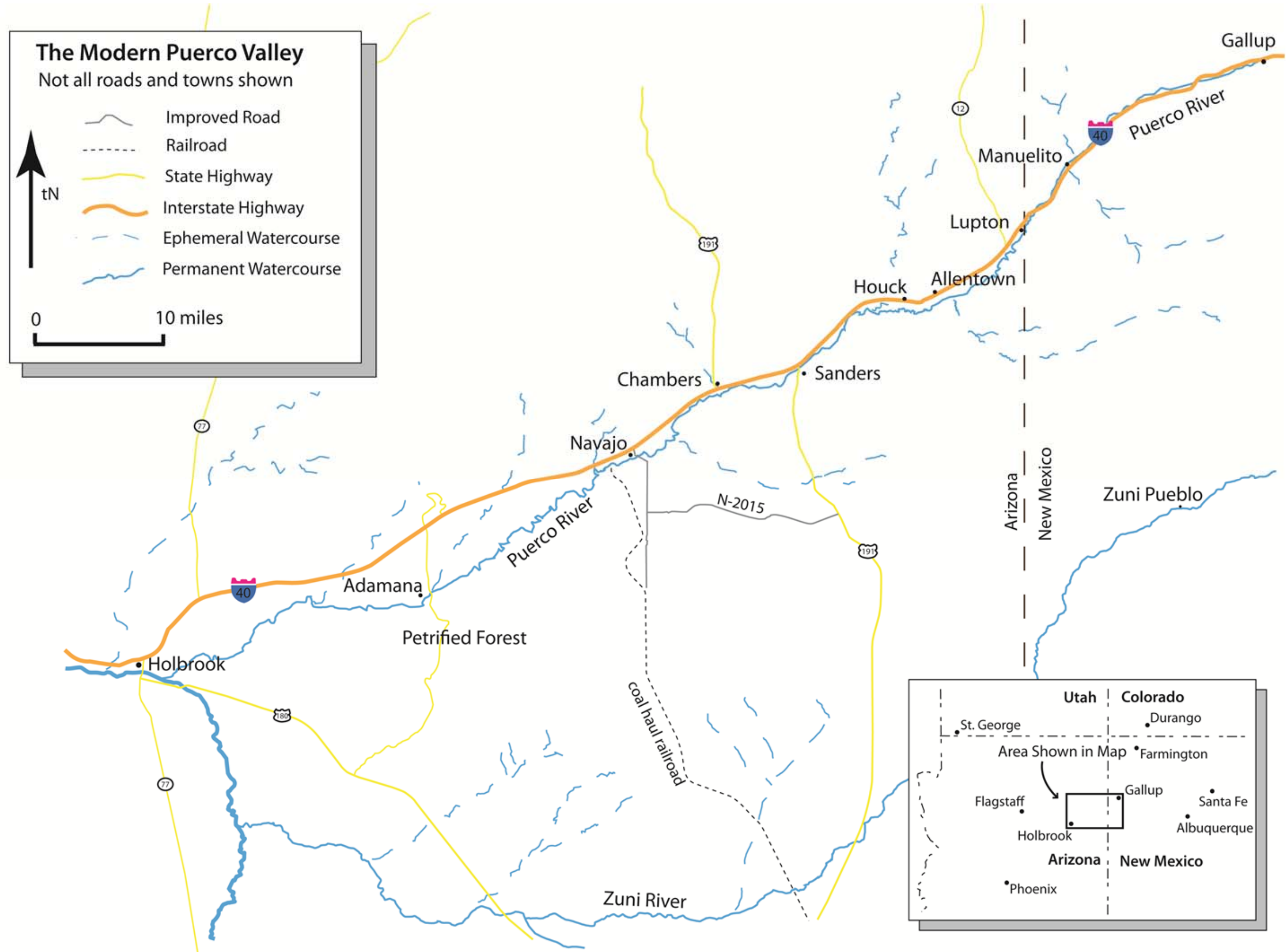

Figure 2: The Modern Puerco Valley from Holbrook, AZ, to Gallup, NM.

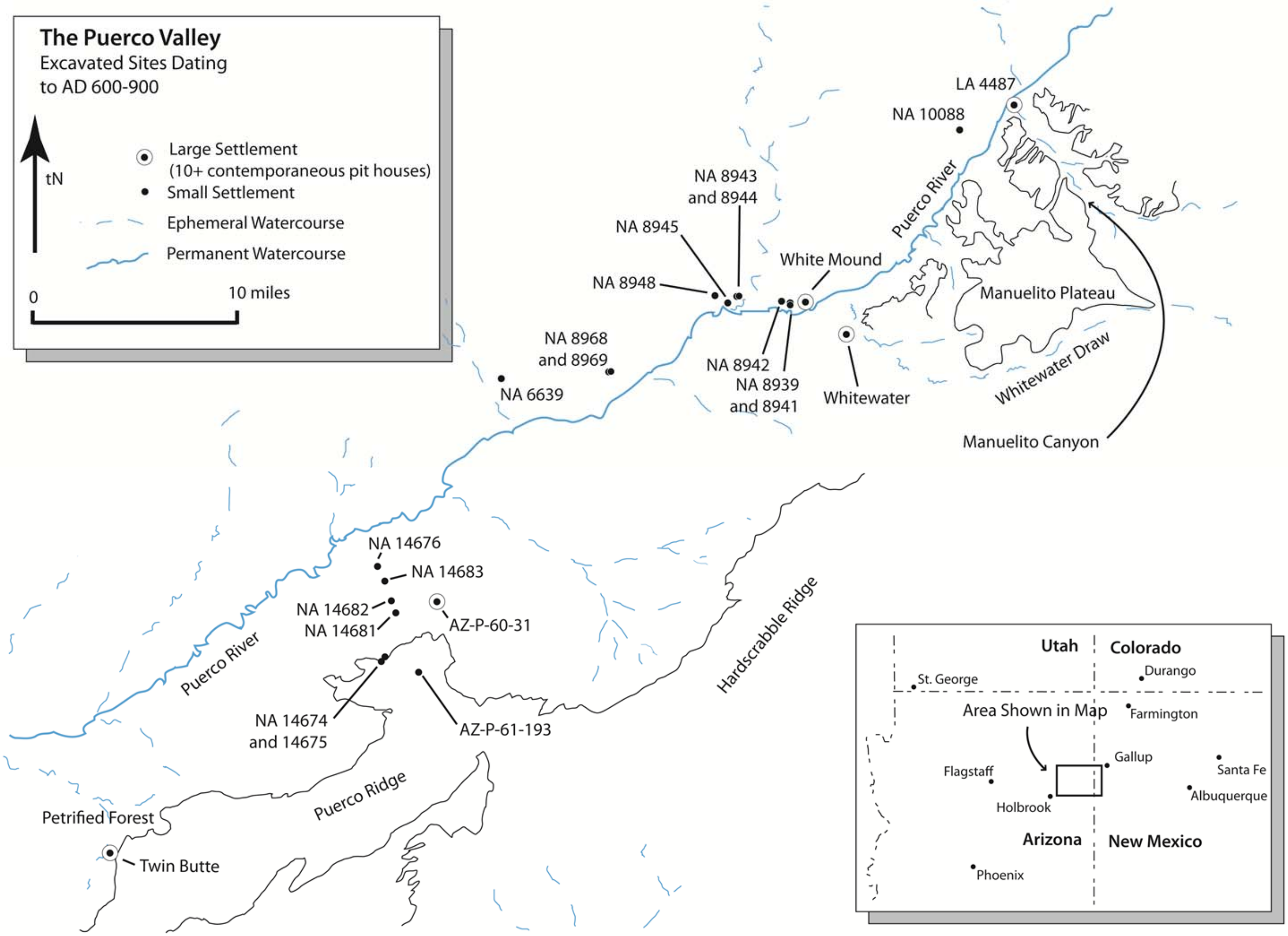

Figure 3: The Early Pueblo Period Puerco Valley.

current study came into focus as a result of my work as coauthor of the introductory chapter of that volume (Schachner et al. 2012).

The volume is a consequence of the increased attention archaeologists have given the early Pueblo period in recent years. After long being considered a period of relative stasis and little complexity, it is now known that the first large villages in the northern Southwest formed during the early Pueblo period (Wilshusen and Ortman 1999; Wilshusen and Potter 2010) and that these villages were instrumental in defining the social and political frameworks that culminated in the complex polity at Chaco Canyon in the early 11th century (Wilshusen and Van Dyke 2006). The early Pueblo period in the northern Southwest is also providing information that contributes to global dialogue surrounding the social, demographic, economic, and technological changes that accompany the transition to a Neolithic lifeway (Kohler et al. 2008; Kujit 2000a, 2000b; Rosenswig 2006).

The vast majority of early Pueblo period research has focused on the AD 750-900 interval in the Northern San Juan region (Figure 4) due to the extensive archaeological remains and long history of investigation found there. Without a doubt, the Northern San Juan region was home to the largest concentration of early Pueblo period population in the northern Southwest (Wilshusen 1999). In the spirit of the goals outlined in the introduction of *Crucible of Pueblos*, this study chooses to look at a region outside of the core zone of early Pueblo period settlement. The Puerco Valley is located near the intersection of the Kayenta-Tusayan, Mogollon, and Cibola culture areas, and it was probably the focal point of regional population in those areas during the early Pueblo period (Schachner, Gilpin, and Peeples 2012:125). The notion that these culture areas were the homelands of actual *ethnically* homogenous groups of people has been overemphasized in the past (Bernardini 2005a). In borderland areas where traits overlap, like the Puerco Valley, individual households existed with greater autonomy (Herr 2012:80; 2001), weaving a complex tapestry of cultural patterns. The Puerco Valley is therefore an excellent region in which to explore how diverse and relatively unrestricted groups negotiated identity.

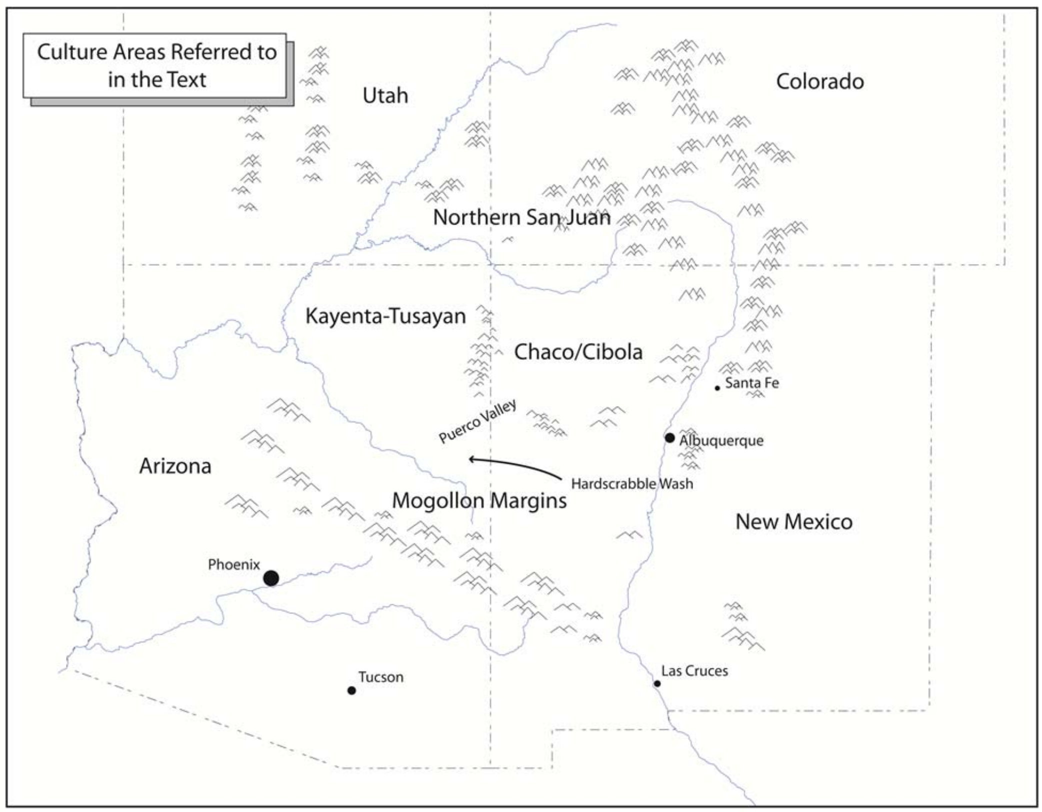

Figure 4: Culture Areas Referred to in the Text.

The Puerco Valley

The physical environment and local climate has had a significant influence on the prehispanic use of the Puerco Valley, limiting the availability of water, encouraging some kinds of agriculture over others, and imposing constraints on the material available for the construction of housing. The conditions offered by the Puerco Valley are partially reflected in the house forms and settlement patterns of the early Pueblo inhabitants. This section briefly explores the influence of the natural environment on Puerco Valley early Pueblo settlement. The nature of archaeological research over the past one hundred years has also had an impact on our perceptions of the early Pueblo period in the Puerco Valley, and this section concludes by briefly considering the history of archaeology in the valley.

The Puerco Valley is located on the southern edge of the Colorado Plateau and is considered part of the larger Little Colorado River drainage. The Puerco River itself begins at an elevation of around 8500 feet on the Dutton Plateau in New Mexico, and merges with the Little Colorado River near Holbrook, Arizona, at an elevation of around 5100 feet. There is little evidence of permanent early Pueblo period settlement in the upper reaches of the river, likely because despite the greater amount of rainfall those areas receive, their growing season is too short for consistent maize agriculture. Within the portion of the Puerco Valley that has firm evidence of early Pueblo period occupation, elevations range from 5200-6500 feet.

Geologically, the Bidahochi and Chinle Formations underlie most of the Puerco Valley. The Chinle Formation is Triassic in age, and its shales, siltstones, and mudstones are best seen in the eroded, multi-colored badlands of the Petrified Forest area. The Bidahochi is Tertiary—much more recent in age—and its sedimentary and volcanic formations are most obvious in the eastern portions of the central Puerco Valley from approximately Sanders, Arizona, to the New Mexico border. Overlying both of these formations are Quaternary alluvial sediments and aeolian dunes dating to the last 2000 years.

The Puerco River today is an ephemeral stream in a deeply incised channel that runs only following significant rainfall. However, oral accounts recorded by Roberts from the oldest of his local Navajo work crew at the Whitewater site attest that in their childhood the Puerco River was not incised (Roberts 1939:2). This coincides with historic evidence and geomorphological studies that suggests that drought and over-grazing greatly contributed to stream down-cutting across the Southwest in the 1880s and 1890s (Finger and Morehouse 2007:546-547). Documentary evidence suggests that since the time of the Coronado expedition, the Puerco River has never been a perennial water-course (Arizona Navigable Stream Adjudication Commission n.d.).

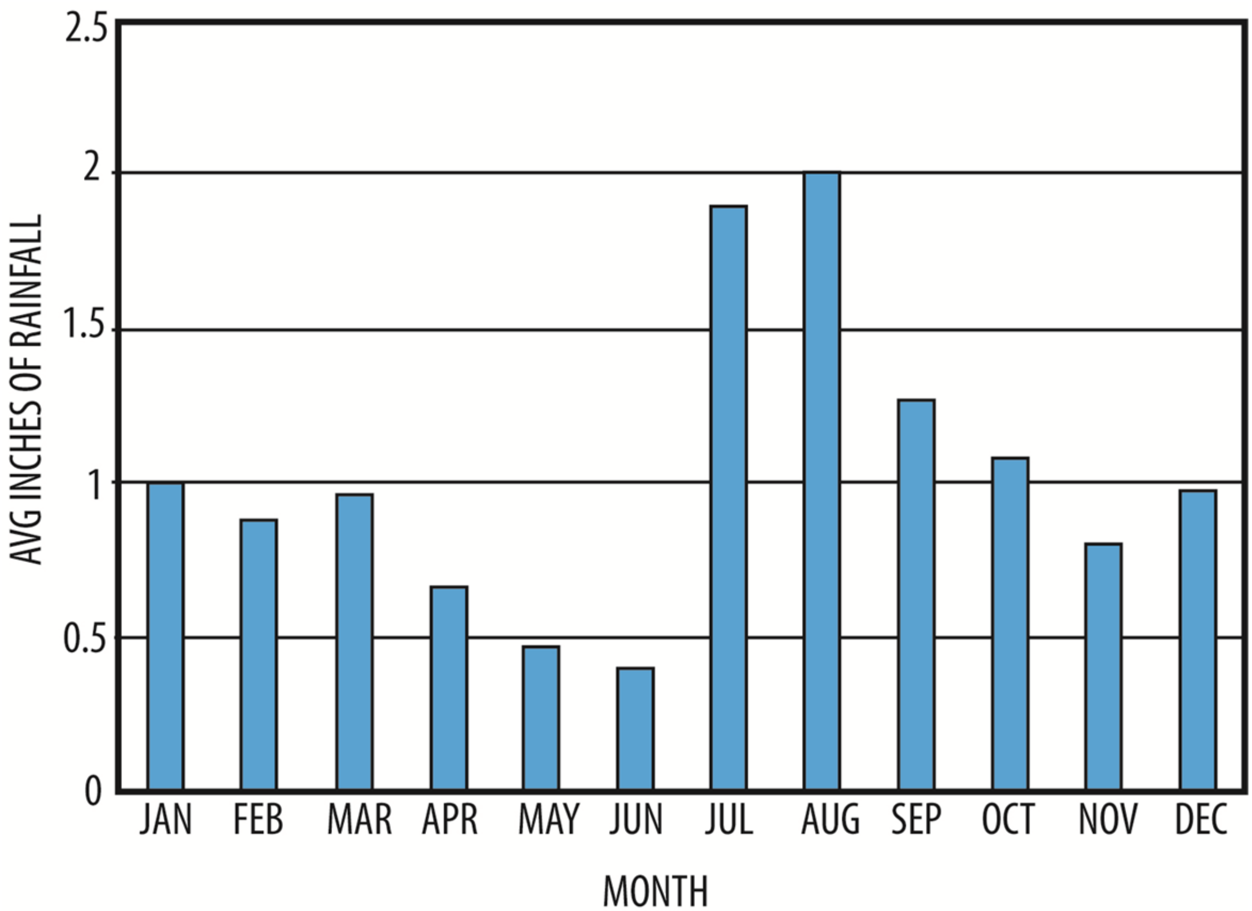

Figure 5: Puerco Valley Rainfall Totals by Month in Apache County, AZ 1895-2005. (source: http://www.cefa.dri.edu/Westmap/Westmap_home.php).

This is not to say that water is unavailable in the Puerco Valley. Rainfall in the valley is highly correlated with elevation, with the Holbrook area (5004 feet) in the west receiving approximately 9.2 inches of annual precipitation, and the Puerco Ridge near Sanders (6250 feet) receiving an average of 13.71 inches of annual precipitation. Areas in between receive rainfall along a gradient between these two totals (Arizona Department of Water Resources 2007:91). A graph of monthly rainfall totals between 1895 and 2010 indicates that the Puerco receives the majority of this moisture during the summer monsoons in July and August (Figure 5). The driest months are in April, May, and June. Winter precipitation occurs primarily as snow.

Rainfall and elevation also dictate the varieties of biotic communities found within the Puerco Valley. The majority of the valley is considered Plains and Great Basin Grassland, and Great Basin Desert Scrub, while slightly higher elevations support Great Basin conifer woodlands (ADWR 2007:16). Major expanses of the Puerco Valley contain few if any trees. This is particularly true in the western portion of the valley. Juniper and the occasional pinyon pine are found at the higher elevations of Puerco Ridge, Hardscrabble Ridge, the Manuelito Plateau to the south, and the Defiance Plateau to the north, but overall, the Puerco Valley is "timber-poor," which contributed to recycling and salvaging of wood in the past.

The lack of early growing season rainfall could significantly affect the agricultural potential of the Puerco Valley, if not for the advantageous soils, sediments, and geology. The aeolian sand that covers much of the Puerco Valley helps create many local, near-surface aquifers along washes and stream channels within the Bidahochi formation (ADWR 2007:8). Winter precipitation seeps into the upper sandy sediments but is stopped by the finer underlying lacustrine clays, forming pockets of damp soil that last through the dry months of spring and early summer. The relatively shallow gradient of many ephemeral waterways in the Puerco Valley probably contributes to these localized alluvial aquifers (Overby 2007). Elsewhere, such as along the north slopes of the Puerco and Hardscrabble ridges, seeps and springs occur as groundwater percolating through the sands of the Bidahochi Formation encounter the clays and silts of the Chinle formation (Ahlstrom, Greenwald, and Marek 1993:9). The agricultural potential of these areas may have been confined to sand dune and seepage field farming, as described by Hack (1942:32-34). *Ak-chin*-style agriculture that channels and directs floodwater from arroyos and washes following summer rains was probably practiced in the Puerco Valley as well.

Despite the arid environment and the lack of readily available surface water, the remains of over 800 years of ancestral pueblo archaeology cover the Puerco Valley, which spurred early archaeological interest in the area. Gladwin (1945), Roberts (1939), and Wendorf (1953) all undertook large-scale excavations within the Puerco Valley, using their data to establish what traits best characterized the Basketmaker III and Pueblo I periods. Following the 1950s, the majority of work in the Puerco Valley resulted from either highway salvage excavations (Sciscenti 1962; Gumerman and Olson 1968; Gumerman 1982) or other cultural resource management projects (Stebbins et al. 1986; Greenwald et al. 1993; Dykeman 1995; Latady 1991; Leach-Palm 1994). During this phase of archaeological work in the valley, the early Pueblo period was not the sole focus of research, which necessarily dealt with the totality of archaeological remains encountered by a given development project. Therefore, major advances in understanding the early Pueblo period occurred primarily in other regions, particularly the Northern San Juan (Breternitz, Robinson, and Gross 1986; Lightfoot 1994; Breternitz 1993; Schlanger and Wilshusen 1993) where a major development project (the damming of the Dolores River) coincided not only with the location of some of the densest early Pueblo settlement in the entire northern Southwest, but also with a community of archaeologists who took an interest in understanding the development of the early agricultural communities they had encountered.

Although the region was not fundamental to intellectual advancement like the Northern San Juan, the Puerco Valley quietly contributed to early Pueblo research throughout the 20th century. Archaeologists working in the Puerco Valley amassed a significant dataset, albeit one that has never been completely synthesized or contextualized. A major goal of this thesis is adequately describing early Pueblo period architectural variability revealed through many independent, developer-funded projects. I firmly believe that engagement with the early Pueblo period archaeology of the Puerco Valley will provide a stimulating counterpoint to research undertaken in other parts of the northern Southwest. For example, the effects of village formation on social relationships and cultural identity have been examined within the context of Northern San Juan region. Whether these processes played out in similar fashion elsewhere in the northern Southwest—where populations were smaller and individual households much more prevalent than villages —requires further inquiry. The Puerco Valley can offer an alternative perspective on the interplay between cultural identity, architecture, migration, and community formation,

What is a Pit House?

During the early Pueblo period, the primary domestic structure in the Puerco Valley (and the rest of the Little Colorado region) was the pit house. I follow Gilman (1987:539) in describing a pit house as any structure that has a floor partially excavated into the ground. This definition significantly overlaps with contemporaneous surface structures, which typically have sunken floors. The distinction between surface structures with sunken floors and shallow pit structures can at times be arbitrary, as noted by Gilman as well as Bullard (1962:99). Within the Puerco Valley, being flexible about the depth of a "proper" pit house is important because a great many structures that share more features with pit houses than surface structures are less than 20 centimeters in depth. The lack of interior hearths, differences in posthole patterns, and wall construction using foundations of upright slabs or masonry are clues that a structure was not a habitation but rather a surface storage room or a covered activity area. In this study I rely on the interpretations of the archaeologists who wrote the reports that provided my data as to whether a structure was a pit house or a surface structure. My assumption is that in the course of excavation they engaged in a "hermeneutic spiral" (Hodder 2004), continually reassessing the function of a structure based on the changing context of other classes of information.

Many authors use the term "pit structure" to denote any building that includes a pit as major structural component, but where they do not want to incorrectly assign a habitation function. This is especially true of AD 900-1300 "kivas," which may primarily have been ceremonial structures rather than habitations (although see Lekson 1988). I use the term pit house in my study because structures included in the architectural sample are those I deem likely to have been habitations. I also want to emphasize the fact that these are dwellings—places that shape and are shaped by the inhabitants' activities, histories, cosmologies, worldviews, and aspirations—and I feel that pit house conveys this sentiment more effectively.

Southwest archaeologists frequently distinguish between "true pit houses" and "houses-in-pits." True pit houses are those that use the sides of the pit as a major architectural element, generally forming the lower "walls" of the pit house. Houses-in-pits are structures where the walls of the pit house are not the native earth of the sides of the pit, but some other material such as wood or adobe. The pit is primarily used to create a partially subterranean house floor.

During the early Pueblo period, true pit house construction was more characteristic of the northern Southwest, while house-in-pit construction was more common in the southern Southwest (Herr and Young 2012:8). Within the Puerco Valley, many of the shallowest pit houses used house-in-pit construction techniques.

Figure 1 displays the principle features of a stereotypical northern Southwest pit house of the AD 800s. There is a great deal more variation in pit house architecture than can be summed up in a single image. Pit house shape can be circular, sub-rectangular, square, oval, D-shaped, "bean-shaped," or irregular. Their depth can vary from a few centimeters to two meters or more. The can be entered by a ladder through a hole in the roof, through a ground-level entry passage, or through an attached antechamber connected to the main pit house chamber by a tunnel. These three factors have a major impact on the overall appearance of the pit house, encouraging the use of certain roof construction techniques depending on which combination of shape, depth, and entry style the inhabitants choose.

Obviously, the amount of work it takes to build a pit house depends on the size of the pit house. Glennie (1983) reconstructed an AD 800s-era pit house from the Dolores River Valley of Colorado. He (and a few friends who were hopefully well compensated) excavated a 6m x 6m x 1.5m pit, using digging sticks for one half and a backhoe for the other. Glennie estimated that digging the entire pit by hand would have taken 330 person hours. Acquiring and shaping the timber for the roof, assembling it, and mixing earth and water to make the plaster floor, adobe wing walls, and earthen covering took a further 252 hours of work, meaning a total of 582 person hours were involved in construction. In addition, nearly 1000 gallons of water were required for constructing the adobe portions of the pit house. In the Puerco Valley, where there are few large, standing bodies of water, the construction of substantial earthen roofs and plaster floors would have been a major commitment on the part of a would-be pit house builder. In addition, because there are so few trees, the acquisition of suitable timber for roof construction would also have been a major concern.

Wilshusen (1988b) has described the engineering of Dolores River Valley pit houses in detail. Three aspects of that analysis are important to describe here. First, the upright posts are not the largest wooden elements in a Dolores Valley pit house; the two primary beams seated atop the uprights need to be almost twice as large in diameter. This is because the columnar strength of wood is far greater than its shear or bending strength. Second, Dolores River Valley pit house builders appear to have constructed substantial roofs in order to accommodate the weight of potentially heavy snowfall. This is less of a concern in the Puerco Valley, where heavy snowfall is rare. Finally, Wilshusen questions the assumption that the "leaner poles" that stretch from the bench to the superstructure were load bearing. In Glennie's reconstructed pit house, this was the weakest portion of the structure and the first to fail, despite the fact that he used leaners nearly twice the size of those found archaeologically. The weight of earth needed to fill the gap between the leaners and the wall of the pit was too great for the poles to support for long. Wilshusen hypothesized that roofs were cantilevered beyond the edges of the pit, and that evidence of poles located just beyond the excavated pit spanning the gap between the ground and the roof is almost always destroyed as the pit collapses (Wilshusen 1988b:607).

Pit houses are generally thought to have been inhabited for only part of the year, although there is disagreement among archaeologists working in different regions as to during which season they were the primary habitation (Gilman 1987; Diehl 2001; Mabry 2005). Pit houses do provide excellent thermal retention, especially if deeply excavated into the ground (Gilman 1987:542), lending credence to the notion that some structures were intended as winter habitations. Smaller, shallower pit structures located near agricultural fields, such as those identified at Las Capas and Los Pozos in southern Arizona may have been temporary summer-season habitations (Mabry 2005). There is no reason to expect that pit houses from different areas were used in the same season. The form of the pit house was manipulated to meet the functional needs of people with widely varying subsistence strategies across the Southwest.

Because they are excavated into the earth and are constructed primarily using wood, reeds, and other perishable materials, pit houses have rather short uselives. The average, well-built pit house with four upright roof support posts and an earth-covered superstructure may not have lasted much more than 15-20 years (Ahlstrom 1985:89). Wooden posts rot quickly when in direct contact with the ground, and water percolating through the earthen-covered roof quickly saturates the vegetal layers contained beneath (McGuire and Schiffer 1983:291; Cameron 1990:29). Ethnographic descriptions of Hidatsa earthlodges suggest that these structures lasted between 7 and 12 years, failing first where the primary roof support poles touched the ground (Ahlstrom 1985:85; Wilson 1934:358, 372). Rain often found its way through the roof at the intersection of horizontal beams and the leaning wall poles (Ahlstrom 1985:85; Wilson 1934:367). Insect infestation may have curtailed occupation of a structure sooner than structural failure—Navajo hogans became uninhabitable for this reason after about 6-10 years (Ahlstrom 1985: 84; McGuire and Schiffer 1983:291). Fleas and mice were a constant nuisance in Pawnee earthlodges (Ahlstrom 1985:85; Weltfish 1965:252, 265), although steps were taken to clean and fumigate structures, rather than abandon them.

At least some of the wood in a pit structure roof would still be usable after elements in contact with moisture failed. The incorporation of salvaged timber from abandoned pit houses into new structures appears to have been a common cost-saving measure (Cameron 1990:33;

Ahlstrom 1985:87). Cameron (1990:33) suggests that this was most common when new pit houses were built in the same settlement or very nearby, as the labor involved in moving large beams—such as the long, heavy primary beams—would have been greater in many cases than simply finding new beams. In the Puerco Valley, the scarcity of trees would probably have increased the distances people were willing to carry pre-cut roof beams. In other cases, there is clear evidence that pit houses were burned on abandonment. About half of all excavated pit houses In the Northern San Juan region show evidence of burning on abandonment (Cameron 1990:33). Among early Pueblo villages along the Dolores River in Colorado intentional burning is most closely associated with the abandonment of particular pit structures containing ritual features like roofed floor vaults, suggesting that different classes of pit structures received different treatment upon abandonment (Wilshusen 1986, 1988c). Finally, the pits of many pit houses, whether salvaged, burned, or not, are often filled with trash by occupants of nearby houses, or by later inhabitants of a site.

Pit houses are frequently associated with storage features and surface structures. It is a truism in the northern Southwest that round and oval subterranean storage features give way to jacal surface rooms and eventually contiguous masonry roomblocks over the course of the AD 600-900 period. At the local level there seems to be a much greater degree of variability in the development of surface architecture over time. At the western edge of the Northern San Juan there is convincing evidence that surface rooms were regularly being used as habitations for at least portions of the year by the late AD 700s (Brew 1946; Lightfoot 1994; Allison 2008:79), while contemporary settlements at the eastern edge of the region do not appear to have surface habitation rooms (Potter and Yoder 2008). Within the Puerco Valley it is unlikely that surface structures were used for habitation until the early- or mid-AD 800s, and in the Zuni River drainage to the south surface architecture of any sort is not common until the late AD 800s and early 900s (Peeples, Schachner, and Huber 2012). The construction of substantial surface architecture is thought to be related to declining mobility (Diehl 1997); in a similar argument, Young and Gilpin (2012) propose that the style of storage facility (i.e. round below-ground cists versus sub-rectangular or rectangular jacal, adobe, and masonry surface rooms) is related to mobility strategy. In both the Puerco Valley and the Zuni area there is variability in the occurrence of surface architecture between adjacent sites, suggesting that contemporaneous groups in the region may have been differentiated by subsistence strategy and mobility.

The size of pit house settlements in the northern Southwest ranges from a single occupied structure to over fifteen contemporary structures. In the Northern San Juan region over half of all inhabitants probably lived in villages with greater than 10 contemporary structures (Wilshusen 1999:210). When villages of this size formed in the Northern San Juan, they depopulated the surrounding landscape and even small settlements tend to be located about 10km from the nearest village (Wilshusen and Perry 2008:420). In other regions of the northern Southwest, the relationship between small settlements and villages is less well understood. It is clear, however, that large villages were not a phenomenon confined to the Northern San Juan region during the early Pueblo period (Schachner, Gilpin, and Peeples 2012). The size, density, and histories of early villages in other parts of the northern Southwest are problems that requires increased attention.

Pit Houses as a Vernacular Architectural Tradition

Pit houses are the dominant form of domestic architecture in the entire Southwest from AD 200 until AD 1000 or later. Although it is likely that some people were recognized as having greater skill at building than others, the knowledge and techniques of pit house construction were available to all. The longevity of the pit house form, its adaptability to available materials, and the fact that pit houses were built by the same people who lived in them marks them as traditional or vernacular architecture. The pit house form was elaborated on by generations of builders, but continued to conform to a slowly changing archetype. Because the builders referenced a series of rules and codes that underlay the conception of what a house should look like, the resulting products conform to recognizable styles (Rapoport 2001:148; Glassie 1975). These underlying systems of rules are not static, but dynamic, being constantly redefined as the composition of the groups in whose minds they are stored changes through death, birth, marriage, migration, and innovation.

Vernacular architecture is reproduced through the maintenance and transmission of rules, methods, and techniques, and thus the term “vernacular” is closely related to “tradition” (Johnson 2010:11). Tradition has been defined many times, but most definitions make the following assumptions: tradition tends to be conservative; tradition constrains practice; tradition harkens back to older models; and tradition views the past as preferable and change as pejorative (Rapoport 1989). These definitions are inadequate because they do not recognize that tradition exists along a continuum from weak to strong constraint. Some traditions are not as conservative or constraining as others. Although tradition takes inspiration from historical models, tradition is socially reproduced through performance, which leaves room for improvisation and innovation. Considered from the perspective of performance, tradition refers to practices that fall within specific, culturally-constituted parameters that may be weakly or strongly enforced. What is considered “traditional” during a performance—and I am considering the construction of a pit house a performance—can be a very narrow range of possibilities, or it can be very broad. Just how narrow or broad depends on the structures of a given society. Considered from the perspective of history it is clear that tradition does not materialize out of thin air (although see Hobsbawn and Ranger 1983). Tradition is a historically contingent development wherein the rules governing the range of practices considered traditional are transmitted between individuals. The range of traditional practices is dependent on social context and therefore subject to re-evaluation and change.

Geographic variation in architectural style is thought to be a result of the resistance of vernacular tradition to change (Rapoport 1989:91). The assumption is that immobile populations develop isolated architectural traditions. This accurately describes the appearance of some distributions of architectural style, but it misstates the reasons for these patterns. The idea of regional stasis implies a self-contained system, wherein the absence of outside influence and a stable environment leads to little change over time. Archaeological evidence of large-scale migrations in Southwest prehistory belies the notion that regional patterns are the result of in situ-populations with great time depth. The movement of people across the landscape of the Southwest should be considered the norm rather than the exception—to quote Tessie Naranjo, “life is movement” (Naranjo 2008). The status of a group of people “affects the social scale at which decisions are made and identity is expressed and reproduced,” suggesting that interactions between immigrants and locals involved clarifying the status and identity of the newcomer (Bernardini 2005a:34-35). Certain social conditions encourage the maintenance of architectural traditions in the face of alternative stylistic options, while others may promote architectural change or hybridity. For example, Kayenta migrants into the Tonto Basin of Arizona found a landscape wherein the best agricultural land was already occupied, which led to their social marginalization (Lyons, Hill, and Clark 2008). The migrants continued their previous architectural practices, never incorporated the local vernacular style, and maintained communities that were separate from the pre-existing local inhabitants. On the other hand, Kayenta migrants into the San Pedro Valley of Arizona found a greater degree of arable land. They moved into a sparsely settled community, initially built in their own vernacular style, and quickly became specialist pottery producers for local San Pedro Valley inhabitants. Over time, the migrants and the local populations appear to have merged, with Kayenta-style housing being erected using local San Pedro Valley techniques (Lyons, Hill, and Clark 2008). Access to agricultural land dictated the social status of the newcomers in these two situations (see Levy 1992 for examples from historic Hopi). The negotiation of status between locals and newcomers significantly affected how architectural style was maintained, adapted, or changed.

The Puerco Valley sits at the intersection of the Kayenta-Tusayan, Cibola, and Mogollon culture areas. Cameron (1998:185) argues that importance of spatial and temporal gradients in these social boundaries has been minimized by the assumption that they somehow represent hard boundaries. Throughout the past decade and a half Southwest archaeologists' understanding of social boundaries and material culture has become more sophisticated. The following statement is indicative of recent approaches: "The difficulty for the archaeologist is to identify social boundaries where the material evidence for boundaries may be ambiguous or where material culture differences may never, in fact, have been sharply defined" (Cameron 1998:186). In regions where groups of people from diverse social and cultural backgrounds interact, many factors will affect vernacular architectural traditions. Puerco Valley architectural traditions should reflect the values of the people building pit houses, both in terms of the historical backgrounds from which their traditions originate, as well as how they choose to construct pit houses within the changing contexts of a diverse social landscape.

Identity and Style

Material culture and identity are related through the concept of style. Style can be an active and conscious signal of group identity, or an unconscious reflection of enculturative frameworks (Lyons, Hill, and Clark 2008:193; Stone 2003). Those who emphasize the active role of material culture in the expression of identity propose that in situations of interaction between cultures or groups of different ethnicities, high visibility stylistic elements on material culture are a way to assert group membership (Wiessner 1983; Mills 2007). Archaeologists who emphasize the unconscious aspects of material culture suggest that low visibility traits, such as forming techniques of pottery or interior features of houses are a reflection of early enculturation into a specific learning framework (Clark 2001; Dietler and Herbich 1998; Lyons 2003).

A great deal of current research concerns the relationship between identity and technological style (Cameron 1998; Gosselain 2008; Clark 2001; Lyons, Hill, and Clark 2008; Peelo 2011; Stone 2003). This approach combines research on production sequences and techniques (or *chaine-operatoire*) with spatial patterning and distribution studies (Stark 1998:2; Stark, Bowser, and Horne 2008:2). Techniques of construction are typically related to the learning frameworks in which a social actor gained competence. Breaking low visibility material culture traits into a series of technological steps also allows for a more complicated relationship between the *chaine-operatoire* and identity. Different steps of the construction process may be related to different aspects of an individual's identity, such as gender, class, or kinship (Peelo 2011). For example, Gosselain (2008) demonstrates that among the Bella of Niger, mobility, ethnicity, and market forces affect the manner in which pottery is made and decorated. Where people learn aspects of pottery making, where they resided at the time of Gosselain's study, and for whom they were making pottery were reflected at different stages of the production process. Similarly, Peelo (2011) suggests that while identity based on place or territory did exist among many groups of southern California native Americans, following missionization by the Spanish different stages of pottery making came to reflect various scales of identity, such as class or gender.

Within the Southwest, the idea of low-visibility traits and technological style has been applied to architecture (Cameron 1998; Van Dyke 1998; Clark 2001; Lyons, Hill, and Clark 2008). Cameron (1998) prefers the use of technological style to high-visibility aspects of style because it is not as dependent on social context. She argues that the spread of adobe architecture after AD 1150—a technological change—may be linked to the spread of Katchnia religion, which many see as a pan-Southwestern religious tradition that helped ameliorate social difference in multi-ethnic communities (Crown 1994; Adams 1991). Van Dyke (1998) examined low-visibility traits in great houses around the San Juan Basin to assess the degree of Chacoan intervention in outlying communities. Certain traits such as core-and-veneer masonry would only have been well known to actual Chacoan stone masons and their absence in some outlying great houses is taken as an indication of local construction. Finally, Clark (2001) and Lyons, Hill, and Clark (2008) have used wall construction techniques and pottery forming technology to track Kayenta migrants who left northeast Arizona in the late AD 1200s and moved into communities in the Tonto Basin and San Pedro Valley.

The aforementioned studies draw on the concept of technological style and rely heavily on the techniques used to construct the walls of surface pueblos and roomblocks. Within pit houses, the concept of technological style is much less applicable. Walls in pit houses are defined by the pit: the actual techniques of excavation are seldom preserved, and the methods of digging a pit were probably similar across much of the Southwest as the digging stick was the only tool available for the task. Furthermore, preservation of pit house walls and floors is often so poor that it cannot be determined whether they were plastered or not. One thousand years is enough time for new soil horizons to develop, often obscuring where the walls of a pit house even were. Pit house roofs are the most complicated and substantial element in the structure, and the portion of the pit house most likely to contain evidence of the construction methods and techniques that could be linked to a specific learning framework. Roofs preserve more poorly than the walls and floors; even in cases of exceptional preservation, archaeologists know next to nothing about the small details such as the joinery was used to connect posts and beams, the choice of vegetal material placed between the beams and the earthen covering, the direction of the beams, or knots tied in cordage used to secure parts of the roof in place.

Technological style therefore does not seem to be the most productive avenue for exploring the relationship between pit house architectural style and identity. Within pit houses, floor area, depth, shape, method of entry, hearth construction and elaboration, ventilator construction, interior partitioning, and can be most reliably recorded. In some cases, roof construction can be conjectured. Throughout this thesis I rely on a combination of these architectural attributes to explore the expression of cultural identity in Puerco Valley pit houses. I expect that prehispanic house builders generally adhered to architectural models they grew up with (as suggested by research on style and enculturation), but I assume that they were willing to change and adapt their architectural traditions depending on the social context. Frequent population movement between the Puerco Valley adjacent areas led to interaction, and probably intermarriage, between groups with different architectural traditions. The negotiation of architectural style in these situations was based on the status of the groups (or households) involved, and resulted in dynamic and changing architectural traditions.

Chapters in this Thesis

There are five more chapters in this thesis. Chapter 2 examines the history of early Pueblo period research in the northern Southwest and describes how changing research agendas and theoretical paradigms have affected archaeologists' understanding of the period. From initially being considered an unimportant and confusing transition between the first agriculturalists and the large masonry pueblos of the 12th and 13th centuries, the early Pueblo period is now recognized as a foundational interval during which social relationships changed dramatically and permanently. Chapter 2 concludes with a discussion of current topics in early Pueblo period research in the northern Southwest. The datasets of the northern Southwest contribute to a global discussion of the Neolithic Demographic Transition, a major shift in birthrates, demographic structure, and mortality that accompanies a commitment to sedentary agriculture (Bocquet-Appel 2006). Research at sites in southwest Colorado has helped expand knowledge of early village societies in a global perspective as well (Bandy and Fox 2010; Wilshusen and Potter 2010). Exploring the ways in which early Pueblo period peoples expressed their social identity is also a major, current theme of research.

In Chapter 3 I narrow my focus to the Puerco Valley. Systematic archaeological research has occurred in the valley for over 100 years, although the contexts surrounding the research have changed. The excavations that provide information on the 153 pit houses I examine in this study were undertaken for reasons ranging from academic inquiry to salvage and mitigation work. Projects with different goals have affected which kinds of sites have been excavated, and how thoroughly they have been investigated. My local history of early Pueblo period research gives way to a discussion of changing perspectives on social identity within the Puerco Valley, which are mainly informed by ceramic studies. Puerco Valley potters took inspiration from technological and stylistic traditions from surrounding areas to the south, north, and east (Hays-Gilpin and Van Hartesveldt 1998). The mixture of ceramic traditions within the valley is indicative of small-scale population movement as well as extensive interaction and trade with adjacent locales (Hays 1993; Mills 2007). On a sparsely settled landscape with limited permanent water the circulation of people around the landscape is not surprising, nor is the notion that Puerco Valley inhabitants maintained ties with nearby groups of people. However, there has been little work to date that seeks to better characterize the nature of these social boundaries during the early Pueblo period. The long-standing debate over the degree of "Mogollon" influence in the valley relied on the uncritical association of cultural identity with ethnic identity (Shennan 1989b), and assumed that these social boundaries will be obvious and discrete. The role of Kayenta-Tusayan groups within the Puerco Valley during the early Pueblo period has also seen little discussion. Investigation of how the architectural traditions of Puerco Valley inhabitants changed over time will hopefully provide a clearer understanding of the complex nature of these social boundaries, and illuminate aspects of the cultural identity of the occupants that ceramics studies do not.

The remainder of Chapter 3 describes the sites included in the study and how I selected them. One-hundred-and-fifty-three pit houses from twenty-three settlements are included in the architectural analysis. I gathered this information from four sources: the Laboratory of Anthropology, in Santa Fe, New Mexico; the Museum of Northern Arizona (MNA), in Flagstaff, Arizona; the Office of Navajo and Hopi Indian Relocation (ONHIR), also in Flagstaff; and from published sources. I describe the sites in detail because I continue to reference aspects of their archaeology for the remainder of this study. Furthermore, whether a settlement was large, small, seasonally occupied, or inhabited year round influences the construction of different kinds of pit houses. Finally, I place the excavated pit houses into three chronological categories: an Early Period (AD 600-750), a Late Period (AD 750-900), and an "Indeterminate" category for structures that could not be confidently dated to either period.

Chapter 4 describes the methods I use to analyze the pit houses from the sites described in Chapter 3. I begin by discussing how archaeological patterns have been used to explore identity before describing how I bounded the Puerco Valley study area and selected pit houses for inclusion in the architectural sample. I then describe the architectural attributes that I use in the study, and emphasize the relative importance of some features (such as shape) over others (such as wall preparation) for assessing cultural identity. I then explain the four steps undertaken in the architectural analysis. First, I explain how I measured changes in the frequencies of certain attributes over time. I then describe an index of architectural elaboration that I developed to better understand the functional characteristics of Puerco Valley pit houses. Some structures appear to have been built with the intention of shorter occupations than others, and the index helps identify these. In most cases, pit houses with short intended spans of occupation did not express cultural identity as overtly as more elaborate and substantial structures. This presents problems for the archaeologists seeking to understand social boundaries in the Puerco Valley, but it does provide information about how the valley inhabitants may have viewed the relationship between mobility and architecture. I then describe how I used a statistical measure—Gower's coefficient of similarity (Gower 1971)— to compare structures in the Puerco Valley to each other as well as to contemporary pit houses from other regions of the northern Southwest.

Chapter 5 contains the analyses of the attributes described in Chapter 4 and discusses the results. The pit houses that most strongly expressed a particular cultural affiliation are located at the largest settlements. I also identify a number of cases where migrants from outside the Puerco Valley had a major impact on building traditions within the valley. At times, it appears to have been advantageous to maintain relatively well-bounded architectural traditions, especially within larger settlements or in situations where a number of households founded a settlement together. At other times, particularly in situations where individual households moved frequently in the Puerco Valley, architectural traditions were mutable, and less overtly expressed a particular cultural affiliation. At the largest scale, it can be seen that between AD 600-750 the Puerco Valley inhabitants adhered to architectural styles most common to the south, but by the AD 750-900 interval they adopted architectural styles found primarily to the north. Finally Chapter 6 provides a summary of the results and conclusions of the architectural analyses, and I outline a few avenues for further inquiry.

During the early Pueblo period the Puerco Valley was a place where groups from distinct social backgrounds interacted with one another. The inhabitants of the valley inscribed the story of this interaction in the changing styles of pit houses they built. The transformation of architectural traditions over time is a reflection of changing expressions of identity on the part of the occupants of the valley over a three hundred year interval. The resistance of some traditions to change, and the ease with which others were adapted, adopted, or dropped is an indication of the relationships Puerco Valley inhabitants held with each other and the people in regions around them.

Chapter 2: A History of Early Pueblo Period Research in the Northern Southwest

Introduction

My examination of cultural identity in the Puerco Valley is one aspect of a larger ongoing conversation in the northern Southwest concerning social and cultural change during the early Pueblo period. Archaeologists involved in this conversation explicitly embrace a pan-regional approach and note the importance of understanding the historical construction of knowledge on the topic (Schachner et al. 2012). Evolving perceptions of the early Pueblo period over the last century greatly affected the interpretations of archaeologists whose work contributes to the dataset I present in the second half of the next chapter. Major excavations at important sites, theoretical frameworks and the debates surrounding them, and the development of the discipline from an exploratory undertaking to a federally mandated enterprise were events with consequences reaching all corners of the US Southwest. It is impossible to separate the results of individual projects in the Puerco Valley from the broader perspectives on the prehispanic Southwestern that informed them.

In this chapter, I outline the history of early Pueblo period research in the northern Southwest to demonstrate how perceptions of the period have changed over time. Early archaeologists focused on material culture to develop trait lists that characterized cultures in particular places and at particular times. Packages of traits were thought to represent discrete, well-bounded, and essentialized cultural entities that were conservative and changed only slowly. As more information was gathered, the complicated nature of cultural boundaries and social interaction became increasingly evident. However, throughout many of the later decades of the 20th century, archaeologists were hesitant to suggest either small- or large-scale interaction as a causal factor in social change, preferring to explore human adaptation to localized environmental conditions. The past twenty years have seen recognition of the multi-causal factors that influence cultural change, which is a combination of historical events, environmental possibilities, technological innovation, migration, interaction, and daily practices. This has led to a diversification of research interests, among them group identity in early Pueblo society.

As I mentioned in the previous chapter, the early Pueblo period is a seminal and foundational interval in Pueblo history that combines two periods from the venerable old Pecos Classification: the last portion of Basketmaker III (AD 500-700) and Pueblo I (AD 700-900). Encompassing the dramatic social and cultural changes credited to Pueblo I, current understanding of the early Pueblo period is far from the "transitional" phase that was originally envisioned by framers and amenders of the Pecos Classification (Kidder 1927; Morris 1939; Roberts 1935). Rather than being a confusing period of cultural stasis between the momentous adoption of agriculture during Basketmaker II and III (1200 BC-AD 700) and the development of the large villages and towns known from the ruins of Chaco Canyon and Mesa Verde in the Pueblo II and III periods (AD 900-1300), Pueblo I is now understood to be the period when the potential presented by agricultural intensification led to the rapid development of the first villages in the northern Southwest (Wilshusen and Potter 2010), which provided the economic foundations and social fabric that made the Chaco phenomenon possible (Wilshusen and Van Dyke 2006).

The use of the term "early Pueblo period" to encompass late Basketmaker III and Pueblo I is meant to emphasize a broader, historical perspective essential for understanding social change that occurs across the entire northern Southwest in the AD 600-900 interval (Schachner et al. 2012:3). It is also intended to move away from the use of Basketmaker III and Pueblo I as reified, static concepts that ostensibly describe Ancestral Pueblo culture during two successive chronological periods. The Pecos Classification was never intended to be a chronological system, but a series of "stages" through which Pueblo culture passed, each characterized by a package of archaeologically recognizable traits. By the 1950s, Basketmaker III and Pueblo I as flexible developmental stages had ossified into chronological periods, but what constituted the beginnings and ends of these periods—and what was meant by them—varied by location and institution as archaeologists became more regionally specialized (Schachner et al. 2012:6). The product of this was a useful set of short-hand terms for time periods (BMIII pronounced: "bee-em three"—meaning AD 400/500-700/750; PI pronounced: "pea-one"—meaning AD 700/750-875/950) that actually manage to communicate very little about the archaeology they refer to, and even less about the social and cultural changes evident during the AD 600-900 interval.

For the remainder of this study, I use the term early Pueblo period (AD 600-900) to refer to the period during which the population of the northern Southwest grew rapidly and the first large villages formed. Prior to AD 600, there is little evidence of large, aggregated settlements in the northern Southwest, and after AD 900 the increasing influence of Chaco reshapes cultural and social identities. During the interval in between a variety of novel experiences faced the inhabitants of the northern Southwest: greater population densities than had previously been encountered; settlements of greater size and permanence; new forms of communal and private ritual; increasingly powerful leadership roles; and emerging social and ethnic identities. An expanded early Pueblo period from AD 600-900 allows for a more holistic examination of the unique cultural trajectories taken in different regions of the northern Southwest—big history (Lekson 2008). At the same time, it provides enough breadth to emphasize the locally specific histories that play out within a larger context.

Early Research on Basketmaker III and Pueblo I (1919-1948)

The massive masonry ruins of Chaco Canyon and the Mesa Verde region attracted the earliest archaeological attention in the northern Southwest, but by the 1890s there were hints that earlier groups of people had inhabited the region. During collecting trips in southeast Utah Richard Wetherill observed that beneath the cliff dwellings that we now know date to the AD 1200s there was evidence of an earlier "Basket Maker" culture, distinguished by the dominant use of basketry over pottery (Lipe 1999:57). Kidder and Guernsey (1919) reported similar material from northeast Arizona, and established "Basket Maker" as the name used to refer to the groups that pre-dated the "cliff-dwellers." Among the characteristics of these Basket Makers were: the use of caves for winter shelter and slab-lined cists for food storage, the use of the atlatl rather than the bow and arrow, the construction of crude, plain pottery formed in baskets, and un-deformed dolichocephalic crania—unlike the round, deformed crania of later Cliff-dwellers (Kidder and Guernsey 1919:209).

Over the next few years, researchers in the Southwest recognized more stages of development prior to the Cliff-dwellers. Guernsey and Kidder (1921) added a "Post-Basket Maker" and "Pre-Pueblo" period upon the realization that there were groups of people making pottery, but not building with coursed masonry. Morris (1919), excavated at open-air sites in the La Plata Valley and established that the houses of some of these "pre-Pueblo" sites were constructed of jacal—or adobe strengthened with wooden posts—rather than masonry, and by 1921 he, like Kidder and Guernsey, had developed a developmental sequence leading from Basket Maker, through a pre-Pueblo stage, and on to Early and Late Black-on-white periods defined by pottery (Lipe 1999:63).

The defining moment for this nascent developmental sequence was the assembly of prominent archaeologists and ethnologist in 1927 at A.V. Kidder's field camp at Pecos Pueblo, in northern New Mexico. Known as the Pecos Conference, attendees met outdoors under the shade of trees and hashed out the developmental scheme that became known as the Pecos Classification. The classification may have been roughed out ahead of time, created by consensus at the conference, or introduced by one of the participants (Woodbury 1993:90-93), but the subsequently published outcome (Kidder 1927) has affected Southwestern archaeology profoundly. The Pecos Classification was the first time the terms Basketmaker III and Pueblo I were used, and, reporting on the proceedings of the conference, Kidder described them as follows:

> "*Late Basket Maker, Basket Maker III, or Post-Basket Maker*—the pit- or slab-house-building, pottery-making, stage (the three Basket Maker stages [Basketmaker I, II, and III] were characterized by a long-headed population, which did not practice skull deformation).
>
> *Pueblo I, or Proto-Pueblo*—the first stage during which cranial deformation was practiced, vessel neck corrugation was introduced, and villages composed of rectangular living rooms of true masonry developed (it was generally agreed that the term pre-Pueblo, hitherto sometimes applied to this period, should be discontinued)." (Kidder 1927:490).

It is likely that a number of Southwestern archaeologists active at the time of the first Pecos Conference had a role in defining the different stages of the Classification, but Earl Morris, more than any other, provided crucial information for characterizing the "pre-Pueblo" and Basket Maker (Woodbury 1993:95). It is therefore interesting to note the difficulty he had characterizing the Pueblo I period within the confines of the Pecos Classification just a few years after its creation. Commenting on the differences between his own uses of the term "Pueblo I" in the La Plata drainage of Colorado and New Mexico, and that of Roberts (1931) at Kiatuthlanna in Arizona, a flustered Morris wrote:

> "It is far harder than I supposed ten years ago, to set up criteria for period differentiation that will be adequate for even the majority of localities. Every district that is subjected to extensive and carefully observed excavation provides so many deviations that an attempt to fit them all into definite niches in the time system leaves one in a maze of confusion and perplexity. This results, I presume, from *thinking in terms of a cultural uniformity that never existed*." (Morris 1939:31 emphasis mine).

Taxonomical systems of the 1930s were not well-suited to the variability in early Pueblo material culture across the northern Southwest. Morris was far closer to the truth of the matter than he probably knew: what for him was a vexing frustration—the inability to adequately correlate ceramic and architectural changes in one region with those in another—is today the very foundation of a historically-based archaeology that recognizes the contextual nature of social, economic, and technological change. There was no single "Pueblo I" for the northern Southwest, but rather a constellation of related shifts in architecture, subsistence and society that played out in a variety of ways depending on where you look. The cultural variability of the period was partly because early Pueblo villages represented a new development; village inhabitants had little experience with aggregations of this size and each village was an experiment. Variability also resulted from the presence of some areas of greater population density and stronger cultural patterns situated against a backdrop of relatively weak patterns of material culture (in the sense of Herr 2012). The Puerco Valley was one of these areas where greater household autonomy resulted in weaker patterns. With few impediments to frequent residential mobility, Puerco Valley residents likely existed within fairly fluid social boundaries, and group identity—as reflected in pit house architecture—was probably not as strictly defined.

For early 20th century archaeologists, the difficulties inherent in trying to understand the variability of Pueblo I across the northern Southwest led to it being an orphaned period, known but under appreciated. Morris' wife Ann, herself an archaeologist, characterized the Pueblo I period as a “transition interval—so transient, in fact, that it out-transitions all the other seven periods [of the Pecos Classification]” (A. Morris 1934:56). Roberts (1935:32), noting the difficulty of finding Pueblo I or Pueblo II in certain regions suggested combining them and returning to a term first proposed by Earl Morris years before, “Developmental Pueblo,” implying that the whole AD 700-1150 period was just a build-up to the “real” pueblos of the 1200s. The storage cists and pottery of Basketmaker III were readily identifiable, as were the masonry pueblos and cliff-dwellings of Pueblo III, but the hard to characterize architecture and pottery of Pueblo I defied attempts to place it into a progressive, developmental, and evolutionary system such as the Pecos Classification (Schachner et al. 2012:5). The fact that many of the AD 750-900-era settlements excavated during the 1920s and 1930s far exceeded in size many of the AD 900-1100 ruins was incommensurate with this developmental view, and was largely overlooked. Morris, who excavated one of the larger Pueblo I period villages on the La Plata River, (Morris 23—see Chuipka [2008]), commented: “the La Plata Pueblo I dwellings so far excavated are so closely similar to Basket Maker III that they are to be distinguished from the latter only by a tendency toward more substantial construction and the pottery they contain” (1939:34). That the individual house units of the Basketmaker III-period are often found dramatically aggregated into large villages containing over 50 pit houses during Pueblo I seems to have gone unnoticed by Morris, Roberts, and others. Much of the period of early research on Basketmaker III and Pueblo I was more concerned with classifying cultural change—such as the perceived architectural progression from domestic pit houses to ritual kivas (Brew 1946)—than with understanding the broader social implications of increased settlement size.

During the 1940s, the perplexing nature of Pueblo I and its status as a transitory period in most classifications led archaeologists to focus on Basketmaker III—which they believed was better understood. Morris considered it the most important period of the entire cultural sequence (1939:19). Basketmaker III was a period when painted pottery first developed, and people lived in relatively permanent semi-subterranean houses, growing beans and several kinds of maize (Roberts 1939:9; Morris 1939:20). These “cultural” developments, new to Basketmaker III, were thought to have provided the impetus for most subsequent development of Puebloan culture. The Pueblo I period was one of “transition and instability” (Roberts 1939:9), and it witnessed the elaboration of pottery making and great variability in architectural form. Many archaeologists thought that round-headed newcomers superseded the older Basketmaker populations (Roberts 1939:9), or that some of the Basketmakers themselves were this population of newcomers (Morris 1939:20; Gladwin 1945:3). By the 1940s, careful scrutiny of the variation inherent in skull shape across a population had closed the book on the idea of a round-headed invasion, demonstrating that the use of new cradle boards by the same populations resulted in the cranial deformation. Most archaeologists had little of substance to say concerning Pueblo I, other than that it was a period when “people lived in pit-houses” (Gladwin 1945:3), much like they had previously, and “ceramics took on definite features typical of the period” (Roberts 1939:9). The advent of dendrochronology allowed more definitive dates to be placed on the Basketmaker III and Pueblo I periods, but the nature and extend of social change during the AD 750-900-era was still beyond recognition.

“New” Perspectives on Culture Change and the Advent of Cultural Resource Management Archaeology (1948-1990)

In 1948, Walter Taylor published *A Study of Archeology* as a memoir of the American Anthropological Association. The personal nature of his critiques of respected figures in

American archaeology such as A.V. Kidder, Emil Haury, and Frank H. H. Roberts detracted from his message, but he exposed many of the underlying assumptions clouding archaeological interpretation. To address the contradiction between "writing history" and "doing anthropology" that he felt characterized much archaeological research in the first half of the 20th century, Taylor advocated for an archaeology that generalized, contextualized, and created broad cultural syntheses. The extent to which *A Study of Archeology* ushered in the era of the "New Archaeology" is overstated, but it did mark a turning point in the goals and objectives of Southwestern archaeology. For Taylor, classification and description of cultural trends over space and through time was just one step on the way to "deriving sound cultural abstractions" which will further the study of culture itself (Taylor 1948:42).

Many heeded Taylor's call for a more rigorous archaeological discipline by advocating an explicitly scientific approach that took inspiration from the emerging field of cultural ecology (Steward 1949; 1955; White 1949). Although Taylor intended a hybridization of history and anthropology, throughout the 1950s archaeologists allied themselves increasing with cultural anthropology, which at the time was interested in developing a science of culture change predicated on evolutionary adaptation (Sahlins and Service 1960; Binford 1962). Although this was the stated aim of research for many archaeologists, the nature of the archaeological discipline was changing in ways that were not necessarily conducive to the style of research demanded by an explicitly scientific approach. Beginning in the 1950s, the National Park Service, Arizona State Museum, the Museum of Northern Arizona, and the Laboratory of Anthropology commenced a program of salvage archaeology meant to offset the damage done to archaeological sites by pipelines dams, and highways. Archaeologists who typically had other duties as administrators, graduate students, or professors were often alerted last minute of planned development, leaving little time for the preparation of research designs. Whereas earlier research undertaken by universities, museums, and federal agencies was often problem oriented and sought to fill in data-gaps, salvage archaeology projects occurred where development dictated, and dealt with any archaeological remains that were encountered. Detailed analysis of excavation results was often hampered by a lack of time and funding.

Many salvage projects encountered Basketmaker III and Pueblo I settlements. Along the Puerco Valley of eastern Arizona and western New Mexico, excavations during the 1950s and 1960s uncovered numerous settlements occupied between AD 600-900 (Gumerman 1982; Gumerman and Olson 1968; Sciscenti 1962; Wasley 1960). In New Mexico, excavations ahead of the construction of Navajo Reservoir were centered on a major regional cluster of Basketmaker III and Pueblo I period sites (Eddy 1966). These settlements were frequently not placed within a larger regional context and were treated as discrete cultural manifestations. Theory du jour downplayed historical developments and inter-areal relationships and instead explained changes in material culture patterning as the in situ adaptation and evolution of economic, technological, and social systems. Within this scheme, the Basketmaker III and Pueblo I periods were a transitional phase during which the pit house adaptation was giving way to a pueblo adaptation, and social and economic systems were in flux (Plog 1974). Through the 1970s and into the 1980s, most major cultural resource management projects relied on systems theory to interpret (explain) patterning in the archaeological record. While the notion of cultural diversity and group identity were not completely ignored, most variability—like that found in the Puerco Valley—could be attributed to niche adaptations rather than conscious decision-making on the part of the prehistoric inhabitants of the Southwest.

The nature of cultural resource management projects encouraged interpretation that treated culture as a closed system and economic and social change as ultimately stemming from increasingly efficient environmental adaptations. Projects only examined the archaeology that is within the area-of-impact, building artificial borders around the prehistoric settlements. Funding typically was (and is) insufficient for project archaeologists to spend the time required to contextualize their excavation and survey results with those of other nearby projects. Given this "closed-system" approach, I think it is not surprising that many cultural resource management projects of the 1970s and 1980s continued to think of Late Basketmaker III and Pueblo I as primarily transitional phases along an adaptive evolutionary path from part-time agriculturalist to full-time sedentary farmer. Some saw this shift primarily occurring in Basketmaker III, with Pueblo I representing the almost imperceptibly different continuation of the "Late Basketmaker adaptation" (Glassow 1980:39), or a post-script to major changes in subsistence economy that occurred during the whole Basketmaker sequence (1980:99-100). Presented with data comprising complete settlement histories of specific bounded localities and theory encouraging the internal development of cultures through adaptive process, archaeologists used these "natural laboratories" to explain what they saw—which was limited in geographic and historical scale (Lekson 2008:111). This contributed to a further problem for interpreting the early Pueblo period, because even small-scale population movement into or out of a study area could not adequately be accounted for. It is likely that throughout much of the northern Southwest relatively small, kin-based groups initiated both short and long distance migration, and the successive movements of people every generation or less led to the composition of these groups changing dramatically over time (Bernardini 2005a:34). Population movement therefore was a major factor in cultural change through processes of negotiation that occurred as immigrating groups sought a place within larger host communities. This notion of culture change, however, was not compatible with the closed-system theories of the 1970s and 1980s.

Subsistence and adaptation necessarily influenced the forms of housing constructed by the prehistoric residents of the Southwest. During the 1980s debate surrounded the so-called “pithouse to pueblo transition” (McGuire and Schiffer 1983; Gilman 1987; Wilshusen 1988d), which resulted in a number of explorations of pit house form and function. My architectural analysis draws heavily on these earlier—and yet to be supplanted— studies of the construction costs, engineering, and lifespan of pit houses. Not since Daifuku (1961) or even Roberts (1939) had as much attention been given to the actual physical form of pit houses, and experimental reconstructions demonstrated that some long-held assumptions about pit house construction were in error. I draw less from the debate over the social implications of the shift to surface architecture because recent theoretical advances have rendered it somewhat peripheral, but the empirical studies of architectural form and function produced in the 1980s are essential to my investigation of Puerco Valley pit houses.

The heart of the matter that resulted in the studies I just mentioned was the shift from semi-subterranean pit dwellings to surface pueblos made of masonry, adobe, or both. The transition occurred unevenly across the entire Southwest, but by the AD 1300s, nearly all the prehistoric inhabitants lived in above ground, pueblo-style houses. This transition had long been associated with changes in social organization, often uncritically assumed to reflect “developing Pueblo culture.” McGuire and Schiffer (1983) used this architectural transition as a test case of their theory of architectural design. The primary advantages of surface architecture made of stone and adobe over semi-subterranean houses constructed of wood, earth, and vegetal material are maintainability and longevity. As Puebloan society became less mobile, stored more food, and populations were increasingly differentiated and unequal, the advantages of surface architecture would encourage the shift to this more versatile architectural form (1983:289-290). In addition, if household size is increasing as new social structures develop, rectangular surface rooms are much easier to remodel and add rooms to.

Wilshusen (1988d) critiqued McGuire and Schiffer’s model of architectural change on several points. First, he contended that replication studies demonstrated that there was little difference in structural longevity between pit structure and the jacal surface rooms that pre-date full masonry surface pueblos. The shift to masonry surface pueblos was therefore an indirect result of some other cause. Furthermore, Wilshusen proposed that there is a direct mechanical relationship between the construction of pit houses and surface rooms: dirt from the excavated pit that does not become part of the roof of the pit structure is used to construct the surface rooms. The size and number of pit structures correlates with the number of surface rooms on many sites dating to the AD 800-900 interval. The “household” and its relationship to architecture during the early Pueblo period was being redefined in the late 1980s and early 1990s (Lightfoot 1994), so Wilshusen does not propose an alternative theory of the *social* changes that may have accompanied the pithouse-to-pueblo transition. He does note that the shift to masonry construction could in part be a response to the lack of available excavated dirt as pit structures began to function as kivas rather than residences, and fewer of them were built in relation to the number of surface rooms. A masonry pueblo may require up to 40% less earth and water than one of adobe and jacal (Wilshusen 1988d:707).

Working primarily from data gathered south of the Colorado Plateau but including a global ethnographic perspective, Gilman (1987) contended that construction costs were largely unimportant, and non-causal, in the pithouse-to-pueblo transition. More important to the transition were shifts in subsistence strategy, food processing, and food storage. Gilman argued that a greater investment in agriculture resulted in an increased need for long-term food storage, for which surface pueblos are better suited. Furthermore, increasing community size led to stress in food information networks, prompting food storage to move inside houses for secrecy. With greater amounts of food to be stored (as described, this already contributes to a need for surface storage features), this led to the designation of specific storage rooms, appended to living rooms for thermal efficiency. It is typically impossible to build multi-room, subterranean structures. Surface pueblos therefore represent the most efficient solution to a series of related problems in subsistence, economic, and social systems.

Although each of these studies approached the pithouse-to-pueblo transition in different ways, the common thread is awareness that one of the most important periods of change in subsistence, architecture and social organization in the Southwest occurred in the AD 600-900 period. However, the dominant perception of the Basketmaker III and Pueblo I periods continued to be one of relatively “long-lived sites, small population, and gradual change” (Schachner et al. 2012:8). The paradigm of generalization was an important rectification of earlier problems but itself suffered from a tendency to extrapolate from small-scale research to “culture” at large. As a result, the internal variability of the Basketmaker III and Pueblo I period went unrecognized in favor of explanations of the period that could be extended to intermediate level, early agricultural societies in general. Ignoring the potential for brief events to have lasting consequences—that is, history—and a dismissive attitude towards migration also led to larger, pan-regional patterns being overlooked.

The accumulation of greater quantities of data as a result of the quickening scale and pace of cultural resource management archaeology provided a large amount of material on which interpretations could be built. The largest project that contributed the most to changing perceptions of the early Pueblo period in the northern Southwest was the Dolores Archaeological Program (DAP)—a massive, multi-year project (1978-1985) undertaken in southwest Colorado prior to the construction of McPhee Reservoir. The research goals of the DAP were firmly rooted in the "New Archaeology" and primarily aimed to understand the interaction of sociopolitical organization and environmental constraint through the use of a "systems model of culture" (Kane 1983: 3-4). Not surprisingly, the final synthesis of the project emphasized how changing environmental pressures, population growth, and the need for managerial control led to greater social complexity over time within the project area (Lipe and Kane 1986:707). While these results are accurate in an abstract sense, the strikingly dynamic nature of settlement in the project area between AD 750 and 900 is muted when described in these terms. However, the immense quantity of data gathered by the DAP coupled with the fact that the project examined the most densely occupied portion of the northern Southwest in the AD 750-900 period contributed to a complete re-evaluation of the Pueblo I period over the next twenty years.

Current Trends in Early Pueblo Period Research

The ongoing re-evaluation of the early Pueblo period across the northern Southwest is due to a combination of changing theoretical perspectives, fortuitously located cultural resource management projects that have produced large amounts of high-quality data, and the actions of a few individual personalities. The publication of *Migration in Archaeology: The Baby in Bathwater* (Anthony 1990) sparked reconsideration of the role of migration in cultural dynamics and historical process. Not always directly referenced in archaeological literature of the early Pueblo period, it nonetheless was a cause and a symptom of dissatisfaction with systems-style thinking, and particularly with a “paralyzing fascination with the *causes* of migration” (Anthony 1990:897 emphasis mine). The contribution of population movement to some of the major archaeological patterns observed in the northern Southwest—and thus on the groups creating those archaeological patterns—revealed new avenues of inquiry and reintroduced a sense of history into the study of Southwestern “prehistory.” For example, Bernardini (2005a:31-32) contends that archaeologists’ fascination with space had led them to overlook the fact that Native American groups emphasize time when discussing cultural identity. “Hopi clans acquired their identities through their accumulated migration experiences, which changed over time with the addition or loss of members and their associated experiences” (Bernardini 2005a:33). He used to term “serial migration” to refer to the successive historical movements of relatively small groups of people that Hopi clans see as essential to the composition of their group and its identity.

It is probably not appropriate to extend the social composition of exogamic, kin-based Hopi clans as far back as the early Pueblo period, but it is important to recognize that population movement is an essential component of identity construction. Movement facilitated cultural change, and areas like the Puerco Valley where multiple groups co-resided were loci of important interactions between different peoples that contributed to identity creation. Borderlands would have been locations driving cultural change as the inhabitants negotiated their statuses and roles within newly forming communities.

Reengagement with the topic of migration provided a framework for investigating the early Pueblo period from this perspective. Wilshusen and Ortman (1999) argued persuasively for a Pueblo I period (AD 750-900) characterized by extensive population movement and cultural diversity. Key to their analysis was a connect-the-dots approach to pan-regional momentary population counts that demonstrated that during the ninth century the majority of people living in the Southwest could be found in the Mesa Verde region (see also Wilshusen 1999). Furthermore, Wilshusen and Ortman showed that there were major differences in architecture, settlement history, and ceramics at two villages located within a few miles of each other on opposite sides of the Dolores river, contrary to assumptions that Pueblo I settlements were generally similar and exhibited little variability. They hypothesized that the differences in material culture and site history reflected underlying cultural distinctions between the inhabitants.

Embracing population movement highlighted the role that AD 840-880 settlements in the Mesa Verde played in the early growth of Chaco Canyon. Most of the Pueblo I villages occupied in the Mesa Verde region were abandoned after AD 880 (Wilshusen and Ortman 1999:380-381), and population declined precipitously across the entire Northern San Juan region (Varien et al. 2007); at the same time population increased in the San Juan Basin to the south in the AD 875-925 interval. A number of San Juan Basin outlier great houses recorded by Marshall et al. (1979) appear to have been first occupied shortly after AD 875. Windes and Forde (1992) noticed the similarity in architectural style between McPhee Pueblo in Southwest Colorado and the earliest late ninth century roomblocks at Pueblo Bonito and Penasco Blanco in Chaco Canyon. Wilshusen and Van Dyke (2006:257) argue that the social institutions begun in Pueblo I villages in southwest Colorado were “reformatted” as Chacoan great house communities in the San Juan Basin.

Current research on the early Pueblo period is situated within the local historical contexts of the northern Southwest, but connected to three broader themes: The Neolithic Demographic Transition (NDT); the formation of early villages; and social identity. Societies in the midst of an NDT—such as the early Pueblo Southwest—are expected to experience rapid and profound changes in social order as populations rapidly increase. While this thesis does not directly address demographics in the Puerco Valley, it does recognize that this sort of demographic shift likely increased population densities in the valley. In conjunction with the NDT, the early Pueblo world saw the formation of the first large villages in the northern Southwest. Social relationships within early villages were likely more complex than their predecessors, which altered the inhabitants' perceptions of their roles and statuses in society. Finally, both village formation and the NDT affected cultural identity as people encountered new social situations.

The Neolithic Demographic Transition

Scholars have known for a long time that societies investing more energy into agriculture and less into mobility tend to experience profound changes (Binford 1968; Childe 1951; Cohen 1977; Braidwood 1960). This transformation has been studied around the world, in Europe (Bocquet-Appel 2002), in the Near East (Kujit 2000), and in Mesoamerica (Flannery 1976; Rosenswig 2006). Following agriculture and sedentism, populations grew rapidly as high infant mortality was outpaced by even higher fertility; in response, new dwelling types developed, new settlement types appeared, and novel social forms arose in response to changes in the division of labor and higher population densities. This suite of changes is referred to as the Neolithic Demographic Transition (Bocquet-Appel 2002). The signature of an NDT can be found by comparing the ratio of 5-19 year olds to the total population over the age of 5 (the "5p15" ratio). This change, which is the result of higher birth rates, appears to occur within about 500 years of the "local advent of Neolithic lifeways," a rather nebulous concept, which probably differed from region to region.

The presence of an NDT has been confirmed within the general US Southwest (Bandy 2005; Bocquet-Appel and Naji 2006; Kohler et al 2008). Here, it seemed to more closely correlate with a host of new technological innovations such as pottery and the bow and arrow. The entire Southwest is portrayed as being affected by this demographic transition over the course of 1000 years between approximately AD 500 and 1500, although Kohler et al. (2008) feel the effects are seen most clearly within early Pueblo villages in the northern San Juan region. Very high growth rates are predicted from Northern San Juan cemetery data during AD 750-900, which is commensurate with an NDT.

Broadly speaking, a Neolithic Demographic Transition should lead to rapid population growth, which most current research suggests will result in the rapid aggregation of people into large settlements—such as is seen in the Northern San Juan. The cemetery at LA 4487 was the only one from the Puerco Valley included in the initial NDT calculations for the Southwest. The population density within the Puerco Valley was probably much lower than the Northern San Juan. Wilshusen and Ortman (1999) estimate less than a 1000 people lived in the whole Puerco Valley, a far cry from the 10,000+ people hypothesized for the Northern San Juan during the same time period. While NDT theory predicts rapid changes in family size, social structure, and political institutions, I believe that the localized effects of such a transition probably varied. The research in this thesis does not directly address the demographics of the Puerco Valley, but it does describe changes in architecture that might have been related to rapid population growth.

The Importance of Early Villages

The “village threshold” was (and is) frequently overlooked in research on the Neolithic Revolution because of its intermediate position between the origins of agriculture and the rise of states, but villages became a major topic in during the 1970s (Flannery 1972; 1976). However, villages have continued to be uncritically defined in literature that does not explicitly concern them. In the Southwest, archaeologists have tended to refer to most settlements as villages, regardless of size, masking the difference between a single-family farmstead and a true village of fifteen or twenty families. Within this study and others in the northern Southwest, ten contemporaneous dwellings suggesting a population of 40-70 individuals is considered the lower limit of a “village” (Wills and Windes 1989; Wilshusen 1991:47).

Village formation is directly relevant to research in this thesis, because these novel social landscapes would have forced re-evaluation of social and cultural identity as people were suddenly faced with living in much greater proximity to their neighbors—who may have come from a different cultural and historical background. Village formation is a transformative process for a society, and is influenced by the availability of intensifiable food production, relatively permanent residence, political autonomy of the village or settlement cluster, and nearness in time to the origins of sedentary life (Bandy and Fox 2010:2-8). The last fact mentioned implies that pristine village formation is different than village formation in societies that already have a history of urbanism. Population growth during a Neolithic Demographic Transition increases the chances of village formation (Bandy 2010), although it also leads to instability that can cause villages to fission or disperse. In places where occupation length can be measured accurately, like the northern Southwest, many villages have been shown to have surprisingly short-lived, lasting between 25 to 40 years (Wilshusen 1999:210). In Southwest Colorado, competition over prime agricultural land may have intensified as population grew, especially if household autonomy was high and social mechanisms had not developed to overcome intra-community strife (Wilshusen and Perry 2008:422). This may have been one reason that villages were abandoned frequently. Violence within villages appears to be more common than violence between villages, as attested by the massacre of at least 35 individuals at Sacred Ridge by members of their own community (Potter and Chuipka 2010), or the paired male and female burials of individuals who met simultaneous, violent ends at McPhee Pueblo (Wilshusen and Perry 2008:435).

"Relatively permanent residence" is one criterion that affects village formation (Bandy and Fox 2010:5) that is difficult to gauge in the Southwest because in many places households and small groups routinely relocated to pursue better agricultural prospects (Varien 2002; Preucel 1990; Bernardini 2005a, 2005b). During the AD 600-900 interval, there has been considerable contention as to whether populations were full-time sedentary agriculturalists or continued to be mobile part time hunter-gatherers, particularly in the Mogollon and Mimbres regions south of the Colorado Plateau (Gilman 1987; Diehl 2001; Diehl 1996; Diehl 1997; see chapters in Young and Herr 2012). The presence of seasonally mobile farmers makes the interpretation of potential village sites difficult because a series of sequential occupations by a few families will result in a similar amount of structures as a village of contemporaneously occupied houses. Within the Northern San Juan, research has demonstrated that a great many of the structures within early villages were contemporary. The average village contained nearly 40 households, although there is a wide standard deviation (Wilshusen 1999:Table 7-2). However, in other parts of the Southwest like the Little Colorado region, it is not known whether or not large archaeological sites are a reflection of large prehispanic populations (Schachner, Gilpin, and Peeples 2012:104).

The crux of the problem in determining whether a settlement is a full-time village or the site of occasional large aggregations is not the size of the settlement per se, but the potential for institutionalized and permanent leadership roles. Temporary leaders usually have control of certain specific situations, whereas permanent leaders extend their authority beyond specific contexts (Kantner 2010:256). Permanent leadership represents a dramatically different social scale than situational and temporary leadership, and whether sites represent the occasional or seasonal aggregation of people or year-round villages is an important aspect of understanding the growth of social complexity in the northern Southwest.

The Northern San Juan region is the undisputed focal point for village formation between AD 750-880 in the northern Southwest. Three distinct episodes of village formation (Wilshusen and Ortman 1999) culminated in the occupation of up to 40 villages in the central part of this region at AD 860 (Wilshusen et al. 2012:25-26). The first villages formed on the east and west peripheries of the Northern San Juan region shortly after AD 750, possibly by recent migrants to an already well-settled area (Wilshusen and Perry 2008:423). During the AD 800-840 interval the peripheral areas became less important while the areas around the La Plata and Mancos drainages south of Mesa Verde grew in population (Wilshusen and Ortman 1999:374). There is evidence of significant immigration to the Northern San Juan region throughout the AD 840-800 interval (Varien et al. 2007). Finally during the AD 840-880 interval, the Dolores River Valley of Colorado became the most densely settled part of the Northern San Juan region.

The earliest villages displayed great variety in layout, ceramics, and architecture reflecting the fact these villages were novel experiments (Wilshusen and Potter 2010:172-173). Over time, however, diversity gave way to greater homogeneity in village form (Wilshusen et al. 2012:31). Two major styles of village were constructed, reflecting underlying cultural differences between the occupants—tightly arced roomblocks that were often stockaded at one end, and long linear roomblocks fronted by pit structures (Wilshusen and Perry 2008:428). Great kivas fell out of fashion after AD 840 (Wilshusen 1999:26).

Although the densely populated Northern San Juan region best illustrates the process of village formation, I do not mean to suggest that this was the only location in which village formation took place. There are settlements of substantial size found in the Little Colorado drainage of Arizona (Gilpin and Benallie 2000; Schachner, Gilpin, and Peeples 2012; Roberts 1931; 1939; Schachner et al. 2011; Wendorf 1953), and the San Juan Basin of northwest New Mexico (Windes and Van Dyke 2012). The only region of the northern Southwest that seems largely devoid of large settlements during the AD 600-900 interval is the northern Rio Grande (Lakatos and Wilson 2012). The formation of villages outside the Northern San Juan region is less well understood because other regions lack the comprehensive databases developed through many years of focused research that provide demographic and environmental context. Research in places like the Puerco Valley is likely to identify alternative trajectories of village formation, and will help situate the social and cultural processes that created these early communities within a pan-Southwestern perspective.

Cultural Identity and the Early Pueblo Period

Identity comprises a range of ways in which individuals and groups perceive themselves and represent themselves to others. Early archaeological research tended to equate archaeological patterns with actual cultural or ethnic distinctions. The conflation of these two concepts has been a longstanding and problematic assumption (Shennan 1989:7), leading to the reification of culture areas as “real” boundaries without critically examining the data has persisted, despite changing trends elsewhere that suggest this reification is unfounded

(Bernardini 2005a:32). A further wrinkle has developed as some archaeologists question whether well-bounded social formations like ethnicities existed in many pre-state societies (Shennan 1989:16). In the US Southwest, this argument has focused on the nature of communities, and the variety of ways in which communities are structured (Varien and Potter 2008; Young and Herr 2012). Schachner (2008:174) has suggested that prior to the 13th century, groups in the Southwest moved with enough frequency and lived in small enough settlements that identity based around the community was subject to great fluidity. Obviously, such a mutable social world poses problems for defining patterns that are thought to reflect ethnic or cultural identities.

I agree with Shennan (1989) that the origins of "ethnicity" are probably found with the creation of states, and not as a pre-existing "natural" condition. However, a great deal of Southwest research uses the term ethnicity or ethnic identity, and in the following discussion I leave the term intact. My definition of cultural identity is meant to be a more broadly constructed term than ethnicity. It refers to the fact that even in pre-state (or pre-urban) societies, archaeological patterns often suggest that neighboring households practiced divergent house construction techniques, selected different ceramic forms and styles, prepared food in different ways, and had dissimilar family structures. It is a heuristic to bridge the gap between archaeological pattern and sociocultural reality.

The methodologies of pattern recognition are similar to those practiced throughout the 20th century, but today a much wider array of theoretical approaches is available to relate material culture patterning to cultural identity. Patterns are not direct reflections of past cultural behaviors (Schiffer 1987; Binford 1962; 1965): they are "contingent interrelations of different distributions produced by different factors" (Shennan 1989:13). However, patterns in the archaeological record are not all disorganized palimpsests or random variation—material culture is used as a medium to communicate membership in particularly groups, ethnicities, and statuses (Wobst 1977; Wiessner 1983); as a result, material culture patterns do reflect real social and cultural entities.

Stone (2003:32) suggests that archaeologist have taken two approaches to studying ethnicity. One approach examines interaction between groups, and the other looks at how ethnic groups constituted themselves. The difference between the groups is mainly to what degree people are conscious and self-reflective in their creation and use of an item. She has argued (2003:43) that since ethnicity necessarily entails the conscious manipulation and public display of identity archaeologists should be looking at the intentional and symbolic use of material culture, such as advocated by Hodder (1978), Wobst (1977), and Wiessner (1983). Stone stands with the interactionists. However, Cameron (1998:191) argued that in many cases, the contextual nature of symbols means that actively signaled style can be very hard to relate to ethnicity. She and others (Stark 1998; Gosselain 1998; Clark 2001; Van Dyke 1999; Lyons, Hill and Clark 2008) have used the idea of technological style to examine social boundaries.

Technological style is an approach derived from the French tradition of *chaine-operatoire* (Stark 1998:2-3) that examines the steps undertaken and materials used to produce an object. *Chaine-operatoire* is an approach that links patterns in the material record with the "sociopolitical relations of production" (Dobres 1999). It also draws on practice theory (Bourdieu 1977) and suggests that people construct identities in the process of constructing things (Dobres 1999:159). Technological approaches to style recognize that different aspects or scales of identity may be related to different steps in the process of construction (Peelo 2011). The advantage of technological style over approaches that rely on the symbolic nature of material culture is that techniques of construction are typically habitual actions that reflect learning frameworks developed early in life. As a result, they may be more stable indicators of group affiliation and identity as they reflect the traditions in which an actor gained competence (Gosselain 2000; Dobres 1999).

Archaeologists have relied on a combination of these theoretical approaches to to examine ancient Southwest populations. Methods of wall construction in surface pueblos have figured prominently in discussions of migration, interaction, and group affiliation. For example, 13th century migrants from the Kayenta region have been traced into the Point of Pines region (Stone 2003; Riggs 1999:327 and 2001), as well as the Tonto Basin and San Pedro Valley (Lyons, Hill, Clark 2008) because they have distinctive styles of wall construction. Elsewhere, Cameron (1998) discusses how the spread of adobe architecture across the Southwest after AD 1150 may be related to the spread of the Katchina religion, although she notes that there are other factors that need to be considered as well. Van Dyke (1999) examined wall construction and other variables to assess the extent to which outlying Chacoan great houses were local emulations or Chacoan-directed construction projects.

The majority of these examples pertain to migrations that occurred in the AD 1300-1400s. However, similar techniques are being used to examine the negotiation of identity in the early Pueblo period. The vast majority of research on early Pueblo period social identity has occurred in the Northern San Juan region. At least three distinct groups of people are thought to be present in the Northern San Juan region at AD 750: a group to the west producing red ware pottery and constructing relatively substantial surface structures; a group to the east producing early glazed black-on-white ware pottery and living primarily in pit structures with little surface architecture; and the group of people who were already in the central portion of the Northern San

Juan region living in pit structures with antechambers and producing a mineral-painted black-on-white pottery (Wilshusen and Ortman 1999; Wilshusen and Potter 2010:177; Chuipka 2009; Allison 2008). The distribution of these ceramic wares across the Northern San Juan region corresponds with settlement layout and domestic architecture, suggesting that these are distinctions rooted in the maintenance of disparate social identities (Allison 2008:47).

The manners in which two Dolores River Valley villages, McPhee and Grass Mesa, grew over time and were abandoned were different enough to suggest that they were inhabited by people of dissimilar ethnicities (Wilshusen and Ortman 1999). Grass Mesa initially contained a great kiva, while McPhee did not. Ceramics distributions demonstrated that the two villages participated in different trading networks. Ritual structures were treated differently on abandonment in the two villages, both of which ceased to be inhabited by AD 890.

Within villages, certain individuals seem to have gone to lengths to distinguish themselves from their peers. Some structures at Morris 23, Sacred Ridge, and Blue Mesa, all in southwest Colorado, are surrounded by wooden stockades, which may have been a strategy used by the inhabitants to control space and assert their ethnic identity (Chuipka 2009:75). The stockades were probably not substantial enough to have been used for defense, but rather to demarcate the space of a particular household. In other villages, access to certain styles of ceramics seems to have demarcated group affiliation. In southeast Utah, red ware bowls were associated with feasting at oversized pit structures in the late AD 700s (Allison 2008:56), but in southwest Colorado—where these bowls were imported—they are not associated with feasting at this point in time. The red ware ceramics instead seem to be a symbol of certain families' ties to the communities in southwest Utah.

Within Ridges Basin, in southwest Colorado (an area that encompasses Sacred Ridge and

Blue Mesa—mentioned above), archaeologists have defined ethnic distinctions within villages on the basis of pit house and surface architecture. Between AD 750-820, immigrants from east and west moved into Ridges Basin. Pit house to the west of Ridges Basin were square or rectangular with wingwalls, single-hole ventilators, and two-room wide surface rooms, while those to the east of the basin were circular, lacked wingwalls, had two-hole ventilators, and were associated with surface architecture consisting of one-room deep roomblocks often surrounded by a stockade (Potter and Yoder 2008:21-39). Architecture with Ridges Basin itself consisted of a combination of the two styles, although this was not simply a result of trait mixing, but rather of “immigrant households from various origins actively working to establish and signal their identities” (Potter and Yoder 2008:29). Some of these immigrants chose to construct houses reflecting long-standing traditions, whereas others created houses in styles with no prior precedent. Over time, many pit houses in Ridges Basin came to resemble those constructed at Sacred Ridge, a village in the western part of the basin with a unique ridge-top complex that visually (and possibly socially) dominated the entire valley. The inhabitants of Sacred Ridge used innovative architectural forms such as a jacal and adobe tower, a massive storage features, and a village layout that restricted access to the ridge-top complex, to distinguish themselves from other residents of Ridges Basin.

Potter and Yoder (2008) suggest that the degree of architectural variability is the result of experimentation within newly founded community populated by migrants. Migration and resettlement in a new area essential created a "blank slate" situation, where traditions were made anew, incorporating some aspects of prior social practices while creating new ones as well. Furthermore, the people who arrived in Ridges Basin in the late AD 700s likely did not share a prior history, and came from different parts of the northern Southwest. The Ridges Basin therefore became a "contested landscape" wherein identity construction and maintenance took on heightened salience (Potter and Yoder 2008:36). In this light, the significance of differences in interior and exterior architectural features noted by Chuipka (2009) probably sent potent signals of group membership and ethnic affiliation.

Migration into Ridges Basin resulted in architecture of greater formality that reflected a complicated process of social negotiation among the new arrivals. The Puerco Valley exhibited a similar history in the post-AD 750 era, as a sparsely populated, or even depopulated, landscape filled with people from a variety of backgrounds. I expect a similar process of negotiation between migrants in the Puerco Valley is responsible for the variability in pit house architecture observed within a relatively small geographical area.

The expression of social identity in the Northern San Juan occurred at the scale of the region (as ceramic technological tradition), at the scale of the village (as social practices, economic pursuits, and trade networks), and at the scale of the household (as choice of architectural and ceramic style). Social identities such as ethnic affiliation (Wilshusen and Ortman 1999), gender (Potter and Perry 2011), or status (Allison 2008) were expressed in ceramics, architecture, and other forms of material culture less obvious to archaeologists. The expression of identity was not static, but rather one that was redefined as populations moved in and out of the region, and as the contexts of artifact and housing styles were redefined by historical process.

Conclusion

Over the course of 100 years, the early Pueblo period has gone from being a poorly understood transitional phase to a major period of social transformation in the northern

Southwest. During the early Pueblo period Southwestern peoples formed large and dynamic aggregated settlements or a size that suggests the relationships between individuals were forced to change. These processes were most striking in the Northern San Juan region, but the events and activities going on in that region would not have escaped the notice of inhabitants of other parts of the northern Southwest. By AD 900 the inhabitants of most regions constructed surface architecture, were sedentary for a significant portion of they year, and probably were familiar with villages, if they did not live in one themselves (see chapters in Wilshusen et al. 2012, and Young and Herr 2012).

The next chapter describes early Pueblo period research in the Puerco Valley. The Puerco Valley did not exist in a social vacuum in prehistory, nor does it today. The paradigms and perceptions described in this chapter have shaped and guided research over the last eighty years. In addition, the early Pueblo inhabitants of the Puerco Valley were part of a larger constellation of peoples who interacted on a continuum from daily to periodic. The nature of these interactions is reflected in the various ways in which people expressed their cultural identity.

Chapter 3: Early Pueblo Period Research in the Puerco Valley

Introduction

Archaeologists have been working in the Puerco Valley since the late 19th and early 20th century. The first projects focused on documenting and excavating the largest, most prominent ruins, the majority of which dated to the AD 1150-1350 period. Beginning in the 1930s, archaeologists began investigating the earlier ruins and rubble mounds that are scattered the length of the valley. After 1950, archaeological work in the valley followed the tempo of energy development and infrastructure expansion. Periods of significant survey and excavation that encountered early Pueblo period remains occurred in the early 1960s, the mid 1970s, and again in the late 1980s and early 1990s (Table 1).

No synthesis of Puerco Valley archaeology has been written since the late 1960s (Gumerman and Olson 1968), although a major overview of the archaeology of the region accompanies the ceramics manual of Hays-Gilpin and Van Hartesveldt (1998). A great deal of the land in the Puerco Valley either belongs to Navajo Nation or is privately owned, meaning that academic projects on public land have been almost non-existent. The largest contiguous section of public land is Petrified Forest National Park. A number of recent projects have capitalized on this fact, although only one has explicitly dealt with the early Pueblo period archaeology of the Park (Schachner et al 2011). The presence of multiple land-holding agencies and individuals and the lack of any focused, long-term academic projects in the Puerco Valley have left a documentary record largely contained within the “grey literature” of cultural resource management. Data quality has been impacted somewhat, and records, reports, and files are spread across two states and

Reference	Date of Excavations	Sites Included	Context of the Project
Roberts (1939, 1940)	1931-1933	Whitewater	Smithsonian
Gladwin (1945)	1936	White Mound	Gila Pueblo
Wendorf (1953)	1949-1950	Twin Butte (NA 5065)	Harvard University; Petrified Forest National Park
Breternitz (n.d.)	1957	NA 6639	Highway Salvage; Museum of Northern Arizona
Sciscenti (1962)	1961	LA 4487 (Bi'Chilly Village)	Highway Salvage I-40; Laboratory of Anthropology
Gumerman (1982); Gumerman and Olson (1968)	1964, 1965	NA 8939, NA 8941, NA 8942, NA 8943, NA 8944, NA 8945, NA 8948, NA 8968, NA 8969	Highway Salvage I-40; Museum of Northern Arizona
Rippey (1969)	1968-1969	NA 10088	69kv line; Museum of Northern Arizona
Stebbins et al. (1986)	1976-1977	NA 14674, NA 14675, NA 14676, NA 14681, NA 14682, NA 14683	Coronado Project Coal Haul Railroad; Museum of Northern Arizona
Latady (1991)	1989-1990	AZ-P-60-31	N-2015 Salvage; Office of Navajo and Hopi Indian Relocation; Zuni Archaeological Program
Leach-Palm (1994)	1991-1992	AZ-P-60-31	N-2015 Salvage; Office of Navajo and Hopi Indian Relocation; Zuni Cultural Resources Enterprise
Dykeman (1995)	1991-1992	AZ-P-61-193	Hogan Well Range Cluster Housing Site; Office of Navajo and Hopi Indian Relocation; Navajo Nation Archaeology Department
Marek et al. (1993)	1991	NA 14674, NA 14675 (Cottonwood Seep and Cottonwood South)	Coronado Project Coal Haul Railroad Expansion; SWCA Archaeological Consultants

Table 1: Archaeological Projects in the Puerco Valley

between four or five different federal, state, and tribal agencies. A goal of this thesis is to pull from as many of these sources as possible to undertake a synthetic review of early Pueblo period architecture in the Puerco Valley.

In this chapter I describe early Pueblo period research that has occurred in the Puerco Valley. Following that, I give special attention to research that has directly addressed cultural identity in the valley. Identity has been assessed primarily through ceramics studies; current evidence suggests the presence of multiple ceramic wares in use in the Puerco Valley during the early Pueblo period (Hays-Gilpin and Van Hartesveldt 1998:194). Over the years, debate has revolved around the degree of Mogollon influence within the Puerco Valley, although today this is viewed as a red herring (Mills 2007; Hays 1993). Technological overlap between the Puerco Valley and the Mogollon region does not necessarily indicate that Puerco Valley inhabitants were ethnically "Mogollon." Few studies have explicitly looked at the pit houses constructed in the Puerco Valley during the early Pueblo period, and it is my hope to provide a new perspective on the expression of social identity not offered by ceramics.

With the remainder of the chapter I provide brief descriptions of the sites that provided excavation data for this study. These descriptions are intended to give a sense of the size and scale of individual settlements used in the study, as well as to explain how many pit houses each site contributed to the study. I reinterpret the archaeology of some of the sites that were excavated during the 20^{th} century to make the data from them more comparable with recent excavations. A final goal is to give a sense of the nature of occupation on each site. Some small settlements were seasonally occupied for only a few years; others were probably occupied year round but for no more than 10 or 15 years. Some settlements were intermittently inhabited by small numbers of people for centuries, resulting in a very large and complex archaeological site. Yet other large settlements appear to have been permanent villages.

Twenty-three sites excavated between 1931 and 1992 (Table 1) provided data on 153 pit houses used in this study. Settlements ranged in size from one or two to over twenty pit houses. Some of these sites are well known, such as White Mound Village (Gladwin 1945), whereas others are found only within the grey literature, for example AZ-P-60-31 (Latady 1991; Leach-Palm 1994). One of the biggest issues is to establish a chronology of the excavated sites and structures within the Puerco Valley. Aside from a few frustrating exceptions, most pit houses in the Puerco Valley can at least be dated to within a single century, if not a decade. Radiocarbon and tree-ring dates suggest a possible hiatus in occupation between AD 710-750 during which few pit houses are built. After AD 750 a much wider range of architectural styles occur in the Puerco Valley and the number of occupied sites increases greatly. The AD 600-900 interval can therefore be divided into an Early Period (AD 600-750) and a Late Period (AD 750-900).

111 Years of Early Pueblo Period Research in the Puerco Valley

I begin this overview with Walter Hough's (1903) Museum-Gates Expedition of 1901 because it was one of the first reconnaissance and excavation projects to recognize the prominence of early Pueblo period remains in the Puerco Valley. The expedition spent the summer working throughout the Little Colorado River drainage, but in particularly explored the area around the Petrified Forest, not yet a National Park at that time. Hough encountered three sites near there that yielded evidence of early occupation: "Metate," "Woodruff," and "Milky Hollow" (Hough 1903:318-320). "Metate" is now known as Twin Butte, a large AD 700-800-era ruin that is discussed in more detail later in this chapter. Woodruff and Milky Hollow are both large, AD 500-550 era settlements dominated by a pottery ware unique to the Petrified Forest area—Adamana Brown Ware (D. Gilpin personal communication 2011).

Hough was at a loss as to classifying these three early sites, and he does not indicate that he thought settlements such as Metate, Woodruff, and Milky Hollow were earlier; he merely states that they must have been the result of a "people of a low state of culture, not related to the tribes occupying the known pueblos of the region (Hough 1903:320). He suggested that Metate [Twin Butte] might bear a resemblance to sites in the vicinity of Navajo Springs (Hough 1903: 318), located some distance upstream along the Puerco River. In fact there are numerous large, early Pueblo period sites in the vicinity of Navajo Springs. Lacking stratified sites like those found in the caves of the Four Corners region, Hough and others did not draw major conclusions about the nature of the early Pueblo period in the Puerco Valley, but they were beginning to establish the presence of earlier material in the Little Colorado region.

Leslie Spier, Lyndon Hargrave, and Emil Haury all worked in the vicinity of Petrified Forest National Park over the next twenty years (Theuer 2011a:19-20), although the next project to identify and describe early Pueblo period material in detail was H.P Mera's (1934) wide-ranging survey for the Laboratory of Anthroplogy in Santa Fe, New Mexico. Mera named and described Adamana Brown Ware, which is now recognized as one of the earliest ceramic wares in the northern Southwest (Hays-Gilpin and Van Hartesveldt 1998:146). He also identified ceramics associated with slab-lined dwellings that he named Woodruff Brown and Lino Grey (Theuer 2011a:20-21). These are among the most common ceramic types found on early Pueblo period sites in the Puerco Valley, particularly within its western half.

During the 1930s, archaeological investigation of the eastern portion of the Puerco Valley began in earnest. Following a lead from Joseph Grubbs—who operated the White Mound

Trading post on the Puerco River, near Allentown, Arizona—Frank H. H. Roberts established a field camp in the Whitewater District in 1931. Roberts was employed by the Bureau of American Ethnology, but worked in tandem with the Laboratory of Anthropology excavating near the Allentown great house, which at the time was owned by Mr. Grubbs. The prominent ruins themselves post-date AD 1000, but to either side of the great house (and possibly under it) Roberts (1939, 1940) uncovered the remains of one of the largest villages in the Puerco Valley. Today this village is variously cited in the literature as either Allentown or Whitewater—I use Whitewater, and describe this large, early village in greater detail below. Portions of eighteen pit houses dating to the AD 800s were excavated within the central part of the site, four pit houses were excavated downslope nearby, while a small, later roomblock was excavated about a mile up Whitewater Draw. Roberts' excavations were the first to examine early Pueblo period architecture in the Puerco Valley in detail.

Shortly after Roberts' excavations at Whitewater, Harold Gladwin of Gila Pueblo initiated a large-scale reconnaissance and collecting project in the Puerco Valley and adjacent Red Mesa Valley. Gladwin notes that his interest in the region was sparked by the acquisition of the Scorse pottery collection consisting of 2000 pieces of pottery excavated from sixteen ruins in the Puerco Valley (Gladwin 1945:1). Surveying up and down the Puerco Valley from Holbrook to the Red Mesa Valley, Gladwin's crew identified a dense concentration of an unknown early pottery type (they named it White Mound Black-on-white) at a site adjacent to the White Mound Trading Post, still owned and operated by Joseph Grubbs, who granted Gila Pueblo permission to excavate. Gladwin's primary objective was to understand the local variety of the Chaco culture better known from further to the northeast, and to establish the degree of Kayenta influence in the area (Gladwin 1945:10). Emil Haury and E.B Sayles oversaw most of the day-to-day work of excavation. Ultimately, six pit houses and a number of surface rooms were excavated at White Mound Village, which tree rings suggest was occupied during the late AD 700s and early AD 800s.

Following a hiatus during the years of World War II, research began again in the Puerco Valley, this time back in Petrified Forest National Park. Fred Wendorf was introduced to the Petrified Forest by Harold Colton (Theuer 2011a:22), the benefactor and director of the Museum of Northern Arizona in Flagstaff, Arizona, and an influential figure in the mid-20th century archaeology of the Little Colorado region. Wendorf initially sorted sherds from collections made in the Park, but by 1949 he was working on a Harvard Ph.D. and leading an excavation at the Twin Butte site (formerly known as Metate Ruin). Because of the size of the Twin Butte site Wendorf opted to sample different portions of the site rather than concentrate on a single area (Wendorf 1953:21). He excavated stratigraphic test trenches in the central portion of the site, revealing over two meters of deposits dating between AD 600-800 (Schachner et al. 2011; Theuer 2011b:110). Elsewhere at the site, he completely excavated a large pit house and its associated granaries and surface rooms. Among the most unusual features uncovered by Wendorf were a series of large deep granaries excavated into the underlying shale bedrock.

Whitewater (Roberts 1939, 1940), White Mound (Gladwin 1945), and Twin Butte (Wendorf 1953) form the core of most archaeologists' perceptions of the scale and character of early Pueblo settlement in the Puerco Valley. They are frequently cited publications because they are relatively easy to acquire. The last half of the 20th century saw far more archaeological excavation in the Puerco Valley than the first half, but the majority of that work is described in hard-to-find cultural resource management reports, which have reached a much more limited audience of archaeologists. During the 1950s, the archaeological discipline in the Southwest was shifting from being a pursuit of universities and museums, to one of federal and state agencies, tribal governments, and eventually for-profit cultural resource management firms. For example, in 1950 Wendorf was tapped by Jesse Nusbaum of the National Park Service to oversee one of the first major salvage projects in the Southwest, a natural gas pipeline that extended from Farmington, New Mexico all the way to the Colorado River at Topoc, Arizona (Woodbury 1993:199; see Wendorf, Fox, and Lewis 1956). For the remainder of the 20th century, most research in the Puerco Valley was in response to development that might negatively impact specific archaeological remains.

Within the Puerco Valley, the greatest impact on archaeology (aside from looting) in the past 60 years has been infrastructure development. During the 1950s and 1960s, the interstate highway system was upgraded to four divided lanes. As a result, a great deal of archaeology was due to be impacted by the construction of Interstate-40 between Gallup, New Mexico, and Holbrook, Arizona. A consortium comprised of the Museum of Northern Arizona (MNA), the Arizona State Museum (ASM), and the Laboratory of Anthropology in Santa Fe oversaw the excavation of many early Pueblo period sites along the interstate right of way, and recorded sites that had already been impacted by Route 66—which the interstate was replacing. These excavations are crucial for understanding variability among early Pueblo period settlements in the Puerco Valley. However, because three separate institutions were involved in the project the collections, files, and reports are spread between two states and three museums.

James Sciscenti (1962) managed the New Mexico portion of the highway project (which was much smaller than the Arizona portion) for the Laboratory of Anthropology. The project right-of-way cut through a prominent butte at the head of Manuelito Canyon, an area long known to house a great number of ruins and ancient settlements. Survey by Stewart Peckham in the late

1950s identified sites with high frequencies of early pottery types such as Lino Gray and White Mound Black-on-white within the portion of the butte top slated to be blasted away by the highway department. One of these sites, LA 4487 (called Bi'Chilly Village by Sciscenti and excavated in 1961), proved to contain at least eleven pit houses, fifteen jacal and masonry surface rooms, and over thirty burials. The results were reported in cursory fashion the following spring, but a comprehensive final report has never surfaced. Maps, ceramics tallies, and the excavated artifacts themselves are essentially all that remains of this AD 800s settlement.

To the west of Manuelito on the Arizona section of the highway project, archaeologists from the Museum of Northern Arizona (led by George J. Gumerman and R. Gwinn Vivian) excavated many early Pueblo period pit houses during the 1962, 1964, and 1965 seasons (Gumerman 1982). Most sites were a palimpsest of sequential occupations probably separated by hiatuses of anywhere from a few years to centuries, and they contained evidence of human activity in the area from the pre-ceramic era up into the AD 1300s. Significant amounts of pottery, many tree ring samples, and architectural data from at least nine sites with early Pueblo period remains were recovered. However, the tree ring dates were not reported in detail until they were included in Richard Ahlstrom's dissertation in 1985. A summary of MNA's results from the salvage excavations was published in *Plateau*, the museum's annual publication (Gumerman and Olson 1968). A final report on these highway salvage excavations has never actually been published, although in the early 1980s Sara Stebbins compiled and edited an uncompleted manuscript begun by Gumerman some fifteen years before (Gumerman 1982).

The difficulty in bringing the vast quantity of data generated by these early salvage projects to publication was noted by most of the archaeologists involved. Gumerman and Olson (1968:113) stated that "the pressures of rapid and sequential projects have widened the gap between excavation and publication." William Wasley's similar engagement in salvage work elsewhere in the Puerco Valley[1] led him to write:

"The gathering of such a large volume of objects and information in a thirty-day salvage operation created a new problem. How is the material to be analyze and the results made public? As a rule salvage contracts do not, as this one did not, make any or adequate provisions for proper analysis and preparation of a complete report. Most institutions participating in archaeological salvage projects, particularly this type which arises on the spur of the moment, are not in a position to employ additional personnel to accomplish these tasks" (Wasley 1960:41).

These statements highlight the challenges faced by the earliest practitioners of cultural resource management in the Southwest. During the 1960s, museums and state agencies found money in their budgets to send archaeologists—with other responsibilities of their own—into the field. These archaeologists then organized and executed some of the largest excavation campaigns yet in the Southwest. The lack of final synthetic reports is not surprising under these circumstances. It should be a goal of current archaeologists to address the large quantities of information generated by these efforts at mitigation and preservation.

The problem faced by the highway salvage archaeologists was that while they believed that something needed to be done about the destruction of archaeological properties, existing federal legislation in the late 1950s and early 1960s was vague as to through what means this could be accomplished. The passage of the National Historic Preservation Act (NHPA) in 1966 created the National Register of Historic Places, a list of properties deserving of protection or at least consideration during development planning (King 1998:15). The NHPA also included Section 106, which *required* agencies to consider the effects of projects on properties included on the National Register. The passage of the National Environmental Policy Act (NEPA) in 1969 further strengthened the legal requirements for consideration of cultural properties. These

[1] Which unfortunately was not examined for this study, because I was unable to travel to the Arizona State Museum where the records are housed.

and other legislation were further defined in the courts, but by the early 1970s Southwest archaeologists were at the forefront of establishing “cultural resource management” (CRM) as the primary means by which archaeology was dealt with under federal law (King 1998:18; see Lipe and Lindsay 1974).

The acts of legislation passed in the 1960s and early 1970s greatly influenced the archaeology that has since occurred in the Puerco Valley. It has solved a few of the problems encountered by the first generation of salvage archaeologists like George Gumerman, Fred Wendorf, and William Wasley. Perhaps most importantly, as the legal ramifications of the new legislation become better defined, a greater range of archaeological sites were investigated as archaeologists began to appreciate that potentially eligible sites were worthy of consideration as well. Furthermore, the significance of a site was judged as a combination of site integrity as well as by meeting certain criteria. This meant that different kinds of sites than had previously been excavated in the Puerco Valley were suddenly under consideration. Sites that would not have been given great attention in the early 20th century (mostly because of their dubious potential to produce a great amount of pottery for east and west coast museums) were included in the testing and mitigation plans dictated by the new legislation. The CRM projects of the 1970s, late 1980s, and early 1990s in the Puerco Valley demonstrated that there was much greater variability in early Pueblo period settlement patterns and architecture than was evident from the earliest excavations of Roberts and Gladwin.

One of the first projects in the Puerco Valley to be conducted under the new legislation was associated with the construction of the Coronado Generating Station, a coal-fired power plant south of St. Johns, Arizona. A railroad to haul coal to the power plant was built, running from Navajo, Arizona, where the old Atchinson and Topeka line parallels the Puerco River, across the Puerco Ridge, crossing Hardscrabble Wash and terminating at the power plant (Figure 2). The Museum of Northern Arizona was again contracted to complete the necessary archaeological survey and excavation in 1976 and 1977. MNA excavated many sites along the coal haul railroad (Stebbins et al. 1986), but most importantly they identified a massive early Pueblo period settlement in the area surrounding Cottonwood Seep, at the spot the railroad crested the ridge south of the river. Although only a corner of the site was clipped by the railroad right-of-way, MNA excavated twenty-two pit houses and a variety of extra-mural storage features and activity areas (Stebbins et al. 1986:523). The pit houses were of a variety never before seen in the Puerco Valley, and the entire settlement was hypothesized to be a very large but seasonally occupied farming settlement capitalizing on the presence of a permanent seep or spring at the site.

Because it was likely only occupied on a seasonal basis and surface architecture was largely absent, the site presented little more than an extensive artifact scatter of grey and brown ware ceramics on the surface. Furthermore, the strong westerly winds that roar through the Puerco Valley in the springtime had deposited up to three meters of sand on portions of the site, completely obscuring the pit houses beneath, most of which were only identified through sub-surface testing. Because Cottonwood Seep presented little indication of its unusual architecture on the surface, only through cultural resource management investigation did the existence of this intriguing site come to light.

A series of major archaeological projects were begun in the late 1980s as a response to the Navajo-Hopi Land Settlement Act of 1974. The boundaries drawn for the Navajo and Hopi reservations (in 1934 and 1882, respectively) resulted in Hopis living on land allocated to the Navajo, and Navajos living on land allocated to the Hopi. Over the years this led to increasing tensions between the two groups, and eventually it was decided to resettle many families (mainly Navajo) on land acquired by the federal government near the Puerco River. The area set aside for resettlement is known as the Chambers-Sanders Trust Lands, or CSTL (also referred to as the "New Lands" in some publications), named for the two largest nearby towns. Beginning in the 1980s large block surveys were undertaken on parcels designated for the construction of housing clusters to accommodate the resettled families. New roads were constructed and old roads were paved, primarily in the area south of the Puerco River where the largest amount of land was added to the Navajo Reservation. A wide range of for-profit cultural resource management firms (SWCA Environmental Consultants; La Plata Archaeological Consultants, and others), and tribal archaeological programs (Navajo Nation Archaeology Department; Zuni Archaeological Program a.k.a. Zuni Cultural Resource Enterprises) completed the work.

The large block surveys were the first focused, large-scale sampling project in the Puerco Valley and resulted in a complete re-evaluation of Puerco Valley ceramics (Hays-Gilpin and Van Hartesveldt 1998). In addition, while many of the housing clusters were reoriented to minimize impact to archaeological sites, in some cases it was necessary to excavate portions of sites. A number of early Pueblo period settlements were investigated as a result of the Chambers-Sanders Trust Lands projects. One of the most important early Pueblo excavations actually resulted from an unintended discovery: graders building the N-2015 road exposed portions of a large, multi-component settlement (AZ-P-60-31) buried beneath a sand dune. Emergency salvage excavations by archaeologists with the Zuni Archaeological Program uncovered the remains of six pit houses, ten extra-mural pit features, and the remains of eighteen human burials within the road cut (Latady 1991). Later, the N-2015 road was realigned resulting in the excavation of a further twelve pit structures and many storage pits and activity areas (Leach Palm 1994).

Radiocarbon results suggest a complex occupation, but most of the remains probably date between AD 670 and 710.

Almost concurrent with the on-again-off-again 1989-1992 excavations at AZ-P-60-31, archaeologists employed by SWCA Environmental Consultants were back at Cottonwood Seep, expanding the railroad right-of-way because sand dunes kept covering the tracks (Ahlstrom et al. 1993:2; Marek et al. 1993). They uncovered further information on the unusual architecture at the site (described below), excavating many more pit houses as well as identifying a series of round, post and adobe surface structures that had heretofore gone unrecognized at the site. The SWCA archaeologists also uncovered radiocarbon results suggesting a long occupation span at Cottonwood Seep, beginning around AD 600 and lasting intermittently until nearly AD 900 (Ahlstrom 1993:35-36).

The completion of archaeological investigation at Cottonwood Seep and AZ-P-60-31 were among the last large cultural resource management projects in the Puerco Valley, and are in fact the last extensive excavations of early Pueblo period sites in the region. Recent work in the valley has been initiated at Petrified Forest National Park, where archaeologists with the University of California Los Angeles and UC-Redlands have been engaged in remapping sites originally recorded by Hough (1903), including Twin Butte. In addition, there are plans to submit charred maize samples from Twin Butte for accelerated mass spectrometry (AMS) dating. Two recent publications have begun the task of creating a synthesis of early Pueblo archaeology in the Puerco Valley (Schachner, Gilpin, and Peeples 2012; Young and Gilpin 2012). It is my hope that this thesis study contributes to these current efforts to better understand the archaeology of this region of Arizona and New Mexico.

Between 1931 and 1992, archaeologists excavated portions of at least twenty-three sites containing a total of more than 153 pit houses dating to the early Pueblo period. They have recorded more than 400 sites with pottery suggesting early Pueblo period components (Throgmorton n.d.). Over the years work in the Puerco has shifted from exploring the cultural-historical connections of some of the largest and most obvious early Pueblo period settlements, such as Twin Butte and Whitewater, to examining settlements like Cottonwood Seep that fit less comfortably within the standard classificatory frameworks. Federal legislation concerning cultural resources has shaped the discipline of archaeology and contributed to changing perceptions of the early Pueblo period in the Puerco Valley. The investigation of smaller, less conspicuous sites has established that there is a wide degree of variability between early Pueblo period settlements in the Puerco Valley. The following section considers how archaeologists have interpreted this variability in terms of cultural and social identity.

Approaches to Early Pueblo Period Cultural Identity in the Puerco Valley

From the early archaeological investigations of Roberts and Gladwin, the Puerco Valley has been placed within the Anasazi or Ancestral Puebloan cultural sequence, despite recognition that there is a great degree of variability in both the architecture and ceramics of the region. Although early researchers who defined the major culture areas of the northern Southwest relied on a variety of types of material culture, ceramics have played the largest role in differentiating groups of people in the Southwest. There have been many critiques of equating pots with people, but ceramics offer the most readily apparent patterns without excavation and even after the recognition that social and cultural identity will cross-cut material culture, I think that ceramics have been prioritized as an aid in assessing cultural affiliation in the region. Therefore, throughout this brief overview of research on social identity in the Puerco Valley, ceramics figure prominently. Over the past century, Southwestern archaeologists have refined their chronologies for pottery types and developed increasingly fine-grained data sets. At the same time, theory concerning the relationship between the spatial patterning of material culture and actual, lived social realities has become more sophisticated, and this is reflected in changing interpretations of how the Puerco Valley relates to the larger world around it. Researchers now see a large degree of overlap in technological and stylistic traditions between the Puerco Valley and surrounding regions (Mills 2007; Hays-Gilpin and Van Hartesveldt; Jernigan 1982); in light of this general trend architectural studies like this one may provide new insights.

Roberts' investigations in the Whitewater District (1939; 1940) focused on architectural remains to a greater extent than ceramics. His statement (Roberts 1939:254) concerning the pit houses at Whitewater sums up his thinking on the cultural relationships between the Puerco Valley and elsewhere during the early Pueblo period: "The pit structures on the whole are comparable to those in other sections of the Anasazi province. There are various individual and local differences of a minor nature that probably have no significance as far as the structural type is concerned." Within Roberts' developmental framework of culture change in the northern Southwest, he saw little reason to expect variation in culture this early in the sequence. He was more interested in understanding the structural and functional changes that led through various pit house styles and ultimately culminated in Great Pueblo architecture. Ancestral Pueblo culture—indeed modern Pueblo culture—was treated as a discrete, holistic package, and regional variation only served to obfuscate the slow but inevitable development of Pueblo cultural traits.

The Gladwins' dendritic classification scheme for Southwest culture reflects the greater attention they gave to ceramic evidence (Gladwin and Gladwin 1934). Harold Gladwin relied on this "stems and branches" approach to cultural diversity when he used information gathered from survey and excavation in the Puerco and Red Mesa Valleys to describe the Chaco Branch (Gladwin 1945). The Puerco Valley occupied a cultural region that had developed out of a Little Colorado stem from a Basket Maker root. It fell within the Chaco Branch of this Little Colorado Stem. Distinct cultural phases (such as the White Mound phase), ordered sequentially, represented the evolution of this Chaco Branch. Gladwin clearly saw great cultural affinity between the Puerco Valley, the Red Mesa Valley and the Chaco region as a whole by including them all within the "Chaco Branch" (Gladwin 1945:9). The Puerco occupies a unique geographical location, however, forming a natural corridor from west to east—as a result it must have been a place of interaction between the Kayenta and Chaco Branches, interaction that Gladwin (1945:10) mostly sees evident in ceramics.

Furthermore, to Gladwin the White Mound phase in the Puerco Valley showed evidence of a good deal of influence from the south. While the presence of smudged brown ware ceramics associated with the Mogollon region to the south may have signaled the presence of a separate group at White Mound, Gladwin believed that brown ware was a trend shared more generally by a variety of groups of people It was the blending of northern and southern features found in White Mound Black-on-white that was evidence of a migration of people from the south (Gladwin 1945:40). Numerous archaeologists have noted the similarity in decorated style between White Mound Black-on-white and Mogollon Red-on-brown (Haury 1940:95; Jernigan 1982:46; Hays-Gilpin and Van Hartesveldt 1998:61) which is found to the south of the Puerco in the Mogollon Highlands and the drainages of the Gila and Mimbres rivers. The firing *technologies* of these two pottery types are distinct, but the decorative *styles* are very similar. All the same, in his final analysis, Gladwin attributes the outside influence that more generally affected Southwest groups at this time but for which he found specific evidence in the White Mound phase to the arrival of a relatively unknown "Cordilleran Complex" of people in the region (Gladwin 1945:135-139). This idea is clearly meant to accommodate the belief that the transition from Basketmaker III to Pueblo I was one that involved population mixing or replacement by some outside group—as described above, this was a prevalent belief in the first half of the 20th century.

The patterns recognized by Gladwin in ceramics, and to a lesser extent other aspects of material culture, found at White Mound village in the Puerco Valley led him to place the site within the larger Chacoan culture province, highlighting perceived affinities between the two regions. Gladwin also noted that certain aspects of material culture at White Mound suggested influence from southern, Mogollon-region populations. Following extensive excavation across the San Juan Basin, Wendorf and colleagues (1956) proposed a change to Gladwin's Chaco Branch formulation. Lacking clear evidence of a White Mound phase they proposed that the Chaco region was its own cultural entity, distinct from the Puerco Valley, and that greater affinities could be found within the San Juan and Little Colorado drainages than between them (1956:194-5). They proposed that during Basketmaker III the White Mound phase should refer to the Puerco Valley and the La Plata phase refer to the Chaco region, while during Pueblo I the Puerco Valley witnessed a Kiatuthlanna phase whereas Chaco is tentatively assigned to a "Piedra?" phase (Wendorf, Fox, and Lewis 1956:195). Piedra Black-on-white is a Northern San Juan region pottery type, further highlighting the contention of Wendorf and his colleagues that the Puerco Valley has more in common with sites found to the south and west that it does to those located north and east.

Evolutionary cultural historical approaches like those implied by Gladwin's branching culture scheme and the phases of Wendorf gradually gave way to greater reliance on anthropological designations for regions, although the idea of cultural evolution was still an underlying assumption. By this I mean that many of the archaeologists in the 1950s and 1960s working in the Puerco Valley perceived the differences between the modern Eastern Pueblo (Tewa, Tiwa, Towa and Keres speaking) and Western Pueblo (Hopi and Zuni speaking). These distinctions were reflected not only in language but also in customs, religious observances, political systems and architecture. Bullard (1962) relied greatly on the distinction between Eastern and Western Anasazi—which mirrored the historic-period divide between Eastern and Western Pueblo—in his pan-Southwestern examination of pit structure architecture prior to AD 900. Geographically, the Puerco Valley is located within Bullard's "Upper Little Colorado" region between these two major culture areas, and he saw many of the architectural changes that occur over time within the Valley as a result of influence from one or the other direction. The influence of the Western Anasazi tradition became especially prevalent during Late Pueblo I (the AD 800s), and Bullard associated this with an influx of Kana'a Black-on-white pottery and pit houses with full-encircling benches observed at Whitewater (1962:178). Bullard also recognized a north to south axis of variability mainly characterized as the distinction between Mogollon and Anasazi cultures, by this time well recognized due to the work of Wheat (1955) and Haury (1936). Bullard argued for a peripheral zone between these two culture areas (1962:187) that received a particularly strong degree of Anasazi influence during Basketmaker III. His peripheral zone refers to an area south of the Puerco Valley, but it demonstrates that Bullard saw some similarities between the peripheral zone, the Puerco Valley, and parts of the Anasazi world further to the north in the AD 500s and 600s.

The north/south axis of culture areas became a major research theme over the coming years, largely because of the Puerco Valley was one of the northernmost regions of the Southwest to regularly produce brown ware pottery well into the AD 900s. Gray wares were typically associated with the Anasazi region and brown wares were associated with the Mogollon region, where they are one of the most frequently occurring pottery wares. These regional material culture patterns were uncritically associated with actual cultures, contributing to the idea that brown ware ceramics signified the presence of Mogollon peoples. In fact, it is now known that most of the Southwest experienced an early brown ware horizon between AD 200-500, but that on the Colorado Plateau gray ware ceramics became more common after AD 600, at least partially as a result of the kinds of clay located there (Reed, Wilson, and Hays-Gilpin 2000). From the 1950s to the 1980s and beyond, however, the co-occurrence of grey wares and brown wares within the Puerco Valley was the source of most discussion over social identity within the valley.

Wendorf (1953) encountered a combination of gray ware and brown ware ceramics at Twin Butte in Petrified Forest. While he believed that the different pottery wares were the hallmark of two different groups of people, he felt that that brown ware was most likely acquired by trade from people living further to the south (1953:126). One reason for this was that Wendorf believed that Twin Butte architecture fit firmly within the Anasazi architectural development sequence (1953:104-108, 112), and that therefore the inhabitants must have been producers of gray ware pottery. Wasley (1960), working at the opposite end of the Puerco Valley, interpreted the co-occurrence of gray ware and brown ware differently. At the time of Wasley’s excavations the La Plata phase of Basketmaker III (roughly AD 550-700) was considered the first period of pottery production in the Puerco Valley. However, he encountered a series of settlements contemporary with Lino Grey pottery-producing La Plata phase sites, but that had distinctly different pit house architecture and contained almost exclusively brown ware pottery. Deeming this co-tradition the Lupton phase, he hypothesized that these sites represented a Mogollon colony within the Puerco Valley that facilitated the diffusion of things such as beans, cotton, rectangular pit houses, the bow and arrow, and plaited sandals from the Mogollon to the Anasazi (1960:35). Wasley relied heavily on Wheat's (1955) chronology of the Mogollon, and the south-to-north spread of these items cannot now be so clearly demonstrated. Furthermore, Wasley's "Lupton Brown" pottery type is now synonymous with "Obelisk Gray"—archaeologists recognize that there is considerable overlap in color between gray and brown ware in the Puerco Valley, especially among early pottery types (Reed, Wilson, and Hays-Gilpin 2000:206).

A few years after Wasley (1960) discussed the Lupton phase sites as possible intrusions of Mogollon people into the Puerco Valley, Gumerman and Olson (1968) published on sites excavated during highway salvage prior to the construction of Interstate 40. Although they refered to no sites by name, NA 8939-8968 used in this study contributed greatly to their understanding of the AD 750-900 interval in the Puerco Valley. They found little evidence of a pure Mogollon Lutpon phase existing next to an Anasazi La Plata phase in the Puerco Valley, but rather felt that differences in pottery color and pit structure form may have been temporal, with the Mogollon border moving south through time (1968:117). The presence of brown wares in the Puerco Valley therefore was the result of trade, similar to Wendorf's (1953) suggestion. They do, however, describe two "Kiatuthlanna Phase" sites at which 75% of the decorated ceramics were Kana'a Black-on-white, a pottery type from the Tusayan tradition to the west (1968:119). This almost certainly refers to NA 8968 and 8969; site files suggest that Kana'a

Black-on-white comprises 77% and 71% of their decorated ceramics assemblages, respectively. Gumerman and Olson found the presence of this type "unusual in view of the proximity to the Chaco Basin" and hypothesized that rather than reflecting trade, these two sites were border villages (1968:119). Whether the actual occupants of these border villages were affiliated with the dominant population of the Puerco or with the adjacent Kayenta region they do not say.

Results from a number of excavations undertaken as part of the Coronado Project in the 1970s sought to shed light on the Mogollon-Anasazi borderland issue (Swarthout and Dulaney 1982). Swarthout and Dulaney ultimately decided that the clinal nature of pottery trait distribution in the region, coupled with ambiguous architectural remains, meant that neither Anasazi nor Mogollon could be assigned to the AD 600-900 period sites. Hays (1993:46) has heavily critiqued this analysis. She took issue less with the decision not to assign any affiliation than with the reasoning by which Swarthout and Dulaney arrived at that conclusion. She felt that Swarthout and Dulaney appear to be assuming that "if previous researchers defined certain kinds of pots as Anasazi and others as Mogollon, then a people with both kinds of pots could be neither Anasazi or Mogollon." She (1993:47) contends that all that has been demonstrated to date is the fact that the Puerco Valley is a "ceramic transition zone," not a cultural transition zone. This was a major departure from previous research, which—despite often acknowledging the complicated nature of material culture and identity—tended to describe material culture patterns as if they were actually lived cultural patterns. While the technological aspects of brown ware ceramics manufacture may reflect cultural affinities or contact between people in the Mogollon region and the Puerco, it does not necessarily represent the presence of "Mogollon" people (Hays-Gilpin and Van Hartesveldt 1998:54).

Recognition that the brown ware tradition in the Puerco Valley represents a local manifestation rather than some sort of Mogollon intrusion allows for a more sophisticated evaluation of the different ways in which identity may have been constructed in the region. It takes emphasis off of a generalized pattern and its relationship to an overly rigid concept of identity, and moves it towards recognizing the nuanced and multifaceted ways in which identity can be expressed. Local populations appear to have continued to manufacture brown ware ceramics after the remainder of the Colorado Plateau had opted to modify firing techniques in order to produce gray wares. Beginning around AD 600, Puerco Valley inhabitants imported gray wares and Cibola white wares from the north and east (Hays-Gilpin and Van Hartesveldt 1998:40-41). In the latter half of the ninth century, Puerco Valley residents imported Tusayan white wares as well (Hays-Gilpin and Van Hartesveldt 1998:41, 111). It seems likely that Puerco Valley potters could manipulate local materials to make reasonable facsimiles of most of these pottery wares, styles and types (Hays-Gilpin and Van Hartesveldt 1998:40-41), although the degree to which individual potters were adept in more than one tradition is unknown (Hays-Gilpin and Van Hartesveldt 1998:194). Most decorated ceramics produced during the AD 600-900 period display considerable overlap between different ceramics traditions (e.g. Cibola, Tusayan, Mogollon, Northern San Juan), suggesting that potters were aware of the kinds of design styles that were being used elsewhere in the northern Southwest (Jernigan 1982).

Mills (2007:215-216, 219) suggests that the continued preference for smudged brown ware bowls in the Puerco Valley may represent a tradition of cuisine and food serving, not just a preference for a pottery style or a learned series of techniques. Mills tends to see the multiple traditions within the valley as result of the entangled processes of small-scale migration, exchange, and emulation (2007:219), as migrants from different areas converged on the Puerco

Valley (2007:216). Hays-Gilpin and Van Hartesveldt (1998) imply that much of the variability in ceramics is the result of people within the valley making choices about construction technology, finishing, and firing. Architectural studies that use pit house architecture as a means to assess cultural identity may provide a counterpoint to these ceramics studies.

Schachner and colleagues (2012:125) suggest that the utility of pit house architecture as a means of exploring identity during the early Pueblo period, although they also note the complexities of this approach, which requires determining variability in structural form due to seasonal occupation, or short intended lengths of stay, as well as understanding current theoretical approaches to architectural form and identity (e.g. Clark 2001; Lyons 2003; Bernardini 2005a, 2005b; Cameron 1995). Pit house form does offer a number of advantages over ceramics studies of identity. Pit house do not “move around” the way that pottery does, and may more directly express and reflect culturally important values, beliefs, worldviews, and traditions. They contain a variety of features that have varying degrees of visibility—some aspects of pit house form like roofing style, shape, or method of entry may have been obvious expressions of identity, while others like hearth construction or interior features may have more privately reflected enculturation. Pit house form has long been a criteria used to differentiate the three major culture regions of the Southwest—the Mogollon, the Hohokam, and the Anasazi (Bullard 1962; Wheat 1955). Recent researchers have begun to examine the finer-grained distinctions in pit house architecture that may reflect identity at a smaller scale (such as Potter and Yoder [2008] described above).

This study seeks to undertake a similar examination of pit house architecture in the Puerco Valley. Variability in ceramics assemblages suggests that Puerco Valley inhabitants may have had complex relationships to surrounding regions. They may have perceived long-standing historical connections to certain regions—such as the Mogollon—without actually maintaining firm ties to that region other than the continuation of particular foodways associated with brown ware vessels. In other cases, they may have seen themselves as trading partners with particular areas, such as people living to the north and east producing Cibola white wares. In yet other cases, they themselves may have been recent migrants to the Puerco Valley, bringing their own ceramics traditions. It is especially in this last case that architectural studies may highlight population movement that is relatively undetectable in ceramics assemblages. Non-locally produced pots carried by migrants to a new area will disappear within the palimpsest of a few years worth of local ceramic production and discard. These non-local sherds may be considered "imports" acquired through exchange, rather than carried directly from a previous homeland. However, the houses that people build in such situations may be a more direct reflection of the methods and techniques popular in their homelands. The relatively slow rate of structure replacement as opposed to ceramics replacement also means that contrasts resulting from changing styles will be more distinct.

I will describe the methods I use to analyze Puerco Valley pit house architecture and discuss the underlying rationale more fully in Chapter 4. With the remainder of this chapter I describe the archaeological sites used in this study. The history behind the projects and excavations that contributed this data set has been related at length, and the descriptions that follow are meant to give an idea of how large each site may have been, what sorts of issues complicate interpretation, and during what years each site might have been occupied. Following that, I discuss the chronology of the entire Puerco Valley during the early Pueblo period.

A Description of Excavated Sites Used in this Study

Twenty-three sites dating between AD 600 and 900 provided architectural data that I used in this study (Table 1, Figure 3). If absolute dates were available for every pit house in the Puerco Valley, understanding the shifting patterns of architectural style and observing how traditions change over time would be a relatively straightforward task. Unfortunately, this is not the case, and many pit houses are dated based on associated ceramics or the relationship of the pit house to other better-dated features on the site. In a few cases the dating of entire sites are based largely on ceramic evidence. Table 2 displays known absolute dates in the valley. These are derived from radiocarbon, archaeomagnetic, and dendrochronological samples. Table 2should be taken with a grain of salt because many of the dates are derived from poor contexts or are subject to interpretation. However, through a combination of absolute dates and ceramic evidence a rough sequence of occupation in the Puerco Valley can be determined. The following site descriptions are ordered chronologically based on the earliest evidence for occupation. A gap in the occupation sequence between about AD 710 and 750 suggests a hiatus in activity in the valley, which also allows the architectural sample to be broken into an Early Period (AD 600-750) and Late Period (AD 750-900). I discuss these two periods in greater detail in the next section. The following pages provide descriptions of the sites that provide data for this thesis. They are organized chronologically, based on the earliest evidence of occupation during the early Pueblo period.

Site	**Structure**	**Intercept or Midpoint (AD)**	**Earliest (AD)**	**Latest (AD)**	**Method**
NA 14674	Feature 81	490.5	425	556	C14
NA 14674	Feature 93	499	426	572	C14
NA 14674	Feature 126	536	431	641	C14

NA 14674	Feature 21	536	431	641	C14
NA 14675	Feature 17	537.5	434	641	C14
AZ-P-60-31	Midden	564	504	624	C14
NA 14675	Feature 19	591.5	538	645	C14
AZ-P-60-193	Feature 7	605	533	677	C14
AZ-P-60-31	Structure 12	640	230	1000	C14
AZ-P-60-31	Feature 98	651	559	687	C14
NA 14674	Feature 27	657.5	600	715	Arch-mag
NA 14674	Feature 71	657.5	600	715	Arch-mag
NA 14674	Feature 49	662.5	600	725	Arch-mag
AZ-P-60-31	Pitstructure 3	668	625	780	C14
AZ-P-60-31	Feature 12	670	610	790	C14
AZ-P-60-31	Feature 10	670	600	860	C14
AZ-P-60-31	Unit 7	671	611	731	C14
NA 14674	Feature 35	675	600	750	Arch-mag
AZ-P-60-31	Pitstructure 6	680	630	870	C14
NA 14681	Pithouse 1	685	645	725	C14
AZ-P-60-193	Feature 19	685	594	776	C14
AZ-P-60-31	Feature 51	690	653	874	C14
AZ-P-60-31	Feature 34	690	620	940	C14
AZ-P-60-31	Pitstructure 1	690	620	940	C14
AZ-P-60-31	midden	710	550	1010	C14
AZ-P-60-31	Feature 8	711	656	881	C14
AZ-P-60-31	Pitstructure 2	727.5	680	775	Arch-mag
NA 14674	Feature 12	734	667	801	C14
AZ-P-60-193	Structure 2	775	650	900	C14
NA 14682	Feature 2/Pithouse 2	780	735	825	C14
NA 14674	Feature 41	811	732	890	C14
NA 14674	Feature 6	825	800	850	Arch-mag
NA 14683	Pithouse 1	830	605	1055	C14
NA 8942	Pithouse 3			734	TR
NA 8948	Pithouse 3			758	TR
White Mound	Cist 1			786	TR
White Mound	House 3			786	TR
NA 8942	Pithouse 1			803	TR
NA 8944	Pithouse 3			805	TR
NA 8939	Pithouse 3			812	TR
White Water	Structure 2			815	TR
LA 4487	Feature 36/Pithouse 2			817	TR
LA 4487	Feature 4/Pithouse 5			842	TR
LA 4487	Feature 38/Pithouse 1			845	TR
LA 4487	Feature 19/Pithouse 6			846	TR
NA 8944	Pithouse 6			858	TR
White Water	Structure 3			867	TR
NA 8968	Room 8			871	TR

NA 8945	Pithouse 2			876	TR
White Water	Structure 15			888	TR
White Water	Structure 12		844	918	TR
NA 10088	Pithouse 1		522		TR
NA 10088	Posthole 2		648		TR
NA 8968	Room 2		817		TR
NA 8939	Pithouse 2		837		TR
NA 8941	Pithouse 1		853		TR
NA 8969	Granary		867		TR
NA 8944	Pithouse 5		873		TR

Table 2: Absolute Dates from Puerco Valley Pit Houses

NA 14674/14675 (Stebbins et al. 1986; Marek et al. 1993)

NA 14674 is commonly referred to as Cottonwood Seep after the large spring-fed seep that continues to provide water at the site today. NA 14675 is a small site located just to the south of Cottonwood Seep that is often called Cottonwood South. These two sites contain very similar occupation histories, artifacts, and architecture, and I consider them together as a unit for the rest of this thesis. The seep at NA 14674/NA14675 is formed by rainwater that percolates through the semi-permeable sands and clays of the upper Bidahochi formation, reaches the lower, impermeable Chinle clays and then flows downhill and emerges as small seeps and arroyos. Hack (1942:32-34) describes the kind of farming that could be practiced at Cottonwood Seep as “Sand Dune Agriculture” and “Seepage Fields.” These two kinds of agriculture are closely related and often overlapping; the key concept is that the sand acts as "dry mulch" that encourages absorption and discourages evaporation. In low, sandy hollows, groundwater may pool above a less permeable substrate, creating seeps of (very) shallow standing water. In deeper, higher dunes, it is the retention of rainwater in the upper layers of sand that makes agriculture possible. The location of NA 14674/14675 is undoubtedly due to the presence of excellent seep and dune farming potential at Cottonwood Seep.

As described above, the site has been excavated twice, once in 1976-1977 (Stebbins et al. 1986) and again in 1991-1992 (Marek et al. 1993). Cottonwood Seep is a dense, deep palimpsest of cultural features. A total of 61 pit houses were excavated at NA 14674 and nine were excavated at NA 14675 (Marek et al. 1993:40, Marek et al 1993:150). Many features and pit house were superimposed upon one another, providing evidence that the site saw repeated, seasonal occupation over the course of many years. The small size of the pit houses and the absence of large hearths within them, as well as the lack of storage features much larger than $0.5m^3$ led the excavators to interpret the site as a seasonal farming settlement, utilized repeatedly by small groups of people for many years in sequence (Marek et al 1993:146-148).

Ahlstrom (1993:36-39) examined the temporal relationships between the different features on NA 14674/14675. On each site, he identified local sequences of house construction, but these local sequences often could not be related to one another. However, chronometric evidence from radiocarbon and archaeomagnetic dating and stratigraphic relationships suggest that at least three phases of occupation occurred within the excavated portion of the site: one from AD 600-725, another that may be later than that but pre-dates AD 800, and a third that dates from AD 750-850/900. Ahlstrom did not think that NA 14675 was occupied after AD 800. He found little evidence for short bursts of construction followed by abandonment; rather Cottonwood Seep and Cottonwood South appear to have hosted small-scale but relatively continuous occupation from AD 600 until AD 900.

Both the earlier excavations by MNA and the later ones by SWCA Archaeological Consultants investigated only the far eastern edge of the artifact scatter that surrounds Cottonwood Seep. Well over 300 pit houses are probably hiding under the shifting sand dunes at the site, although they would not all have been inhabited at the same time. The average pit house at NA 14674/14675 was probably in use for no more than a few years, which is one reason why so many of them are found at the site, especially considering its long occupation span.

NA 10088 (Rippey 1969)

NA 10088 is located in New Mexico on a hill two miles north of the Puerco River. It was encountered during salvage operations in 1968 in preparation for the construction of a 69 KV transmission line. The Museum of Northern Arizona excavated a total of seven pit structures and a series of trenches into sheet trash at the site (Rippey 1969). Six of the seven pit structures lacked interior hearths, suggesting this was a seasonal site occupied in the summer when interior heating was not a necessity. MNA archaeologists recovered two tree-ring dates from excavations at this site: a post placed into a structure after its abandonment produced a date of 648vv (indicating that it post-dates 648 by an unknown number of years), and wood recovered from the fill of Pithouse 1 produced a date of 522vv. The site could therefore date as early as the mid-500s but no later than the mid- to late-600s. Site notes indicated that a significant number of Tallahogan Red sherds were recovered during the excavations; this rare red-slipped grey ware dates from 620-775/800 (Oppelt 2002). However, the architecture of the structures at NA 10088 is very similar to AD 500s-era structures at Puerco Valley sites such as Flattop and Sivu'ovi (Wendorf 1953; Burton 1990). In addition, the excavators may have mistakenly identified Tohatchi Red (Obelisk Grey sherds with a red slip, AD 550-675) as Tallahogan Red (Lino Grey sherds with a red slip, AD 620-775/800) (Hays-Gilpin p.c. 2011). If this is the case, the site most likely dates between AD 550-650. NA 10088 is almost certainly a short-term, seasonal site occupied briefly sometime in the late 500s or early 600s. The number of structures and their presumed contemporaneity means that six or seven separate small groups of people could have inhabited the site. Despite the uncertainty that NA 10088 post-dates AD 600, I have chosen to include the structures on this site in the architectural analysis.

AZ-P-61-193 (Dykeman 1995)

This small site is located south of Cottonwood Seep and AZ-P-60-31. The Navajo Nation Archaeology Department (Dykeman 1995) excavated AZ-P-61-193 prior to the construction of a small housing development (the Hogan Well Range Cluster Housing Unit). The site consists of a single pit house and a series of sequentially used storage pits. One of the storage pits was modified for use as a habitation, possibly concurrent with the occupation of the main pit house. The site has been broadly dated by ceramics and radiocarbon assay to the AD 550-800 interval, although the highest quality radiocarbon samples (from maize kernels) have a 1-sigma range of AD 633-681 and AD 561-657. The excavators felt the evidence was equivocal whether the site was occupied year-round or seasonally, but they propose that it was occupied for no more than six to ten years in either case (Dykeman 1995:276-277). Two families, at most, inhabited the site.

AZ-P-60-31 (Latady 1991; Leach-Palm 1994)

A short distance (3.5 miles) to the northeast of NA 14674/14675 is located AZ-P-60-31, a contemporaneous settlement located along the crest of a north-south trending sandy ridge. I already related the story of site’s accidental discovery during road construction and how it was subsequently excavated on two occasions (Latady 1991; Leach-Palm 1994). Between these two projects, Zuni Archaeological Program archaeologists excavated a total of eighteen pit structures, two middens, and over 100 pit features. In addition, either eighteen (the amount given by Leach-

Palm [1994] for both projects) or twenty-four (if Latady's [1991] figures are added to the number given by Leach-Palm [1994] for the 1992 excavations alone) human burials were excavated. The excavations clipped the southern edge of a site that stretches over 3/4 of a kilometer to the north. Whether the rest of the site contains cultural material similar to that excavated in the road cut is unknown, although the excavation reports note that later ceramics (AD 900-1100) exist just outside the right-of-way. Files at the Museum of Northern Arizona show that four more sites (AZ-P-60-165, 168, 159, 170), three of which are more than 600m long, lie just to the south of AZ-P-60-31 along the ridge top. Ceramics suggest a wide range of occupation dates from the AD 600s into the 1100s. If these sites also contain significant AD 600-800 period occupations, this whole complex is one of the largest communities in Puerco Valley during this time period. However, to date only a fraction of the entire site has been excavated, or even thoroughly recorded.

In contrast to Cottonwood Seep, AZ-P-60-31 has a relatively brief occupation span. AZ-P-60-31 is dated by eleven radiocarbon dates and one archaeomagnetic date. Calibrated dates show a span of occupation that may begin as early as the 640s or 650s, has a cluster of dates between 670 and 710, with the statistical possibility of some dates extending into the mid-700s. This is a much tighter occupation range than that of Cottonwood Seep and Cottonwood South. The excavators felt that there was compelling evidence that AZ-P-60-31 was occupied continuously without a hiatus (Leach-Palm 1994:209-210). Analysis of the dates could not temporally differentiate areas of the site, although two middens are present, one underlying the other and separated by a layer of clean aeolian sand. The density of features and the frequency of superposition clearly show that not all pit houses or features were in use at the same time. It is possible, however, to associate some storage pits with particular pit structures based on their relative positions (i.e. there are arcs of pits located to the northwest of some pit structures, a typical AD 600-800 arrangement). The site was occupied during the spring and summer at the very least, and substantial interior hearths and formal pit houses suggest at least some residents over-wintered at the site (Leach-Palm 1994:iii-iv). The occupation history of AZ-P-60-31 is not at all like that of Cottonwood Seep and Cottonwood South. It appears to have been a settlement that at times was occupied seasonally, while at other times it was occupied year-round. As opposed to the long-term but low-intensity occupation of Cottonwood Seep, the early Pueblo period occupation of AZ-P-60-31 appears to have lasted less than 100 years, and perhaps as few as 50.

NA 8942 (Gumerman 1982)

This site was excavated in 1964 by MNA during highway salvage operations, and is located about a half a mile north of the Puerco River on a flat-topped ridge. It contains multiple sequential occupations dating between AD 700-1150 based on ceramics. I think it is likely that at least three separate periods of occupation are present at NA 8942, one in the 730s, another around AD 800, and a later occupation after AD 1000. Three pit houses at the sites date to the early Pueblo period. The earliest dates at the site are a series of closely clustered tree rings dates: 733r-734r. Site descriptions prepared twenty years after the excavation of the site state that these came from “Pithouse 4”, as do earlier records from the Laboratory of Tree Ring Research. However “Pithouse 4” is described in the 1982 post-hoc report as a semi-subterranean room attached to a small three room surface pueblo that contains architecture that most likely post-dates AD 1000. Fields notes and sketch maps from the time of the excavations clearly indicate that “Pithouse 4” is actually an isolated pit structure located twenty meters or more south of the trash area associated with the later surface roomblock. This structure is called "Pithouse 3" in the 1982 report. At some point, the numbering of the two pit structures was mixed up. I use "Pithouse 3" to refer to the isolated pit structure that was called "Pithouse 4" by both the original excavators and the Laboratory of Tree Ring Research, and which produced the AD 734 dates.

Pithouse 1 also produced tree ring dates that suggest construction in the late AD 790s or early 800s (755vv, 792vv, 792vv, 795vv, 803r, and an anomalous "later support post" date of 1056vv recovered from structure fill). Information on Pithouse 2 in field notes differs from that of the 1982 site description, again suggesting that structure numbers have been mixed up. Handwritten ceramics forms indicate a Kiatuthlanna Black-on-white sherd was recovered from floor fill in Pithouse 2, suggesting a post-AD 850 occupation date (Hays-Gilpin and Van Hartesveldt), but so too was a Wingate Black-on-red sherd which clearly post-dates the early Pueblo period occupation of the site. Deposits within Pithouse 2 may be mixed or disturbed (the structure is partially truncated by a later kiva), and it could easily be contemporary with Pithouse 1.

NA 8942 may have had two occupations during the early Pueblo period; an initial single pit structure was built in the 730s. It was almost certainly out of use and abandoned by the time that Pithouse 1 was constructed in the AD 790s or early 800s. Pithouse 2 may be contemporaneous with Pithouse 1, or it may date slightly later. NA 8942 was probably a small farmstead, occupied for a short amount of time in each instance. There was no evidence of surface architecture associated with the early Pueblo period pit houses.

NA 8948 (Gumerman 1982)

MNA archaeologists excavated three pit structures at NA 8948. There may have been more in prehistory, but a road cut for Route 66 probably destroyed other structures on the site. A single tree ring date of 758r was recovered from a "cross beam" from Pithouse 3. Pit structures 1 and 2 are superimposed upon one another, forming a "figure-eight" in plan, while Pithouse 3 is located a short distance away. Ceramics recovered from the fill of these structures are consistent with a 750-800 date. A sherd of Kiatuthlanna Black-on-white was supposedly recovered from Pithouse 3 floor contexts; standard dates for Kiatuthlanna Black-on-white indicate that this pottery type was not manufactured until about AD 850, or 100 years after the cutting date of 758r associated with this structure. Perhaps the sherd was introduced into the structure by a later occupation of the site that was destroyed by the road cut. Other ceramics in trash fill within Pithouse 3 post-dates AD 1000 so perhaps the Kiatuthlanna sherd was included in later refuse dumped into the structure. Alternately, the sherd may have been mis-identified.

NA 14682 (Stebbins et al. 1986)

This site is located north of Cottonwood Seep on the gentle plains leading down to the Puerco River. Four pit structures from this site date to the AD 780s into the early AD 800s. The structures represent at least two and maybe three phases of sequential construction. Pithouse 1 and Pithouse 2 may have been built first—a radiocarbon sample from the floor of Pithouse 2 suggests it was constructed around AD 780. The excavators from MNA argued that Features 4 and 5 post-dated Pithouse 1 and 2 by about twenty to fifty years, meaning they were built in the early AD 800s. However, the excavation report mentions the presence of ceramic types that may indicate occupation as late as AD 900. The excavators argue that the site is a seasonally or temporarily occupied settlement based on the sequence of construction and ephemeral nature of the architecture.

White Mound Village (Gladwin 1945)

White Mound Village is located on a rounded hill-top about a quarter of a mile north of the Puerco River. Gila Pueblo excavated three arcs of surface rooms and six pit structures at the site in 1936. Few absolute dates were recovered from the excavations. Gladwin (1945) felt that House 3 and Cist 1 were built around AD 787 based on a strong cluster of tree ring dates, and Ahlstrom's reanalysis agreed (1985:212). Ahlstrom suggests that House 3 and possibly Cist 1 as well were repaired around AD 803.

The actual size of White Mound village is uncertain. The six pit houses are located in two groups, three in Gladwin's "Unit 6" and three in "Unit 7." The tight linear association of pit house in front of the jacal roomblocks suggests they were built in sequence without hiatus. Gladwin suggested that Houses 1 and 4 were built first for they were filled with trash and contained burials, while Houses 3 and 6 may have been built last because they had filled naturally with blown sand. If each pit structure in each unit was built sequentially, assuming a use-life of 15 years for each pit house extends the earliest occupation back to around 755, if House 3 was in fact one of the last constructed structures in "Unit 7". More likely, there was some overlap in occupation between at least two of the pit houses in each unit. The lack of pit houses in front of "Unit 5" is perplexing. Gladwin excavated thirty-three burials at White Mound village (1945:27). Lightfoot (1992:227; 1994:151) projected that an AD 800s hamlet consisting of four pit houses and 19 surface rooms was inhabited by between 14 and 25 individuals in three household groups. It seems reasonable that at most four of the excavated pit structures at White Mound were simultaneously occupied, suggesting it housed a similar population. The thirty-three burials at the site would therefore mean that the remains of two complete generations of White Mound inhabitants were interred at the site, with no one left over! The quantity of burials recovered on the site is out of step with the number of habitations reported by Gladwin, suggesting that White Mound may be a good deal bigger than it appears at first glance. Thirty-three burials were also recovered from nearby LA 4487, which I will argue is one of the larger villages in the Puerco Valley. Finally, Gladwin's maps only show units 5, 6, and 7, implying there are at least four more similar sized arcs of rooms at White Mound.

Twin Butte—a.k.a NA 5065, a.k.a Metate Ruin (Wendorf 1953; Hough 1903; see also Schachner et al. 2011)

This large and complex site contains ceramics that date between AD 600-800, but as of yet no absolute dates exist. A preference for smudged rather than painted bowls in the Petrified Forest area has greatly depressed the number of diagnostic sherds available to help date Twin Butte (G. Schachner 2011 personal communication), but White Mound Black-on-white is the most common decorated ceramic type, suggesting a slightly tighter date of AD 700-850 (Hays-Gilpin and Van Hartesveldt). It is the westernmost site in the study, located a few miles south of the Puerco River in present-day Petrified Forest National Park. Twin Butte was first recorded by Hough (1903) as "Metate Ruin", and investigated by Wendorf (1953) during two seasons in the late 1940s. Always known to be an exceptionally large early Pueblo period settlement, a recent mapping and recording project (Schachner et al 2011) revealed Twin Butte to be larger that previously thought. The central core of the site is situated along the south flank of a prominent cone-shaped butte, covers approximately 300 square meters and contains evidence of many slab-lined storage cists, rectangular slab-lined surface rooms, and two areas that appear to be heavily eroded, circular or oval slab-lined structures up to ten meters in diameter (Schachner et al. 2011).

A great deal of scattered masonry covers the slopes of the butte, and it is likely that many pit structures are buried beneath the rubble. In deep test trenches of the central core of the site, Wendorf uncovered evidence of at least two separate, sequentially constructed pit houses, as well as three massive subterranean “granaries” (1953:105).

Around two-dozen habitation units consisting of slab-lined surface rooms, pit house depressions, and trash are scattered to the southwest, west, and northwest of the main site core at Twin Butte. Ceramics suggest that these habitation units are contemporaneous with the site core, although given the lack of diagnostic sherds already mentioned, that is a tentative suggestion. Twin Butte is located adjacent to two of the largest lithic quarries in the entire Little Colorado region (the Crystal and Jasper Forest areas—now in Petrified Forest National Park), although it is uncertain whether Twin Butte exerted control over this resource (Theuer 2011:113).

Despite the size of Twin Butte, only two pit houses have been excavated at the site (Structure D4 and F4), and only one of those completely (Structure F4). Theuer (2011:110) seems to suggest that Structure D4 could pre-date AD 700—and this may be the case—but for this study both Structures D4 and F4 are considered to post-date AD 750.

NA 8944 (Gumerman 1982)

This is a multi-component site is located a half mile north of the Puerco River. Five of the six excavated pit houses may date to the early Pueblo period. Archaeologists from MNA recovered twenty-seven tree rings dates from Pithouse 3 suggesting it was constructed in AD 805 or 806. Roof beams from Pithouses 5 and 6 suggest those structures were contemporaneous with one another and built around AD 858. A repair in Pithouse 5 may have occurred in AD 862. Pithouse 2 contained a number of Kiatuthlanna and Kana’a Black-on-white sherds in trash fill and White Mound Black-on-white on the floor; the pit structure may have been abandoned sometime after about AD 850 but probably prior to AD 900. Kiatuthlanna Black-on-white was recovered from floor contexts in Pithouse 4, suggesting it was in use after AD 850. Ceramics and architectural evidence indicate that Pithouse 1 was inhabited later in the history of the site, after AD 1000. Therefore, at least two separate early Pueblo period occupations are found at NA 8944, an early one consisting solely of Pithouse 3, and a later one after AD 850 consisting of Pithouses 2, 4, 5 and 6.

NA 8939 (Gumerman 1982)

Two pit houses from this multi-component site date to the early Pueblo period. While the records at MNA contain no mention of tree-rings recovered from this site, Ahlstrom (1985:215) apparently encountered files at the Laboratory of Tree-ring Research pertaining to NA 8939. His description of the site matches that of the MNA site files, and I am confident that Ahlstrom's dates refer to this site. There appears to have been confusion surrounding the site numbers given to three sites along the ridge top on which NA 8939 sits—in at least one other case it is clear that NA numbers assigned by the originally MNA surveyors were later changed during excavations (NA 8940 to NA 8941), and perhaps something similar happened to NA 8939.

Pithouse 2 produced dates indicating in was built in the AD 830s, and it was located stratigraphically below Pithouse 1. Ceramic evidence dates Pithouse 1 as belonging with a later, AD 1100 or 1200s occupation of NA 8939, although because the two pit houses are superimposed, sherds are comingled. Sherds of White Mound Black-on-white, Kiatuthlanna Black-on-white, and Kana'a Black-on-white were recovered from near the floor of Pithouse 2, however, which reinforces the idea that this structure dates to the mid AD 800s.

A map of Pithouse 3 found in MNA site files clearly shows the location of a number of burned beams that must have provided the series of dates Ahlstrom (1985:216) felt indicated that the structure was constructed sometime after AD 810. In addition, a fragment of a White Mound Black-on-white bowl depicting alternating male and female figures dancing was recovered from the floor of Pithouse 3. The other structures on the site probably post-date the construction of these two pit houses as they contain much later-dating sherds in floor contact locations. Gumerman wrote in site notes on file at MNA that Pithouses 2 and 3 may have been contemporaneous with nearby site NA 8941, but the single structure from NA 8941 post-dates AD 850. It may have just overlapped with the occupation of Pithouse 3 at NA 8939, but probably did not overlap with the use of Pithouse 2.

NA 14676 (Stebbins et al. 1986)

Archaeologists from MNA excavated this site as part of the Coronado Project. The site had been badly eroded by a wash, and the two pit houses that were excavated were badly affected by this. As a result, Pithouses 1 and 2 from NA 14676 were often excluded from certain analyses due to a lack of information.

LA 4487 a.k.a Bi'Chilly Village (Sciscenti 1962)

This site is potentially one of the largest villages in the Puerco Valley, although only a portion of it has been systematically excavated. Sciscenti (1962) excavated eleven pit houses and fifteen surface rooms at LA 4487 prior to the construction of a road cut for Interstate 40. His crew recovered tree ring dates from four pit houses. Pithouse 2 was probably built around AD 816-817 based on a series of cutting dates. Pithouses 1, 5, and 6 were probably constructed in the AD 840s. Ahlstrom (1985:218) expressed surprise at the relative lack of reused timber in the AD 840s pit houses, and suggested that either the site was abandoned prior to the construction of these three pit houses, or that an abrupt increase in site size—such as through immigration—may have required new timbers for construction.

The total extent of LA 4487 is unknown, but there is evidence that it is much larger than the eleven pit houses that Sciscenti excavated. LA 4487 occupies a prominent butte at the head of Manuelito Canyon. The site setting has extensive vistas for miles to the east and west along the Puerco River, as well as to the south into Manuelito Canyon. The nearby village of Whitewater is visible from this butte. Also occupying the butte is a later Chaco-era great house called Kin Hocho'i that is notable for the size and scale of its prehispanic roads and earthen berms. Fowler et al. (1987:43) found the presence of such substantial public architecture compeling evidence that the Kin Hocho'i great house was a regional center during the Chacoan era, presumably because of its key location at a "geographic wall separating the eastern and western realms of the Anasazi."

Fowler et al. (1987:42-43) also document a significant early Pueblo presence beneath the Chacoan great house. An earthen berm surrounding the great house contains large amounts of "earlier ceramics," suggesting that the great house sits atop an "earlier center." About 260 meters north of the great house, a portion of a prehispanic road swale cuts through a "small Pueblo I to II structure." One of two great kivas at the site (Great Kiva 1) may have been impacted by the construction of two Chaco-era road berms, suggesting that it pre-dated them. Fowler et al. note that east of this early 16 meter diameter great kiva are burned structures, upright slabs, and trash indicating a date range of AD 730-800, and that the early great kiva may have been the "focus of an earlier center." Finally, to the southwest of the great house is a “series of slab-lined depressions, fronted by depressions of pithouses” associated with a trash midden containing “early Pueblo I” pottery types like Lino Gray and White Mound Black-on-white, which Fowler et al. say is similar to the trash found near the early great kiva.

A search of records housed at the Laboratory of Anthropology uncovered two more sites occupying this relatively confined butte that are thought to date to the early Pueblo period. LA 4486 was recorded by Peckham (n.d.) and noted by Sciscenti (1962) and is a scatter of trash dating to AD 500-900, while LA 54151 is a dark stain and artifact scatter found in the road cut of Interstate 40 containing White Mound Black-on-white, potentially dating the site to AD 700-800. Sciscenti also excavated LA 4483, located just east of the butte, and found it to be a single-family farmstead with a pit house dating to around AD 800. Finally, he notes the presence of a rubble filled “earlier structure” and five hearths “connected with an earlier occupation” at LA 4485, which was mainly an AD 1150-1300 era unit pueblo located a short distance from LA 4487 (Sciscenti 1962:5).

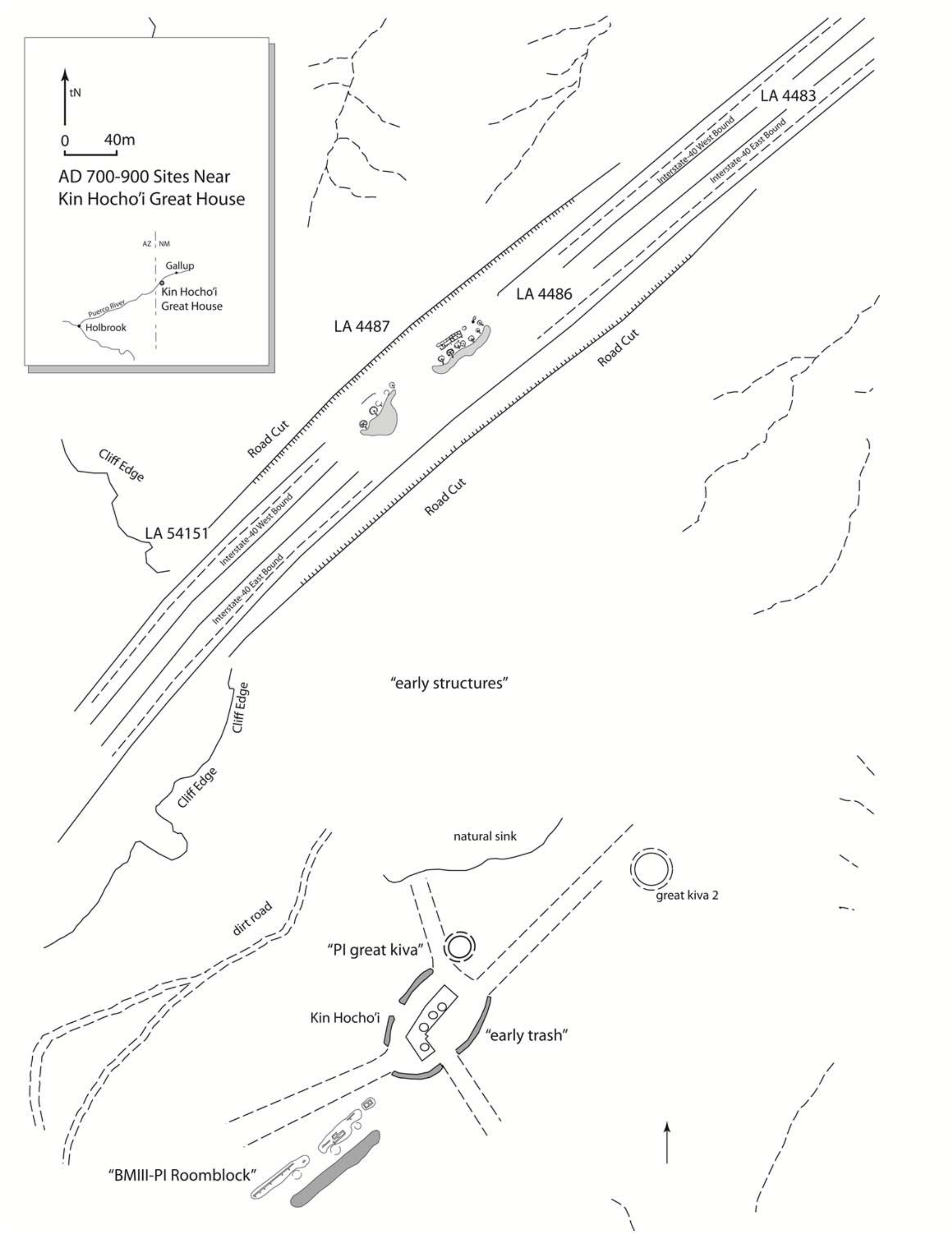

Figure 6: Map showing the relationship between LA 4487 and the Kin Hocho'i Great House

It appears that the entire butte top is covered with evidence of an AD 700-900 occupation (Figure 6). The description given by Fowler et al. suggest the presence of at least another eleven pit houses beneath the Kin Hocho'i great house and its associated earthen architecture, as well as a 16 meter diameter great kiva. This area is about 360 meters south of LA 4487. A Chacoan road segment has exposed early Pueblo period remains about 260 meters north of the great house, or 100 meters south of LA 4487. Just to the west of LA 4487 the I-40 roadcut has exposed evidence of a AD 700-800 artifact scatter and dark-stained soil, while LA 4486 located to the southeast of LA 4487 appears to be a small site of similar date. Sciscenti apparently excavated an early Pueblo period pit house just east of the butte, and hints at the presence of earlier material beneath LA 4485. The only portion of the 0.5 square kilometer ridge top that has been surveyed in detail is a 20-acre block immediately surrounding the great house. I think it is likely that further survey would uncover the presence of a very large AD 750-850 era dispersed village, focused around a great kiva. An estimate of forty or more pit structures does not seem unreasonable, although it is unlikely that all of these would have been occupied at the same time. Only further survey will clarify the extent of this early center, and establish the temporal relationships between the different occupation areas identified so far.

NA 8941 (Gumerman 1982)

This site consists of a single pit house, Pithouse 1, and is located immediately adjacent to NA 8939. There has been confusion in some of the paperwork over the years, and in some files and reports the number NA 8940 is used to refer to this site, but NA 8941 and 8940 clearly refer to the same thing. A long span of non-cutting dates in Pithouse 1 originated from a series of horizontal logs cemented into the wall-floor juncture by adobe coping. Ahlstrom (1985:220) suggests that the structure was built in the AD 850s and that other timbers have lost rings due to poor preservation, or were salvaged timber. Whether or not Pithouse 1 is part of NA 8939 is tough to say (see above), but given the separation in time between the structures at these sites (around 15-30 years from Pithouses 2 and 3 at NA 8939), I think that slightly later inhabitants of the ridge top built Pithouse 1 at NA 8941.

Whitewater (Roberts 1939, 1940; see also Young and Gilpin 2012)

LA 4487, Whitewater is a site that has a much more complicated occupation history than the published report implies (Roberts 1939; 1940). The site consists of at least twenty-two pit houses located near a Chaco-era great house (Figure 7). The great house is often referred to as the Allentown great house, and older publications often refer to the early Pueblo period remains as “the Allentown site” as well. Technically, “Whitewater” refers to the entire district, which is a large side-drainage of the Puerco River than begins in New Mexico and flows west and north meeting the Puerco River near Allentown, Arizona. The main Whitewater site consists of two groups (Roberts’ “Group 1” and “Group 2”) located to the north and south of the Chaco-era great house. Group 1 is south of the great house and contains twelve pit houses and a number of poorly preserved surface rooms arranged in a long linear block. Group 2 is located north of the great house and contains a large “dance plaza”, evidence of six pit house (although two are superimposed upon one another and a third is stratigraphically beneath the dance plaza), and evidence of surface rooms and storage cists. Located at the base of a talus field below the great house, Units 1 and 2 are adjacent to one another. Unit 1 consists of a pit house or kiva and about five slab-lined adobe surface rooms, while Unit 2 contains two pit structures and a surface

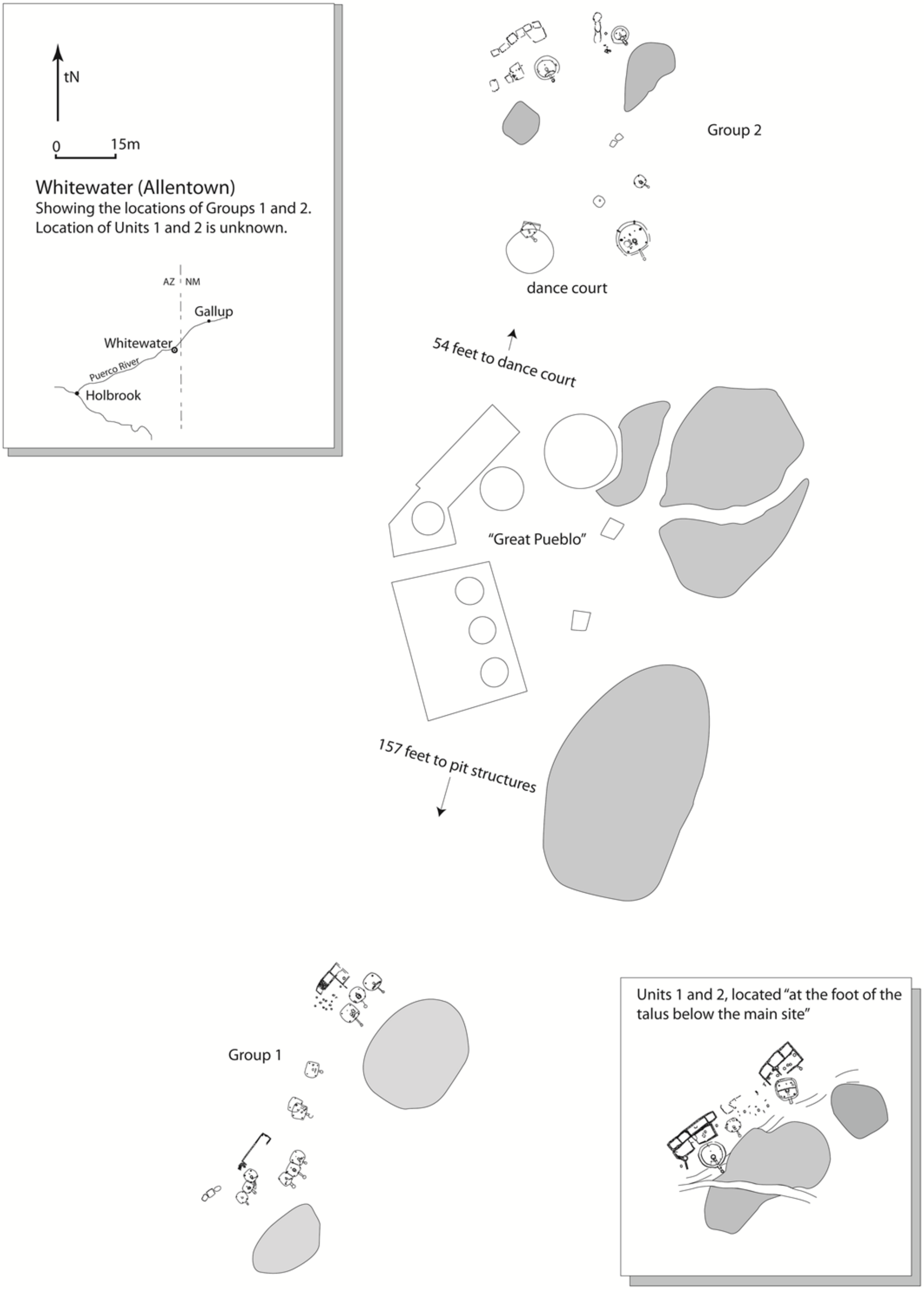

Figure 7: Map showing the layout of Groups 1 and 2 at Whitewater

roomblock built of slabs, masonry, and adobe. About a mile away to the east, Unit 3 consists of six masonry rooms and a pit house or kiva, and it most likely post-dates the early Pueblo period. Thus, there are eighteen excavated pit structures within a small area surrounding the great house, three located a short distance away at the base of a slope, and one located almost a mile away.

Tree ring dates from Whitewater span most of the AD 800s and into the 900s and 1000s suggesting a long, continuous occupation of the site. However, the proveniences of tree-rings recovered from Whitewater have long been questioned (Schachner, Gilpin and Peeples 2012; Ahlstrom 1985:204; Bannister et al. 1966:12). The earliest published dates on Whitewater are from Miller (1934, 1935), and they suggest that only three structures produced datable material. “Kiva 32/G” is apparently the kiva associated with Roberts’ “Unit 3”, the unit located about a mile east of the main Whitewater site (Roberts 1939:239). Miller’s “House 4 32” is Roberts’ “Structure 15” based on its description and a footnote (Roberts 1939:142 note 58). Finally, Miller’s “A-1” is Roberts’ “Structure 12” (Roberts 1939:108). However, Bannister et al. (1966) provide dates for numerous other structures at Whitewater (they refer to it as Allentown) that span a period between approximately AD 800-1000. Based on the fact that some single proveniences produced dates spanning well over 100 years, Bannister et al. (1966:12) suggest that aside from the three structures cross-references by Roberts (1939) and Miller (1934, 1935), the remaining proveniences have somehow become comingled and misnumbered.

A histogram of *all* dates on the site (Figure 8) shows a massive spike during the AD 840-880 interval and almost no dates between AD 880-890. Between AD 900 and 1000 there are a consistent series of dates, peaking between AD 920-940. Finally the major spike between 980 and 1020 are mostly the tree-ring dates supposedly recovered from the Unit 3 kiva. This last period of tree-ring dates may be associated with the earliest construction of the great house, although Roberts' did not investigate that structure. This trend is still evident even when only cutting or near cutting dates are considered (Figure 9). The trends in settlement suggested by considering tree-ring dates at Whitewater irrespective of provenience are extremely intriguing. I will discuss the implications in greater detail in Chapter 5.

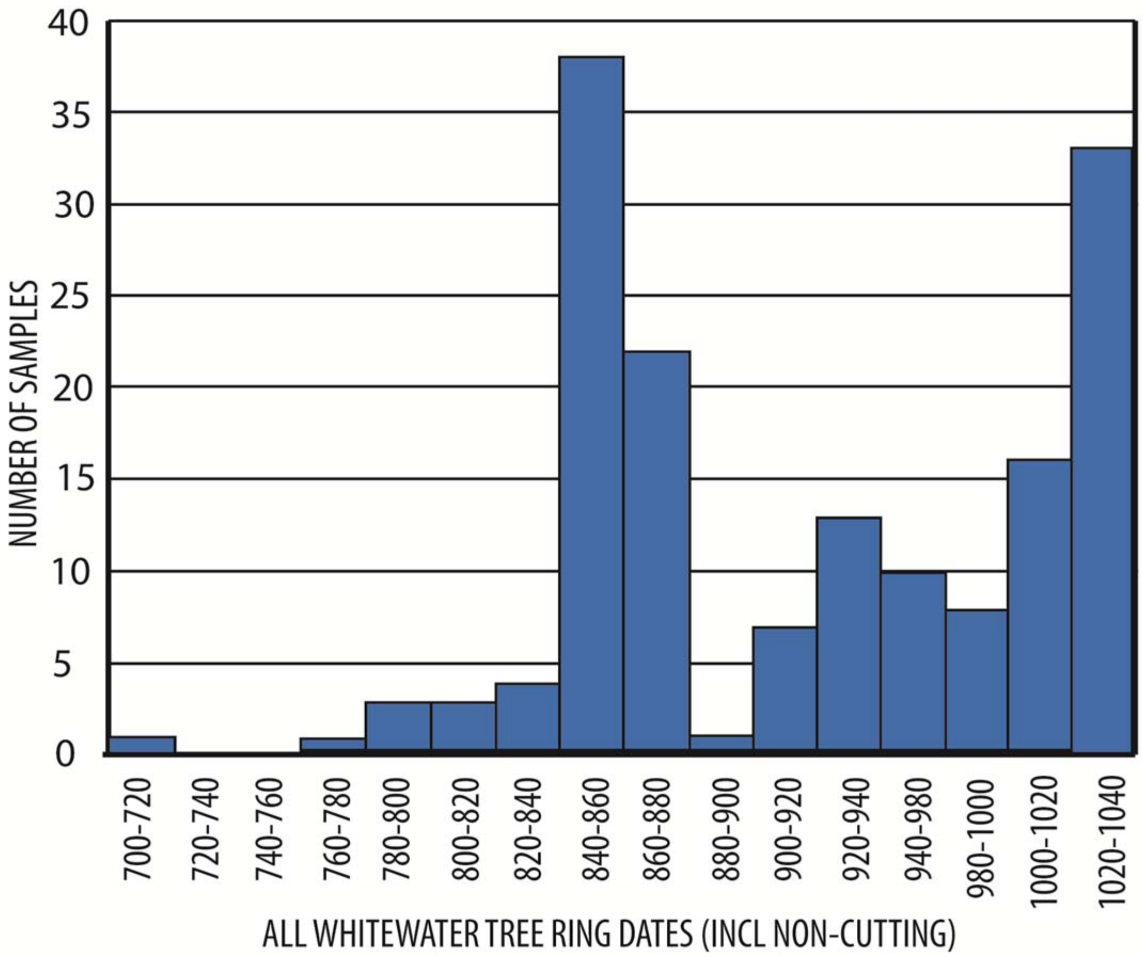

Figure 8: All Tree Ring Dates from Whitewater

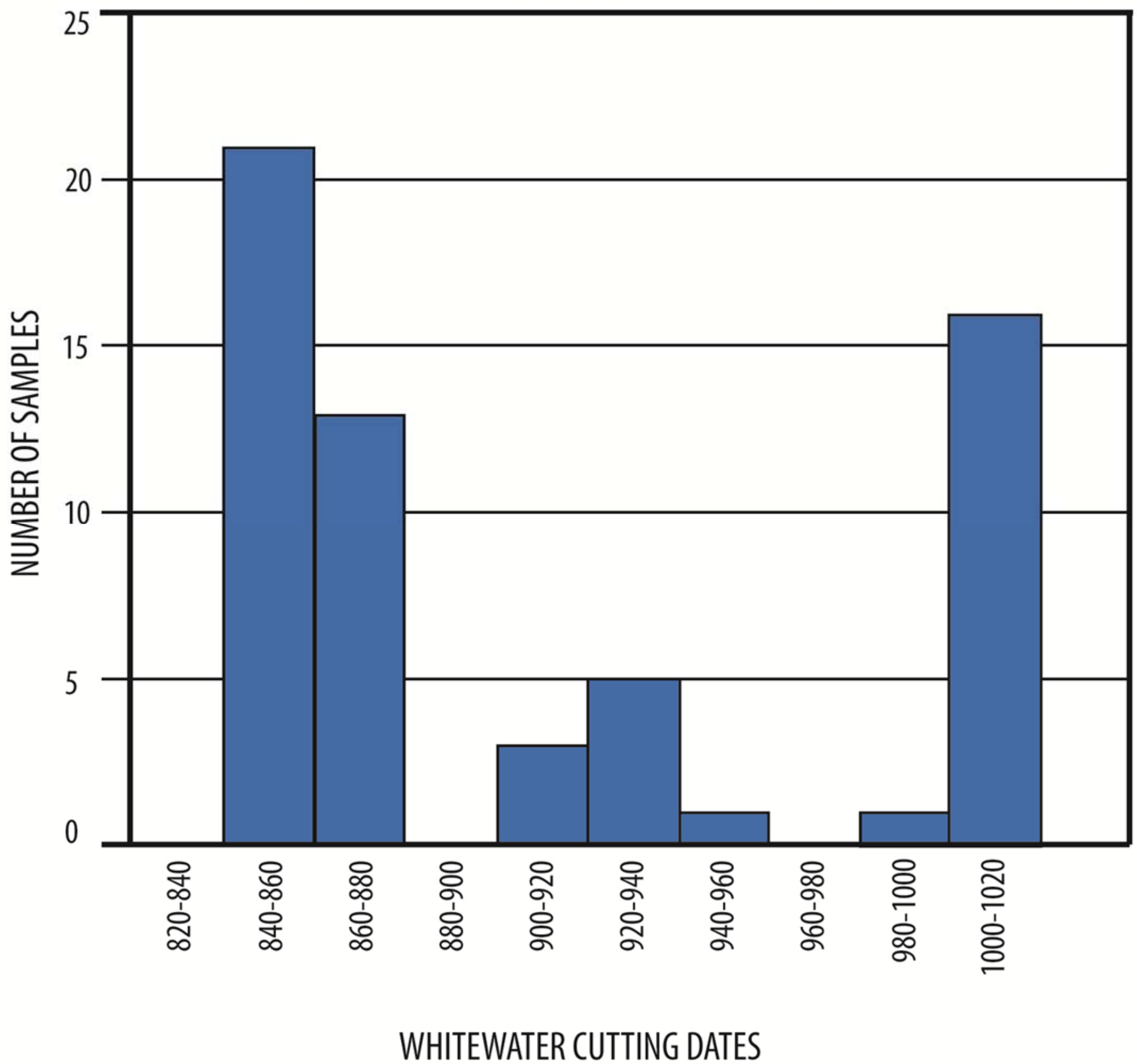

Figure 9: All Cutting Dates from Whitewater

Among the structures dated by Miller (1934, 1935) and cross-referenced with Roberts (1939) footnotes, Structure 12 produced a span of cutting or near-cutting dates between AD 844 and 918. This as an exceptionally long span of occupation for a pit structure, but this is, as we will see, also an exceptional pit structure. Miller's dates on Structure 15 suggest it was built around AD 888, but more dates from this provenience published in Bannister et al. (1966) suggest a much larger span of cutting or near-cutting dates from AD 844 to 1015. Finally, the kiva of Unit 3 appears to have a strong cluster of dates suggesting construction between AD 1004 and 1016. Architecturally, it appears to be a later construction as well, and it is not included in the architectural sample for this study.

Because of the major problems with the tree-ring chronology from Whitewater, I tended to use comparison with better-dated structures in the northern Southwest to decide whether to include or exclude pit structures from Whitewater in the AD 600-900 sample. I excluded Structure 13b because on closer examination, it resembled the large, shallow, round Lupton Phase structures described by Wasley (1960), which are actually found only a few miles to the north of Whitewater along the Puerco River. Wasley's excavations and subsequent analysis of "Lupton" brown ware ceramics suggest that this style of structure probably dates to the AD 400s or 500s. I also excluded the Unit 3 kiva, because it is the most securely dated of all Whitewater district pit structures and probably was built after AD 1000. The substantial use of masonry architecture in both the pit structure and the surface rooms suggests that this is the case. A number of the structures I included within the sample could have been occupied after AD 900, but I chose to give them the benefit of the doubt. In addition, regardless of exact provenience, the tree-ring dates demonstrate that people were on the site steadily throughout the AD 800s and again in the 900s; at least a few structures may have been occupied across the AD 900 boundary.

NA 6639 (Breternitz n.d.)

David Breternitz excavated a single pit house, called a "kiva" in the excavation notes, at this site. He felt that based on ceramics and architecture it belonged to the Kiatuthlanna phase and dated it between AD 800 and 900. The presence of Kiatuthlanna and Red Mesa Black-on-white sherds near floor contexts suggests that this structure dates to the end of that time period, after AD 850. The pit house contained a significant amount of trash fill, suggesting that it was not the only habitation at NA 6639, but there is no evidence in the sites notes of how large the site is or how many other structures may be present.

NA 8943 (Gumerman 1982)

This multicomponent site sits upon a knoll above the Puerco River. While a large of amount of AD 1100s pottery was recovered, the two pit houses excavated here most likely date to the late AD 800s. A series of surface rooms were located adjacent to these pit houses, but whether they were associated with the earlier or the later occupation is unknown.

NA 8945 (Gumerman 1982)

This site is primarily an AD 1100s unit pueblo, but at least two pit houses found beneath the walls of the masonry surface rooms probably date to the early Pueblo period. Pithouse 2 produced tree-ring dates from burned roof timbers and support posts that suggest it was constructed in AD 876-877. Immediately above this pit house was another, Pithouse 1, built into the burned debris of Pithouse 2. The excavators recovered ceramics from near the floor of Pithouse 1 that indicate it was probably occupied not long after the abandonment of Pithouse 2, but no later than AD 950. I included Pithouse 1 and Pithouse 2 in the architectural sample, although they are both poorly preserved and none mostly from excavation notes rather than plan maps.

NA 8968 (Gumerman 1982)

This site is located so closely to NA 8969, and contains such similar material that they were probably inhabited at the same time. They also appear to have similar site histories. NA 8968 contains two pit houses and a series of adobe surface rooms. Pithouse 1 was located some distance from the surface rooms, and contained two human skeletons within structure fill. The remains of three more individuals were found haphazardly placed into a shallow pit just north of Pithouse 1. Pithouse 2 is known only from excavation notes, and was located near the adobe surface rooms. The surface rooms were found to contain storage pits full of burned and charred maize. In both pit houses the fill was largely devoid of sherds, suggesting little activity on the site after its abandonment. The only evidence for continued use at the site were the fact that the two burials in Pithouse 1 were located some distance above the floor, as if the structure had begun to fill with debris prior to the placement of the remains, and a hearth was located in the fill of Pithouse 2. This contrasts with most other sites along the Puerco River, which tend to have multiple components. The surface rooms supplied a number of tree-ring dates spanning much of the AD 800s; the only cutting or near-cutting date is AD 871. Decorated ceramics on the site are dominated by Kana'a Black-on-white, most common in the Puerco Valley between AD 850 and 900 (Hays-Gilpin and Van Hartesveldt 1998), suggesting the site occupation probably did not span much later than AD 900 because very few later sherds were recovered from contexts that may have been in use immediately prior to abandonment.

NA 8969 (Gumerman 1982)

As mentioned above, this site is immediately adjacent to NA 8968, and is probably a related and contemporary site. MNA excavated two pit houses and a slab-lined jacal surface structure at the site. The excavators were surprised at how insubstantial Pithouse 1 was, and they hypothesized it may even have been built by children and used as a play house. Pithouse 2 was much more formally built. Two disarticulated human skeletons were found arranged on the floor of Pithouse 2. Three tree-ring samples from the surface rooms failed to produce any cutting dates, but two non-cutting dates of AD 866 and 867 suggest that the structure was probably built not long after those dates, making NA 8969 roughly contemporary with NA 8968.

NA 14681 (Stebbins et al. 1986)

A single pit house, Pithouse 1, was excavated at this site, which is located north of Cottonwood Seep on the plains above the Puerco River. The excavators felt they investigated approximately 25% of the site. Two radiocarbon intercept dates of AD 645 and 725 were recovered from Pithouse 1. However, floor ceramics within the structure include Kana'a Black-on-white, suggesting these dates (like many Puerco Valley radiocarbon dates) are probably too early. I assigned a date of approximately AD 875 to the pit house based on the ceramics assemblage. Surface trash on the site contained Black Mesa Black-on-white and Red Mesa Black-on-white in greater frequencies than White Mound Black-on-white, suggesting that the use of the immediate area, and by proxy Pithouse 1, probably occurred after AD 850 and possibly into the AD 900s. However, it is unknown if the surrounding trash belongs with Pithouse 1, or other unexcavated structures.

NA 14683 (Stebbins et al. 1986)

This site is also located north of Cottonwood Seep, and near NA 14681 and 14682. MNA excavated a single pit house (Pithouse 1) and associated activity areas at NA 14683. A beam from the structure produced a radiocarbon date suggesting occupation during the AD 800s, while ceramics narrow this range to the later half of the AD 800s. The excavators felt that this site represented a seasonal settlement.

Establishing a Puerco Valley Chronology: The Early Period and the Late Period

Based on the absolute dates that archaeologists have recovered from Puerco Valley sites, I believe that the AD 600-900 interval can be divided into two halves, an Early Period (AD 600-750) and a Late Period (AD 750-900). There is a distinct gap in house construction between approximately AD 710 and 758 (Table 3). A number of sites have produced radiocarbon samples that have 1-sigma ranges that cross this fifty-year period, but only three pit houses have a high probability of being built during this period. Pitstructure 2 at AZ-P-60-31 has an archaeomagnetic date of 680-775, the midpoint of which falls between AD 710 and 758. If this date is correct, it slightly post-dates other structures at AZ-P-60-31, the majority of which seem to have been constructed after AD 670 but prior to AD 710 (Table 3). This is based on a fairly optimistic reading of the cluster of radiocarbon intercept dates occurring at AD 670, 680, 685, 690 and 710. Furthermore, the exact relationships between structures at AZ-P-60-31 are complicated by the fact that the excavated portions of the site were heavily impacted by road construction prior to archaeological investigation.

("Best Guesses" in **Bold** are based on absolute dates)		
Early Period (AD 600-750)		
Site	**Structure**	**Best Guess**
NA 14674	Feature 17	600s (early)
NA 14674	Feature 21	**600s (early)**
NA 14674	Feature 93	**600s (early)**
NA 14675	Feature 17	**600s (early)**

NA 14675	Feature 19	**600s (early)**
NA 14674	Feature 27	**600s**
NA 14674	Feature 35	**600s**
NA 14674	Feature 71	**600s**
NA 14674	Feature 49	**600-725**
AZ-P-60-193	Structure 1	600s (mid)
AZ-P-60-193	Structure 2	600s (mid)
NA 10088	Pithouse 1	650-700
NA 10088	Pithouse 2	650-700
NA 10088	Pithouse 2A	650-700
NA 10088	Pithouse 3	650-700
NA 10088	Pithouse 4	650-700
NA 10088	Pithouse 5	650-700
NA 10088	Pithouse 6	650-700
NA 10088	Pithouse 7	650-700
AZ-P-60-31	Pitstructure 10	670-710
AZ-P-60-31	Pitstructure 11	670-710
AZ-P-60-31	Pitstructure 14	670-710
AZ-P-60-31	Pitstructure 2	670-710
AZ-P-60-31	Pitstructure 4	670-710
AZ-P-60-31	Pitstructure 5	670-710
AZ-P-60-31	Pitstructure 7	670-710
AZ-P-60-31	Pitstructure 8	670-710
AZ-P-60-31	Structure 12	670-710
AZ-P-60-31	Unit 2	670-710
AZ-P-60-31	Unit 39	670-710
AZ-P-60-31	Unit 41	670-710
AZ-P-60-31	Unit 44	670-710
AZ-P-60-31	Unit 8	670-710
AZ-P-60-31	Pitstructure 3	**668**
AZ-P-60-31	Unit 7	**671**
AZ-P-60-31	Pitstructure 6	**680**
AZ-P-60-31	Pitstructure 1	**690**
NA 8942	Pithouse 3	**734**
Late Period (AD 750-900)		
Site	**Structure**	**Best Guess**
Twin Butte	Structure A	700s (late)
Twin Butte	Structure D4	700s (late)
Twin Butte	Structure F2.2	700s (late)

Twin Butte	Structure F4	700s (late)
White Mound	House 1	700s (late)
White Mound	House 2	700s (late)
White Mound	House 4	700s (late)
White Mound	House 5	700s (late)
NA 14674	Feature 41	**750 (postdates)**
NA 8948	Pithouse 1	750s
NA 8948	Pithouse 2	750s
NA 8948	Pithouse 3	**758**
NA 14682	Feature 2/Pithouse 2	**780**
NA 14682	Feature 13/Pithouse 1	780s
NA 14682	Feature 4	780s
White Mound	House 6	780s
White Mound	House 3	**787**
NA 8942	Pithouse 1	**790s**
LA 4487	Pithouse 10	800-850
LA 4487	Pithouse 11	800-850
LA 4487	Pithouse 4	800-850
LA 4487	Pithouse 7	800-850
LA 4487	Pithouse 8	800-850
LA 4487	Pithouse 9	800-850
NA 14682	Feature 1	800s (early)
NA 14682	Feature 5	800s (early)
NA 14674	Feature 85	**800s**
NA 14676	Pithouse 1	800s
NA 14676	Pithouse 2	800s
NA 6639	Kiva	**800s**
White Water	Structure 1	800s
White Water	Structure 10	800s
White Water	Structure 11	800s
White Water	Structure 13a	800s
White Water	Structure 14	800s
White Water	Structure 16	800s
White Water	Structure 17	800s
White Water	Structure 18	800s
White Water	Structure 2a	800s
White Water	Structure 4	800s
White Water	Structure 5a	800s
White Water	Structure 5b	800s

White Water	Structure 6	800s
White Water	Structure 7	800s
White Water	Structure 8	800s
White Water	Structure 9	800s
NA 8943	Pithouse 1	800s (late)
White Water	Kiva A	800s (late)
White Water	Kiva B phase 1	800s (late)
White Water	Kiva B phase 2	800s (late)
White Water	Structure 12	**800s (late)**
NA 8942	Pithouse 2	850 (postdates)
NA 8944	Pithouse 2	850-900
NA 8944	Pithouse 4	850-900
NA 8943	Pithouse 2	**850-950**
NA 8944	Pithouse 3	**806**
NA 8939	Pithouse 3	**812**
White Water	Structure 2	**815**
LA 4487	Feature 36/Pithouse 5	**817**
NA 14674	Feature 6	**820s**
NA 8939	Pithouse 2	**837**
LA 4487	Feature 4/Pithouse 1	**842**
LA 4487	Feature 19/Pithouse 2	**845**
LA 4487	Feature 38/Pithouse 6	**845**
NA 8941	Pithouse 1	**850s**
White Water	Structure 3	850s
NA 8944	Pithouse 6	**859**
NA 8968	Pithouse 1	870-900
NA 8968	Pithouse 2	870-900
NA 8944	Pithouse 5	**870s**
NA 8969	Pithouse 1	870s
NA 8969	Pithouse 2	870s
NA 14681	Pithouse 1	875
NA 8945	Pithouse 2	**876**
NA 8945	Pithouse 1	876-950
NA 14683	Pithouse 1	**880**
White Water	Structure 15	**888**
Indeterminate		
Site	**Structure**	**Best Guess**
NA 14674	Feature 12	**700s**
NA 14674	Feature 127	600-800

NA 14674	Feature 128	600-800
NA 14674	Feature 129	600-800
NA 14674	Feature 130	600-800
NA 14674	Feature 14	600-800
NA 14674	Feature 15	600-800
NA 14674	Feature 34	600-800
NA 14674	Feature 4	600-800
NA 14674	Feature 43/36	600-800
NA 14674	Feature 46	600-800
NA 14674	Feature 47	600-800
NA 14674	Feature 48	600-800
NA 14674	Feature 7	600-800
NA 14674	Feature 79	600-800
NA 14674	Feature 86	600-800
NA 14674	Feature 87	600-800
NA 14674	Feature 9	600-900
NA 14674	Feature 96	600-800
NA 14674	Pithouse 1/Feature 8	600-900
NA 14674	Pithouse 10/Feature 68	600-900
NA 14674	Pithouse 12/Feature 70	600-900
NA 14674	Pithouse 13/Feature 71	600-900
NA 14674	Pithouse 14/Feature 72	600-900
NA 14674	Pithouse 15/Feature 77	600-900
NA 14674	Pithouse 16/Feature 80	600-900
NA 14674	Pithouse 2/Feature 27	600-900
NA 14674	Pithouse 3	600-900
NA 14674	Pithouse 4	600-900
NA 14674	Pithouse 5/Feature 31	600-900
NA 14674	Pithouse 6/Feature 48	600-900
NA 14674	Pithouse 7/Feature 50	600-900
NA 14674	Pithouse 8/Feature 10	600-900
NA 14674	Pithouse 9/Feature 56	600-900
NA 14675	Feature 1	600-800
NA 14675	Feature 2	600-800
NA 14675	Feature 9	600-800

Table 3: Puerco Valley Pit Houses Separated into Early, Late, and Indeterminate Categories, with Best Guess Dates of Occupation

The midpoint of a radiocarbon date from Feature 12 at NA 14674 falls between AD 710 and 758, although it has a 1-sigma range of AD 667-801. This date does not inspire much confidence, and I am willing to place it in the same category as those other radiocarbon dates that cross the AD 710-758 span—they possibly reflect construction during this period, but have just as high a likelihood of having been constructed before or after.

Finally, Pithouse 3 at NA 8942 produced a tree-ring cutting date of AD 734. This is the most convincing evidence that the Puerco Valley was not completely abandoned during the AD 710-758 interval. However, following the numerous dates suggesting significant occupation at NA 14674 through the early to mid AD 600s, and the strong cluster of dates in the late AD 600s from AZ-P-60-31, the decline in dates between AD 710 and 758 is striking. In Chapter 5 I will demonstrate that after this hiatus in occupation new pit house styles appeared in the Puerco Valley, implying a major shift in construction technology and stylistic choices—further justification for separating the Early and the Late Period. Finally, only NA 14674 shows significant evidence of relatively continuous occupation across the AD 750 divide. Every other site was occupied only in the Early or the Late Period, or appears to have hosted only minimal or temporary settlement outside of its primary span of occupation.

Summary and Discussion

Table 3 shows the structures used in this study divided into the Early and Late Periods. Based on the dates discussed in the site descriptions and summarized in Table 2 most structures can be placed into either of these two periods. Thirty-eight pit houses can be confidently dated to the Early Period (AD 600-750). Seventy-seven pit houses date to the Late Period (AD 750-900). There are thirty-seven pit houses that I could not confidently place in either the Early or the Late Period, all located at NA 14674 and 14675. Despite the large amount of excavation at this site, many of the structures do not have associated dates, and could only be dated by ceramics. Unfortunately, the low numbers of painted ceramics meant that the proposed range of occupation of many structures is either AD 600-900 (for most of the structures that were excavated by the Museum of Northern Arizona) or AD 600-800 (for those structures excavated by SWCA Archaeological Consultants). The SWCA excavators felt that they were in earlier deposits than those encountered by MNA, and they excavated a number of structures dug directly into the shale substratum underlying the large dune-field that contains NA 14674 and 14675, hence their more limited proposed temporal range.

The estimated dates of occupation of pit houses at NA 14674 and 14675 in Table 3 do not match the absolute dates in Table 2. SWCA archaeologists felt that the inhabitants of the Cottonwood Seep area used significant amounts of recycled and salvaged timber for construction, and that old wood and shrubs collected from the surface were used as fuel for fires, which skewed the radiocarbon dates earlier than the actual occupation. There was very little other evidence to suggest the site was occupied before AD 600 (Ahlstrom 1993:35?).

Sites containing structures that date to the Early Period include a large settlement occupied seasonally (NA 14674/14675), an equally large settlement that shows clearer evidence of year-round habitation (AZ-P-60-31), a small one or two family habitation site (AZ-P-61-193), and a seasonal camp occupied by up to six or seven groups of people (NA 10088). This mixture of large and small sites, and seasonal and year-round habitation indicates that the AD 600-750 occupants of the Puerco Valley practiced a variety of subsistence strategies. Multiple approaches to settlement organization were also clearly present in the Puerco Valley between AD 600-750. The organization of some settlements may have been de facto arrangements based on circumstances such as the need to accommodate new arrivals, the season that the settlement was first occupied, or the expectation that occupants would soon move to greener pastures. Family, ritual, and political structures were likely another factor governing the layout of larger settlements such as Cottonwood Seep and AZ-P-60-31. The difference in occupation history and settlement organization at these two sites suggests underlying cultural differences between the inhabitants, but that alone is insufficient evidence. In chapter 5, I will examine the architectural differences between these two sites in greater detail.

One question that is arises when looking at the Early Period sites is whether different groups in the Puerco Valley practiced only one subsistence strategy (e.g. they never occupied sites year round) or whether they relied on a variety of strategies (e.g. for some years they resided in one place, and during others they seasonally occupied a series of locations). If people consistently followed certain patterns of living, and constructed housing that is appropriate to that style, they may have developed stronger group identities than if they were flexible, adaptive, and comfortable building housing in a variety of architectural styles.

The sites included in the Late Period demonstrate that after AD 750, settlements were more permanent, but farmsteads occupied by one or two families still continued to be the most common settlement type on the landscape. However, the Late Period sample includes architectural data from at least three large villages (Twin Butte, LA 4487, and Whitewater) in addition to the many smaller sites. The White Mound site is problematic—it probably was not as large a settlement as any of the three previously mentioned villages, but it appears to have been larger than most of the other farmsteads within the Puerco Valley. NA 14674 continued to be inhabited during the Late Period, although it probably decreased in size. Fewer of the Late Period sites are interpreted as seasonally occupied settlements, meaning that subsistence strategies changed following the brief 40-year hiatus in settlement within the Puerco Valley. In addition, the sheer increase in the number of sites argues for a substantial population increase in the valley during the AD 750-900 interval.

The three possible villages inhabited during the Late Period all contain evidence of communal or public architecture. If LA 4487 is in fact part of a much larger settlement, as I have argued, then Great Kiva 1, located adjacent to Kin Hocho'i great house, was probably in use while people inhabited the LA 4487 pit houses. The dance plaza in Group 2 at Whitewater is a similar feature. I will argue in Chapter 5 that the Whitewater dance plaza should probably be considered part of Group 1 (the long, linear roomblock south of the great house), and that the presence of the later great house has skewed our perception of the relationship of these features. The Whitewater dance plaza and LA 4487/Kin Hocho'i great kiva form a pair similar to the Basketmaker III paired great kivas noted by Young and Gilpin (2012) just to the north of the Puerco Valley on the Defiance Plateau, in the Chinle and Chuska Valleys, and in Chaco Canyon. In these areas, large sites with communal architecture are often found within a few miles of second large site with communal architecture, although whether great kivas at these sites were contemporary or sequential is not known.

Finally, recent remapping at Twin Butte identified two possible circular features located near the summit of the bentonite ridge containing the central core of the settlement. In both cases severe erosion has significantly altered the appearance of these features. The eastern circle is currently a partially slab-lined depression about 12 meters in diameter. All that remains of the western circle is an arc of stones just below the summit of a narrow bentonite cone that forms the highest point in the Twin Butte community. The quantity of stone rubble within the central core of Twin Butte is unusual for early Pueblo sites in the lower Puerco Valley, and this debris may be the remains of other substantial masonry buildings that may have been public or ritual in nature.

An interesting pattern that needs to be investigated more fully is the fact that very few of the prominent Early Period sites contain evidence of re-occupation in later periods. Both NA 14674/14675 and AZ-P-60-31 contain a few sherds dating to the AD 750-1300 interval, but no later Puebloan housing intrudes on the early Pueblo period pit houses. However, many of the AD 750-900 sites excavated by MNA during highway salvage are completely covered by AD 900-1300 Puebloan architecture. This makes identification of Late Period features difficult. The Kin Hocho'i great house sits atop early Pueblo period structures, as does the great house at Whitewater. The Navajo Springs great house, located some miles to the west of Whitewater also appears to be on top of an earlier AD 750-900 settlement (Warburton and Graves 1992), although the early Pueblo period component has not been described in detail.

One explanation for this pattern is that following the AD 710-750 hiatus agricultural practices shifted and people began to utilize the valley bottom more frequently than they previously had. The largest Early Period sites are located on Puerco Ridge and may have relied on seepage field and dune field farming. The large Late Period sites are located on high landforms but are within a short distance of large drainages such as Whitewater Draw or the Puerco River itself. Perhaps farming along the larger drainages became the dominant method of agriculture in the Puerco Valley throughout the remainder of the Puebloan occupation of the valley, leading to the repeated use of sites first established after AD 750. One final thought is that perhaps the earliest pit house settlements were considered by later inhabitants to belong to a different group of people, or became sites that were avoided for future habitation. Brenda Bowser (personal communication 2011) relates that within village societies in the Amazon it is common for people to avoid abandoned villages that were not constructed by their own ethnic group. If the great increase in population that occurred in the Puerco Valley after AD 750 involved immigration from outside the valley (a likely possibility I explore in Chapter 5), then they may have actively avoided settlements of the Early Period inhabitants.

Conclusion

Research in the Puerco Valley identified many important early Pueblo period settlements in the years prior to 1950. The advent of salvage archaeology and cultural resource management expanded the range of sites investigated in the valley, which demonstrated that there was greater variability between early Pueblo period settlements than may have been originally evident. Examination of chronometric dates from excavated sites in the Puerco Valley suggests that the AD 600-900 interval can be divided in half. The Early Period (600-750) is characterized by a combination of large and small sites and presumably high degree of seasonal mobility. The two largest Early Period settlements (NA 14674/14675 and AZ-P-60-31) were located a short distance from one another on Puerco Ridge. Following a hiatus in pit house construction, the number of occupied sites in the Puerco Valley increased significantly after AD 750. At least three village-sized settlement were occupied during the Late Period, all of which contain public architecture; all the same, Late Period settlements most commonly contain less than four contemporary pit houses. The increase in the number of occupied sites may be accompanied by a shift in settlement patterns, as Late Period sites are consistently overlain by AD 900-1300 remains, but Early Period sites are less frequently re-occupied in later periods.

Chapter 4: The Methods for the Architectural Analysis

Introduction

Chapter 3 described the previous research and excavations that provide the data for this study. In this chapter I describe the methods I use in four separate architectural analyses of that data. I begin by discussing some of the underlying assumptions of research that uses patterning in architectural attributes to study identity. Then, after explaining how I bounded my study area and selected pit houses for inclusion in the analysis, I describe how each architectural attribute was defined and measured. I also discuss the kinds of information each attribute can provide, and explore a few problems that arise when using certain attributes in certain types of analysis. I then explain the steps involved in the four architectural analyses, which are ordered hierarchically from most basic and concrete, to most complex and abstract. The first analysis examines changes in the frequency of architectural attributes, like the frequency of benches, structure shape, and floor area, between the Early Period and the Late Period. This is constructed to provide information on general trends over time in Puerco Valley pit house architecture, but also reflects underlying changes in subsistence, mobility, and family size.

I then describe the Elaboration Index, a method of measuring the amount of materials and energy invested in a structure. Although I arrived at my method independently, upon further investigation I found it is very similar to the approach used by Diehl (2001). The Elaboration Index ranks different architectural attributes on an ordinal scale, then pools these results to provide an "elaboration score" for each structure in the Puerco Valley. I use the index to identify "less elaborate" pit houses that likely had shorter intended use-lives and exhibited less substantial construction, or were built of materials with low initial costs but high maintenance costs (see McGuire and Schiffer 1983; Diehl and Gilman 1996; Diehl 2001). Not only do these "Less

Elaborate" pit houses offer less material for the archaeologist to use in comparative study (because they tend to have fewer interior features), I believe they were never imparted with as much symbolic content as more permanent structures, and therefore did not communicate identity as strongly. Identifying these structures will help in the subsequent two analyses, which are geared towards exploring similarities between structures that result from a perception of close cultural affinity or shared identity on the part of the pit house builders.

Next, I discuss how I established the degree of similarity between pit houses in the Puerco Valley. I used a statistical measure of similarity—Gower's coefficient (1971)—to compare the 153 pit houses in the sample to each other. Gower's coefficient can be used with nominal, ordinal, and ratio level data, so it can incorporate continuous variables like floor area in square meters as well as nominal variables such as the presence or absence of a bench. Comparing all pit houses in the valley to each other produces a matrix that is comprised of coefficients representing the degree of similarity between pairs of pit houses. These values can be used to examine the relationships between pit houses on a single site (for example, how homogenous are the pit houses at Whitewater?), or the values from individual sites can be averaged and compared to one another (for example, how similar are the pit houses at Whitewater to those at LA 4487?). In each instance, I incorporate the conclusions from the previous two sections to aid in my analysis.

Finally, I again use Gower's coefficient, but this time to compare Puerco Valley pit houses to a sample of 141 other pit houses located on sites from around the northern Southwest. I do this in recognition of the fact that the Puerco Valley is a relatively small portion of the Southwest; patterns of similarity or difference that are hard to detect at the small scale may become evident at the large scale. In addition, if immigration fueled the growth in the number of sites in the Puerco Valley after AD 750, the migrants may have brought architectural traditions from their last place of residence with them. A regional comparison is necessary to identify these extra-Puerco architectural traditions. The regional comparison also attempts to provide a more nuanced view of large-scale cultural identities than has previously been achieved by studies distracted by concern with "Mogollon" and "Anasazi" identities. As new arrivals in the Puerco Valley from surrounding areas negotiate their position relative to other valley inhabitants, architectural traditions are reinterpreted in a variety of ways—the analyses described in the last section of the chapter are designed to allow for a multi-scalar and multi-faceted examination of architectural attributes.

Archaeological Patterning and Identity

Before elaborating on the steps of the analyses and their methods in greater detail, I want to briefly examine how Southwest archaeologist have used techniques like those I just mentioned to link architecture to identity. The relationship between architecture and identity is principally understood through the recognition of spatial and temporal patterns. At the most basic level this entails establishing in what order a sample of buildings were constructed and seeking similarities and differences between them. Some of these similarities and differences may be the result of changes in architectural traditions over time, whereas others may reflect regional distributions of style and technology. This approach has its roots in the cultural historical models of the early 20th century. The methods used to recognize patterns and distributions in the archaeological record have become more sophisticated, but the underlying rationale is very similar to earlier attempts to understand regional historical continuities in material culture. However, archaeologists now know that social relationships are far more complex than the discrete cultural/ethnic units recognized by early culture historians. Studies such as Bernardini's (2005a), demonstrate that Pueblo peoples tend to see themselves as part of much smaller groups than the culture areas defined by archaeologists. He goes on to explain that adherence to a kin-based descent group was of much greater importance in establishing a group's status and identity than allegiance to a larger social category primarily defined by geography. In addition, the intricate processes of migration have led to situations where adjacent communities are comprised of sub-clan-level groups from a variety of historical backgrounds, each of which expresses its identity through different customs, ceremonies, and ritual knowledge. Finally, Bernardini demonstrates that the continual historical processes that contribute to modern Hopi identity also occurred in 14th century ancestral Hopi villages.

Current theoretical perspectives on culture change, material culture, and society provide greater nuance to identity-based research, and moving beyond description and towards interpretation has been a hallmark of archaeological research since the 1960s. Several recent publications have studied architectural style, technology, and cultural identity in the prehispanic US Southwest (Van Dyke 1998, 1999, 2004; Clark 2001; Cameron 1998, 1999a; Lyons, Hill and Clark 2008; Bernardini 2005a, 2005b; Potter and Yoder 2008; Chuipka 2008, 2009; Fox 2002; Roth and Stokes 2006). The theoretical underpinnings of these publications vary widely, but the authors begin with a similar methodology. Most studies decide upon a number of architectural attributes with the potential to display regional or temporal contrasts. They examine these attributes within a sample of structures, categorizing them in terms of various attribute states. For example, a series of masonry pueblos within a region could be classified by whether they exhibit simple, compound, or core-and-veneer style masonry construction. Once the structures have been classified by their architectural attributes, patterns are sought in the data. Continuing with the example I presented, do all of the structures with simple masonry cluster within a single valley? If so, perhaps they represent a discrete architectural tradition. Alternatively, the clustering of this trait in a single area may be related to the availability of materials. Or perhaps there do not appear to be any patterns at all in the distribution of masonry styles. In this case, masonry style may not have been a signifier of any importance to the inhabitants of the region, and its occurrence varied randomly as a result of individual preference.

Actual case studies are much more complicated than the example I just gave. Environmental factors, sampling bias, and differential preservation of some attributes over others greatly affect the nature of patterning in the archaeological record. Natural and cultural transformations can be dealt with methodologically (Schiffer 1987). The meanings attached to particular architectural styles may have shifted while the actual style did not; the contextual nature of meaning in material culture has been recognized for some time (Hodder 1982), and examining a broader spectrum of social fields for change is one way of accommodating this. However, archaeologists looking at the same pattern can interpret its meaning in widely divergent ways depending on their theoretical perspective (for example the Binford-Bourdes debate, or the Grasshopper/Chavez Pass debate).

The biases of the archaeologist will always intrude into his or her interpretation of the past (Hodder 2004; Hodder and Hutson 2003). The only way this can be dealt with is by being as explicit as possible about the use of theory and underlying assumptions. This chapter explains the choice of architectural attributes for my study and describes the steps I took in each analysis. Along the way, I attempt to explain my rationale for each decision made. An overarching theme of this thesis is that *peoples' choices in house construction are a reflection of the frameworks in which they learned to build houses, mediated by the availability of materials and the constraints* *of the social setting in which they currently live.* This theme pays homage to the vast literature on cultural transmission (Stark, Bowser, and Horne 2008; O'Brien 2008; see articles in the Journal of Archaeological Method and Theory 2000 volume 7, numbers 3 and 4; also JAMT 2008 volume 15, number 1), which acknowledges that while early enculturation often forms the core of technical knowhow and competency as a social actor, situations later in life can greatly influence or alter traditional practices. It also follows Rapoport in recognizing that climate and environment are important—but not primary—variables in the design of vernacular housing (Rapoport 1969:19-26). Local environment renders some architectural forms impossible (no igloos in Albuquerque), but renders no architectural form inevitable. Rapoport (2000:148) also suggests that recognizable building styles result from the consistent and systematic application of rules; housing can communicate identity because it is a reflection of these culturally constituted rules. Finally, the theme presented above suggests that migration, mobility, and other processes that move people around the landscape, (such as captive taking— see Cameron [2011]), play important roles in cultural change. In the case of vernacular Southwestern architecture like pit houses, I assume population movement to be a greater contributor than trait diffusion to the distribution of architectural styles. Population movement forces people into novel social situations as they attempt to integrate into new roles, groups, or communities. The negotiation of architectural tradition is one aspect of this process.

Gathering the Data and Selecting Structures for the Architectural Study

Data for this thesis comes eastern Arizona and western New Mexico. I defined my study area fairly tightly around the Puerco River. The majority of projects that I gathered data from occurred in Arizona—by coincidence, the number of excavated early Pueblo sites drops off significantly in the part of the Puerco Valley located east of the New Mexico border, a pattern that reflects a very small early Pueblo population in that area (Windes and Van Dyke 2012:95).

Within Arizona, I bounded my study area by using the quadrangle system used by the Arizona State Museum (ASM). The ASM database geographically divides Arizona into a number of quadrangles labeled alphabetically from northwest to southeast. Each quadrangle, in turn, is divided into sixteen rectangles that correspond to USGS 15 minute maps. For this study, I chose excavated sites within rectangles that the Puerco River passes through (AZ K:11-15, AZ Q:1, and AZ P:4—the AZ denotes quadrangles in the state of Arizona, as opposed to New Mexico or other adjacent states which also use a quadrangle system).

I tried to gather data from every major excavated site dating between AD 600-900 that fell within these parameters. I drew from well-published sources such as Gladwin's (1945) White Mound village excavation report and Robert's (1939) volume on the pit houses in the Whitewater District. The majority of my data I gathered during a visit to the site files housed at the Museum of Northern Arizona (MNA), in Flagstaff, in the summer of 2010. This included the unpublished highway salvage reports for work done by MNA, and original copies of maps from the Coronado Project—which was initially undertaken by MNA. Some files pertaining to projects associated with the Chambers-Sanders Trust Lands (CSTL) were located at MNA, but I found others located at the Office of Navajo and Hopi Indian Relocation (ONHIR), also in Flagstaff. Apparently, MNA was transitioning away from being a primary file and artifact repository for this part of Arizona during the early 1990s at the same time the ONHIR offices were taking over responsibility for archaeological work on CSTL land. Copies of reports from CSTL projects are on file in Window Rock with the Navajo Nation Archaeology Department, but I did not examine the database housed there.

Only two sites in this study are located in New Mexico—NA 10088 and LA 4487. NA 10088 was recorded in the 1960s when MNA was still involved in salvage archaeology projects, so it has an "NA" number (associated with MNA), despite being in New Mexico. I have no idea if there is an associated LA number given by the Laboratory of Anthropology in Santa Fe, New Mexico. Both MNA and the Laboratory of Anthropology had a habit of giving numbers to any site their personnel examined, leading to considerable overlap in numbering along the Arizona/New Mexico border. The records for LA 4487 are housed at the Laboratory of Anthropology in Santa Fe, New Mexico, although I am told that an unpublished manuscript report on the site is in the possession of the excavator, James Sciscenti (T. Windes, personal communication 2010). I examined a number of cultural resource management reports from the upper reaches of the Puerco River, but as I mentioned before, there was little early Pueblo habitation in those higher elevation areas, and I identified no excavated pit houses.

The only significant gap in my data that I am aware of are sites excavated by William Wasley for the Arizona State Museum (ASM) during highway salvage projects in the 1950s, and a re-excavation of one of these sites by Alan Ferg in the 1970s. I did not travel to the repository at ASM, but I believe that less than 15 early Pueblo period pit houses are included in the files I did not examine. Aside from NA 6639—which serendipitously fell out of the file cabinet—I did not examine NA numbers below NA 8000. The location of many of these sites, particularly those below about NA 4000, are not well known because they were recorded before detailed maps of the Puerco Valley were available, while I found the information recorded at others to be inconsistent or too fragmentary to work with. After spending a few precious days wading through the convoluted trail of paperwork on these early-recorded sites, I realized it was more time-effective to target the later ones.

I ultimately ended up with data from twenty-three sites excavated between 1931 and 1992. The next task was to decide which structures to include and which to exclude. I initially took a very open approach to defining "pit houses" within these published reports and unpublished files. However, as the goal of the study is to understand domestic, vernacular architecture, I became stricter in my definitions and began to remove structures that may not have primarily functioned as *houses*. Often, the presence of a hearth is taken as an indication that a structure is a habitation, but I quickly realized that many of the "less elaborate" structures would be eliminated under this criterion. Ultimately, I relied on the excavator's decision that a structure was, in fact, a habitation. In a few cases, I made my own subjective evaluation, based on the kinds of artifacts associated with the structure, its internal features, and other structures on the site. In most cases, the decision to include a structure was not difficult. However, I wrestled with a few; for example, there are a number of large, jacal-walled structures excavated by SWCA at NA 14674 and 14675 that may be habitations or communal work areas. I decided to exclude these structures because I could not be sure of the fact that they were habitations. In another case, I believe that I may have incorrectly included a couple of surface rooms at Twin Butte used primarily for food processing or other activities (Structures A and F2). Obviously dichotomizing between "habitation" and "activity area" is a fairly subjective enterprise especially considering that covered activity areas can easily become part-time, summer season habitations in most cases. The number of pit houses in the database that fall into this grey area is relatively small, however, and I am not concerned that the inclusion of a few activity area/habitation structures has significantly altered the results. If anything, these structures will fall into the "less elaborate" pit house class—which is precisely what they are. After applying these criteria, I was left with 153 excavated pit houses to include in the architectural study.

Data quality was also an issue. I tried to include as many structures as possible, even if they were missing data. Of the 153 pit houses in the study, a few ultimately play little role in the analyses discussed in Chapter 5 because they were missing too much data to be of value in particular operations. Most of these are either at NA 14674, 14676, and AZ-P-60-31, sites that are located in sand dunes, subject to extreme erosion, or, in the case of AZ-P-60-31, were heavily damaged by recent activity.

A Description of the Architectural Attributes used in the Study

Each of the four analyses is concerned with different aspects of pit house architecture, with the ultimate goal of better understanding the negotiation of cultural identity within the early Pueblo period Puerco Valley. Therefore, I used different architectural attributes and attribute states in each analysis. Some attributes and attributes states were used in multiple analyses, while others were only used once. When I broadened my investigation to pit houses across the northern Southwest, the data became less homogenous as a result of different archaeological recording practices in different areas. I was forced to use a slightly different group of attributes to compare the Puerco Valley to other regions to accommodate this fact. The attributes used in each analysis are shown in Table 4. Before explaining in the greater detail the four analyses described in brief at the beginning of the chapter, I begin by describing just what is referred to by each architectural attribute, which operations I used each one in, and how I used them.

Attributes and Attribute States	Descriptive Statistics	Elaboration Index	Puerco Valley Analysis	Regional Analysis
floor area	X	X	X	
depth	X	X	X	
structure shape				
circular	X		X	X
oval	X		X	X
sub-rectangular	X		X	X
D-shaped	X		X	X
irregular	X		X	X
unknown	X		X	X
roof construction				
primary posts	X	X	X	
primary posts and perimeter posts		X	X	
four primary posts		X	X	
four primary posts and perimeter posts		X	X	
perimeter posts	X	X		X
cribbed-log	X	X		
upright poles	X	X		X
no postholes	X	X		X
unknown				
cribbed-log or upright poles				X
five or less primary posts				X
Post Location				
offset from wall			X	
adjacent to wall			X	
unknown			X	
not available			X	
Number of Posts			X	
Wall Preparation				
native earth		X	X	
adobe/plaster		X	X	
jacal		X	X	
slab-lined		X	X	

masonry		X	X	
unknown			X	
Floor Preparation				
native earth/use-packed		X	X	
adobe/plaster		X	X	
flagstone		X	X	
Ventilator Style				
present				X
absent	X			X
shaft/tunnel	X	X	X	
trench	X	X	X	
chimney	X	X	X	
unknown			X	X
Ventilator Material				
earthen		X		
adobe		X		
masonry		X		
Ventilator Orientation				
N	X		X	
NE	X		X	
E	X		X	
SE	X		X	
S	X		X	
SW	X		X	
W	X		X	
NW	X		X	
Antechamber				
present				X
absent				X
unknown				X
Hearth Style				
none	X	X	X	
hearth slabs or burned area on floor	X		X	
burned area on floor		X	X	
hearth slabs		X	X	
circular	X	X	X	
rectangular	X	X	X	
unknown			X	

Hearth Elaboration				
none		X	X	
ash box		X	X	
ladder rest		X	X	
ash box and ladder rest		X	X	
side hearth		X	X	
unknown			X	
Ash Pit				
present				X
absent				X
unknown				X
Hearth Location				
not available			X	
central			X	
against wall			X	
offset			X	
offset towards vent			X	
unknown				
Hearth Material				
not available				
earth		X		
adobe		X		
slabs		X		
unknown				
Wingwalls				
present	X	X	X	X
absent	X	X	X	X
unknown	X		X	X
Wingwall Material				
not available				
adobe				
slabs				
slabs and adobe				
Wingwall Elaboration				
not available				
present		X		
absent		X		
Adobe Floor Ridges				
present				X

absent				X
unknown				X
Bench				
present	X	X	X	
absent	X	X	X	
unknown	X		X	X
one-quarter				X
one-half				X
three-quarters				X
full				X
Interior Storage				
present	X		X	
absent	X		X	
unknown	X		X	
Surface Structures				
none			X	
miscellaneous pits			X	
cists			X	
adobe rooms			X	
jacal rooms			X	
masonry rooms			X	
Burning on Abandonment				
present	X			
absent	X			
Trash-Filled on Abandonment				
present	X			
absent	X			

Table 4: Attributes, Attribute States, and the Analyses They Are Used In

Floor Area

I determined the floor area of the pit houses in this study by redrafting plan maps at a standardized scale and measuring area with a polar planimeter. Floor area does not include antechambers, alcoves, or passage entries, and if a pit house contained a bench, area was measured inside it. I made no attempt to exclude the floor area occupied by storage pits, hearths, or other floor features. Within this study, floor area plays a variety of roles. It is a component of the "Elaboration Index" because pit house size conditions the amount of materials necessary for construction. Very large structures that nonetheless have few internal features still require a good deal of energy expenditure, and by including floor area in the Elaboration Index large but simple structures will not be at a disadvantage to small but complicated structures. I include floor area in the Gower's coefficient calculation for structure-to-structure comparisons within the Puerco Valley, because size is one component of the organization of interior spaces. I did not include floor area in the Gower's coefficient calculation for comparisons between Puerco Valley pit houses and others in northern Southwest because I was not able to reliably determine how floor area was calculated in other studies. I found large discrepancies between floor area estimates that used standard formulae for calculating area and those arrived at using the planimeter. Although the floor area of certain pit house shapes was consistently over- or under-estimated, without knowing the specific formulae used in other studies the Gower's coefficient would not produce results consistent with the intra-Puerco Valley analysis previously described.

Floor area is one of the most visible and archaeological accessible architectural attributes (Cameron 1999b:201). Cameron (1999b) provides a summary of the interpretive applications of floor area, which includes: estimating population (Naroll 1962; Bullard 1962), determining room function (Hill 1970), studying social organization (Crown and Kohler 1994; Reid and Whittlesey 1982), social status (Lightfoot and Feinman 1982; Bowser n.d.), and cultural identity (Baldwin 1987). Applying these approaches to architectural data from Oraibi, Cameron (1999b) found that floor area was most useful for understanding the organization of construction. More recently Bernardini (2005b:90-91) has suggested that because room size reflects underlying differences in proxemics systems and technological traditions, populations with distinct social and historical backgrounds may have inhabited 14th-century ancestral Hopi pueblos with different rooms sizes.

I include floor area in this study because the ordering of interior, domestic spaces both affects and is affected by other aspects of society and culture (Bourdieu 1977); the circumscription of space within the house is a reflection of prevailing social order as well as providing an arena for the redefinition of that order (Parker Pearson and Richardson 1994c). That two groups of people gave different meaning to space will be reflected in the spaces they created, even if those meanings themselves cannot be directly accessed. Defining these differences is important to assessing cultural diversity within an area like the Puerco Valley that was inhabited by multiple groups of people.

Depth

I measured depth either directly from profiles of pit houses drafted in published reports or sketched in unpublished field drawings. In cases where profiles were unreliable or not available, I relied on narrative descriptions. In a few cases, depth could not be determined, most notable at LA 4487 because I could locate no excavation records beyond a site map, a ceramics tally on a brown paper bag, and a three-page preliminary report. Depth was a variable in all of the analyses except for the regional comparison of similarity. I included it in the descriptive statistics to track changes over time than might be related to increasing sedentism, because a deeper structure require more effort to excavate, thus suggesting a greater intended length of stay. For the same reason, I included depth in the computation of the Elaboration Index. In a replication study of an AD 800s-era pit structure from the Northern San Juan, the single largest time investment was excavating the pit, which took 330 hours (Glennie 1983:95). The next most time-consuming activity was roof construction, which took 168 hours. Depth was a variable in the structure-to-structure similarity comparison in the Puerco Valley because I used consistent methods to measure it from pit structure profiles and descriptions, but I excluded it from the regional comparison because I was unsure of how previous researchers measured depth, and also because I was more interested in the distribution of features like ventilators, antechambers, adobe floor ridges, and roof construction.

The depth of a structure's floor below the ground surface has not been as popular a variable as floor area in looking at either room function or cultural identity, likely because many architectural studies incorporate data from pueblo surface rooms that are not subterranean. Bullard (1962:121,127) saw little correlation between pit structure floor area, depth, and structure shape, and found that temporal trends in depth varied from region to region in the Southwest. In the Northern San Juan region, Wilshusen (1988b) found that among Dolores area pit houses an increase in depth over time correlated with greater investment in surface architecture. Deeper structures meant more sediment that could be used in constructing the jacal walls and wood and earthen roofs of surface storage and habitation rooms. Within the Zuni region, to the south of the Puerco Valley, the correlation between pit house depth and surface structures is less clear (Peeples, Schachner and Huber 2012). The long continuation of high residential mobility as well as a diversity of co-existing subsistence practices within a single region probably does not result in the same pattern observed among the Dolores area pit houses and surface rooms.

There is a direct relationship between the depth of a pit house and the construction of its roof. Shallowly excavated structures will require significantly more material above the pit to complete the walls and roof. Pit houses with benches may be a response to increasing depth.

Typical reconstructions of pit houses with benches depict the “leaner” poles of the structure resting on the bench and extending to the main roof superstructure. In deeper pit houses the construction of a bench may help mitigate against too much of the roof’s weight being borne by nearly horizontal poles—the bench allows the leaner poles to remain much closer to vertical. The columnar strength of wood is far greater than its longitudinal strength. All the same, Wilshusen (1988b) has proposed that the typical reconstruction is incorrect, and that leaner poles on benches are too flimsy to bear the weight of the dirt that rests on top of them. Finally, in the very deepest structures in the Northern San Juan region, benches disappear entirely, and it is hypothesized that beams were laid horizontally on the ground across the opening of the pit (Wilshusen 1988b:626). Most reconstructions of pit houses use the typical four-post roof pattern that is common in many parts of the northern Southwest, but there are many other possible roof construction techniques, judging from the diversity of posthole patterns found in pit houses. The relationship between pit houses depth and roof construction was not examined in detail for this study, but it is an aspect of structural engineering that needs to be further pursued.

Structure Shape

I grouped pit houses in this study into five different shape categories: circular, oval, sub-rectangular, D-shaped, and irregular. Circular pit houses have a length-to-width ratio of greater than 0.9, while oval structures have ratios below 0.9. Sub-rectangular pit houses are those which exhibit relatively straight sides in plan view, but have rounded corners. The distinction between sub-rectangular structures that have slightly curved sides and circular or oval structures was occasionally a very subjective distinction. D-shaped pit houses are typically oval or circular on three sides but flattened on a fourth side, which almost universally contains the opening for a ventilator that brings fresh air into the pit structure.

I used structure shape in all analyses except the Elaboration Index, because it is impossible to give ordinal rank to structure shape. Because pit house shape is a highly visible attribute, I felt that it was important to track how it changed over time within the Puerco Valley as well as compare the distribution of different shapes within the Puerco Valley and surrounding regions. Shape may be one of the most salient features for understanding identity. Shape is primarily governed by the nature of the interior space intended by the builder. Bullard (1962) noted that the Western Anasazi area (encompassing northern and eastern Arizona and southern Utah) is characterized by circular pit houses, whereas the Eastern Anasazi area (northern and western New Mexico and southwest Colorado) is characterized by sub-rectangular pit houses. As I have previously mentioned, this distribution (of culture area, not architecture) uncritically mirrors the traditional anthropological distinction between the modern Eastern and Western Pueblo. During the early Pueblo period, the distribution of these ethnic and linguistic distinctions may not have been the same; they may not have existed at all. The distribution of pit house shape requires further inquiry and the incorporation of recent theory on the permeability of culture areas and the fluidity of cultural identity.

As discussed above in reference to floor area, interior domestic spaces are often highly charged with social and cultural meaning (Parker Pearson and Richards 1994b; Bourdieu 1977; Lekson 1988). Houses encourage “repetition and routine” and formalized behavior (Whittle 1996), which contributes to the creation and maintenance of worldviews and norms of behavior. The shape of a pit house is therefore closely related to perceptions of appropriate or “typical” domestic space, ideas that are established through enculturation early in an individual’s life

(Lekson 1988:225-226). The selection of pit house shape can be a low visibility variable that stems from the habitus of the builder (who is generally the future inhabitant), and is a reflection of personal beliefs and values.

Pit house shape is related to the construction of the pit house's roof. Different methods of placing of main posts and primary and secondary beams are required for structures that are circular, sub-rectangular, D-shaped, or have different modes of entry. Among all but the deepest pit houses, the shape of the roof is an indication of the shape of the pit house. Because of its relationship to roof construction, shape is also a high visibility architectural attribute. In cases of population movement where households of diverse enculturative backgrounds encounter one another, structure shape may be a means by which groups signal identity (Potter and Yoder 2008:29), but it may also be malleable and subject to negotiation. Within areas of dense settlement such as villages and surrounding communities, pit house shape may be a highly structured architectural attribute because of its visibility. Recent immigrants may feel pressure to conform to the architectural standards of their new home as a means of establishing themselves within the settlement—which could lead to increased economic, social, and ritual opportunities.

Roof Construction

Roofs are the most complicated architectural attribute of a pit house, as well as one of the most variable. They are subject to material constraints, and are important in identity signaling because of their high visibility, but are also greatly affected by the intended length of stay in a structure. I classified roof construction in slightly different ways for each analysis. This was partially to satisfy the requirements of each analysis, but also because through the course of this study I found more meaningful ways of classifying roofs.

For the comparison of attribute frequencies between Early Period and Late Period pit houses, pit house roofs were grouped into five different categories: primary posts, perimeter posts, upright poles, cribbed log, and no postholes. Structure-to-structure comparisons using Gower's coefficient of similarity used a more complicated roof classification scheme. The biggest difference between this scheme and the one used with the descriptive statistics is that it splits rather than lumps. "Primary posts," "primary posts with perimeter posts," "four primary posts," and "four primary posts with perimeter posts" are all versions of the same roofing technology. If it was clear that the structure originally had a posthole pattern represented a four-post roof support system, then it was grouped into the "four primary posts" and "primary posts and perimeter posts" categories. Structures with less or more than four primary postholes, or where the evidence was especially equivocal, were placed in the other two categories.

Finally, a third classification was used for the regional comparison. All pit houses that exhibited five or less vertical primary posts were considered together as a group—in almost all cases these structures had four primary posts, or evidence supported interpretation of a four-post roof support system (e.g. three primary posts in three corners of a pit house floor, and poor preservation in the fourth corner). In nearly all cases a where pit house had six or more substantial postholes, these posts were placed around the perimeter of the structure adjacent to or actually in the structure wall. I placed these into a group of "perimeter post" structures. Structures that had no evidence of postholes comprised a third group. I grouped structures with upright poles and cribbed log structures in a fourth group. Grouping these two classes of structure together did not significantly change the results of the analysis because cribbed-log structures are only found in the Puerco Valley, and structures with upright poles are very uncommon outside the Puerco Valley and Hardscrabble Wash area. I do not know whether this is because these structures are reported as something other than “pit structures” or “pit houses” elsewhere in the northern Southwest (perhaps as “pit rooms”?), or because there is a greater degree of seasonal and residential mobility in the Little Colorado River drainage during the early Pueblo period. I would argue the latter, although as of yet I cannot rule out the former.

In hindsight, the first four categories used in the Puerco Valley comparative analysis (primary posts, primary and perimeter posts, four primary posts, four primary posts and perimeter posts) can probably be collapsed into a single category in future analyses. The biggest factor contributing to whether I considered a pit house to have perimeter posts in addition to primary posts was the preservation of the area just outside the excavated pit of the structure where the “leaner poles” or perimeter posts would rest. The upper-most portion of the pit house walls and the area immediately adjacent to the pit are the most prone to post-abandonment slumping. It is likely that almost all pit houses have some form of “leaner post” or perimeter post, and this became especially apparent while surveying the wider regional literature.

“Primary posts” (which basically encompass “primary posts with perimeter posts” “Four primary posts” and “four primary posts and perimeter posts” for the reasons given above) almost always occur as a set of four, and it is likely that they always had some form of perimeter posts or “leaner poles.” These perimeter posts or leaner poles can either originate on the bench of a structure or on the ground surface outside the pit of the structure, but they always rise to meet some portion of the superstructure of the roof—usually a square formed by secondary and tertiary rafters placed atop the upright beams. “Perimeter posts” generally occur as a series of more than 5 primary posts placed adjacent to the wall around the interior of a structure.

“Upright poles” refers to situations where the postholes are small enough to suggest that the posts they held probably did not support the substantial roofs associated with “primary posts” and “perimeter posts.” They most likely supported either bent-pole style roofs that were covered with reed matting or brush, or wickiup-style structures similarly constructed of reeds, branches, and brush. In many cases these structures may also have been covered in a layer of earth. Upright poles are generally not found in quadrilateral posthole patterns, but rather as a series of small holes ringing the perimeter of shallow round pit structures, or as irregularly placed posts within the interior of a pit house.

“Cribbed-log” style roof construction is practically unique to the Puerco Valley during the early Pueblo period. This term can refer to two related but distinct construction techniques. During the early AD 900s and into the late 1200s, kiva roofs are constructed by placing logs between a series of masonry pilasters (typically numbering 5-8) that are located around the interior circumference of the pit structure. Subsequent courses of successively shorter logs are “cribbed” on top of these beams, their ends being slightly offset from the pilaster with each successive course. This creates a strong, stable, corbelled-dome roof. This is not the style of cribbed-log roof construction common in the Puerco Valley between AD 600-900. Rather, shallow, small diameter pits (2-3m) are excavated into the ground. A series of small “cribbing stones” (simple sandstone slabs no bigger than 15-20cm across) are placed around the interior perimeter of the pit, and on these is constructed a cribbed, corbelled dome of small diameter beams. The first course of beams is typically firmly plastered in place atop the cribbing stones. The resulting dome is then covered in earth and adobe. The size of the beams are small enough to suggest they were often only branches of trees and not the trunk; all the same, they lack of easily available wood in parts of the Puerco Valley led to the salvaging of the roofs or most cribbed-log structures. The construction technique is confined to only a few sites in the Puerco Valley (NA 14674/14675, NA 14681, 14682, 14683, 8941, and AZ-P-60-31). It otherwise resembles Basketmaker II-era structures excavated at Talus Village, near Durango, Colorado, by Morris and Burgh (1954), and a series of Archaic pit structures from the Gunninson area of Colorado (Stiger 2001).

Structures that otherwise exhibited good preservation of the floor or floor features but had no evidence of postholes I classified as having “no postholes,” while those where preservation was a factor in discerning roof construction were classified as “unknown.” At least three reconstructions are possible for pit houses that exhibit no postholes. Adobe walls could be constructed outside the excavated pit, and a variety of roof styles constructed on these walls (Drake 2007:222). Alternately, if the pit house is deep enough (probably in excess of 1.75m deep), beams could be placed from edge to edge horizontally across the hole resting on the ground surface (Wilshusen 1988b:626). Finally, the roof could have been so insubstantial that it left no evidence of its construction.

The reason for the confusing classification systems described is that through the course of this analysis I realized that roof construction deserves much greater consideration than it has generally received. I say generally, because there are some excellent studies of pit structure roof technology—see Wilshusen (1988b) and Bullard (1962). On the whole, however, the diversity in pit house roof construction has been overlooked as an important facet of cultural identity. The construction of the roof of a pit house is related to its shape and depth. It is also the most complicated portion of the pit house and contains the most potential for reflecting the identity of the inhabitants. In cases where the roof protrudes above ground, it serves as a reminder of the shape of the pit structure. Structural elements of the roof may protrude through the dirt covering, providing clues as to the methods of roof construction. In these cases, its visibility within a settlement means that roof construction may be subject to negotiation between the constraints of social pressure and the decisions a builder makes based on prior construction experience and enculturation.

Roof construction may be a gendered activity mainly undertaken by males. While no ethnographic accounts describe the methods of construction of pit houses by modern Pueblo peoples, they do describe the construction of stone and adobe pueblos. Perhaps surprisingly (or not!), most steps in house construction are the purview of Pueblo women—wall building, mortar mixing, plastering, and the construction of interior features (Stevenson 1894:23-24, 1904:349; Mindeleff 1891:100-102, 129; Stevenson 1904:349; White 1932: 33). The one activity men are typically associated with is timber procurement and the initial stages of roof construction. Mindeleff (1891:102) describes the construction of a roof at Oraibi:

"The roof is always made nearly level, and the ends of the beams are placed across the side walls at intervals of about 2 feet. Above these are laid smaller poles parallel with the side walls, and not more than a foot apart. Across these again are laid reeds or small willows, as close together as they can be placed, and above this series is crossed a layer of grass or small twigs and weeds. Over this framework a layer of mud is spread, which, after drying, is covered with earth and firmly trodden down."

Elsewhere, Mindeleff mentions that men move most of the beams into place, while women complete the roof by laying the layers of poles, reeds, and earth.

Stevenson corroborates this division of labor and the construction methods used. At Zuni Pueblo she states that "After the logs are placed, carefully selected willow boughs are laid crosswise upon rafters, brush is spread over these, and the whole is covered with earth" (Stevenson 1904:349). Men place the initial beams that support the upper layers of the roof. At Zia Pueblo, the men "do all the carpentry work…they also lay the heavy beams, and they sometimes assist in the other work of the building" (Stevenson 1891:23).

Two important facts can be drawn from these descriptions. First, roof construction in the historic pueblos closely mirrors the reconstructed roofs of many early Pueblo period pit structures excavated in the northern Southwest. After a superstructure of large beams is erected (the largest actually being the primary beams placed on top of the main upright posts—bearing the weight of the roof longitudinally they must be of greater diameter), a layer of smaller poles is placed side-by-side perpendicular atop the first rafters, followed by another perpendicular layer of smaller poles, reeds, and brush (Figure 10). This in turn is topped by adobe and earth. Although the material supporting the rafters has changed—from wooden posts to stone and adobe walls—the actual roof construction methods have changed very little. Second, ethnographic accounts support the idea of a division of labor. Men are in charge of the carpentry, acquiring timber, trimming logs, and securing the largest beams in place. Women oversee most other aspects of house construction, such as the building of the walls, the completion of the roof, the construction of interior features, and final plastering of the entire house's walls, floor and roof.

Further inquiry is necessary, but I tentatively propose that during the early Pueblo period men were more involved in the construction of pit house roofs, particularly the placement of primary posts, rafters, perimeter posts, and "leaners," while women were more involved in the construction of interior features, and the plastering of the floors, walls, and roof. The actual excavation of the pit may have been done by either sex. The ethnographic data suggest that men have a limited role in most aspects of house building aside from the heavier tasks, which excavating the pit certainly is. At the same time women are described as the primary masons and wall builders, and building the walls of a pit house and excavating the pit are practically the same activity.

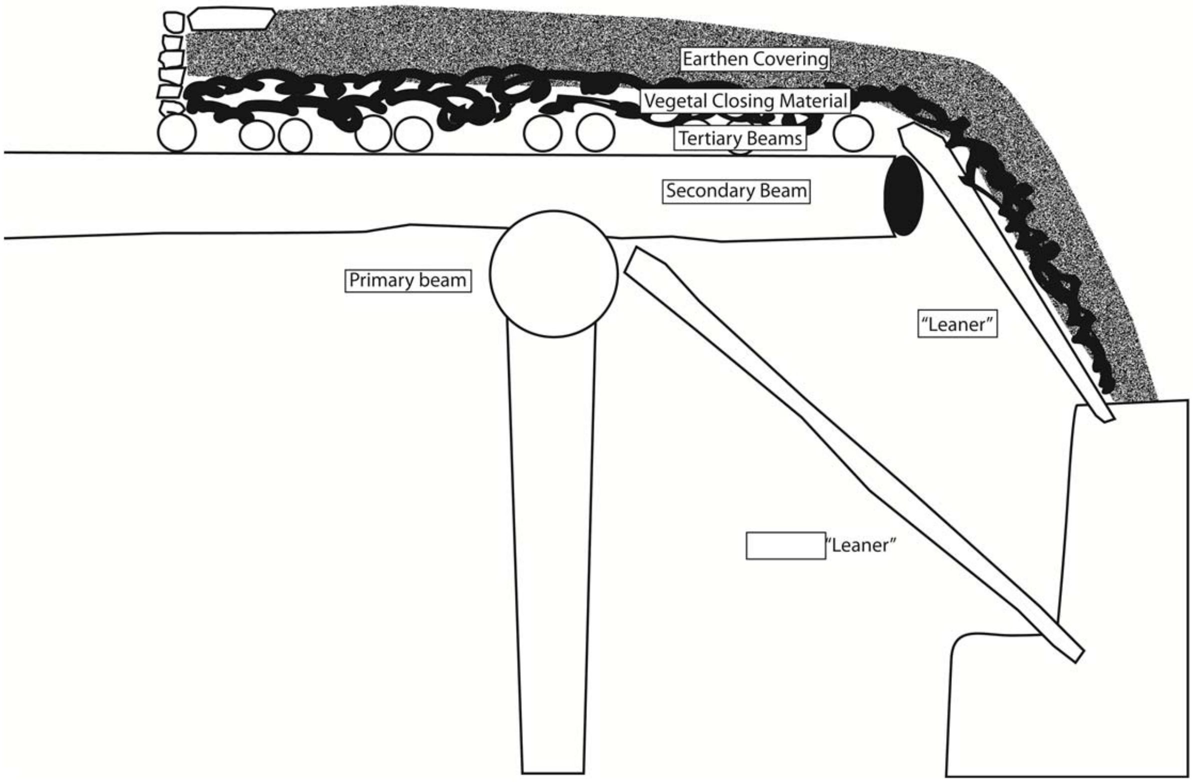

Figure 10: Pit House Roof Construction. Adapated from Wilshusen (1988:fig 18.8).

Finally, roof construction is also related to mobility and the intended length of occupation of a pit house. Structures that are only intended for summer season occupation may have less elaborate or substantial roofs than those that are meant to provide shelter through the winter months. Short-term structures are therefore more likely to have upright pole roof construction, which was then covered in brush and earth. In some cases, pit houses show no evidence for postholes of any size. Some of these contain formalized interior features and may have been roofed by placing beams across upper jacal or adobe walls that have not preserved well in the archaeological record. Others may have had very flimsy roofs.

Some structures that were intended for year-round occupation may still have had relatively less substantial roofs than others. The orientation and size of many of the postholes associated with perimeter post-style roof construction suggests they could not bear as much weight as a four-post roof support design. Without main upright posts set in the floor of the pit house, the distance the primary beams span is greater because they must stretch from edge to edge of the pit.

The formal construction of a pit house roof is the most complicated step in the building process, requiring the greatest number of prepared materials, the greatest variety of material (wood of a range of sizes and shapes, reeds, brush, adobe, and probably cordage), and the most technical knowledge. Roof construction may have made a very potent statement about group affiliation and cultural identity. Given the structural requirements and somewhat specialized knowledge that would have been essential for building longer-lasting, durable roofs, construction techniques for the most elaborate and substantial roofs were probably not haphazard and did not result from trial and error on the part of the builder. Rather, these techniques probably were traditional knowledge passed from generation to generation or learned by assisting someone with greater house-building experience.

Post Location and Number of Posts

These attributes were only used for the structure-to-structure comparison within the Puerco Valley. During the course of initial data gathering I noticed a pattern where some pit houses had primary posts that were adjacent to the wall or even incorporated within it, where others had primary posts that were separated from the wall by a half a meter or more. This may be because the distance between the primary posts remained fairly constant as a result of the maximum available length of secondary and tertiary rafter beams, while the diameter of the pit house changes based on the needs of the builder. I did not pursue this idea further because it was beyond the scope of this study, but I did use post location as a variable in Gower's coefficient computation for the Puerco Valley structures.

Likewise I recorded the number of primary posts within each structure, but ultimately poor preservation caused this variable to be relatively meaningless. I used in the Gower's coefficient computation for the Puerco Valley, but for a great deal of pit house the value had to be ignored because it was unknown.

Wall Preparation

Wall preparation was a variable in the Elaboration Index as well as the structure-to-structure comparison within the Puerco Valley. Walls of pit houses could be comprised of native sediment, plastered with adobe, lined with poles and adobe (jacal), slab-lined, or lined with coursed masonry. For the Elaboration Index these variable states were ranked from less elaborate to more elaborate. For the Gower's coefficient, different construction techniques were taken to represent learned techniques from other members of the same social group. However, it is possible that some techniques, such as slab-lining, are used primarily to shore up the walls of pit houses excavated into relatively soft, sandy sediments.

Floor Preparation

As with wall preparation, floor preparation was taken to be an indicator of elaboration as well as of enculturative framework. Floors were classified as consisting of use-packed native sediment, adobe or plaster, and flagstone. Only a handful of structures, all from NA 10088 exhibited flagstone floors.

Ventilator Style

Ventilators are not necessary in pit houses, but they do allow fresh air to circulate through the house and assist in providing oxygen for hearths and encouraging smoke to exit through roof entrance holes. Multiple methods of ventilator construction exist. In this study, ventilator construction techniques are classified as shaft/tunnel, trench, chimney, none, or unknown. Shaft/tunnel ventilators are common during the early Pueblo period throughout the northern Southwest and consist of a vertical shaft dug some distance from the pit house, and connected to the main pit house chamber by a narrow tunnel. Where the tunnel enters the pit house, occupants frequently placed a specially-made stone "O-ring" or vent aperture. Shaft/tunnel ventilators are typically earthen although they are occasionally plastered in sandy sediments, and in the later 800s and 900s they are often masonry lined. "Trench" style ventilators involved excavating a trench into the floor of the structure. This trench extended from the hearth beyond the walls of the structure. Wooden slats, stone slabs, and adobe are used to cover the trench, creating a surface flush with the floor of the pit house, and filling in the area beyond the walls of the structure. The end result is similar to a shaft/tunnel style ventilator, although the construction methods are different. Trench-style ventilators do not become common until the late AD 800s, and they tend to incorporate more masonry and adobe into their construction than shaft/tunnel style ventilators.

A "chimney" is a specialized style of ventilator that is largely confined to the Puerco Valley. Chimneys are closely associated with cribbed-log style roof construction. They consist of a very short tunnel that extends from the wall of the structure to a coursed-masonry "chimney" that rises about a half a meter above the ground. The tunnel is short enough that the chimney is largely incorporated into the cribbed-log roof of the structure. The tunnel is almost always lined with slabs. Nearly every structure with a chimney also has a slab-style hearth.

"No ventilator" is a category used when preservation of the structure was good enough to suggest that the lack of a ventilator was real. "Unknown" is used when preservation was poor, or a backhoe trench, road cut, or other disturbance had removed the portion of a structure where a ventilator would be expected to occur.

These four categories were used to track change in attribute frequency between periods, in the Elaboration Index, and in the structure-to-structure comparison within the Puerco Valley. The presence or absence of a ventilator was noted for the regional comparison, but further details concerning specific type were not included.

Wendorf (1953:109) suggested that the ventilator replaced the passage entry sometime after AD 700 in the Little Colorado Region, from whence it diffused to other areas. Bullard (1962:144) contested this, feeling that evidence from the Cerro Colorado site suggests that the ventilator replaced the antechamber. He agrees that it diffused northward from the Little Colorado region. I have not traced the origin of the ventilator in detail so I cannot comment on which is more likely, although I imagine the situation does not demonstrate a clear evolutionary path from one feature to another. The distinction between big shaft/tunnel ventilators, small passage entries, and deep, small antechambers is occasionally hard to discern, especially when factoring in poor preservation and the fact that ventilators are frequently not excavated—only noted—on recent CRM projects that are pressed for time. Big ventilators may have occasionally been used as pit house entrances and exits.

Fox (2002) found that ventilator construction was one of the features most clearly linked to cultural identity in Puerco Valley pit structures after AD 900. In a comparison of AD 900-1275 pit structure architecture in the Puerco and Southern Chuska Valleys, he found a clear preference in the Puerco Valley for shaft/tunnel style ventilators, whereas the Southern Chuska Valley structures more frequently had trench-style ventilators. Ventilators are not the most highly visible feature in a pit house, although the opening of the ventilator inside the pit house is often the most differentiated aspect of its construction. For example pit houses at Blue Mesa near Durango, Colorado, often had ventilator openings filled with an adobe plug containing two holes, creating "nostril"-like openings (Potter and Yoder 2008:24; Wilshusen 2007:393; J. Chuipka 2012 personal communication). These ventilator apertures differentiated Blue Mesa pit houses from others located further west in Ridges Basin, which tended to lack this feature. The double ventilator hole feature is reminiscent of the two holes associated with an adobe wall separating the passage entry from the main chamber of Pithouse D at Jeddito 264 (Daifuku 1961), as well as the side hearths located within some of the earliest pit structures at NA 14674 in the Puerco Valley (Greenwald et al. 1993:13-14)—discussed in more detail later on.

Within the Puerco Valley the lack of a ventilator may be of greater importance than the form it takes. Structures that are only intended to be used for a short period of time (such as during a single summer season while farming, or during a single winter while preparing to build a more elaborate, permanent pit house) may have no ventilator at all. Ventilators, like modern chimneys, seem to require special knowledge and practiced technique to properly execute. Several pit houses have been replicated in the past thirty years—none have managed to make the ventilator/hearth/smoke hole system draft the structure properly (R. Wilshusen personal communication 2011). This may be a feature that is only worth adding if the inhabitants intend to occupy the structure for more than a few months.

Alternately, a structure may have no ventilator because it instead has an antechamber or passage style entry. This was considered in the region-to-region comparison of pit house similarity, because some regions neighboring the Puerco Valley had much higher frequencies of either antechamber or passage entries.

Ventilator Material

I used this variable only in the Elaboration Index. If a pit house did not have a ventilator it was categorized as “not available.” Most pit houses have earthen or adobe ventilators, although a few had masonry lined ventilator shafts. Chimneys are by default of masonry construction, unless a report explicitly stated otherwise.

Ventilator Orientation

Ventilator orientation generally determines the major axis of the pit structure. A ventilator can be located in one of the eight principle directions (NE, E, SE, S, etc.), and typically a formal pit house will display some degree of symmetry along a line that bisects both the hearth and the ventilator. Most archaeologists by convention consider the side of the structure containing the ventilator the “front” and the side opposite the “back,” although whether these semantic categories actually meant anything in prehistory has never been rigorously examined. Out of a sample of 308 pit houses, Hensler demonstrated a tendency across the northern Southwest for the ventilator (or passage entrance or antechamber in the absence of a ventilator) to face south (19.8%), southeast (67%), or east (10.7%) (Hensler 1999:925), and Fox

(2002:25) suggests that this is partially conditioned by the direction of prevailing winds. When storage cists, storage pits, or surface rooms occur with pit houses they tend to be located north or northwest of the pit structure—in the "back"—and trash deposition tends to occur to the south or southeast—in the "front."

In this study, ventilator orientation is recorded as being one of the eight principle directions rather than as compass bearings because many reports are not specific about whether plan maps use true or magnetic north. The eight principle directions are considered to record ventilator orientation within this margin of error. Change in ventilator orientation between the Early and Late Period is included in the section that examines changes in attribute frequency, and it is used in the structure-to-structure comparison within the Puerco Valley. Because ventilator orientation probably has little meaning in terms of energy investment I did not use it in the Elaboration Index. The regional comparison does not use ventilator orientation either, because this variable has been demonstrated to be so consistent across the entire northern Southwest.

Antechamber

This variable was recorded as present or absent and is used in the regional architectural comparison as a counterpoint to the presence or absence of a ventilator. Antechambers, passage entries, and alcove entries were all considered within a single category essentially encompassing "non-roof"-style entries. It is possible for a pit house to have both an antechamber, alcove, or passage entry, and a ventilator. In cases where it was unclear whether a feature was a passage entry or a ventilator, the structure was categorized as having both.

An antechamber is a small pit room usually attached to the main chamber of the structure by a short passage, although occasionally it is simply a large extension of the main chamber.

Passage entries are long, narrow passageways that enter the main chamber of the structure. They extend from the ground surface to the floor of the pit house like a ramp, are entered via a ladder at the far end, or require a step down into the pit house at the end of the passage. Alcove entries are appended to the side of pit structures, and serve as a spot of the placement of a ladder, or in shallow pit houses act as a step down to enter the structure.

Bullard (1962:137-142) examined the distribution of antechambers and passage entries. He found that antechambers are more common in the Eastern Anasazi region (the Northern San Juan, Chaco, and eastern Cibola regions), while passage entries are most common in the Mogollon region. Bullard had a limited dataset for northeast Arizona and the Northern San Juan, so this distribution may change with newer data.

Although the distinction between a ventilator, an antechamber, and a passage entry is subtle, it directly affects the way in which the pit house was entered. Structures with ventilators almost certainly were entered through the roof, while those with antechambers or passage entries were entered from ground level. Alcove entries are a form of roof entry, just located at the edge of the pit house rather than in the middle. Roof entries verses ground-level entrances condition the use of space within the structure in vastly different ways. After about AD 900 passage entrances, alcoves, and antechambers become very uncommon modes of entry into pit houses or kivas in the northern Southwest, but they remain the primary means of entry into Late Three-Circle Phase pit houses in the Mogollon and Mimbres regions.

Hearth Style

I categorized hearths as circular, rectangular, “hearth slabs,” or “burned area on the floor.” I also recorded the lack of a hearth. Circular and rectangular hearths are excavated into floor of the pit house. “Hearth slabs” refers to a particular kind of hearth associated with chimney style ventilators. They are flat stone slabs placed in front of the spot where the chimney enters the pit house. In almost all cases they show evidence that small fires were lit on the slabs and vented through the chimney. Some structures did not have formalized hearths but nonetheless had burned areas of the floor where fires were occasionally lit.

I tracked changes in the frequency of different hearth styles over time is included in the descriptive statistics section, and hearth style was a variable in both the Elaboration Index and the structure-to-structure comparison within the Puerco Valley. I did not include hearth style in the regional analysis because in nearly every pit house hearth style was “circular,” and the variable contributed little to understanding pit house diversity in the northern Southwest. For the descriptive statistics, the categories “hearth slabs” and “burned area on the floor” were pooled in order to meet the requirements of the chi-squared statistic.

Hearths are possibly the most central feature of a house, as they provide warmth, light, and are essential for cooking. Within pit houses, which are single room dwellings, the hearth and its associated activities shares space with all the other activity systems taking place within the domestic setting. Some authors regard this placement of cooking and eating facilities in the same space as other activities as reflecting a co-operative and egalitarian mode of work (Glassie 1975; Parker Pearson and Richardson 1994b). Forming such a fundamental part of the domestic space, I would expect hearth style to be closely related to social identity, although the relative homogeneity in its shape across the Southwest would seem to suggest otherwise. More subtle aspects of hearth construction such as the addition of elaborating features and actual construction techniques and materials (both discussed below), may be more informative.

Hearth Elaboration and Ash Pits

I used hearth elaboration in both the Elaboration Index and the structure-to-structure comparison within the Puerco Valley. Hearth elaboration attribute states include none, the presence of an ash pit, the presence of ladder rests, the presence of both an ash pit and ladder rests, and the presence of a side hearth. Ash pits are small subfloor bins located adjacent to the hearth. Ladder rests are typically two small holes—frequently plastered—for the placement of the base of the entrance ladder. Side hearths are features confined to a few of the earliest structures at NA 14674. They consist of a small depression for holding a pot next to a flat, plastered space that shows evidence of burning. An extra opening from the structure's chimney feeds air to the fire. Side hearths appear to be specialized features for cooking in pots in structures that have chimneys and hearth slabs.

Ash pits can also be used as ladder rests (Roberts 1939:40, 50), so in this study ladder rests refers specifically to the presence of two holes in a position near the hearth. Likewise Bullard (1962:159) felt the exact function of ash pits was baffling, given the evidence for multiple uses. Because of the difficulties in defining the differences between ladder rests and ash boxes, I did not use hearth elaboration as a category in the descriptive statistics. Whether the extra bins held ashes or ladders, or both, their presence is important, so for the regional comparison, I did record the presence or absence of an ash pit.

Hearth Location

This variable proved difficult to classify in a meaningful way. Categories included central, against the wall, offset from central, and offset towards the ventilator or entryway. I only use hearth location in the structure-to-structure comparison in the Puerco Valley.

Hearth Materials and Construction

I grouped hearth construction and materials into three categories: earthen, which had no preparation other than the excavation of a basin; adobe, which consisted of either adobe-lined or adobe-collared hearths; and slab-lined, where stone slabs were plastered into place to form the sides of the hearth. Hearth materials and construction were only used in the Elaboration Index, ranked in order of energy investment. Adobe-lined hearths are considered more elaborate than earthen ones, and slab-lined hearths more elaborate still because they require both getting stone and mixing adobe to plaster the stone into place. The advantages of adobe- and stone-lined hearths are found mostly in their maintainability (McGuire and Schiffer 1983).

Fox (2002) combined hearth style and hearth materials and construction into a single "hearth type" category—and in hindsight this appears to be a more productive classificatory method. Comparing structures in the Puerco Valley with those along the Chuska slope in New Mexico, he determined that hearth type had utility for examining ethnic or cultural identity (Fox 2002:110). My classification system was not well suited to elucidating subtle differences in hearth type either within the Puerco Valley or between regions of the northern Southwest, so I ultimately left it out of most analyses.

Wingwalls, Wingwall Elaboration, and Adobe Floor Ridges

Wingwalls are partition walls that divide a structure into two unequal portions. Wing walls are typically located on the side of the pit house that contains the ventilator opening, passage entry, or antechamber. They extend from the walls of the pit house towards the hearth, often times terminating at or incorporating primary roof support posts. They do not extend all the way to the roof of the structure, but serve to demarcate a space near the ventilator or entrance that seems to be used for storage and food preparation (Southward 1982). Bullard found that over 70% of AD 400-900-era pit houses in the Southwest contained wingwalls or other forms of partitioning (1962:152). Wingwalls are constructed of upright slabs, earth left in place during the excavation of the pit, or masonry, and are generally covered in adobe plaster.

I categorize wingwalls as present or absent, and use them in all four analyses. Wingwall elaboration refers to cases where a second partition is present or a slab-lined or adobe-lined bin has been appended to a wingwall. This variable is only used in the Elaboration Index.

Finally, adobe floor ridges are a special case that is only used in the regional comparison. In the first three analyses, all forms of partitioning of interior space are considered together. However, as I examined a greater number of structures from beyond the Puerco Valley, it became clear that not all partitions are created equal, and that different variations exist across the northern Southwest. Adobe floor ridges do not rise more than a few centimeters above the floor, so they are not as physically constraining to space as wingwalls, but they nonetheless delineate discrete spaces within the floor of a pit house. There is evidence that some adobe floor ridges were constructed to provide a footing for woven reed screens that were presumably attached to the structure ceiling as well (Drake 2007:221). In the regional analysis they are considered in addition to wingwalls. A pit house can have both wingwalls and adobe floor ridges.

Wingwalls and adobe floor ridges are important because they greatly affect the interior shape of a pit house, and condition the use of space during the course of domestic activity. The presence of these features—especially of adobe floor ridges, which appear to be largely confined to the Kayenta-Tusayan region—is considered here to reflect the identity of whoever oversaw construction of the interior space of a pit structure. What constitutes "proper" partitioning of space is most likely learned early in life, and the decision to build a house in accord with these worldviews is expected to reflect the architectural tradition in which the builder was raised. This is not to say that the placement of wingwalls and adobe floor ridges is not subject to negotiation—particularly in cases of co-residence within a single structure by individuals from distinct cultural backgrounds. But it does suggest that the presence or absence of wingwalls and adobe partitions is a statement about the origins and cultural affiliations of the inhabitants of a pit house.

Benches

Benches are raised areas located against the walls of pit houses. They form a platform between the floor of the pit house and the roof that can either fully or partially encircle the interior of a structure. For tracking changes in attribute frequency over time and the Puerco Valley structure-to-structure analysis, benches are classified as either present or absent. However, in the course of the regional analysis, it became clear that full benches and three-quarters-encircling benches had different distributions—in fact Bullard (1962:148) noted this as well. Three-quarter benches are most common in the Chaco, Northern San Juan, and eastern Cibola regions, while full benches are most common in the western Cibola and Kayenta-Tusayan regions. For the Gower's coefficient used in the regional analysis, structures can have a ¼, ½, ¾, full, or no bench. Benches are also used in the Elaboration Index because they represent a greater degree of architectural sophistication.

In nearly all cases dating prior to AD 900, benches do not seem to have been used for sitting on. Artifacts are occasionally found resting on benches so at least portions of them were available as a surface for storage (Haury 1940:22). They do no contribute to the total usable floor area of a pit house, so I did not include them in floor area analysis. Benches appear to primarily serve the function of providing support for leaner poles or perimeter posts. Sometimes these posts are set deeply into the bench, but in other cases they are simply rested on the bench. In those cases where they are only resting on the bench, they may have been secondary to other, exterior leaners poles that actually supported the roof (Wilshusen 1988b). As described above, the addition of a bench may have helped change the angle of the leaner post from base to roof, helping to utilize the greater columnar strength of the posts.

Interior Storage Features

Most pit houses contain a number of holes in the floor assumed to be for the storage of small items frequently used in domestic activity. However, some of these floor pits can be much bigger than necessary for this kind of storage, and may have been used to store food or other perishable items that required protection from the elements. I considered storage features over $0.1m^3$ for this study. Although total storage volume was estimated, only the presence or absence of storage features was used in analysis. Changes in the frequency of interior storage were tracked, as well as in the structure-to-structure comparison in the Puerco Valley. The presence of interior storage is related to mobility and subsistence strategy, and is therefore forms a component in cultural identity.

The presence of visible, exterior storage features suggests that people were on-site to monitor resources most of the time, while hidden, subterranean storage features more likely were left during periods when people were not residing at a site (Young and Gilpin 2012; Gilman 1987). Interior storage features may suggest that occupants were pursuing political strategies at the network end of the corporate-network continuum (Feinman, Lightfoot, and Upham 2000; see Blanton et al. 1996), by keeping their resources hidden from other members of the settlement.

Storage features were not a focus of this study, so I do not make the interpretations that other researchers do based on the location, form, and size of storage. In this study, interior storage features are primarily seen as one way of incorporating a need—storage space—into architectural design.

Surface Structures

This attribute is not directly related to the architecture of the pit house, but it does provide information about the degree of mobility practiced by a particular group. In most areas of the southwest between AD 600-900, surface architecture completes an “architectural suite” with a pit house (Lightfoot 1994). Attribute states include no surface structures, miscellaneous storage pits, formal storage cists, adobe surface rooms, jacal or wattle and daub surface rooms, and masonry surface. Jacal or wattle and daub surface rooms consist of upright posts between which is placed adobe. Without evidence from postholes or impressions in fired clay, it is difficult to differentiate between adobe and jacal surface rooms. Both often include upright slabs that provide the foundation for the structure and protect the base of the walls from erosion by puddles formed by dripping rainwater. Masonry surface rooms are typically made of coursed slabs of stone. The upper portions of many masonry surface rooms may have been made of a composite of jacal, wattle and daub, and adobe (Wilshusen 1988b; Varien 1984).

Surface structures are included as a variable within the structure-to-structure comparison within the Puerco Valley, but are not in any other analysis. While in many parts of the northern Southwest there are clear and predictable relationships between pit houses and surface architecture (Wilshusen 1988b), within the Puerco Valley—and the whole Little Colorado River drainage—these relationships are not as clear (Peeples, Schachner, and Huber 2012). In general, over time an arc of round storage cists are replaced by an arc of contiguous slab-lined adobe or jacal oval surface rooms, which are in turn replaced by rectangular slab-lined adobe/jacal structures. The very latest pit houses in the Puerco Valley have masonry surface rooms, which may occur in roomblocks two rooms deep (Young and Gilpin 2012). However, this relationship is only true in the most general sense, and at many late-dating settlements that have substantial pit house architecture, such as Kiatuthlanna (Roberts 1931), surface architecture does not appear to be present (Peeples, Schachner, and Huber 2012; Schachner, Gilpin, and Peeoples 2012).

In addition, excavators have been inconsistent about defining or recording surface rooms and storage cists during excavations of pit houses. The nearly complete lack of storage cists recorded with any of the sites excavated during highway salvage operations in the early 1960s is very suspicious. In addition, those sites contain multiple components, and it is very difficult to ascertain whether the surface rooms belong with the AD 800s era pit houses, or the later AD 900-1300 pit structures and kivas. At AZ-P-60-31, there are many storage cists and pits arranged in arcs, but actually associating them with particular pit houses is nearly impossible without a major re-evaluation of the site's stratigraphic relationships. For these reasons, surface structures are not included in any analysis other than the Puerco Valley Gower's coefficient, and in that case it was considered that the variable states were broadly enough defined that associations between pit and surface structures would be meaningful.

Burning on Abandonment

This refers to whether a pit house showed significant evidence of having portions of the superstructure destroyed by fire. I only kept track of burning on abandonment to observe changes in this variable's frequency over time, because it does not actually involve the architecture of the structure, but rather the behavior of the occupants on abandonment. While some archaeologists attribute burning to warfare and raiding, Cameron (1990) argued that a wider variety of reasons exist for burning a structure, such as insect infestation. Wilshusen (1986) suggested that among Dolores Valley pit structures, those with the greatest amount of ritual features are burned most consistently. Regardless, while catastrophic, un-planned fires doubtless consumed a few pit houses, in most cases when a structure was burned it was as part of a planned abandonment.

Trash-Filled on Abandonment

Like burning, this variable was recorded as present or absent, and I only used it to track changing attribute frequencies over time. Inhabitants of sites in the northern Southwest routinely filled abandoned pit houses with trash. This variable mainly provides evidence that occupation of a site continued (or recommenced) after the abandonment of a structure. It can also be used to provide relative dates of occupation on multi-structure site. Gladwin (1945) used the presence of trash fill and a few tree-rings dates to provide a convincing sequence of occupation at White Mound Village, and demonstrated that not all pit houses on the site were occupied at the same time.

Summary of Attributes Used in the Study

I examined twenty-three attributes of Puerco Valley pit houses. Not all of the attributes were used in all analyses. Table 4 shows how different attributes contributed to different analyses. Most attributes were designed to classify pit house architectural features into different style categories: “circular” pit houses or “sub rectangular” pit houses, “primary post” or “perimeter post” roofs, and so on. A few attributes were recorded mainly to track changes in how Puerco Valley residence treated structures on abandonment, such as burning them or filling them with trash. The following sections describe how I used the attributes that I recorded.

Attribute Frequency Comparisons between the Early Period and the Late Period

To gauge architectural changes over time I examined the frequency of certain attributes in the Early Period and the Late Period. Attributes chosen for this operation are displayed in Table 5. An attribute becoming more or less common over time is an indication that architectural traditions changed in the Puerco Valley. This change may have been due to the introduction of new architectural styles as migrants move into the valley, or they may represent a shift in mobility patterns associated with more permanent settlements and decreased seasonal and residential mobility. Architectural attributes used in this analysis ranged from ratio level data to the simple presence or absence of a feature; therefore, different statistical tests are required to test the significance of changes between periods. For ratio level data, I used the student’s t-test to determine whether there were significant differences between the Early and Late Periods. I used the chi-square test of independence to see if the frequencies of nominal level data changed between periods. In cases of presence or absence, which can be reduced to a 2 x 2 contingency table, I used a version of Fisher’s exact test adapted for large samples.

Attribute	Level of Measurement	Statistical Test
floor area in square meters	ratio	student's t
depth	ratio	student's t
roof construction	nominal	chi-square
shape	nominal	chi-square
hearth style	nominal	chi-square
ventilator style	nominal	chi-square
wingwalls	presence/absence	Fisher's exact
bench	presence/absence	Fisher's exact
burning	presence/absence	Fisher's exact
interior storage features	presence/absence	Fisher's exact
trash fill after abandonment	presence/absence	Fisher's exact

Table 5: Attributes and Statistical Tests for Comparison Between Periods

The Elaboration Index

In the previous chapter I suggested that some Puerco Valley inhabitants practiced seasonal and residential mobility during the early Pueblo period. House builders invest less energy into structures that they intend to occupy seasonally or use only for a short time (McGuire and Schiffer 1983:294-296; Diehl and Gilman 1996). The combination of long- and short-term housing needs of the prehispanic inhabitants of the Puerco Valley is one factor responsible for the variability of pit house architecture in the area. Understanding variability that may be related to subsistence strategy or structure function is a necessary step before trying to define variability that results from differences in cultural identity (Schachner, Gilpin and Peeples 2012). Short-term structures often exhibit a paucity of features and are characterized by a simplicity or expediency of form that makes them difficult to use for investigating cultural affiliation. This is, in part, because they contain fewer distinctive attributes that can be used to assess affiliation. It also stems from the fact that mobile groups tend to invest less energy in features designed for symbolic purposes (McGuire and Schiffer 1983:286). In situations of frequent mobility and relatively ephemeral housing, identity may be more closely linked to cultural landscapes (see

Basso 1996), or it may be displayed through media other than housing, such as clothing, hair-styles, projectile points, and adornment. Simple, short-term structures do not lack “cultural content,” but they do have “low cultural content,” and their lack of distinctive or regular construction techniques renders them poorly suited to the analysis of pit house similarity and difference discussed in the next section.

To identify pit houses that exhibit less complex and or formalized architecture, I developed an “Elaboration Index” to rank structures by the amount of labor and materials that the builders had invested in them. The index is ordinal, with less elaborate structures scoring lower and more elaborate structures scoring higher. The attributes chosen for this analysis were discussed in the previous section; Table 4 serves as a quick refresher and reference. Simply put, pit structures with a greater number of architectural features (such as benches, ventilators, and extra interior partitions) and constructed with materials involving more steps to acquire, prepare, and assemble score higher on the index. For example, a hearth that consists of nothing more than a burned area on the floor scores a "1,” whereas a formalized, circular hearth scores a "2.” Construction materials are also taken into account; hearths exhibiting earthen construction receive a score of "1,” adobe construction a "2,” and slab-lining a "3.” The attribute states and associated scores are provided in Table 6.

Attribute	**Score**
Depth	
shallow	1
medium	2
deep	3
unknown	
Roof Support System	
primary posts	4
4 primary posts	4

primary posts and perimeter posts	5
4 primary posts and perimeter posts	5
upright poles	1
perimeter posts	2
no discernable postholes	2.5
cribbed log	3
unknown	
Wall Construction	
native earth	1
adobe/plaster	2
jacal	2
slab-lined	2
masonry	3
unknown	
Floor Construction	
native earth/use-packed	1
adobe/plaster	2
flagstone	1.5
Ventilator Style	
none	0
shaft/tunnel	1
chimney	1.5
trench	2
unknown	
Ventilator Material	
n/a	0
earth	1
adobe	2
masonry	3
unknown	
Hearth Style	
none	0
burned area on floor	1
circular	2
rectangular	2
hearth slabs	2
unknown	

Hearth Material	
n/a	0
earth	1
adobe	2
slabs	3
unknown	
Hearth Elaboration	
none	0
ash box	1
ladder rest	1
ash box and ladder rests	1
side hearth	1
unknown	
Wingwalls	
yes	1
no	0
unknown	
Wingwall Elaboration	
n/a	0
yes	1
no	0
unknown	
Bench	
yes	1
no	0

Table 6: Attributes and Scores for Elaboration Index

Future versions of this Elaboration Index will greatly benefit from experimental energetics research that can verify whether wide spread commonsense rankings such as earth-->adobe-->slabs are actually meaningful in terms of energy investment. After assigning scores to the various attributes, I calculated total elaboration scores using the following equation:

Elaboration rank = floor area x (depth + roof support + wall preparation + floor preparation + (ventilator style x material) + (hearth style x (hearth material + hearth elaboration)) + wing walls + wing wall elaboration + bench).

The inclusion of floor area was meant to act as a tie-breaker, since many structures had similar construction techniques, but very few structures had exactly the same floor area. In addition, I considered this a way to acknowledge that a very large but simple structure may require as much energy investment as a small but complicated structure. In hindsight, this may have been a mistake, but only through experimental replication will these sorts of differences become evident.

In many cases, pit houses were lacking certain pieces of data, which would unfairly disadvantage them. While there is no way to "reconstruct" the score they should have received, I assigned those pit structures the minimum score they could have received. For example, Feature 4/Pithouse 1 at LA 4487 had no recorded depth or ventilator material, so I scored it as a "1" for depth since at the very least it must have been "shallow," and gave it a "1" for ventilator material, since just having a ventilator required earthen construction at a minimum. These "minimum possible scores" were used to rank the structures from least to most elaborate. In Table 22, and Table 23 pit houses with missing data and "minimum possible scores" are marked with an asterisk.

Other researchers have used a similar approach to understand the role of mobility in architectural decision-making. Diehl (2001) recorded the formality of hearth construction, the presence of interior plastering, the density of postholes, and other variables to test the idea that length of residency in pit houses increased from the Early Pithouse Period (AD 200-550) to the Three Circle Phase (AD 825/850-1000). Four of five variables he examined suggested increased effort invested in constructing and maintaining pit houses (Diehl 2001:45). Based on previous ethnographic research seeking correlations in house construction material and length of stay, Diehl (2001:46) hypothesizes an increase in residency within pit houses from 8-12 months during the Early Pithouse Period to 10-12 months during the Three Circle Phase.

Although the methods used by Diehl, and the methods that I use in the Elaboration Index are similar, the analyses attempt to understand different aspects of prehistoric architecture. Diehl was interested in understanding how seasonal mobility decreased over time in the Mimbres/Mogollon region. I am interested in determining whether there are co-occurring, contemporary, but distinct architectural styles related to seasonal and residential mobility. For much of the past 500 years, the northern Southwest has supported co-existing groups of sedentary agriculturalists (the Pueblo) and mobile hunter-gatherer-farmers (the Navajo, the Apache, and the Ute). During the early Pueblo period, the transition from hunting and gathering to agriculture in earnest appears to have caused some of the most dramatic demographic changes in the history of the Southwest (Kohler et al. 2008). There is no reason to expect that this transition played out in identical ways, or was experienced by different groups in the same manner. The presence of mobile groups in close proximity to sedentary groups is almost a certainty during the period between AD 600-900, and the architectural signatures of these two subsistence patterns are likely to be distinct. Alternately, within a fairly marginal environment such as the Puerco Valley, a single group of people may practice multiple subsistence strategies.

Lumping all pit houses together to examine cultural identity will inadvertently lead to comparing pit houses that differ greatly, both in their function and the role they play in a group's larger settlement system. The Elaboration Index allows for pit houses from distinct settlement systems to be separated and dealt with on their own terms. Seasonal and short-term occupation pit houses can be examined to understand their role within the larger settlement patterns of the Puerco Valley. More elaborate pit houses, occupied for a longer amount of time and containing a greater number of architectural attributes can be compared to one another to understand cultural diversity. Eventually, it may be possible to relate these two types of pit houses to one another and determine whether distinct groups of people practicing different mobility strategies occupied the Puerco Valley, or whether most valley residents constructed seasonal pit houses at certain times of year, or during certain years where environmental constraints demanded flexibility. Ceramics and perishable material culture will be avenues for further investigation on this research question.

Measuring Pit House Similarity and Difference

After identifying architectural variability that relates to mobility and subsistence, I analyze the degree of similarity and difference among the pit houses. I do this at two scales: one examines the relationships between pit houses within the Puerco Valley, and the other compares Puerco Valley pit houses to contemporaneous pit houses from a number of other sites in the northern Southwest. I use Gower's coefficient of similarity (Gower 1971)—a measure of statistical distance—to compare architectural attributes between pit houses. Gower's coefficient is capable of comparing multiple variables and incorporating nominal, ordinal, and ratio/interval levels of measurement. The equation is shown below:

$$G_{ijk} = 1 - \frac{|x_{lk} - x_{jk}|}{r_k}$$

where *i* and *j* are the cases being compared, *k* are the number of variables, and r_k is the absolute range of values. Gower's coefficient of similarity compares attributes between pairs of cases. For both the Puerco Valley and regional analysis, I compare each pit house in the sample with every other pit house in the sample, resulting in an *n* x *n* matrix of similarity coefficients, where *n* is the number of cases in the sample. Similarity coefficients in the matrix range from 0 (no similarity) to 1 (complete similarity). The attributes on which these comparisons are based are shown in Table 4. Gower's coefficient handles different kinds of variables in slightly different ways. For variables recorded as present or absent (e.g. bench: present or absent), the similarity between two cases is the total number of shared variable states. For nominal data where a variable may have multiple variable states (e.g. pit house shape: circular, sub-rectangular, oval, etc.), the operation is the same: the total number of variable states shared by two pit houses. For ratio/interval level data (e.g. pit house floor area in square meters) and ordinal data, the similarity between two cases is the absolute value of the difference between two cases, divided by the range between the smallest and largest values in the dataset. The ratio/interval level value is added to the total values obtained for the nominal and presence/absence comparisons, and this sum is divided by the total number of shared variables between the two cases to produce a value greater than zero but less than one.

The equation for Gower's coefficient of similarity accommodates missing data by not drawing comparisons between variables where one case does not have a known value. The calculation simply ignores a variable if either case being compared does not have a value, so structures missing data are compared on fewer attributes than those with complete data. Therefore, pit houses missing data have fewer chances for dissimilarity to arise. They essential become "non-elaborate" pit houses from a comparative point of view, rendering the Elaboration Index step meaningless. A major point of the Elaboration Index was to determine which structures had the greatest potential for showing contrasts in the expression of cultural identity through architectural style. Therefore, I excluded from further analysis structures missing data in more than 25% of their variables because they received higher coefficients of similarity than they otherwise would have, meaning they appeared similar to *most* structures. Using this threshold seemed to eliminate most of the structure pairs that upon visual examination were not as valid as the statistic would suggest. Excluded structures are listed in Table 7.

Site	Structure
AZ-P-60-31	Pitstructure 1
AZ-P-60-31	Pitstructure 11
AZ-P-60-31	Pitstructure 14
AZ-P-60-31	Pitstructure 6
AZ-P-60-31	Pitstructure 8
AZ-P-60-31	Structure 12
AZ-P-60-31	Unit 44
AZ-P-60-31	Unit 7
AZ-P-60-31	Unit 8
NA 14674	Feature 129
NA 14674	Feature 4
NA 14674	Feature 47
NA 14674	Feature 7
NA 14674	Feature 9
NA 14674	Feature 96
NA 14674	Pithouse 15/Feature 77
NA 14674	Pithouse 16/Feature 80
NA 14675	Feature 9
NA 14676	Pithouse 1
NA 14676	Pithouse 2
NA 14682	Feature 4
NA 5065	Structure D4
NA 8945	Pithouse 1
NA 8945	Pithouse 2

Table 7: Structures Excluded from Gower's Coefficient Analyses

Using Gower’s coefficient of similarity I created two matrices of pit house similarity—one for comparisons between pit houses within the Puerco Valley, and another for comparisons between Puerco Valley pit houses and those from other regions of the northern Southwest. Different variables were used to derive each matrix, and these are detailed in Table 4 and described in the previous section. As I mentioned, one reason I did this was to examine different scales of social identity. However, one of the biggest reasons I used different variables in the regional verses the pan-regional analyses was that I adapted my methods as I learned the limitations of using statistical measures of similarity for comparing architectural attributes. Initially, I thought that comparing the similarities and differences in structure attributes could be done in similar fashion to cluster analysis in ceramics studies: information is coded for individual cases, a measure of distance between those cases is used to extract information into principle components responsible for the most variation, which in turn is used to define clusters in the data. After several failed attempts at an architectural cluster analysis, I decided that there are major differences in how data is derived from ceramic and architectural remains. Furthermore, the underlying assumptions concerning the social and cultural behavior that creates patterns in these items of material culture are different enough to warrant distinct methodologies.

First, the actions of the modern excavator have a great impact on what the excavated pit house will look like. Many portions of pit houses are poorly preserved, especially the upper walls of the pits and the roof elements. The appearance of these portions of the architecture as they ultimately appear in plan maps and descriptions is really an interpretation of the archaeologist. It is as if a ceramics analyst had a block of fired clay and they had to scrape material away until they felt they had achieved the “original” appearance of a sherd. In addition, excavation can occur only once—in effect, the size and appearance of a structure can only be measured once—unlike ceramics where inter-observer error can be accounted for by repeated measurement of the same sherds. Of course, error can be judged by multiple measurements of the floor area of a pit house from a plan map, but the image has already passed through one or more filters just to reach the published page. While archaeologists obviously do not create the archaeological record entirely, I think that excavator interpretation plays a large role in the definition of a pit house's shape, depth, roof construction, or whether a ventilator was actually used as an entrance, for example. I am continually struck by the "clean" appearance of maps from early, important publications such as Roberts' (1939) excavation at Whitewater or Gladwin's (1945) at White Mound. To what extent did they excavate more pristine sites than are encountered today, and to what extent did they fill in the gaps?

Second, it is nearly impossible to adequately quantify some aspects of construction that are important to understanding cultural identity. The consistent presence of extra partitions within a structure, small details in ventilator construction, the location of sand-filled pits in the floor, and other subtle attributes are frustratingly difficult to code in a format can be used in statistical analysis. Accounting for *all* possibilities quickly results in a situation where there are far too many potential variables and variables states compared to the number of pit houses being studied, rendering any statistical conclusions fairly meaningless. On the other hand, lumping small distinctions into larger categories masks the very diversity the research is meant to study. One solution may be to undertake an initial qualitative study that creates subjective categories out of suites of attributes that appear to be meaningful, followed by an extensive quantitative re-evaluation of the sample.

Third, ceramics cluster analysis is a statistical way to discover patterns in data that would be difficult to see otherwise, either because too many variables are being simultaneously examined, or too many sherds are in the sample for a single analyst to adequately keep track of. The concept of principle component analysis takes this a step further and allows the great amount of variation inherent in most samples of material culture to be looked at in terms of a few axes of *the most* important variation, a task that can realistically only be completed by statistical analysis. When ceramics are analyzed using these methods, attributes such as temper, paste, forming technique, corrugation width, and thickness are often relied upon because they are thought to represent relatively stable techniques of construction consistently created by a potter with years of practice and repetition within a particular ceramics tradition. Variation within these small-scale attributes should be largely due to differences between potters with different methods, not random variation resulting from the inconsistencies of a single potter. Coiling pottery and adding corrugations involve repetition that fosters consistency.

Pit house architecture is a very different type of material culture, involving the activation of very different types of skills. The physical motions of pit house construction are not small and repetitive; they are large and subject to great variation. The aspects of construction that might record small-scale and repetitive motion—thing like knots in cordage, the layering of vegetal material in the roof, the joinery at the butt ends of beams—are precisely the kinds of things that do not preserve well in pit houses. The spacing of postholes in a pit house is not subject to the same processes of learning and practice as coiling pottery, and are much more subject to architectural necessities such as the load-bearing capacity of different wood species, post thickness, and the desired angle of support beams. The theory of practice that underlies the assumption of technological tradition and consistency in pottery making rests on the idea that "practice" entails making a great number of pots. Over the course of his or her lifetime, a potter may make hundreds of pots. The average life of a pit house is around fifteen years; assuming that the people who live in a pit house are the same people who built it, a person might need to construct fewer than four pit houses over the course of their life.

Finally, the modes by which ceramic and architectural traditions are transmitted are radically different. While the ways that potters learn their craft are diverse, they typically involve some form of apprenticeship wherein a novice is paired with someone of greater experience. Through practice, assistance, comment, and more practice, neophytes become experts. I find it doubtful that the transmission of pit house architecture involves this sort of process. Individuals likely observed the construction of a pit house a number of times before attempting it themselves, but there is much more room for personal improvisation in the construction of vernacular architecture like pit houses. In addition, it is unclear how many people might have been involved in the construction of a single pit house. As I argued above, men may have been associated with the heaviest aspects of roof construction involving the placement of the roof support posts and primary beams, but women may have performed most of the rest of the construction sequence. Other elements in pit house architecture may have required specialized knowledge, such as ventilation systems (discussed above). Perhaps known “experts” within a community were consulted for certain aspects of construction, depending on the situation. Brenda Bowser (personal communication) described how an ethnically Quichua family in Conambo, Peru, ended up with a typically Achuar style roof—because the only person nearby who knew how to build a roof was Achuar. Similarly, northern US Southwest pit house construction presented many opportunities for methods, techniques, and traditions from a variety of cultural backgrounds to contribute to the final appearance of a structure.

This extended aside should serve as a caveat to future research, but also serves to demonstrate that architectural analysis aimed towards understanding cultural diversity rests on different assumptions than ceramics. There are fewer people actively exploring the potential of quantitative analysis in architecture than in ceramics and meaningful categories and methodologies are not well-established. The social processes that lead to variability in architecture are not the same as those leading to variability in ceramics, and this needs to be better accounted for in the future. My initial analysis that examined pit houses only within the Puerco Valley treated architectural data like ceramic attributes, whereas the pan-regional comparison used a larger dataset based primarily on the presence or absence of large-scale features that were thought to demonstrate the greatest contrasts between regions. More work needs to be done on this topic to determine the best ways to use statistical analysis to explore cultural similarity and difference across multiple regions.

Comparing Pit Houses within the Puerco Valley

To gauge the potential for inter-site interaction, or shared architectural traditions that may be an indication of shared perceptions of affiliations within and between settlements, I examined the Gower's coefficient matrix for pairs of structures that exhibited high degrees of similarity (i.e. close to 1). After experimenting with different thresholds I settled on 0.85 as a limit that included enough structures to highlight interesting and important trends in similarity, but not so many to the make the exercise meaningless. This corresponds to one standard deviation above the mean similarity between all structures in the Puerco Valley. Because architecture changed significantly during the AD 600-900 interval, I analyzed the Early and the Late Period separately.

After identifying pairs of pit houses that had high coefficients of similarity, I calculated the average coefficient of similarity for each settlement (at least for those that contained more than one pit house) and compared this to the average degree of similarity found during each period. This allowed me to determine the degree of standardization found among pit houses within the same settlement. Larger settlements may have influenced the inhabitants to express identity differently through architecture as they shifted the way they related to the people around them.

The Regional Comparison of Pit House Similarit*y*

Comparing pit houses within the Puerco Valley highlights small and medium scales of group identity. These scales show the degree of similarity found among house builders on a single site and the degree to which settlements may have shared architectural traditions. To understand broader scales of group affiliation and identity, I examined the relationship of Puerco Valley pit house architecture to five other parts of the northern Southwest (Figure 4). Three of these regions are commonly recognized culture areas: the Kayenta-Tusayan region, the Northern San Juan region, and the Chaco Canyon region. The Mogollon Margins roughly correspond to Herr's (2012) "Transition Zone" and Bullard's (1962) Mogollon Peripheral area, which includes the Quemado area in New Mexico, and the Forestdale Valley, in Arizona. The last area I selected for comparison is Hardscrabble Wash. Sometimes grouped within the Puerco Valley as part of a larger "Little Colorado" region (Schachner, Gilpin, and Peeples 2012), at other times included with the Zuni drainage (Peeples, Schachner, and Huber 2012), I was curious to see how the early Pueblo period architecture of this area compared to the adjacent Puerco Valley. These two areas are less than a day's walk apart, although there do seem to be some great differences in settlement history between them.

I selected pit houses from a number of sites within these areas to provide a sample against which to compare Puerco Valley pit houses (Table 8, Figure 11). I tried to choose a fairly equal number of pit houses from each region, drawing from published reports. However, I did not use any particular sampling strategy—the comparative pit houses come from literature with which I was familiar and to which I had access. A total of 141 pit houses from outside the Puerco Valley were considered using the variables described earlier in this chapter and in Table 4. I grouped pit houses from the comparative sample into the same Early and Late Period categories as the Puerco Valley structures—even if these temporal categories were not completely valid for the region a pit house was situated in, it makes the datasets comparable.

	Kayenta-Tusayan Region		
Map Code	**Site**	**Structure**	**Reference**
2	AZ-I-25-47	Structure 1	Wilcox (1999)
2	AZ-I-26-3	Structure 7	Hensler and Reed (1999)
2	AZ-I-26-3	Structure 9	Hensler and Reed (1999)
2	AZ-I-26-41	Structure 1	Hensler and Rohrer (1999)
3	AZ-I-61-27	Pit House 10	Drake (2007)
3	AZ-I-61-27	Pithouse 12	Drake (2007)
3	AZ-I-61-27	Feature 7	Drake (2007)
3	AZ-I-61-27	Feature 8	Drake (2007)
3	AZ-I-61-27	Feature 36	Drake (2007)
3	AZ-I-61-27	Feature 39	Drake (2007)
3	AZ-I-61-38	Feature 12	O'Hara (2007)
1	Jeddito 264	Pithouse C	Daifuku (1961)
1	Jeddito 264	Pithouse F	Daifuku (1961)
1	Jeddito 264	Pithouse B	Daifuku (1961)
1	Jeddito 264	Pithouse E	Daifuku (1961)
1	Jeddito 264	Pithouse A	Daifuku (1961)
1	Jeddito 264	Pithouse D	Daifuku (1961)
4	Park Wash	Feature 5	Ahlstrom (2000)
4	Park Wash	Feature 1	Ahlstrom (2000)
	Mogollon Margin		
	Site	**Structure**	**Reference**
6	Cerro Colorado	Structure 2	Bullard (1962)
6	Cerro Colorado	Structure 3	Bullard (1962)

6	Cerro Colorado	Structure 4	Bullard (1962)
6	Cerro Colorado	Structure 4a	Bullard (1962)
6	Cerro Colorado	Structure 5	Bullard (1962)
6	Cerro Colorado	Structure 101	Bullard (1962)
6	Cerro Colorado	Structure 103	Bullard (1962)
6	Cerro Colorado	Structure 201A	Bullard (1962)
6	Cerro Colorado	Structure 203	Bullard (1962)
6	Cerro Colorado	Structure 208	Bullard (1962)
6	Cerro Colorado	Structure 211	Bullard (1962)
6	Cerro Colorado	Structure 402	Bullard (1962)
6	Cerro Colorado	Structure 405	Bullard (1962)
5	Bear Ruin	House 1	Haury (1940)
5	Bear Ruin	House 5	Haury (1940)
5	Bear Ruin	House 2	Haury (1940)
5	Bear Ruin	House 3	Haury (1940)
5	Bear Ruin	House 4	Haury (1940)
5	Bear Ruin	House 6	Haury (1940)
5	Bear Ruin	House 7	Haury (1940)
5	Bear Ruin	House 8	Haury (1940)
5	Bear Ruin	House 9	Haury (1940)
5	Bear Ruin	House 10	Haury (1940)
5	Bear Ruin	House 11	Haury (1940)
5	Bear Ruin	House 12	Haury (1940)
5	Bear Ruin	House 14	Haury (1940)
	Hardscrabble Wash		
	Site	**Structure**	**Reference**
7	Kiatuthlanna	Grp 1 House A	Roberts (1931)
7	Kiatuthlanna	Grp 1 House B	Roberts (1931)
7	Kiatuthlanna	Grp 1 House C	Roberts (1931)
7	Kiatuthlanna	Grp 1 House D	Roberts (1931)
7	Kiatuthlanna	Grp 2 House A	Roberts (1931)
7	Kiatuthlanna	Grp 2 House B	Roberts (1931)
7	Kiatuthlanna	Grp 2 House C	Roberts (1931)
7	Kiatuthlanna	Grp 2 House D	Roberts (1931)
7	Kiatuthlanna	Grp 3 House A	Roberts (1931)
7	Kiatuthlanna	Grp 3 House B	Roberts (1931)
7	Kiatuthlanna	Grp 3 House C	Roberts (1931)
7	Kiatuthlanna	Grp 3 House D	Roberts (1931)

7	Kiatuthlanna	Grp 3 House E	Roberts (1931)
7	Kiatuthlanna	Grp 4 House B	Roberts (1931)
7	Kiatuthlanna	Isolated House	Roberts (1931)
7	NA 14645	Pithouse 1	Stebbins et al. (1986)
7	NA 14645	Pithouse 2	Stebbins et al. (1986)
7	NA 14646	Pithouse 1 (Feat 4)	Stebbins et al. (1986)
7	NA 14646	Pithouse 3 (Feat 3a)	Stebbins et al. (1986)
7	NA 14646	Pithouse 2 (Feat 10)	Stebbins et al. (1986)
7	NA 14646	Pithouse 4 (Feat 12)	Stebbins et al. (1986)
7	NA 14650	Structure 1 (Feat 1)	Stebbins et al. (1986)
7	NA 14650	Pithouse 3 (Feat 14)	Stebbins et al. (1986)
7	NA 14650	Pithouse 4 (Feat 15)	Stebbins et al. (1986)
7	NA 14650	Pithouse 5 (Feat 16)	Stebbins et al. (1986)
7	NA 14650	Pithouse 6 (Feat 17)	Stebbins et al. (1986)
7	NA 14650	Pithouse 7 (Feat 18)	Stebbins et al. (1986)
7	NA 14650	Structure 2 (Feat 32)	Stebbins et al. (1986)
7	NA 14650	Structure 3 (Feat 37)	Stebbins et al. (1986)
7	NA 14650	Pithouse 9 (Feat 49)	Stebbins et al. (1986)
7	NA 14654	Pithouse 1 (Feat 3)	Stebbins et al. (1986)
7	NA 14654	Pithouse 2 (Feat 5)	Stebbins et al. (1986)
7	NA 14654	Kiva 1 (Feat 17)	Stebbins et al. (1986)
7	NA 14654	Feature 22 (kiva?)	Stebbins et al. (1986)
7	NA 14654	Pithouse 4 (Feat 40)	Stebbins et al. (1986)
7	NA 14654	Pithouse 5 (Feat 41)	Stebbins et al. (1986)
7	NA 14654	Kiva 2 (Feat 43)	Stebbins et al. (1986)
	Northern San Juan Region		
	Site	**Structure**	**Reference**
9	McPhee (5MT4475)	Pitstructure 10	Brisbin et al. (1988)
9	McPhee (5MT4475)	Pitstructure 5	Brisbin et al. (1988)
9	McPhee (5MT4475)	Pitstructure 9	Brisbin et al. (1988)
9	McPhee (5MT4475)	Pitstructure 3	Brisbin et al. (1988)
9	Masa Negra (5MT4477)	Pitstructure 1	Kuckelman (1988)
9	Masa Negra (5MT4477)	Pitsructure 2	Kuckelman (1988)
9	Masa Negra (5MT4477)	Pitstructure 5	Kuckelman (1988)
9	Aldea Alfareros (5MT 4479)	Pitstructure 1	Kleidon (1988)
9	Aldea Alfareros (5MT 4479)	Pitsructure 2	Kleidon (1988)
9	Weasel Pueblo (5MT5106)	Pitsructure 2	Morris (1988)
9	Weasel Pueblo (5MT5106)	Pitstructure 3	Morris (1988)

9	Weasel Pueblo (5MT5106)	Pitstructure 4	Morris (1988)
9	Tres Bobos (5MT4545)	Pithouse 1	Brisbin and Varien (1986)
9	Apricot Hamlet (5MT2858)	Pithouse 1	Montgomery (1986)
9	Aldea Sierritas (5MT2854)	Pithouse 1	Kuckelman (1986)
9	Aldea Sierritas (5MT2854)	Pithouse 2	Kuckelman (1986)
9	Prairie Dog Hamlet (5MT4614)	Pithouse 1	Yarnell (1986)
9	Prairie Dog Hamlet (5MT4614)	Pithouse 2	Yarnell (1986)
9	Casa Bodega (5MT2194)	Pithouse 1	Brown (1986)
9	Dos Casas (5MT2193)	Pithouse 1	Brisbin et al. (1986)
9	Dos Casas (5MT2193)	Pithouse 2	Brisbin et al. (1986)
9	Windy Wheat (5MT4644)	Pitstructure 1	Brisbin (1986)
9	Windy Wheat (5MT4644)	Pitstructure 2	Brisbin (1986)
9	Windy Wheat (5MT4644)	Pitstructure 3	Brisbin (1986)
10	5LP184 (Ridges Basin)	Feature 1	Eisenhauer et al. (2008a)
10	5LP184 (Ridges Basin)	Feature 15	Eisenhauer et al. (2008a)
10	5LP184 (Ridges Basin)	Feature 12	Eisenhauer et al. (2008a)
10	5LP244 (Ridges Basin)	Feature 15	Eisenhauer et al. (2008b)
10	5LP244 (Ridges Basin)	Feature 1	Eisenhauer et al. (2008b)
10	5LP246 (Ridges Basin)	Feature 2	Yoder and Lowe (2008)
10	5LP246 (Ridges Basin)	Feature 26	Yoder and Lowe (2008)
10	5LP510 (Ridges Basin)	Feature 6	Desruisseaux et al. (2008a)
10	5LP511 (Ridges Basin)	Feature 1	Desruisseaux et al. (2008b)
10	5LP511 (Ridges Basin)	Feature 2	Desruisseaux et al. (2008b)
10	5LP511 (Ridges Basin)	Feature 3	Desruisseaux et al. (2008b)
10	5LP536 (Ridges Basin)	Feature 1	Eisenhauer et al. (2008)
10	5LP549 (Ridges Basin)	Feature 2	Desruisseaux et al. (2008c)
10	5LP614 (Ridges Basin)	Feature 1	Desruisseaux et al. (2008d)
	Chaco Canyon		
	Site	**Structure**	**Reference**
8	29SJ627	Pithouse C	Truell (1992)
8	29SJ299	Pithouse A	Truell (1986)
8	29SJ299	Pithouse D	Truell (1986)
8	29SJ628	Pithouse C	Truell (1986)
8	29SJ659 (Shabik'eschee)	House P	Truell (1986)
8	29SJ299	Pithouse E	Truell (1986)
8	29SJ628	Pithouse A	Truell (1986)
8	29SJ628	Pithouse D	Truell (1986)
8	29SJ628	Pithouse E	Truell (1986)

8	29SJ628	Pithouse F	Truell (1986)
8	29SJ628	Pithouse G	Truell (1986)
8	29SJ721	Structure A	Truell (1986)
8	29SJ724	Pithouse A	Truell (1986)
8	29SJ659 (Shabik'eschee)	Protokiva	Truell (1986)
8	29SJ659 (Shabik'eschee)	House C	Truell (1986)
8	29SJ659 (Shabik'eschee)	House J	Truell (1986)
8	29SJ1678	Judd's Pithouse 2	Truell (1986)
8	Bc 50	Feature 5	Truell (1986)
8	Bc 50/51	Trash Mnd Pithouse	Truell (1986)
8	Bc 53?	Judd's Pithouse 1	Truell (1986)
8	Bc 236	Bradley's Pithouse	Truell (1986)

Table 8: Pit Houses From Other Regions Used For Comparison

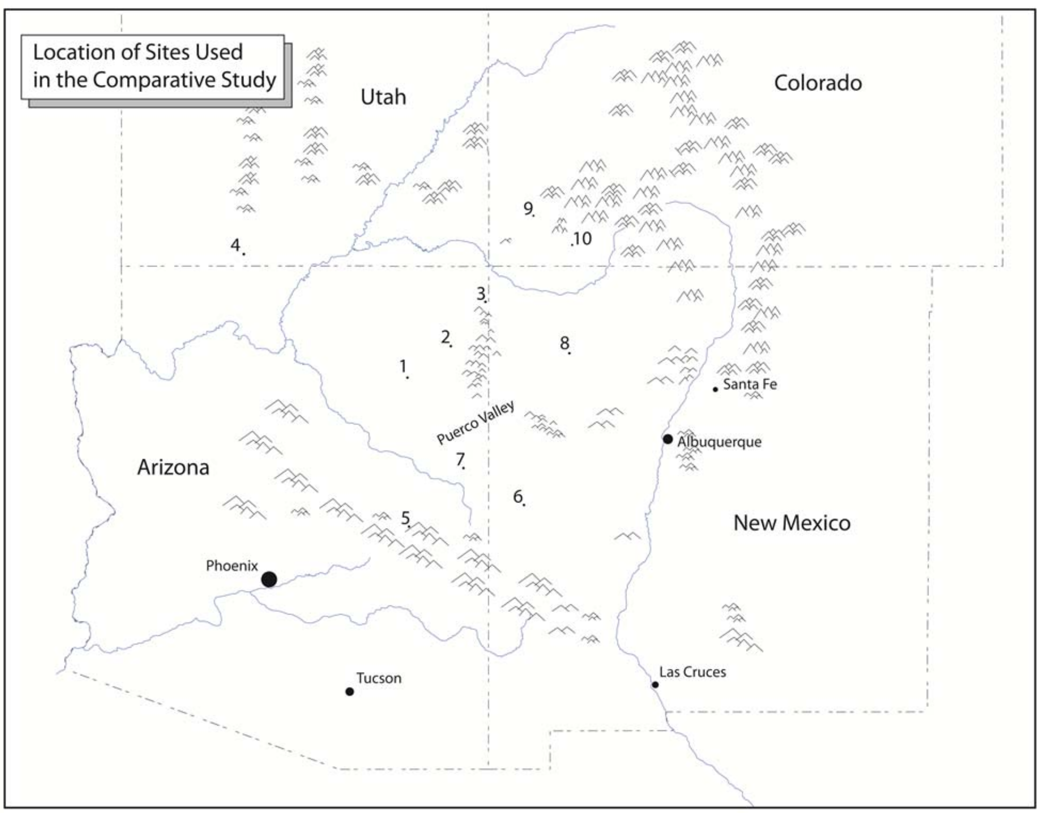

Figure 11: Locations of Sites Used in Comparative Sample

I again computed a matrix of Gower's similarity coefficients for all structures in the dataset. I segregated structures in the Early and Late Periods, and then averaged the coefficient of similarity of the Puerco Valley pit houses and the comparative regions. This reduced the data to five values for each period—the average similarity between the Puerco Valley and each of the other five parts of the northern Southwest. The magnitude of change between the Early and the Late Period is an indirect indication of the degree of social interaction in those periods, while the direction of the value (positive or negative) indicates whether the Puerco Valley became more or less similar to that area over time.

Conclusions

My analyses of pit house architecture in the Puerco Valley and beyond is meant to be multi-faceted and multi-scalar. Tracking changes in attribute frequency over time is meant to provide a basic knowledge of Puerco Valley architectural traditions. The Elaboration Index is meant to understand changes in these traditions as the needs of Puerco Valley inhabitants shifted, principally as mobility decreased and structures became places for the display of symbolic content. Seeking similarities between pit houses is meant to establish the geographic extent of certain architectural traditions. By beginning with individual structures and working up from there, I am acknowledging that the patterns within the variability found in Puerco Valley architectural traditions are the result of the frequent movement of relative small social groups (Bernardini 2005a). I will first establish which patterns are most evident at the scale of the Puerco Valley. However, Puerco Valley ceramics suggest that valley residents participated in material culture traditions much larger in scale (see Chapter 3). Comparing Puerco Valley pit house architecture to wider trends in the northern Southwest seeks to better characterize the nature of social boundaries, both within the valley, and between the valley and surrounding regions.

Chapter 5: Pit House Architecture in the Puerco Valley

Introduction

In this chapter I describe the results of the four analyses outlined in Chapter 4. The four parts that follow are meant to proceed from small scale to large scale, and from most concrete to most abstract. “Part I” looks at trends over time in the architectural attributes I recorded, such as changes in floor area, depth, and the frequency of certain construction methods. It demonstrates that over time Puerco Valley architecture was more substantially constructed, and that during the Late Period a variety of new architectural attributes appeared in the valley. “Part II” presents the results of the “Elaboration Index,” and separates Puerco Valley pit houses into two categories—those that exhibit minimal energy input and elaboration, and those that exhibit a significant investment in time, labor, and materials. The Elaboration Index also suggests that pit houses in the valley became more permanent over time, and that a smaller percentage of structures were occupied seasonally in the Late Period than in the Early Period. “Part III” discusses the results of the structure-to-structure comparison within the Puerco Valley. Architectural traditions were more diverse in the Late Period than the Early Period. The patterning of architectural traditions in the valley during the Late Period is, however, a complex issue, and some settlements adhered rather strictly to only a few architectural styles, while others had considerable stylistic diversity and a great degree of overlap with other settlements. “Part IV” compares Puerco Valley architectural traditions to surrounding regions of the northern Southwest. This is the broadest scale of inquiry in the study, and it suggests that some boundaries were adhered to rigidly; others were relatively poorly defined. It also demonstrates that migration into the Puerco Valley contributed to architectural variability during the Late Period. Finally, I summarize these results and discuss the implications of these four separate analyses.

Part I: A Descriptive Analysis of Pit House Architecture in the Puerco Valley

For the descriptive analysis I compared eleven attributes of the pit houses that could be assigned to the Early or Late Period (Table 4). The purpose of the descriptive analysis was to provide a baseline for subsequent interpretations, and to track major changes in pit house construction methods and style from the Early Period to the Late Period. Frequencies of each attribute by period are shown in Table 10 through Table 21. I also tested the significance of the changes from the Early Period to the Late Period, using the two-sample chi-square test for four attributes, Fisher's exact test (adjusted for larger sample sizes) for five, and the two-sample students-t test for two. The significance of all results are displayed in

Attribute	Significance	Statistical Test
floor area in square meters	p=0.0154	student's t
depth	p=0.0002	student's t
roof construction	p=0.000	chi-square
shape	p=0.022	chi-square
hearth style	p=0.000	chi-square
ventilator style	p=0.000	chi-square
wingwalls	p=0.000	Fisher's exact
bench	p=0.079	Fisher's exact
burning	p=0.043	Fisher's exact
interior storage features	p=0.56	Fisher's exact
trash fill after abandonment	p=0.345	Fisher's exact

Table 9. In all but two cases (the presence of interior storage features and the presence of trash fill), the differences in the distribution of attributes between the Early and the Late period were significant at the p=0.1 confidence interval.

Attribute	Significance	Statistical Test
floor area in square meters	p=0.0154	student's t
depth	p=0.0002	student's t
roof construction	p=0.000	chi-square
shape	p=0.022	chi-square
hearth style	p=0.000	chi-square
ventilator style	p=0.000	chi-square
wingwalls	p=0.000	Fisher's exact
bench	p=0.079	Fisher's exact
burning	p=0.043	Fisher's exact
interior storage features	p=0.56	Fisher's exact
trash fill after abandonment	p=0.345	Fisher's exact

Table 9: Levels of Significance for Variables Compared Between Periods

Significant Changes from the Early Period to the Late Period

Floor Area (Table 10)

	Early	Late	t=	df=	c.v.
mean	6.2191	11.1445	5.485	110	1.98
median	5.53	10.68	**Reject Ho**		
stdev	3.0797	4.8827			
n=	35	77			

Table 10: Changes in Floor Area between Periods

Floor area nearly doubled from the Early Period to the Late Period, a change significant at the $p<0.01$ confidence level. The increase in mean floor area over time is significant even if structures deemed non-elaborate (typically smaller) are removed from the sample: 8.89m^2 (sd=2.999) to 12.22m^2 (sd 4.4356), p = 0.0154. I examined histograms of Early and Late Period floor areas, and the distributions showed a distinct right-hand skew, suggesting that the student's-t test was not the most appropriate statistic to use because the underlying distribution is not normal. I recalculated the results using the two-sample Mann-Whitney U-test, which is nonparametric, and the differences between the two periods are still significant at the $p<0.001$ confidence level.

The increase in pit house floor area implies that Puerco Valley residents invested greater energy in domestic architecture over time. Pit houses became more spacious, allowing them to accommodate a wider range of activities, some of which may have previously been performed outdoors. Another implication of the increase in floor area is that more people may have inhabited Late Period pit houses. Brown's (1987) recalibration of Naroll's (1962) constant for roofed-area-to-inhabitants produced a figure of $6m^2$ per person. The average floor area of an Early Period Puerco Valley pit house was only $6.22m^2$; I doubt that every person in the valley had his or her own pit house during this time! Clearly, Puerco Valley inhabitants were comfortable with close quarters, but this is not very helpful for establishing the actual number of occupants within a pit house. The very largest Early Period pit houses were between $10m^2$ and $14m^2$, which by Naroll's constant would still only suggest two people inhabited each structure. Lighfoot (1994:148) drew on demographic data from modern Southwest Pueblo groups to suggest that a typical "household" during the AD 700-900 period in the Northern San Juan region consisted of five-to-eight individuals. Given their size, I think that the biggest Early Period structures probably housed no more than four or five individuals, or the low end of Lightfoot's estimate for Early Pueblo household size in the Northern San Juan. The smallest Early Period structures were the cribbed-log pit houses at NA 14674/14675, which were probably not inhabited by more than two people. Ethnographic comparison within hunter-gatherer bands might make more sense for establishing the net number of inhabitants per structure for the AD 600-750 period in the Puerco Valley.

The cribbed-log structures at NA 14674 and 14675 (and a few surrounding small sites dating to the Late Period) are a special case. Because the vast majority of these structures do not have associated absolute dates, I could assign most of them to neither the Late nor the Early Period. If pit houses of indeterminate age had been included in this analysis, they most likely would have dramatically reduced the average floor area for both periods—the mean floor area of pit houses of indeterminate date (all from NA 14674 and 14675) is 4.827m^2. The small size of the structures suggests that only a subset of a typical family group or household resided within them. NA 14674 and 14675 are interpreted as seasonal farming settlements (Marek et al. 1993:146-148), and may themselves have only been inhabited by a subset of a family group. Perhaps monitoring agricultural fields was a task delegated to a specific social category of individual. An alternative explanation is that the social structure of the groups that occupied these settlements was radically different than the ethnographic analogies typically sought for prehispanic Puebloan groups. SWCA Archaeological Consultants did, in fact, excavate five large structures at NA 14674/14675 with floor areas ranging between 22-43m^2, but not knowing whether these were communal or ritual structures, or habitations, I excluded them from the dataset. If they were actual dwellings, this would significantly change interpretation of social structure at the settlements around Cottonwood Seep.

Average floor area increased during the Late Period and many structures had floor areas between 10m^2 and 18m^2. The size of the average household probably increased during this period as well. Research suggests that during the early Pueblo period much of the Southwest was experiencing a Neolithic Demographic Transition (Bandy 2005; Bocquet-Appel and Naji 2006; Kohler et al. 2008) characterized by increased fertility rates and larger family sizes. The greater size of Late Period pit houses may be an indication of larger family size in the Puerco

Valley, although the magnitude of this change may not have been great and the average Puerco Valley "household" may never have been as large as surrounding regions. Bullard (1962:124) found that pit houses of the Upper Little Colorado region—which includes the Puerco Valley—were the smallest in the Southwest. This still appears to be the case with fifty more years worth of data.

Depth (Table 11)

	Early	Late	t=	df=	c.v
mean	0.6344	1.0912	5.089	96	1.98
median	0.6	1.2			
stdev	0.2827	0.4867	**Reject Ho**		
n=	35	63			

Table 11: Changes in Depth between Periods

The mean depth of Puerco Valley pit houses increased significantly from the Early Period to the Late Period. If non-elaborate pit houses are eliminated from consideration, mean depth increases from 0.7433m (sd = 0.2984) in the Early Period to 1.224m (sd = 0.3944) in the Late Period. In both cases, this shift is significant at the $p<0.001$ confidence level. Greater depth suggests that Puerco Valley inhabitants invested more labor into the initial excavation of pit houses, implying longer-term use of the structures. Wilshusen (1988) notes that pit house depth correlates with the amount of material needed to build the associated surface structures, at least in the Northern San Juan region. Whether this is the case or not in the Puerco Valley cannot be definitively confirmed or denied; among the structures excavated during highway salvage it is difficult, if not impossible, to determine whether the surface structures identified by Gumerman and others (1982) were associated with pit houses occupied during the AD 900-1150 period or the AD 750-900 period. LA 4487 had substantial surface structures but the depth of the pit houses is unrecorded. Whitewater has information on both, but for reasons that will be discussed in detail later, I believe that migrants from the Northern San Juan, rather than local Puerco Valley inhabitants, built at least half the site. The cribbed-log pit houses at NA 14674, 14675, 14681, 14682, and 14683 were very shallow, and would have contributed little in the way of building material for surface structures. Not surprisingly, there is little evidence of surface structures at these sites.

During both periods only the very deepest pit houses in the Puerco Valley were so subterranean that little or no portion of their roof would be visible above the ground. Late Period pit houses average 1.2 meters in depth and the roof would have to protrude from the ground at least one-half to three-quarters of a meter to accommodate standing room within the structure. During the Early Period almost a meter would be required above ground to facilitate standing within a structure. The upper portions of roofs would have been the most visible aspect of pit house architecture in both periods. Admittedly, many pit houses would probably have been covered with a layer of dirt, but the shape of the structure and some aspects of roof construction may have been visible.

One final observation is that the coefficient of correlation between floor area and depth changes significantly between the Early Period ($r^2 = 0.186$) and the Late Period ($r^2 = 0.332$). While neither of these values suggests a particularly strong correlation between depth and floor area in general (already noted by Bullard [1962:121]), it does suggest that the relationship between these two variables became more standardized over time. One reason for this is that the ratio of elaborate to non-elaborate structures increased over time—there are proportionally far more formal and elaborate pit houses built in the Late Period.

Roof Construction (Table 12, Table 13)

Roof Style	Early	Late
Four Primary Posts	5 (13%)	31 (40%)
Four Primary Posts and Perimeter Posts	0 (0%)	10 (13%)
Primary Posts	6 (16%)	6 (8%)
Primary Posts and Perimeter Posts	0 (0%)	1 (1%)
Perimeter Posts	1 (3%)	1 (1%)
Upright Poles	10 (26%)	1 (1%)
Cribbed Log	9 (24%)	9 (12%)
No Postholes	1 (3%)	5 (6%)
Unknown	6 (16%)	13 (17%)
Total	38	77

Table 12: Roof Construction Techniques by Period

Roof Style	Early	Late	Chi-square=	df=	c.v.=
primary posts	11 (29%)	37 (48%)	27.4	5	11.07
primary posts and perimeter posts	0 (0%)	11 (14%)	**Reject Ho (although 25% of squares have expected values under 5)**		
upright poles	10 (26%)	1 (1%)			
cribbed log	9 (24%)	9 (12%)			
no postholes	1 (3%)	5 (6%)			
all other configs	7 (18%)	14 (18%)			
Total	38	77			

Table 13: Roof Construction Techniques (Modified for Chi-Square Test)

Roof construction changed significantly between the Early and the Late Period, $p<0.000$. Most notably, the percentage of pit houses exhibiting primary post roof support systems (particularly four primary posts) increased from around 30% to more than 60%. Cribbed-log style roofs remained constant between the periods, reflecting that fact that NA 14674, where the majority were located, appears to have been occupied fairly steadily between AD 600-900. The use of upright poles as a roofing technique declined precipitously. All indications are that from the Early Period to the Late Period, Puerco Valley house builders increasingly employed formalized, consistent, and substantial roofing techniques. The spatial distribution of different roofing techniques will be discussed in "Part III."

Pit House Shape (Table 14, Table 15)

Shape	Early	Late
Circular	23 (61%)	30 (39%)
Oval	9 (24%)	14 (18%)
Sub-Rectangular	3 (8%)	21 (27%)
D-Shaped	0 (0%)	7 (9%)
Irregular	1 (3%)	4 (5%)
Unknown	2 (5%)	1 (1%)
Total	38	77

Table 14: Pit House Shape by Period

Shape	Early	Late	chi-square=	df=	c.v.=
Circular	23 (60%)	30 (39%)	11	3	7.82
Oval	9 (24%)	14 (18%)	**Reject Ho (although 13% of expected values are under 5)**		
Sub-Rectangular	3 (8%)	21 (27%)			
All Other Shapes	1 (3%)	11 (14%)			
Total	38	77			

Table 15: Pit House Shaped by Period (Modified for Chi-Square Test)

Structure shape underwent significant changes between the Early Period and the Late Period, p = 0.022. The most striking changes are the increase in sub-rectangular structures (from 8% to 27%) and the appearance of D-shaped structures. The appearance of new pit house shapes immediately following a hiatus in house construction and a possible decline in population within the Puerco Valley suggests migration to the area occurred after AD 750. However, circular and oval pit houses continue to be popular structure shapes throughout the Late Period. I will discuss the spatial distribution of structure shape in greater detail in "Part III" and "Part IV."

Hearth Style (Table 16, Table 17)

<table>
<tr><th></th><th>Early</th><th>Late</th><th>chi-square=</th><th>df=</th><th>c.v.=</th></tr>
<tr><td>Burned Area of Floor</td><td>3 (8%)</td><td>2 (3%)</td><td>39.3</td><td>3</td><td>7.82</td></tr>
<tr><td>Hearth Slabs</td><td>10 26%)</td><td>6 (8%)</td><td colspan="3" rowspan="6">Reject Ho ("Burned Area" and "None" categories combined for chi-square test, "Unknown" exluded)</td></tr>
<tr><td>Circular</td><td>7 (18%)</td><td>57 (74%)</td></tr>
<tr><td>Rectangular</td><td>0 (0%)</td><td>6 (8%)</td></tr>
<tr><td>None</td><td>11 (29%)</td><td>3 (4%)</td></tr>
<tr><td>Unknown</td><td>7 (18%)</td><td>3 (4%)</td></tr>
<tr><td>Total</td><td>38</td><td>77</td></tr>
</table>

Table 16: Hearth Style by Period

	Early	Late
Ash Box and/or Ladder Rest	3 (8%)	37 (48%)
Side Hearth	5 (13%)	0 (0%)
None	24 (63%)	37 (48%)
Unknown	6 (16%)	3 (4%)
Total	38	77

Table 17: Hearth Elaboration by Period

Between the Early Period and the Late Period, the number of pit houses with no hearth or simply a burned area on the floor declined greatly, circular hearths increased significantly in frequency, and rectangular hearths appeared for the first time. The changes are significant at the $p<0.001$ confidence level. The majority of pit houses that had no hearths were found at NA 10088, which is a site that may date to earlier than the AD 600-900 period. Typically, the absence of a hearth in a structure is taken to indicate summer residence, although a number of studies have shown that this pattern is far from clear (Mauldin 2006), or that the use of "on floor hearths" is more common than previously though (Diehl 1997:186). NA 10088 may have been a summer-occupation site or ephemeral hearths may have been overlooked. Regardless, this site contributes greatly to the perception that the Early Period was characterized by temporary and seasonal structures because of the presence of seven pit houses with ephemeral upright-pole style roofs, no ventilators, and no hearths. The remaining Early Period pit houses without hearths were found at AZ-P-60-31.

Another major change evident in hearth style between the two periods is the increase in circular hearths from 18 % (seven) to 74% (fifty-seven). This is partially because the excavation of AZ-P-60-31—which contained many of the "more elaborate" Early Period pit houses—involved trenching through the center of structures, an activity which frequently destroyed evidence of what style of hearth was originally present in the structure. I had to code the hearths of these pit houses as "unknown," though it is possible that many of them could have been circular. Furthermore, a good number of the structures in the Early Period sample are from NA 14674, where pit houses contained hearth slabs and chimneys rather than centrally located, circular hearths. I have no idea whether the thermal properties of these hearth slab-and-chimney style heating and cooking facilities are equal to that of a circular, adobe-lined hearth. Previous researchers have assumed that the small, cribbed-log style pit houses at NA 14674 were most likely seasonal habitation based on their small size and the inadequacy of the hearth-slab and chimney system to provide winter heating—but given the small size of the structure perhaps a small fire was more than sufficient to heat the interior. If the structures at NA 14674 were capable of being occupied in the winter, occupation of the site may have been year-round. Experimental studies involving the replication of one of these structures would be very informative.

In addition to the increase in circular hearths, the number of hearths exhibiting an associated ash box, ladder rest, or both increased from 8% (three—all at AZ-P-60-31) to 48% (thirty-seven). This may be related to the increase in pit houses with four-post roof support designs and ventilators, which had ladder entries through the roof. It also indicates heightened formalization of the hearth and interior domestic space. Ash boxes were almost universally located between the hearth and the ventilator, as were ladder rests. When both features co-occur the ash box was located adjacent to the hearth and the ladder rests were just beyond the ash box in line with the ventilator. In a number of cases, the ash box may have doubled as the ladder rest (Roberts 1939:40, 50). While this relative positioning of features is at least partly the result of placement of the entry hole directly above the hearth so smoke can vent through it, there is no inherent reason the hearth has to be located in the center of the pit structure, or the ash box and ladder in line with the ventilator. The patterned and consistent co-occurrence of roof entry, hearth, ash box, ladder rests, and ventilator is evidence that this suite of features may have functioned together as an element of house construction important to the builders.

The positioning of interior domestic features can approximate cosmological principles or relationships (Parker Pearson and Richards 1994b:11, 1994c:43; Rapoport 1969). The ever more-defined relationship between the threshold (the roof) and the central feature of the house (the hearth) is a potent combination that may reflect a developing, shared tradition rooted in religious symbolism or analogy. Four accounts of Zuni origin stories describe the emergence of people through four successive worlds, climbing wooden ladders from the lowest to the highest, current world (Cushing 1896; Stevenson 1904; Bunzel 1932; Parsons 1923). Among the reasons explained to Mindeleff (1891:117-118) for the subterranean nature of the modern kiva—a continuation of the pit structure form—was that it was in imitation of the original house in the middle of the earth. Shafer (1995) has argued that a similar alignment of features in Transitional or Mangas phase Mimbres houses (a shift to roof entries in semi-subterranean rooms and a new hearth style) is a symbolic reference to the multi-layered universe in Puebloan and Mesoamerican cosmology, with the roof forming an upper world, the house itself a middle world, and the hearth (and in some cases sipapu—or ritual “earth navel” in the floor) protruding into the floor, the underworld. Houses constrain space, and encourage “formalized patterns of behavior, emphasizing repetition, routine, and conformity” (Whittle 1996:25). As domestic spaces became more permanent and more elaborate throughout the early Pueblo period, the associations between cosmology and architectural features became more and more tightly linked through physical repetition and social reproduction. The co-occurrence of roof entries, hearths, ash boxes, ladder rests, and ventilators may have been related to the development of specific cosmological ideas.

Ventilator Style (Table 18, Table 19)

<table>
<tr><th></th><th>Early</th><th>Late</th><th>chi-square=</th><th>df=</th><th>c.v.=</th></tr>
<tr><td>Shaft/Tunnel</td><td>6 (16%)</td><td>41 (53%)</td><td>20.9</td><td>3</td><td>7.82</td></tr>
<tr><td>Chimney</td><td>10 (26%)</td><td>7 (9%)</td><td colspan="3" rowspan="5">Reject Ho, (although 25% of expected values are under 5; "Unknown" excluded)</td></tr>
<tr><td>Trench</td><td>0 (0%)</td><td>7 (9%)</td></tr>
<tr><td>None</td><td>16 (42%)</td><td>18 (23%)</td></tr>
<tr><td>Unknown</td><td>6 (16%)</td><td>4 (5%)</td></tr>
<tr><td>Total</td><td>38</td><td>77</td></tr>
</table>

Table 18: Ventilator Style by Period

Direction	Early	Late
N	0 (0%)	1 (1%)
NE	0 (0%)	0 (0%)
E	2 (5%)	4 (5%)

SE	11 (29%)	44 (57%)
S	6 (16%)	4 (5%)
SW	1 (3%)	2 (3%)
W	0 (0%)	0 (0%)
NW	0 (0%)	0 (0%)
Unknown/NA	18 (47%)	22 (29%)
Total	38	77

Table 19: Ventilator (or entry) Orientation by Period

The occurrence of ventilator styles is significantly different between the Late Period and the Early Period (p = 0.000). Examining the relative frequencies of the four categories of ventilator type shows that the largest changes between the Early and Late period are the increase in shaft/tunnel style ventilators over time and the introduction of the trench style ventilator in the Late Period. The increase in shaft/tunnel style ventilators is almost certainly related to the commensurate increase in the proportion of formalized pit structures to non-elaborate structure (described in the next section). All the trench style ventilators date to the very late AD 800s.

The decrease in chimney-style ventilators from the Early to the Late Period may be an illusion due to my inability to place most of the cribbed-log pit houses at NA 14674/14675 into either of the two periods. Although the number of pit houses dating to the Late Period with chimney style ventilators decreases, this style occurred at a larger total number of sites. NA 8941, NA 14681, 14682, and 14683 all contained cribbed-log pit houses with chimney-style ventilators, while NA 8942 Pithouse 1 contains a chimney within a structure otherwise vented via an antechamber. I therefore think that the decline in chimney-style ventilators that is shown in the frequency tables is probably misleading. If anything, the style became more popular over time.

Ventilator orientation did not change significantly over time. The vast majority of Puerco Valley pit houses that are not constrained by topography have ventilators that face to the southeast. Young and Gilpin (2012) found that during the AD 500-700/800 period structures most commonly faced the east in northeast Arizona and to the south in the southern San Juan Basin. Fox (2002:25) felt that ventilator orientation was greatly affected by the direction of the prevailing winds in the Southwest.

Bullard (1962:142) proposed that the ventilator developed first in the "southern part of the Anasazi area," which would include the Puerco Valley. This assumption was based on the occurrence of ventilators in the mid- to late-AD 600s at Cerro Colorado. While the Puerco Valley data cannot confirm the larger trends in the spread of ventilators through the Early Pueblo world, ventilators were common in the larger pit structures at AZ-P-60-31, which date to the late AD 600s, or contemporary with Cerro Colorado. If chimneys are considered a kind of ventilator, they occurred at NA 14674 as early as the very early AD 600s.

Presence or Absence of Wingwalls (Table 20)

	Present	**Absent**	**Unknown**	**Total**	**chi-square=**	**df=**	**c.v.=**
Early	2 (5%)	35 (92%)	1 (3%)	38	16.62	1	3.84
Late	32 (42%)	42 (55%)	3 (4%)	77	**Reject Ho ("Unknown" excluded)**		

Table 20: Presence/Absence of Wingwalls by Period

The presence of wingwalls increased significantly between the Early and the Late Periods (p=0.000). For this analysis, I did not distinguish between adobe, slab, and earthen wingwalls and adobe floor ridges, so the increase in pit houses with wingwalls from 5% (two) to 42% (thirty) really describes an increase in the frequency of interior partitioning. This increase is striking enough that I believe it represents the introduction of an entirely new interior construction tradition in the Puerco Valley. Within the Puerco Valley, this architectural attribute only becomes common after AD 750, although elsewhere in the northern Southwest wingwalls are present in structures dating to the AD 600s, such as in the Northern San Juan and the Kayenta-Tusayan regions. The implications and spatial distribution of the appearance of wingwalls within the Puerco Valley will be discussed more fully in the following sections.

Wingwalls are important because of the extent to which they shape and define the interior space of the pit house. In some cases, the wingwalls rise high enough and are substantial enough to partition off a separate room within the pit house. That the space beyond the wingwall was perhaps considered separate from the rest of the structure is occasionally seen the method by which the pit structure was excavated. For example, White Mound Houses 4 and 6 both exhibit indentations where the wingwalls intersect the walls of the pit house. It appears that the portion of the structure behind the wingwalls was dug as a separate space, after the completion of the main chamber. In House 3 at White Mound, the encircling bench that served as a support for perimeter poles ends where the wingwalls begin, suggesting that the space beyond was treated differently in terms of roof construction, and perhaps conceived of as a separate room. This pattern has also been observed in Northern San Juan pit houses (R. Wilshusen personal communication 2011).

As with hearths and ash pits, the decision to build a wingwall is intimately tied to ideas about the appropriate construction of domestic space. The increased frequency of wingwalls in the Puerco Valley indicates that new traditions concerning the arrangement of interior domestic space appeared after AD 750. As I noted in Chapter 3, changes in the layout of domestic features and the ordering of interior spaces may be due to the agency of women, for ethnographic analogies suggest they are more likely than men to have constructed interior features.

Presence or Absence of a Bench (Table 21)

	Present	Absent	Unknown	Total	chi-square=	df=	c.v.=
Early	3 (8%)	34 (89%)	1 (3%)	38	3.08	1	2.71
Late	16 (21%)	59 (77%)	2 (3%)	77	**Reject Ho**		

Table 21: Presence/Absence of a Bench by Period

For the most part, the presence of a bench is related to the house builder's choice of roof construction style. The increase in the number of pit houses with benches between the Early and the Late Period from 8% (three) to 21% (sixteen) with benches is significant ($p=0.079$) at the 90% confidence interval. In terms of structural engineering, the Early Period benches are not the same as Late Period benches; they do not appear to be as strongly linked to roof construction. For example, AZ-P-61-193 has a narrow "bench" and perimeter posts supporting the roof. The fact that the bench only encircles ¾ of the pit house and the roof support posts are seated on both the bench and the floor of the structure suggests that its construction was largely independent of the roof.

During the Late Period, benches appear to have been most common among pit houses at the largest sites, such as LA 4487 and Whitewater. Only a single pit house among the structures excavated at small sites during the 1960s-era salvage projects exhibited a bench of any kind. Bench construction implies a greater level of engineering sophistication in roof technology, or perhaps a trend towards more substantial roofing. Thus, the largest sites in the Puerco Valley tended to have greater evidence of permanent, substantial occupation. Bench construction also suggests that the inhabitants of these villages drew on different traditions of roof construction than those living in smaller settlements throughout the Puerco Valley. The presence of benches at large sites but not at small ones could indicate that these settlement types were occupied for different reasons, encouraging different styles of house construction. Finally, the fact that the benches at LA 4487 are almost universally of the ¾ type, while those at Whitewater, about 15 miles distant, are generally of the full-encircling type suggests that differences in bench construction did exist between large settlements.

Burning on Abandonment

This is not really an architectural attribute, but it is a variable that other researchers have judged important (Wilshusen 1986; Cameron 1990). Within the Dolores Valley of Colorado, structures containing ritual floor features correlated closely with burning on abandonment (Wilshusen 1986). Using a larger sample, Cameron (1990:32) found that of a sample of eighty-eight Northern San Juan region pit houses dating between AD 600-950, half were burned at abandonment regardless of ritual use. Although pit houses could have occasionally caught fire by accident, deliberate destruction by fire is most common.

Within the Puerco Valley there does appear to be a significant increase in the frequency of burning at abandonment between the Early and the Late period (p=0.043). Even when accounting for the difference in how Cameron and I divided our samples chronologically, the Northern San Juan displays a constant rate of burning at abandonment from AD 600-950, while the Puerco Valley shows a significant increase. All the same, the Puerco Valley never approaches the percentage of burning at abandonment found in the Northern San Juan, where 44% of all pit structures between AD 600-700, 46% between AD 700-850, and 54% between AD 850-950 are burned. Within the Puerco Valley 7% of all pit houses are burned between AD 600-750, and 24% between AD 750-900. This suggests that while burning on abandonment—either for ritual or other reasons—became more common over time, the practice never took on the importance that it appears to have held in the Northern San Juan region.

Insignificant Changes from the Early to the Late Period

I found no statistical difference in the number of pit houses with interior storage features in the Early Period versus the Late Period. It is possible that storage pits used in the Early Period contained different goods than those in the Late Period because I did not control for storage pit function. All storage features over $0.1m^3$ were given equal consideration; a few structures stand out by having large, subfloor pits (AZ-P-60-31 Units 39 and 41; AZ-P-61-193 Structure 2; NA 8944 Pithouse 6), although these features are generally rare in Puerco Valley pit houses during the early Pueblo period. For the most part, subfloor pits within Puerco Valley pit house from both the Early and the Late Period do not appear to be the primary food storage features of the inhabitants. Larger exterior storage cists served this purpose. Interior storage space was most likely for temporary storage of food or for items of everyday necessity such as stone, ceramic, and bone tools. The need to have some form of interior storage for household accouterments probably did not change between AD 600-900, and therefore the presence of interior storage features did not change either.

Likewise, I found no significant change in the presence of trash fill within abandoned pit houses. If anything, I expected the use of abandoned house pits as trash dumps to increase over time because frequent residential mobility by single households in the Early Period would have created many small, single-occupation sites, while the more intensive occupation of single locations in the Late Period would have created more abandoned houses within still-inhabited settlements. Additionally, as noted elsewhere, the habitations on Early Period settlements are rarely intruded upon by AD 750-1300 occupations. The Early Period architectural sample is dominated by two intensively occupied sites (AZ-P-60-31 and NA 14674/14675) and the use of older house pits as trash receptacles within these settlements may skew the numbers somewhat.

Conclusions

The significant changes that occurred between the Early Period and the Late Period are indicative of an increase in pit house formality as well as the introduction of new methods of construction. Pit houses became larger over time, reflecting an increase in family size predicted by the Neolithic Demographic Transition model, and interior domestic spaces became the setting for a wider variety of domestic activities. The increase in depth over time may correlate with greater investment in surface architecture, although this relationship is far from clear in the Puerco Valley. Regardless, increased depth reflects greater investment in pit house construction because of the labor involved in excavation. In only a few cases did pit houses become so deep that evidence of their roof construction would not have projected above the ground surface. Roofs became more substantially built over time, and a clear preference for four-post roof support systems developed in most parts of the Puerco Valley. Taken as a whole, the increased investment in architecture found in the Late Period is an indication of less frequent mobility. I believe that the appearance of new structure shapes and wingwalls may be related to an influx of people after AD 750, especially considering the hiatus in construction between about AD 710 and 750. Migrants may have carried new architectural traditions into the Puerco Valley during the Late Period. A tight association developed between roof entries, round hearths, ash pits, ladder rests, and ventilators. The formalization of architectural styles during the Late period demonstrates that commensurate with increased sedentism was the development of architectural attributes that communicated cosmological principles or identity.

In the prior discussion, I focused almost exclusively on the frequencies of different architectural attributes. However, my examination of attribute frequencies only presents a coarse-grained depiction of Puerco Valley architecture. It demonstrates that changes in subsistence and society observed across the northern Southwest, like increased sedentism and larger family size, occurred in the valley after about AD 750. Within an area that has long been recognized as a fluid zone on the border of three better recognized but broadly defined cultural traditions, the Puerco Valley is a much more complicated social landscape than those sorts of truisms can encompass. Examining major trends in architectural attributes over time does not help understand the spatial distribution of these trends; patterns over space are the heart of the matter in understanding cultural identity in the region.

Part II: The Elaboration Index

Introduction

With the Elaboration Index I sought to explore the aspects of pit house construction that are related to seasonal mobility or intended length of stay. My ultimate intent is to examine architectural style that reflects cultural identity, but variability of pit house form could also be a reflection of mobility strategies or function. The Elaboration Index provides a relative measure of the energy invested in the construction of a pit house, with the expectation that a house designed for year-round or long-term use would have been sturdier, of more durable and maintainable material, and probably have more formally laid out interior spaces. Structures meant to be inhabited for only a short time or seasonally may be less substantially constructed or contain fewer formalized features. This follows, in large degree, the predictions and observations of McGuire and Schiffer (1983).

The previous section demonstrated that there were significant changes in architectural attributes between the Early and the Late Period. Frequencies of roof construction techniques, hearth elaboration, and increasing area and depth indicate that pit houses in the Late Period are more substantially built than those of the Early Period. Therefore, the Elaboration Index is divided into Early and Late Period comparisons.

Less Elaborate and More Elaborate Pit Houses in the Early Period

Elaborate scores for Early Period pit houses obtained by the methods described in the previous chapter are shown in Table 22. Pit houses below the median (59.025) scored within a range of 43 points, while those above the median were within a much larger range of 152.475. A score of eighty appears to a threshold that separates "less elaborate" from "more elaborate" pit houses. Structures that scored above 80 are either round, oval, or sub-rectangular in shape with four-post roof support systems and shaft/tunnel ventilators, or large, cribbed-log-style structures with side hearths. The "less elaborate" pit houses scored under eighty and tend to be irregularly shaped, have little evidence of roof construction or insubstantial roofs, and lack ventilators (Figure 12). No structure scoring below 80 exhibits four-post roof construction, or the orientation of a formally constructed hearth to a ventilator opening. AZ-P-60-31 Structure 14 is a possible exception, but it was badly impacted by road construction, and it should be remembered that the scores represent *minimum* possible scores. With more information, this structure might have scored higher.

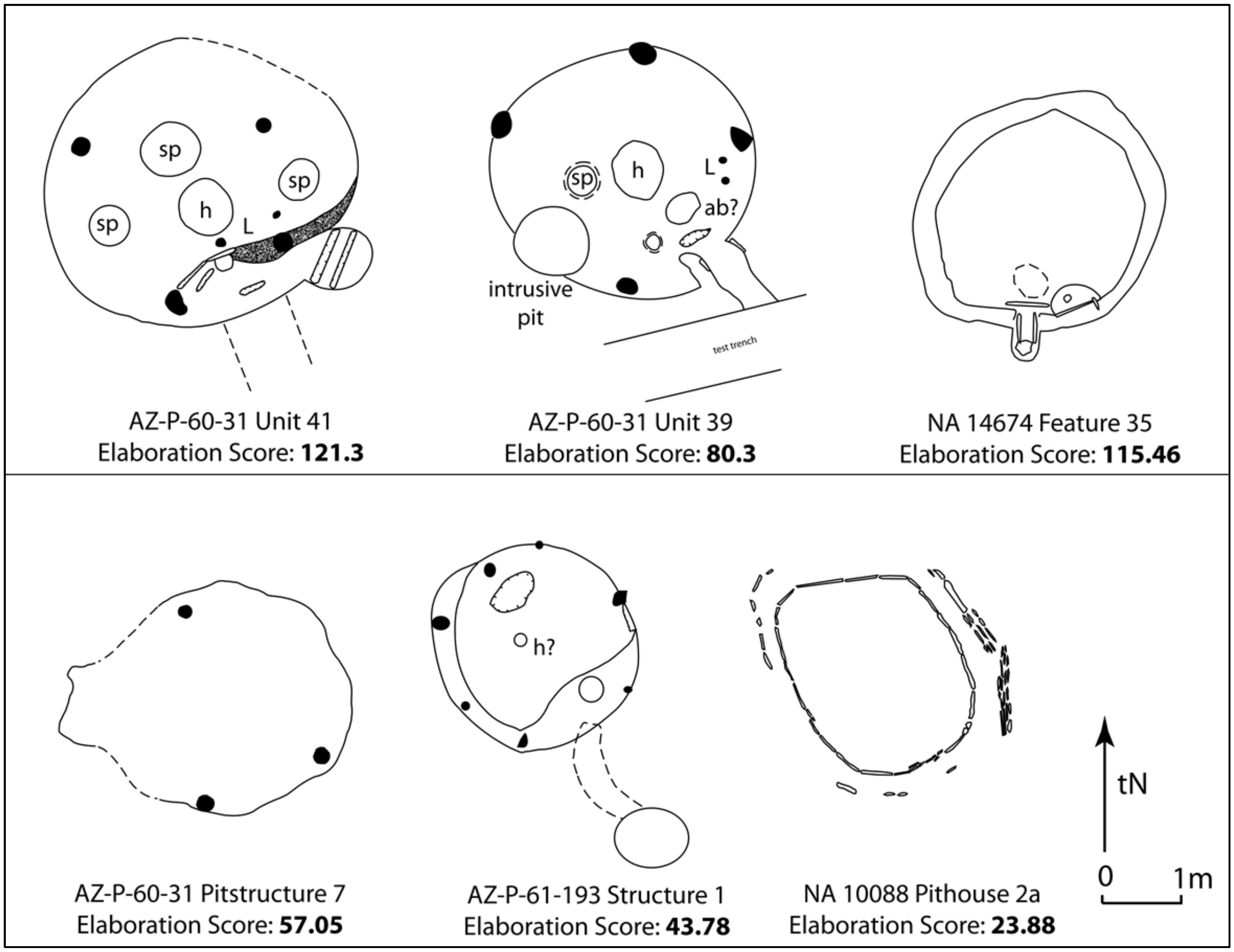

Figure 12: Early Period Pit House Elaboration. Top Row: "More Elaborate." Bottom Row: "Less Elaborate."

Site	Structure	Date	Score
NA 10088	Pithouse 5	650-700	16.02
NA 10088	Pithouse 6	650-700	17
NA 10088	Pithouse 7	650-700	17.85
NA 10088	Pithouse 2A	650-700	23.88
AZ-P-60-31	Pitstructure 1	**690**	28*
AZ-P-60-31	Unit 44	670-710	29.3*

NA 10088	Pithouse 4	650-700	31.02
AZ-P-60-193	Structure 2	600s (mid)	32.41
AZ-P-60-31	Pitstructure 6	**680**	32.85*
NA 10088	Pithouse 3	650-700	33.18
NA 10088	Pithouse 1	650-700	35
NA 10088	Pithouse 2	650-700	35.16
NA 14674	Feature 93	**600s (early)**	40.755
AZ-P-60-193	Structure 1	600s (mid)	43.78
NA 14675	Feature 17	**600s (early)**	43.875
AZ-P-60-31	Pitstructure 10	670-710	49.05
AZ-P-60-31	Pitstructure 7	670-710	57.05
AZ-P-60-31	Pitstructure 3	**668**	59.025
NA 14675	Feature 19	**600s (early)**	61.425
AZ-P-60-31	Unit 7	**671**	63.1*
AZ-P-60-31	Unit 8	670-710	71.19*
AZ-P-60-31	Pitstructure 14	670-710	73.8*
NA 14674	Feature 17	600s (early)	77.61
AZ-P-60-31	Unit 39	670-710	80.3
NA 14674	Feature 27	**600s**	87.29
AZ-P-60-31	Pitstructure 5	670-710	96.03
NA 14674	Feature 21	**600s (early)**	107.5
NA 14674	Feature 35	**600s**	115.455
AZ-P-60-31	Unit 41	670-710	121.3
AZ-P-60-31	Unit 2	670-710	121.975
NA 14674	Feature 71	**600s**	146.52
NA 14674	Feature 49	**600-725**	153.465
AZ-P-60-31	Pitstructure 2	670-710	171.84
AZ-P-60-31	Pitstructure 4	670-710	195.84
NA 8942	Pithouse 3	**734**	211.5

Highlighted Cells are "More Elaborate" Structures. Asterisk indicates structure was missing some data.

Table 22: Early Period Pit House Elaboration Scores

When Early Period elaboration scores are plotted as a histogram, there is no obvious break at eighty that serves to distinguish "less elaborate" from "more elaborate" pit houses. However, structure scores clearly do not distribute normally: there is a distinct extension of the distribution towards higher elaboration scores. If pit structures that qualitatively appear "less elaborate" are treated separately, they approximate a normal distribution curve whereas other "more elaborate" structures exhibit a Poisson distribution. However, because the elaboration scores are based on the same criteria used to qualitatively examine the pit structures (that is, ventilators, hearths, etc.) the statistical observations are not independent of the qualitative evaluation of the structures. Therefore, it is not possible to definitively state that structures under 80 represent an independently identified class of "less elaborate" structures. For the Early Period, 80 points is simply an arbitrary threshold that helps separate "less elaborate" pit structures from those that are "more elaborate." The same issues of statistical independence exist in the Late Period sample.

Of the thirty-five pit houses confidently dated to the Early Period, and for which enough information was available to calculate an elaboration score, I consider 66% (twenty-three) to be "less elaborate" and 34% (twelve) to be "more elaborate." The pit houses on small sites (AZ-P-61-193 and NA 10088) are all included in the "less elaborate" category. The single small-site exception is NA 8942 Pithouse 3, the latest-dating pit house in the Early Period with a tree ring cutting date of AD 734. Both "less" and "more" elaborate structures were built at AZ-P-60-31 and NA 14674/14675. AZ-P-60-31 was probably occupied for less than 100 years during the early Pueblo period, and possibly as few as 50; at least a few of the eighteen pit houses excavated there were inhabited at the same time, although it must be remembered that the "less elaborate" pit houses likely had shorter life-spans than the "more elaborate" ones due to their less substantial roofs, which afforded less protection from water for pit walls and roof support posts. All the same, "less elaborate" structures were probably intended for shorter periods of use anyway. One possibility is that the "less elaborate" structures at AZ-P-60-31 were the first dwellings constructed by newcomers to the area, and they were lived while the immigrants assessed the productivity of the area and gathered building materials for more substantial housing. Another possibility is that some occupants of AZ-P-60-31 chose to pursue more mobile subsistence strategies than others, and their houses reflect the fact that they spent less time at the settlement than the other inhabitants.

At NA 14674/14675, distinguishing between "less" and "more" elaborate pit house is difficult because similar construction methods were used for all pit houses on the site. The biggest differences that contribute to a pit house being included in one category or another are floor area and the presence of a side-hearth. I found pit houses with side-hearths to be slightly bigger on average than pit houses that lack them and they tend to date earlier in the settlement's occupation history, but the excavators note that they did occur alongside structures lacking side hearths (Greenwald, Marek, and Ahlstrom 1993:6). If floor area is excluded from the equation, most pit houses at NA 14674/14675 exhibit nearly identical construction methods: cribbed-log walls and roofs built inside shallow pits with well-plastered floors. Hearths and chimneys are placed to the southeast with enough consistency that later inhabitants seeking salvageable materials always dug into the southeast corner of the structures, removing the hearth slabs and chimney stones without disturbing other portions of the structure.

While I think the nature of "less elaborate" pit houses at AZ-P-61-193, AZ-P-60-31, and NA 10088 is fairly clear, the cribbed-log structures at NA 14674/14675 are more perplexing and equivocal. Their floors were well plastered, unlike other “less elaborate” pit houses, which suggests planning and investment for extended inhabitation. Stevenson's description of Zia women making a plaster-floored tent foundation hints at the amount of labor and water involved in this activity (1894:23-24). I do not have a good idea how long it would take to construct the chimney in a cribbed-log pit house. The cribbed-log roof would have involved less preparation than a comparable-sized roof utilizing four-post roof supports and layers of branches, reeds, and earth, but they probably were substantial enough to withstand winter rain and snow. They are most similar to the cribbed-log and earth roofs of 19th and 20th century hogans, which certainly can withstand winter weather. However, only the lower portions of these cribbed-log roofs have been found intact—the structures may have had cribbed-log walls capped by a less substantial brush superstructure. Most reconstructions of pit houses at NA 14674/14675 have relied on descriptions of Basketmaker II cribbed-log structures excavated in caves near Durango, Colorado, which had relatively intact roofs (Morris and Burgh 1954).

Without a clearer understanding of what sort of investment these cribbed-log structures represented, I am unsure whether they are summer or winter habitations, or both. If they are only summer season structures (as implied by the interpretation of the Cottonwood Seep locale as a seasonal *farming* location), why are they so substantial? Where did the inhabitants move in the winter, and what sort of structures did they build during that portion of the year? Presumably it would be something even more substantial than the cribbed-log pit houses around Cottonwood Seep. If sites with cribbed-log pit houses were occupied year-round then social organization at

NA 14674/14675 must have been rather different than is typically interpreted for pit house communities. The pit houses are generally so small as to prohibit occupation by more than two individuals. As previously mentioned, there are larger surface structures present at NA 14674, but they have been interpreted as communal work areas (Greenwald, Marek, Ahlstrom 1993:11).

In summary, I consider twenty-three Early Period pit houses to be "less elaborate" and twelve "more elaborate.” At only the largest sites—AZ-P-60-31 and NA 14674/14675—did the Early Period occupants of Puerco Valley build both classes of structure. This implies that large archaeological sites during this period did not just become large by accretion over time due to multiple, sequential, seasonal occupations. There are qualitative differences between large site and small site pit houses, suggesting that factors other than just repeated visitation led to the large size of some sites. Some pit houses at these larger settlements represent a greater degree of investment in architecture than others. These "more elaborate" structures contain a greater number of internal features, more substantial roof construction, and greater formalization, as expressed by the symmetrical arrangement of roof entries, hearths, ventilators, and in a few cases at AZ-P-60-31, ash boxes. In short, they contain the features than carry assertive and emblemic style (Wiessner 1983) than communicates group identity. This may be no coincidence. As larger groups of people come together in single settlements over the course of the early Pueblo period (see Varien et al. 2007:290 for a case study from the Northern San Juan), the need to actively assert group identity may have been greater than in the lower density, highly mobile social settings of earlier time periods. The presence of “more elaborate” pit houses at the two potential Early Period villages (AZ-P-60-31 and NA 14674/14675) suggests that by the late AD 600s, architecture played a role in group differentiation at the largest, long-term settlements.

Although all Early Period pit houses are included in subsequent analyses of group identity in Parts III and IV, I rely mainly on the twelve “more elaborate” pit houses identified here. I also continue to consider the cribbed-log pit houses from NA 14674/14675 because—as will be seen—they formed a well-bounded architectural tradition that shared little similarity with other contemporary architecture in the northern Southwest. Despite being mostly "less elaborate,” the unique construction methods of these pit structures renders them suitable for drawing comparisons that may highlight social boundaries or cultural affiliations.

Less Elaborate and More Elaborate Pit Houses in the Late Period

Because the Elaboration Index takes pit house floor area into account and floor area increased over time, I found it necessary to re-examine the threshold that separated “less elaborate” from “more elaborate” pit houses in the Late Period (Table 23). I took a score of eighty to be a starting point, however. Using a score of eighty would have included NA 8948 Pithouse 1 in the “more elaborate” category, which seemed inappropriate since the structure is merely a circular hole in the ground with a square slab-lined hearth. Clearly, the pit house’s slab-lined hearth and floor area boosted its score. LA 4487 Pithouse 10 is the lowest-scoring pit house (107.55) that *appears* to have been “more elaborate,” having a four-post roof support and wingwalls. I arrived at a threshold of ninety points by the same method used with the Early Period pit house: trial and error, examining the frequency distributions of structure elaboration scores with the “less/more” elaboration threshold at different values, and considering the architectural characteristics lacking in the lowest scoring structures. Figure 13 depicts the differences between “More” and “Less” Elaborate pit houses in the Late Period sample. Placing the threshold at ninety relegates most of the small, irregular, asymmetrical structures without ventilators or clear evidence of roof construction to the “less elaborate” category. There is more “grey area” between “less” and “more” elaborate among the Late Period structures than the Early Period structure because of the increased floor area. Excluding this variable might produce better results in the future.

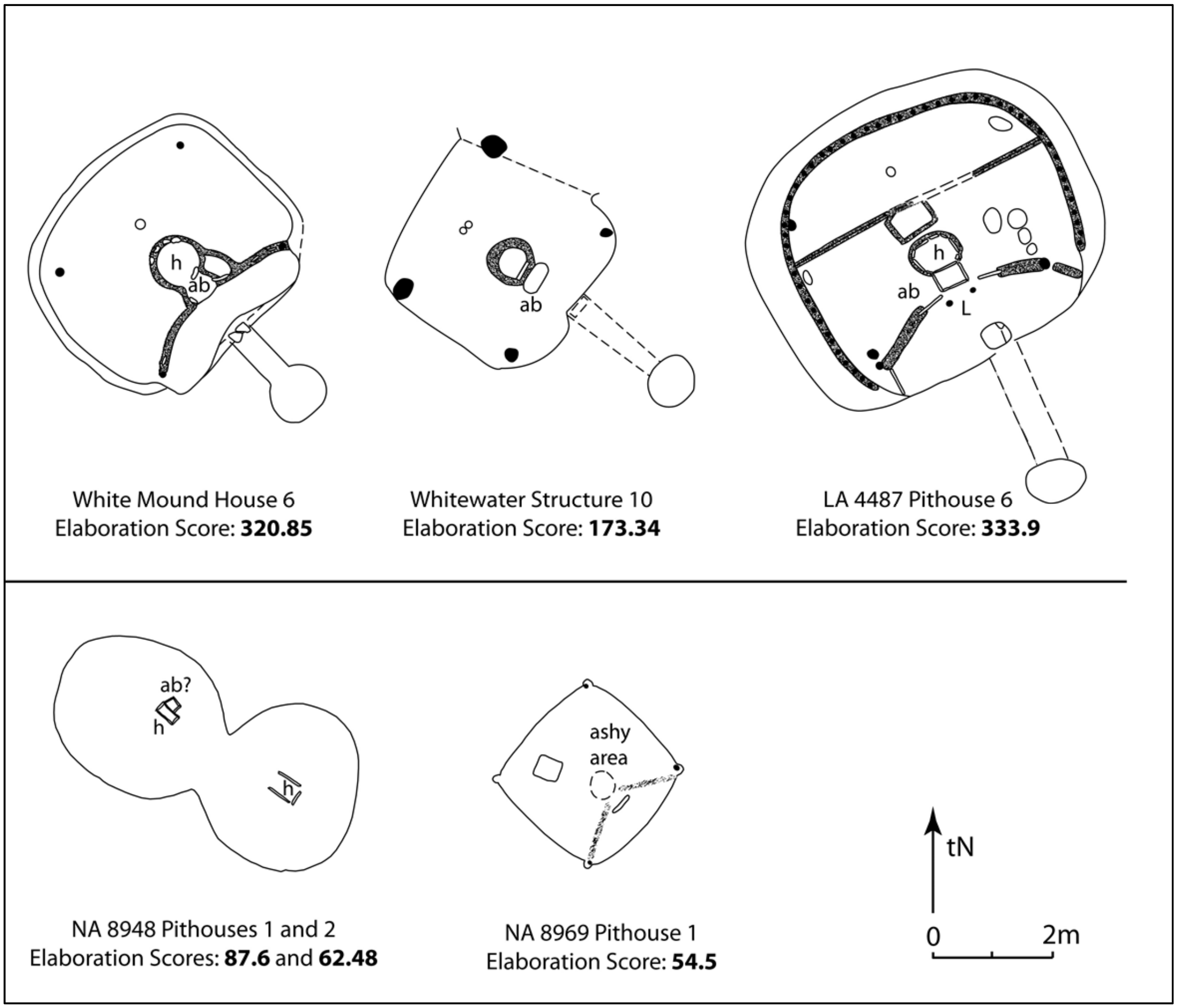

Figure 13: Late Period Pit House Elaboration. Top Row: "More Elaborate." Bottom Row: "Less Elaborate."

Site	Structure	Date	Score

NA 8968	Pithouse 2	870-900	22.5*
Twin Butte	Structure F2.2	700s (late)	33.02
NA 14674	Feature 85	**800s**	35.91
Twin Butte	Structure A	700s (late)	52.5
NA 8969	Pithouse 1	870s	54.5
NA 14682	Feature 1	800s (early)	54.99
NA 8948	Pithouse 2	750s	62.48*
NA 14674	Feature 41	**750 (postdates)**	63.18*
NA 14674	Feature 6	**820s**	68.835
NA 14682	Feature 13/Pithouse 1	780s	73
NA 8948	Pithouse 1	750s	87.6*
NA 14682	Feature 5	800s (early)	90.72
NA 14681	Pithouse 1	875	99.63
LA 4487	Pithouse 10	800-850	107.55*
LA 4487	Pithouse 8	800-850	109.8*
NA 14683	Pithouse 1	**880**	109.98
NA 14682	Feature 4	780s	111.3*
Whitewater	Structure 8	800s	111.9
NA 8944	Pithouse 5	**870s**	112.48
NA 14682	Feature 2/Pithouse 2	**780**	114.985
Whitewater	Structure 16	800s	116.85
NA 8948	Pithouse 3	**758**	118.8*
LA 4487	Pithouse 11	800-850	121.68*
Whitewater	Structure 18	800s	123
Whitewater	Structure 7	800s	126.56
NA 8944	Pithouse 4	850-900	127.545
NA 8939	Pithouse 3	**812**	135
NA 8941	Pithouse 1	**850s**	141.28*
Whitewater	Structure 4	800s	144.32
NA 8944	Pithouse 6	**859**	150.365
LA 4487	Pithouse 4	800-850	155.54*
Whitewater	Structure 13a	800s	164.12
Whitewater	Structure 6	800s	166.4
Whitewater	Structure 5b	800s	172.62
Whitewater	Structure 10	800s	173.34
NA 8943	Pithouse 1	800s (late)	174.2*
White Mound	House 5	700s (late)	175.04
White Mound	House 1	700s (late)	177
Whitewater	Structure 14	800s	189.54
Whitewater	Structure 17	800s	190.2
Whitewater	Structure 9	800s	199.31

NA 8943	Pithouse 2	**850-950**	199.98*
White Mound	House 2	700s (late)	202.92
NA 8944	Pithouse 3	**806**	203.58
LA 4487	Pithouse 9	800-850	204.17*
Whitewater	Structure 11	800s	207.1
NA 6639	Kiva	**800s**	209.44
Twin Butte	Structure D4	700s (late)	211.68*
NA 8944	Pithouse 2	850-900	215.65
Whitewater	Structure 5a	800s	217.76
Whitewater	Structure 3	850s	230.94
LA 4487	Pithouse 7	800-850	240.38*
NA 8942	Pithouse 2	850 (postdates)	247.05
White Mound	House 4	700s (late)	249.66
NA 8939	Pithouse 2	**837**	276.51
Whitewater	Structure 2a	800s	280
Whitewater	Structure 1	800s	282.6
NA 8968	Pithouse 1	870-900	283.22*
Whitewater	Structure 2	**815**	291
NA 8969	Pithouse 2	870s	295.68
LA 4487	Feature 4/Pithouse 5	**817**	303.82*
LA 4487	Feature 38/Pithouse 1	**842**	306.6*
White Mound	House 6	780s	320.85
White Mound	House 3	**787**	322.08
Whitewater	Structure 15	**888**	326.97
NA 8942	Pithouse 1	**790s**	332*
LA 4487	Feature 19/Pithouse 6	**845**	333.9*
LA 4487	Feature 36/Pithouse 2	**845**	334.02*
Twin Butte	Structure F4	700s (late)	356.37
Whitewater	Kiva A	800s (late)	357.48
Whitewater	Kiva B phase 2	800s (late)	454.68
Whitewater	Kiva B phase 1	800s (late)	471.52
Whitewater	Structure 12	**800s (late)**	610.06
Highlighted Cells are "Non-Elaborate" Structures. Asterisk marks structures that had missing data.			

Table 23: Late Period Elaboration Scores by Structure

With the threshold set at ninety points, the number of “less elaborate” structures changes dramatically in the Late Period. Only 15% (eleven out of seventy-three structures with enough data to compute meaningful elaboration scores) are considered “less elaborate,” while 85% are "more elaborate." Of the "less elaborate" pit houses, three were probably more justifiably surface structures rather than pit houses. NA 14682 Pithouse 1/Feature 13 is a shallow, sub-rectangular structure that probably had five roof-support posts originally. The posts were immediately adjacent to the walls of the pit. Similar construction is seen in jacal surface rooms excavated elsewhere in the Puerco Valley (such as Roberts' "Brush Structures") as well as in southwest Colorado (jacal structures of the Sagehill Phase—AD 700-780 [Wilshusen 1988b]). Structures A and F2 at Twin Butte fall into this category, too. They were deep enough to qualify as pit houses, and their construction methods were similar to pit houses, but their placement in relation to other structures suggests that they were most likely sunken-floor, slab-lined storage rooms or activity areas. Within the Puerco Valley establishing a definition of "pit house" that dichotomously excludes shallow surface rooms is difficult. For example, Structure A at Twin Butte was 0.3m deep, and Structure F2 was 0.5 meters deep, while many of the cribbed-log pit houses at NA 14674, which were certainly part-time habitations, were less than 0.25 meters deep.

The remaining Late Period "less elaborate" pit houses were generally small and contain few internal features. Perhaps most telling, of the eleven "less elaborate" pit houses in the Late Period, seven lacked ventilators. Three cribbed-log pit houses had chimneys, and NA 8968 Pithouse 2 contained a ventilator. NA 8969 Pithouse 1 had a deflector stone but no evidence of a ventilator opening. Ventilation systems were not considered an essential item in housing that was intended only for short-term use.

There are pit houses that scored above ninety on the Elaboration Index that appear similar to "less elaborate" structures, and only received high scores because of their floor area (Figure 14). NA 8943 Pithouses 1 and 2, NA 8944 Pithouse 4, and NA 8948 Pithouse 3 all contained little other than a hearth, and NA 8944 Pithouse 4 is the only one that appears to have had a ventilator. The floor areas of these pit houses range from $10m^2$ to over $20m^2$, which is clearly the reason they scored above the ninety-point threshold. Despite their large size, these pit houses may have been used in similar fashion to somewhat smaller structures that also have few internal features and non-elaborate construction techniques. In subsequent analyses, I include structures scoring over ninety that nonetheless appear to have functioned much like “less elaborate” structures, but excluded all pit houses scoring less than ninety points.

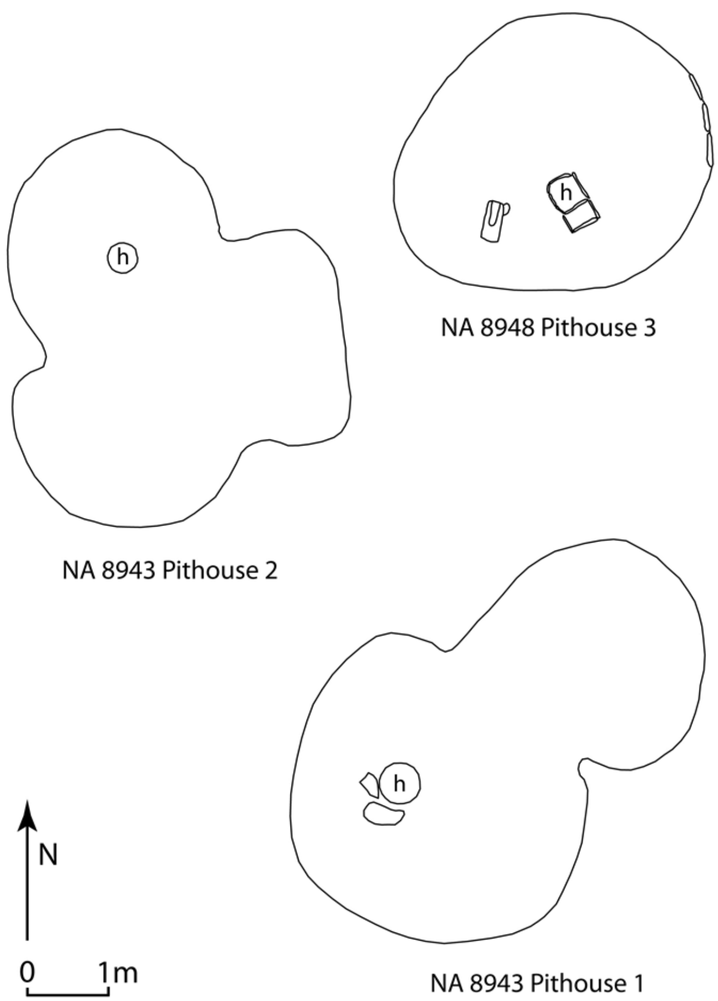

Figure 14: Examples of Late Period “more elaborate” pit houses that can be considered “less elaborate.”

The “less elaborate” pit houses and those described above that probably should also be considered “less elaborate” appear to have been built in two kinds of circumstances. Some “less elaborate” structures may have been intended for a single, brief period of occupation while people built more substantial housing at the settlement. Sites NA 8968 and NA 8969 provide good evidence of this situation. As described in Chapter 2, these sites are separated by a mere 30 meters and have similar construction dates in the AD 870s. They have the highest frequency of Tusayan-tradition ceramics of all the Puerco Valley sites. Architecturally, they were very similar to Kayenta-Tusayan region construction methods, both inside and out; this will be more fully discussed in Parts III and IV. Based on the ceramic and architectural evidence, these two sites—which probably represent a single settlement occupied by two households—are among the best candidates for “unit-intrusion” migration into the Puerco Valley.

NA 8968 consists of a very small (2.25m^2), round pit house (Pithouse 2) with a hearth, deflector, and a ventilator, and a rather large (20.23m^2), oval-shaped pit house (Pithouse 1) with an attached antechamber or alcove encircled by a three-quarter bench. Although neither structure contained much trash fill, Pithouse 1 contained burials in fill about a meter above the floor and three hastily buried bodies in a pit to the north. Nine jacal or adobe rooms were excavated just north of Pithouse 2, two of which may have been living rooms. Neither pit structure contained many features, nor is there evidence of which was constructed first. Either relatively simple pit structure could have served as a temporary residence while the jacal or adobe surface pueblo was being constructed.

More conclusive evidence for a small, simple, expedient pit house built prior to a larger, more elaborate one is found at NA 8969. Pithouse 1 was small (5.45m^2), and sub-rectangular with four roof support beams set into the corners of the structure. It contained an un-lined earthen hearth, a deflector that was simply resting on the floor, and lines of charcoal in shallow troughs in the position normally occupied by wingwalls. In a related newspaper article found mixed in with the site records, Gumerman mentions that he thought the simple structure might even have been a children's "play house." The preparation that went into the roof system seems to argue otherwise, but perhaps the activity of children are responsible for bringing the "deflector" into the structure and demarcating the place where wingwalls "should" have been. Pithouse 2 was a larger (14.08m^2) and much more elaborate structure (scoring 295.68 on the Elaboration Index). It was oval, with a bench on which perimeter posts were seated, an adobe-lined hearth with an ash box, wingwalls containing an extra partition, and a ventilator.

Once again, there is little evidence to suggest which pit structure was constructed first. Pithouse 1 (the smaller of the two) was filled with charcoal flecked sand, but this fill contained few sherds. Pithouse 2 appears to have been in use up until whatever event incited the abandonment of the settlement—possibly a raid or attack. Disarticulated (but purposefully placed) human remains were recovered from the floor of Pithouse 2 above a storage pit containing burned corn. Pithouse 1 may have been a temporary habitation used while the more substantial Pithouse 2 and an associated surface granary were under construction. Following the completion of Pithouse 2, Pithouse 1 may have been left open, and accessible for subsequent activity.

The evidence that the site was inhabited by migrants from the Kayenta-Tusayan region into the Puerco Valley will be discussed more fully later on. The people occupying the site moved from far enough away to require constructing a temporary residence while a suitable, "more elaborate" dwelling could be built. The use of small, unelaborate pit houses as temporary housing has been documented at other sites within the northern Southwest at various times. For example, at Point of Pines (W:10:50), the first thing constructed by newcomers to the site was a pit house village (Stone 2003:57). Following the split at Oraibi in 1908, the expelled Hopi first constructed pit houses at Bacavi to shelter in during the winter (Whiteley 1988:123). The structures "were extremely small: a family of five or six crowded into a floor-space of twenty-five or thirty square feet [2.32-2.78m^2] with a roof only four or five feet from the floor" (Whiteley 1988:123). Nearby a second cluster of pit houses consisted of a "row of pithouses dug four feet into the soil with two or three feet of rock wall above the surface, roofed with brush, branches, and clay." (Whiteley 1988:123). For the early 20th century Hopi temporary housing did not have to be luxurious—whole families crammed into tiny spaces. Furthermore, the tradition of building simple pit houses as a temporary housing type remained part of the Puebloan architectural canon from the early Pueblo period up to historic times.

Other examples may exist of temporary housing adjacent to later, more substantial structures: NA 8968 and 8969 are the clearest examples in the Puerco Valley. Perhaps more common within the Puerco Valley are the second class of "less elaborate" pit houses, those that were short-term habitations that were probably lived in for no more than a couple of years, either year-round or seasonally. These typically are larger than the "temporary" habitations previously discussed, but contain fewer formalized features than most "more elaborate" pit houses. As will be discussed later on, they are also among the most difficult to characterize in terms of group affiliation or identity, because they frequently blend regional styles, or exhibit architecture that is reminiscent of a particular area, but not clearly built in a particular style.

Most of the Late Period pit houses that could be considered "less elaborate" except for their size fall into this category. For example, the inhabitants of NA 8943 built two large pit houses (by Puerco Valley standards) that had floor areas greater than 20 square meters. Other than circular, adobe-lined hearths, the structures contained no floor features. Pithouse 1 was "bi-lobed," having the appearance of two oval structures appended to one another, while Pithouse 2 was "tri-lobed." The structures were associated with masonry surface rooms that may or may not belong with the pit houses occupation of the site, and ceramics suggest an occupation sometime in the AD 1100s post-dating the pit houses. Neither pit house had any evidence of roof construction, suggesting that roofs were built from the original ground surface outside the excavated pit, or that the roofs were insubstantial. One of the structures apparently burned, but the excavators recovered no major beams, so they were either salvaged for use elsewhere, or had never been particularly large. Neither Pithouse 1 nor Pithouse 2 contained any evidence of storage features, or any other features for that matter. There are no other known pit houses on site NA 8943, so these structures may represent the whole early Pueblo period occupation. Given that they were large enough to comfortably accommodate a household of 5 or 6 people, and had formalized hearths, but lacked any further elaboration, I suggest that these structures may have been intended for short-term occupation not lasting more than a couple of years by a group of people who were accustomed to making short residential moves on a regular basis.

Many other structures located on bluffs and benches above the Puerco River floodplain had the same architectural characteristics: floor areas between 10 and 20 square meters, but a paucity of internal features, frequently lacking a ventilator, and little evidence of a roof. However, the nature of the excavations that uncovered these structures makes interpretation difficult. As I have mentioned, archaeologists were in the process of adjusting their methods to accommodate the nature of salvage archaeology, which demanded much quicker action than previous projects. Most of the sites in this study with NA numbers between 6639 and 8969 were each excavated in under a week. The speed of the excavations may be partially responsible for the “less elaborate” nature of these pit houses. All the same, the general lack of post holes, ventilators, and storage features is striking, and suggests that these structures may have formed part of a larger, seasonally based subsistence strategy—with crops being transported elsewhere for storage—or the inhabitants rarely stored more than a year or two worth of food and were comfortable with frequent relocations. In either case, the inhabitants did not invest a great deal of energy into house construction.

“More elaborate” structures from the Late Period have a large range of scores, from just over 90 to 610. Most lie between 90 and 350. A histogram of their scores does not distribute normally, but like the Early Period “more elaborate” structures approximates a Poisson distribution. Late Period pit houses with outlying scores are found primarily at Whitewater. Structure 12 scored 610.06, much higher than any other pit house in the Puerco Valley, while Kivas A and B likewise scored high. Structure F4 at Twin Butte comes close to structures at Whitewater with a score of 356.37. Floor area is one of the driving factors behind these high scores, because these were among the largest Puerco Valley pit houses. A final note regarding Late Period pit house elaboration is that of the top twenty most elaborate structures, two-thirds were located within large settlements: Whitewater, LA 4487, and NA 5065. As in the Early Period, the greatest degree of architectural elaboration occurs in settings that are most likely to bring multiple households together.

Conclusion

During the Early Period, at least two classes of architecture were present in the Puerco Valley. Most structures were small, had relatively few formal features, and were probably occupied seasonally. A few structures at the largest settlements were long-term, permanent houses which adhered to set architectural patterns. During the Late Period, there may have been three classes of pit house architecture. A few structures may represent very short-term housing meant to provide accommodations while more elaborate pit houses or surface structures were being built. Other pit houses are larger but still have little evidence of roof construction and often lack ventilators. These may have provided shelter for people engaged in seasonal farming activities and had more elaborate homes elsewhere. They also may have been houses built by groups accustomed to making frequent residential moves and did not invest greatly in architectural elaboration. The absence of ventilators in most of these structures needs to be examined in greater detail. As I will show in the next two sections, the use of a ventilator is a choice that is probably related to the expression of group identity, but the Elaboration Index suggests that it may also be related to intended length-of-stay. Finally, there are many Late Period pit houses that contained formalized architectural attributes such as hearths, ash pits, ventilator combinations, wingwalls, adobe floor ridges, and evidence of substantial roofing. These pit houses are typically found at the largest settlements and may have been the most permanent housing in the Puerco Valley. They are also the most likely to yield information regarding the inhabitants cultural affiliation or identity.

Part III: Pit House Similarity Within the Puerco Valley

Introduction

As described in the Chapter 4, I used Gower's coefficient of similarity to compare pit houses within the Puerco Valley. The coefficient is a measure of the amount of attributes shared between two cases in a sample; comparison of each case to every other case in the sample results in a matrix of similarity coefficients. Coefficients can be between 0 (no similarity) and 1 (completely similar). Figure 15 and Figure 16 show examples of pit house pairs with high and low coefficients of similarity, respectively. After visually comparing the pairs of similar structures that resulted from different thresholds, I decided that 0.85 represents a significant degree of architectural similarity. This also corresponds to one standard deviation above the mean for the entire Puerco Valley similarity matrix. A coefficient of similarity greater than 0.85 between two pit houses demonstrates shared architecture that could result from close interaction of the inhabitants. The individuals who built these structures may have learned the skills and techniques of pit house building within the same architectural tradition. Another reason that structures may be similar is due to horizontal transmission—skills and techniques passed between two people or groups of similar age (Stark et al. 2008:7). Alternately, architectural similarity may be the result of vertical transmission, whereby the methods of house construction are passed generationally, from the older to the younger (Stark et al. 2008:7). Finally, the same individual or group could be responsible for building similar looking pit houses separated in time. Demonstrating that the architecture of one structure directly influence or anteceded another is likely impossible given the scale at which these settlements can be dated. This is particularly an issue in the Early Period, where radiocarbon and archaeomagnetic dates can demonstrate rough contemporaneity between two structures, but not necessarily establish which came first. In the Late Period, this level of inquiry may be possible, but only under special circumstances. For the most part, the dates associated with even large sites come from just a handful of structures—once again, this can demonstrate generally contemporaneity, but not establish the sequence of construction on a site, or between to structures being compared. As in other analyses, the Early Period is considered first, followed by the Late Period. During the Early Period, there were very few coefficients of similarity greater than 0.85 that were not at the same site, so I primarily discuss the homogeneity or heterogeneity of each site. I do identify a few cases where architecture shared between two settlements was not picked up by the Gower's coefficient operation. A much greater number of structure pairs with significant degrees of similarity were observed between sites in the Late Period. In that section, I discuss the internal relationships on each site before discussing the relationships between pit houses on that site and other pit houses in the Puerco Valley.

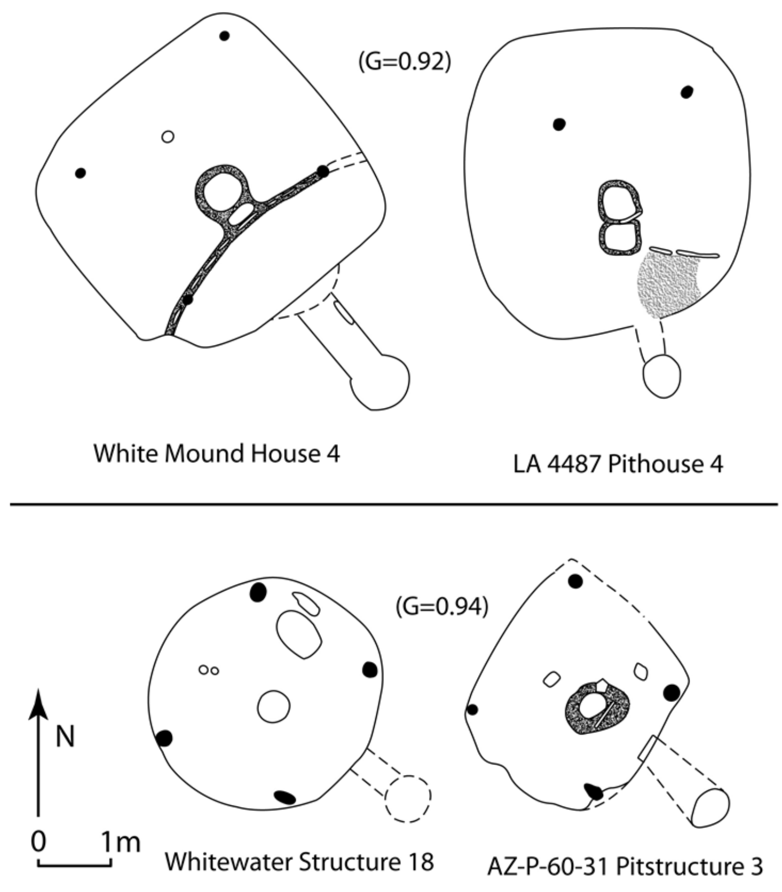

Figure 15: Structure Pairs with High Gower's Coefficients

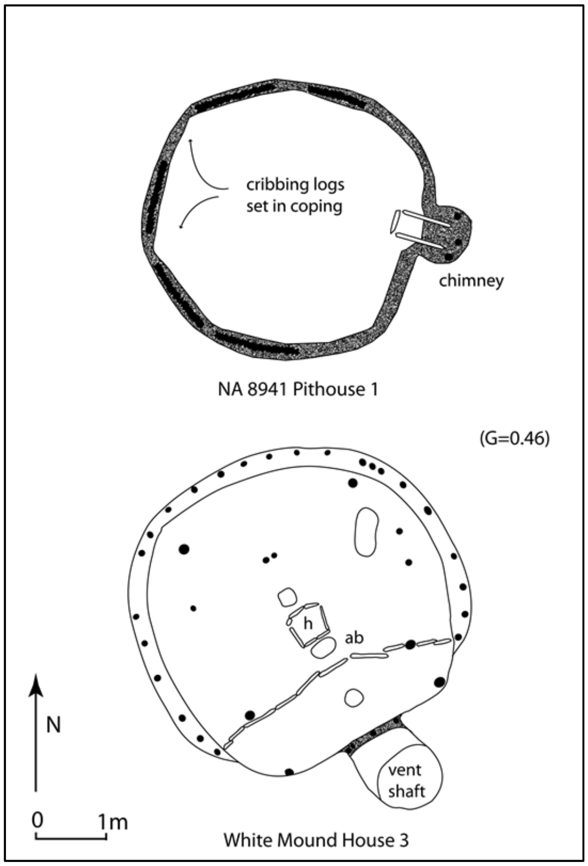

Figure 16: Examples of Pit House Pairs with Low Gower's Coefficients

Structure-to-Structure Comparisons During the Early Period

There were thirty-five structures dating to the Early Period that had enough information to calculate Gower's coefficient of similarity. Strikingly, I found no similarities above the 0.85 threshold between separate sites, except at NA 14674 and 14675 which are immediately adjacent to each other and may be considered a single site. All other similarities greater than one standard deviation above the mean are between structures located on the same site. One factor that might contribute to this is that each site was excavated and mapped by a single group of archaeologists. Drafting conventions and excavation practices may make comparison between sites excavated by different archaeologists difficult. The other possibility is that these dissimilarities represent real differences in past behavior. Construction of multiple houses on a site by the same builder, or builders who learned their skills in the same community could produce such a pattern. Furthermore, on larger sites such as NA 14674/14675 and AZ-P-60-31, there may have been significant social pressures to conform to culturally-defined methods of construction and house appearance. This reinforces the results of the Elaboration Index, which demonstrated that social processes influencing the appearance of architecture seem to be more prominent within larger settlements.

Site	Average Gower's (G=)	Number of Structures
NA 14674/14675	0.8755	n=11
NA 10088	0.8454	n=8
AZ-P-61-193	0.78	n=2
Puerco Valley Avg	0.7424	n=35
AZ-P-60-31	0.7366	n=18

Table 24: Average Gower's Coefficient by Site (Early Period)

NA 14674/14675 had the greatest degree of internal similarity—and thus internal conformity—of all the Early Period sites (Table 24). Over half of the structure-to-structure comparisons produced coefficients of similarity in excess of G=0.9. Aside from a few exceptions, the pit houses on NA 14674/14675 conformed to the standard method of construction described elsewhere—the shallow pit with cribbed-log walls and roofs, and hearth slabs and chimneys. The uniformity of these pit houses is remarkable compared to other structures in the Puerco Valley. Even more remarkable, the techniques used to construct these pit houses remains almost unchanged from AD 600 to at least AD 850. No other architectural style is so constant within the Puerco Valley (or for that matter the rest of the early Pueblo period northern Southwest).

The structures on NA 10088 comprise an internal network where practically every structure is similar to every other structure. Ten of twenty-eight comparisons are above G=0.8. The only pit house on NA 10088 that does not share a similarity of greater than G=0.9 with at least one other structure is Pithouse 1. This is also the only pit house that had a hearth and a small ventilator, and did not have slab-lined walls. The other pit houses on NA 10088 were shallow, slab-lined and slab-floored structures that lacked hearths and contained very little evidence of roof construction. They are conjectured to have been entered at ground level and to have been roofed with bent poles and brush or reed matting. Based on these dissimilarities, Pithouse 1 may even belong to a different occupation than the other pit houses on the site. The site description suggests it may have been located a short distance from other structures at NA 10088. Pithouse 1 is the only pit house that produced tree-ring dates at the site; if it is from a separate occupation, this further strengthens the argument that the remaining structures on NA 10088 may date prior to AD 600.

Only two pit houses were built at AZ-P-61-193—a small round pit house with a small "bench," a ventilator, and a series of perimeter posts that supported the roof. The other structure on the site appears to be a modified storage pit. The constraints of placing a habitation within a storage pit dictated the form of this second structure so much that it did not resemble the other structure on the site, even if the same people built them, which was presumably the case at this briefly occupied, single or double family habitation.

NA 8942 Pithouse 3 is the only structure on NA 8942 that dates to the Early Period, so there are no comparisons within NA 8942. Pithouse 3 is does not appear immediately similar to other Puerco Valley pit houses during the Early Period, though it shares some construction methods with the round pit houses at AZ-P-60-31 that have four-post roof support systems and ventilators.

AZ-P-60-31 is the only site that has a lower coefficient of similarity than the average for the Puerco Valley as a whole during the Early Period (Table 24). This is true only after structures lacking more than 25% of attribute categories are removed from analysis (see Table 7). One of the primary reasons for this may be the combination of "less elaborate" and "more elaborate" pit houses found on AZ-P-60-31. Visual comparison shows that five of the six most elaborate pit houses at AZ-P-60-31 are actually rather similar to one another (Figure 17). Pitstructure 2, Pitstructure 4, Unit 2, Unit 39, and Unit 41 all could be characterized as round or oval shaped, and they had shaft/tunnel style ventilators, and circular hearths. All but Pitstructure 4 most likely had four-post roof supports (it has five). The biggest differences were in hearth construction materials, hearth elaboration, the presence of interior partitioning, and interior storage features. In short, the methods of constructing the actual walls, roof, and ventilation system were similar, but the interior features differed from one another.

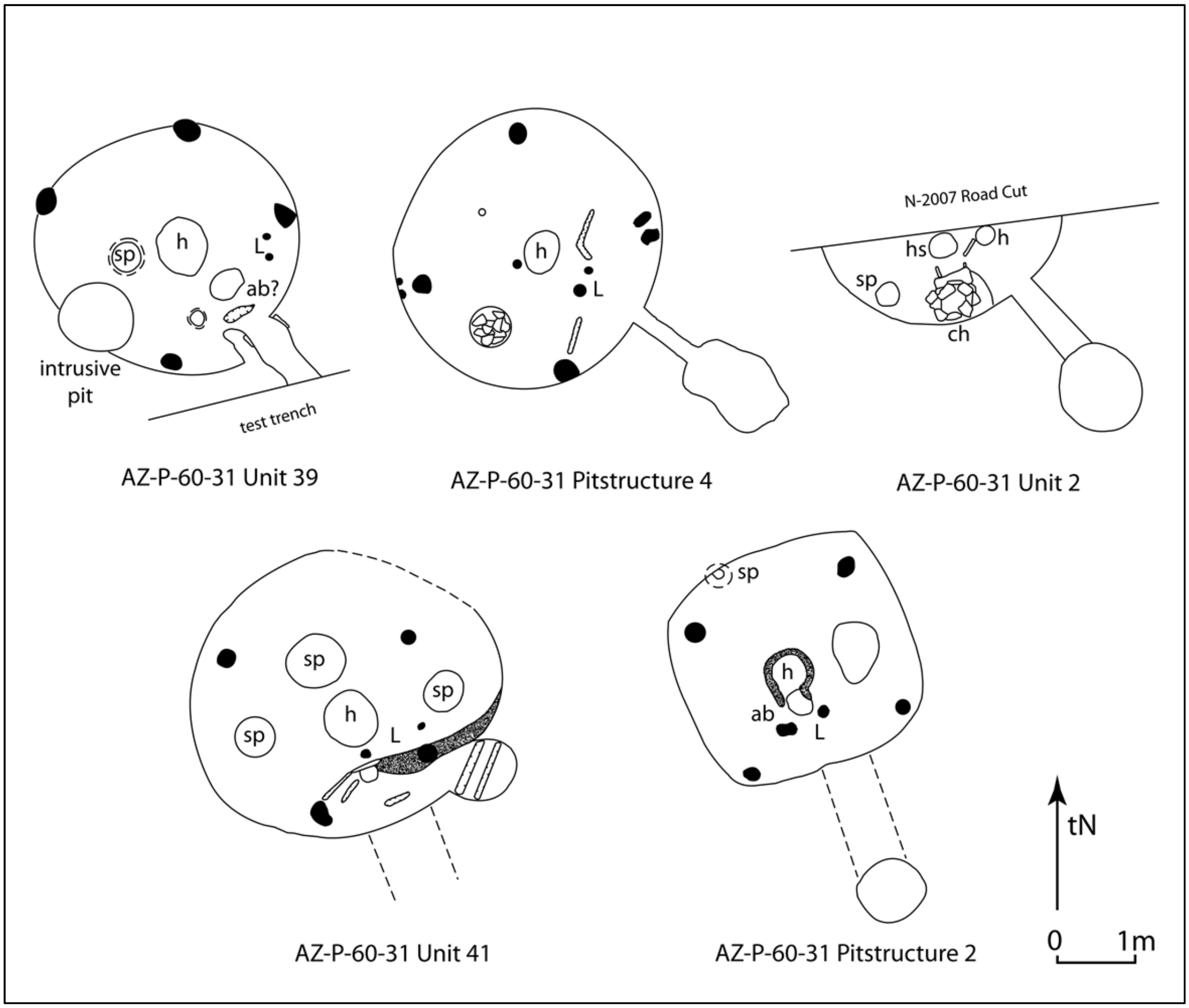

Figure 17: Similar "More Elaborate" Pit Houses on AZ-P-60-31

The sixth "more elaborate" structure at AZ-P-60-31—Pitstructure 2—was sub-rectangular in shape. Pitstructure 2 also has the latest dates associated with the site, an archaeomagnetic sample from the hearth that dates to 680-775. Pitstructure 2 appears to be higher up in the site stratigraphy than other structures, and it may have had arc of storage pits to the north of it that are not intruded on by other, later features. It may be one of the last pit houses built on the site. Only two other pit houses in the Puerco Valley were sub-rectangular shaped during the Early Period, and both were located at AZ-P-60-31. Pitstructure 8 was heavily impacted by road construction, and the shape recorded is just a conjecture, while Pitstructure 10 is probably more correctly called a sunken-floor surface room.

AZ-P-60-31 shares some architectural traits with nearby NA 14674/14675 that were not obvious in the Gower's coefficient matrix. AZ-P-60-31 Unit 2 contained a tabular masonry chimney and a hearth slab similar to the cribbed-log pit houses at NA 14674/14675. The

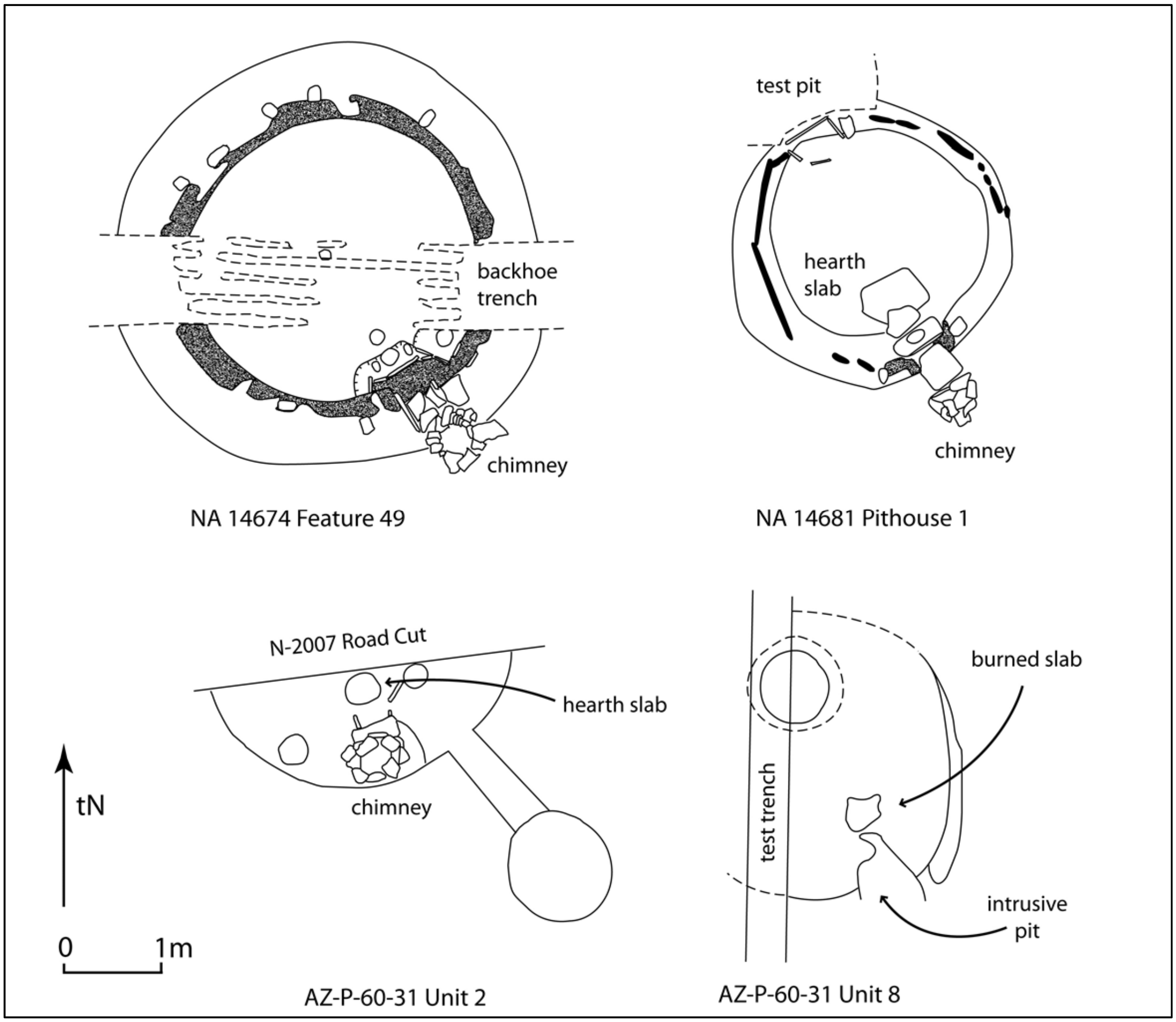

Figure 18: Bottom Row: Possible Chimneys and Hearth Slabs at AZ-P-60-31. Top Row: Cribbed-log Pit Houses for Comparison.

excavators felt that the prehispanic inhabitants of the pit house added this feature during a remodel of the structure. Elsewhere on AZ-P-60-31, Unit 8 appears to be a cribbed-log style pit house that was robbed for material—all that remained besides the outline of the floor was an intrusive pit where the chimney should be located, and a burnt sandstone slab where the hearth slab normally occurs in cribbed-log structures. These two pit houses provide evidence that the inhabitants of NA 14674/14675 and AZ-P-60-31 interacted with each other. Figure 18 compares Units 2 and Unit 8 to cribbed-log pit houses excavated nearby. Unit 8 may pre-date or post-date the major occupation of AZ-P-60-31, but Unit 2 is unequivocal evidence that during the main occupation of the settlement, individuals with the knowledge and desire to create interior spaces resembling the structures at NA 14674/14675 were present.

During the Early Period, most Puerco Valley pit houses bore the greatest resemblance to structures located at the same site. This tentatively suggests two things: that there are no over-arching architectural styles at a scale larger than the settlement during the Early Period; or, larger settlements induced residents to conform to specific architectural styles. However, the sample size is small, comprising only thirty-five structures, of which twenty-three were considered "less elaborate" in the previous analysis. In "Part IV" I look beyond the Puerco Valley for larger architectural traditions that Puerco Valley residents may have participated in. All the same, even with so many generic-looking pit houses, there are still low levels of statistical similarity between sites. The two sites that show some evidence of interaction (NA 14674/14675 and AZ-P-60-31) are inter-visible and only separated by a few miles. They are also two of the largest Early Period settlements in the Puerco Valley, and perhaps expressing cultural identity took on greater importance within the social situations presented this community, than in the small, short-term farmsteads found elsewhere in the valley. In reality, because there are so few excavated sites dating between AD 600 and 750 elsewhere in the Puerco Valley, it is hard to gauge the degree of interaction across space.

Structure-to-Structure Comparisons During the Late Period

Unlike the Early Period, many similarities occur between structures located on different sites in the Late Period (Table 25). The relationships between pit houses can be conceived of as a network tying structures and groups of structures together. The densest "network" occurs in the area between sites NA 8948 and LA 4487 (Figure 3). All of these sites were newly established during the Late Period, with little evidence to suggest they were occupied in the Early Period. LA 4487 and Whitewater contain the greatest number of pit houses, and therefore form the "hubs" of the network of architectural relationships. I will first consider the relationship these two "hubs" have to other sites in the Puerco Valley (including comparing them to each other), before examining the relationships between the smaller sites. The narrative description in the pages that follow is based on the structure matches depicted in Table 25.

Site and Structure	matches with	Site and Structure
Twin Butte Structure F4	←→	LA 4487 Pithouse 2
LA 4487 Pithouse 1	←→	LA 4487 Pithouse 5
White Mound House 2	←→	LA 4487 Pithouse 5
White Mound House 6	←→	LA 4487 Pithouse 5
White Mound House 3	←→	LA 4487 Pithouse 6
White Mound House 3	←→	LA 4487 Pithouse 1
White Mound House 6	←→	LA 4487 Pithouse 1
White Mound House 5	←→	LA 4487 Pithouse 10
LA 4487 Pithouse 8	←→	LA 4487 Pithouse 4
NA 8948 Pithouse 3	←→	LA 4487 Pithouse 4
White Mound House 4	←→	LA 4487 Pithouse 4
Whitewater Structure 14	←→	LA 4487 Pithouse 4
White Mound House 4	←→	LA 4487 Pithouse 7
Whitewater Structure 4	←→	LA 4487 Pithouse 8
NA 6639 Kiva	←→	LA 4487 Pithouse 9
Whitewater Structure 2	←→	LA 4487 Pithouse 9

Whitewater Structure 2a	←→	LA 4487 Pithouse 9
NA 14682 Feature 5	←→	NA 14674 Feature 6
NA 14683 Pithouse 1	←→	NA 14681 Pithouse 1
White Mound House 4	←→	NA 6639 Kiva
Whitewater Structure 17	←→	NA 8939 Pithouse 3
NA 8943 Pithouse 2	←→	NA 8943 Pithouse 1
NA 8948 Pithouse 3	←→	NA 8943 Pithouse 1
NA 8968 Pithouse 1	←→	NA 8943 Pithouse 2
Whitewater Structure 6	←→	NA 8944 Pithouse 3
Whitewater Structure 17	←→	NA 8944 Pithouse 2
Whitewater Structure 6	←→	NA 8944 Pithouse 5
NA 8948 Pithouse 2	←→	NA 8948 Pithouse 1
Whitewater Structure 18	←→	NA 8968 Pithouse 2
White Mound House 2	←→	White Mound House 1
Whitewater Structure 10	←→	White Mound House 1
Whitewater Structure 11	←→	White Mound House 1
Whitewater Structure 6	←→	White Mound House 1
White Mound House 4	←→	White Mound House 2
White Mound House 6	←→	White Mound House 2
Whitewater Structure 14	←→	White Mound House 2
Whitewater Structure 9	←→	White Mound House 2
Whitewater Structure 17	←→	Whitewater Structure 1
Whitewater Structure 14	←→	Whitewater Structure 10
Whitewater Structure 5b	←→	Whitewater Structure 10
Whitewater Structure 8	←→	Whitewater Structure 10
Whitewater Structure 17	←→	Whitewater Structure 11
Whitewater Structure 18	←→	Whitewater Structure 11
Whitewater Structure 4	←→	Whitewater Structure 14
Whitewater Structure 6	←→	Whitewater Structure 17
Whitewater Structure 7	←→	Whitewater Structure 18
Whitewater Structure 8	←→	Whitewater Structure 18
Whitewater Structure 8	←→	Whitewater Structure 18
Whitewater Structure 2a	←→	Whitewater Structure 2
Whitewater Structure 5a	←→	Whitewater Structure 4
Whitewater Structure 5b	←→	Whitewater Structure 4
Whitewater Structure 6	←→	Whitewater Structure 5b
Whitewater Structure 7	←→	Whitewater Structure 5b
Whitewater Structure 8	←→	Whitewater Structure 5b

Table 25: Late Period Pit Houses with Gower's Coefficients Greater than 0.85

Site	Average Gower's (G=)	Total Structures
NA 8945	1	n=2
NA 8943	0.96	n=2
NA 14674	0.89	n=3
NA 8948	0.8867	n=3
NA 8942	0.85	n=2
Whitewater Group 1	0.8206	n=12
White Mound	0.8193	n=6
NA 14682	0.802	n=5
LA 4487	0.7764	n=9
NA 8944	0.772	n=5
Whitewater (all)	0.7562	n=23
Late Period Puerco avg.	0.7127	n=77
NA 8969	0.71	n=2
Whitewater Group 2	0.705	n=5
NA 8939	0.67	n=2
NA 8968	0.65	n=2
NA 5065	0.6433	n=4
NA 14676	0.63	n=2

Table 26: Average Gower's Coefficient by Site (Late Period)

LA 4487

LA 4487 was a large village that had a lengthy occupation. Comparison of coefficients of similarity suggests that the architecture of the site was most similar to White Mound, a nearby settlement. There may have been two sequences of occupation at LA 4487, and the final phase contained two different architectural styles. LA 4487 was surprisingly dissimilar to Whitewater, the only excavated site of comparable size in the immediate vicinity.

The average Gower’s coefficient for pit houses *within* LA 4487 is 0.776, which is greater than the average for the entire Puerco Valley during the Late Period (G=0.713—Table 26). All the same, there are surprisingly few structure-to-structure comparisons on the site that are above the 0.85 threshold. Pithouses 1 and 5 share a coefficient of 0.97—which seems unrealistic when their respective plan maps are examined—and Pithouses 4 and 8 had a coefficient of 0.91. The latter two pit houses do bear a resemblance to one another. Beyond that, there is great diversity among the pit houses on the site. Pithouses 1, 2, and 6 were all 14 to 18m^2, D-shaped structures with three-quarter benches, ventilators, four post roof-support systems and perimeter posts. Pithouses 1 and 6 both had wingwalls and adobe partitions. They were actually rather large by Puerco Valley standards. Pithouses 4, 8, 10, and 11 were all smaller pit houses between 7 and 12m^2 that lacked benches but had four post roof-supports and ventilators. Some contained wingwalls, and some did not. Pithouse 7 was unlike others on the site, in that it was large (17m^2), oval, had a hard to interpret roof support system—it may have been a gable-style roof with two main support posts—and a ventilator. It also had what appears to be a “double” wingwall: the area immediately in front of the ventilator opening was walled off by slabs, and this wingwall was in turn encircled by another arc of slabs that incorporated the hearth and a couple of secondary roof-support posts. What exactly this feature was can only be guessed at because no notes or narrative description of the structure exists. Finally, Pithouse 9 is also somewhat distinct in that it was fully slab-lined and contained a slab wingwall with an extra partition within it. In addition it had a passage or alcove entrance, for there are two postholes illustrated at the end of the “ventilator” which were the footings for a ladder. While a four-post roof support system can be discerned within the posthole pattern on the map, the secondary posts are depicted as large enough to rival the main posts, and some of these secondary posts are located along the perimeter of the structure.

Sciscenti (1962) thought that two social groups were present at LA 4487, and that violence erupted between the occupants, resulting in the destruction of the group that built pit houses with benches (Pithouses 1, 2, 5, and 6). The biggest problem with this scenario is that while it has a bench, Pithouse 5 does not resemble Pithouses 1, 2, and 6 in many other regards. In addition, the tree ring dates from these structures suggest that they are not all contemporaneous. Pithouse 2 may have been built around AD 816-817, while Pithouses 1, 5 and 6 were constructed in the AD 840s (Ahlstrom 1985:217). Pithouses 1, 2 and 6 are distinct enough architecturally that I agree with Sciscenti that they probably represent a distinct group with different building traditions.

Pithouses 4, 8, 10, and 11 actually compare very favorably with the “more elaborate” pit structures at the Early Period site AZ-P-60-31. The Gower’s coefficient matrix shows that LA 4487 Pithouse 10 has similarity coefficients of 0.84, 0.84, and 0.87 with AZ-P-60-31 Structure 4, Unit 39, and Unit 44, respectively. LA 4487 Pithouse 11 and AZ-P-60-31 Unit 39 have a coefficient of 0.84, and LA 4487 Pithouse 4 and AZ-P-60-31 Structure 2 have a coefficient of 0.87. Pithouses 4, 8, 10, and 11 at LA 4487 are undated, and the possibility exists that they represent an earlier, AD 700s-era occupation of the site. Pithouse 8 appears to have been cut into by Pithouse 7, judging from presence of extra posts within Pithouse 7 shoring up the area where the two pit house walls intersected. In addition, Pitstructure 4, 10, and 11 cannot be associated with any particular roomblock; Pithouses 10 and 11 were located near a series of cists and oval-shaped, discontinuous slab-lined rooms, a surface structure type that pre-dated the rectangular, contiguous surface room (Young and Gilpin 2012). Sciscenti recovered at least thirty burials from the trash mound of LA 4487 (Scicenti 1962; Tainter and Gilio 1980:79) also suggesting an intensive occupation through multiple generations.

I think that as many as three separate social groups are represented by the architecture of LA 4487, although only two of these may have inhabited the site at the same time. Pithouses 4, 8, 10, and 11 may have comprised the earliest occupation (“Phase 1” in Figure 19). Later inhabitants of the site built Pithouses 1, 2, 6, 7 and 9 ("Phase 2" in Figure 19). Pithouses 7 and 9 are rather different than 1, 2 and 6, but Pithouses 6 and 7 were associated with surface rooms that abut one another, suggesting they were contemporary. Intriguingly, the roomblock associated with Pithouse 7 was constructed of horizontal sandstone slabs set in adobe mortar, while the roomblock behind Pithouse 6 was adobe placed on a foundation of vertical sandstone slabs, which further distinguishes the architectural style of Pithouses 7 and 9 from Pithouses 1, 2, and 6. In "Part IV" I will introduce

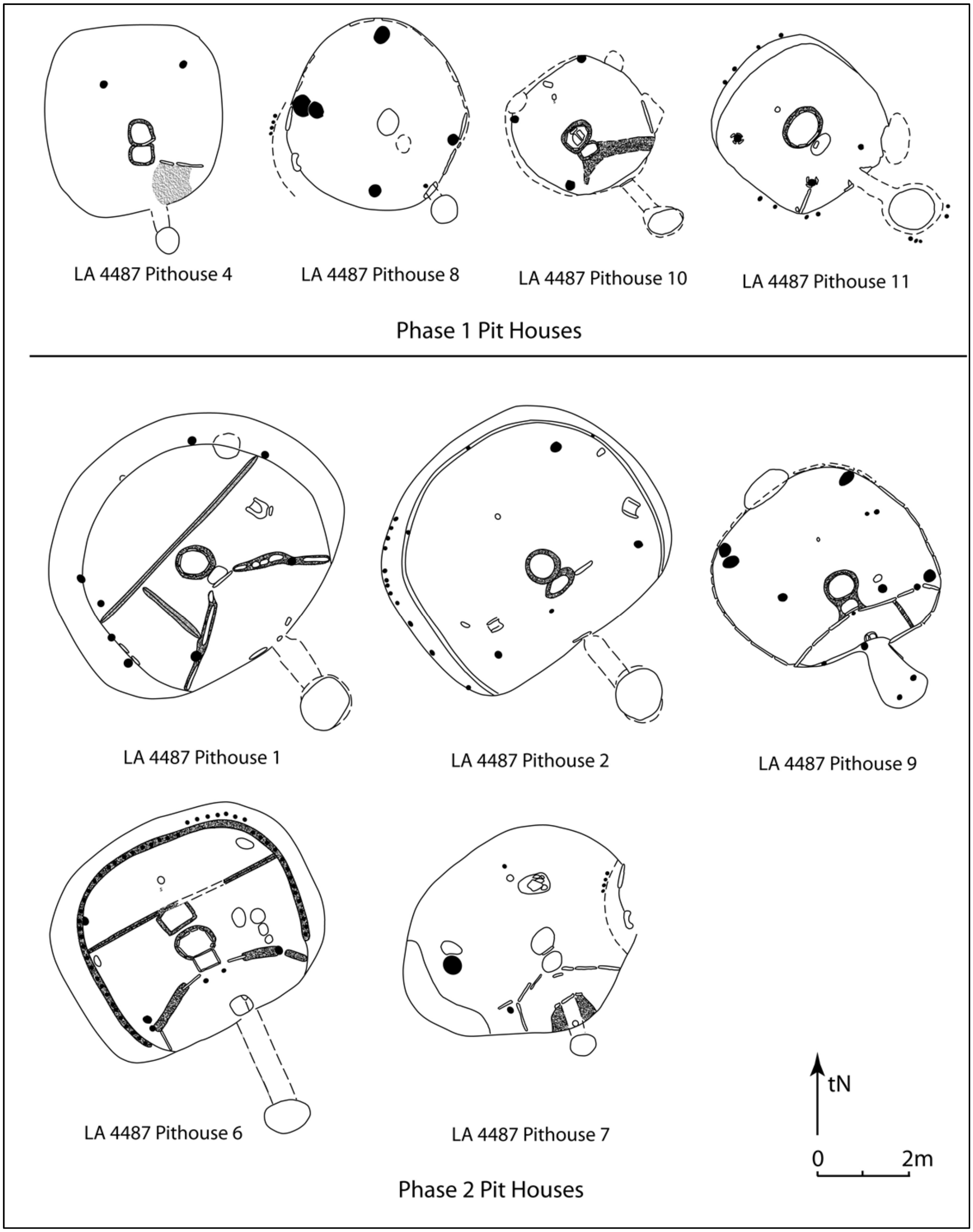

Figure 19: Comparison of Pit Houses at LA 4487.

evidence suggesting that migrants from the Kayenta-Tusayan region may have built Pithouses 7 and 9.

LA 4487-White Mound Village

Containing such diverse architecture, LA 4487 shared a number of similarities with other sites in the Puerco Valley, including White Mound Village, Whitewater, Twin Butte, and NA 6639. Pit houses on LA 4487 and White Mound Village have a number of coefficients of similarity greater than 0.85. All the pit houses on these two sites had hearths accompanied by ash boxes, although as described at the beginning of the chapter this combination of features becomes increasingly common over time. Pithouses 6 and 1 at LA 4487 and White Mound Houses 3 and 6 all had ventilators, three-quarter-encircling benches, four post roof-support systems, and wingwalls. They were also all between about $13m^2$ and $16m^2$, suggesting they were built for households of similar size. White Mound House 3 and LA 4487 Pithouses 6 and 1 show clear evidence of perimeter posts seated adjacent to or on the bench within the structure.

LA 4487 Pithouse 4 and White Mound House 4 were both sub-rectangular shaped, with four post roof-support systems, hearths, ash boxes, ventilators, and wingwalls. The nature of the construction of the wingwalls varies, however; LA 4487 Pithouse 4 appears to have only had a slab-lined wingwall on one side of the hearth, while House 4 at White Mound had an adobe wingwall extending to both sides of the hearth that incorporated two of the roof support posts. LA 4487 Pithouse 7 shares a high coefficient of similarity with White Mound House 4, but in light of the unusual roof construction and wingwalls of Pithouse 7 (described above), it is actually not very similar to White Mound House 4. Finally, LA 4487 Pithouse 10 is similar to White Mound House 5, although it appears that White Mound House 5 had an unusual wingwall and hearth/ash box construction affected by the presence of exposed bedrock at floor level. These last three structure-to-structure comparisons are more tenuous than the others, but demonstrate the high number of significant relationships between White Mound and LA 4487 found in the Gower's coefficient matrix.

I think it is unsurprising that LA 4487 and White Mound share so many similarities as they are only about 15 miles apart along the Puerco River. In addition, they both contained a variety of architectural styles. However, at White Mound, Gladwin has convincingly argued that the differences in pit house form are largely chronological and the two sets of three pit houses he excavated represent a sequential series of construction. White Mound dates to the late AD 700s and early 800s, so it was occupied prior to the earliest tree-ring cutting date at LA 4487. If Pithouses 4, 8, 10 and 11 on LA 4487 were actually earlier than the tree-ring dated structures on the site, as I suggested above, they would potentially have been contemporaneous with White Mound.

LA 4487-Whitewater

LA 4487 shares a few similarities with Whitewater, but not as many as might be expected given the great number of structures being compared to one another (eleven from LA 4487 and twenty-two from Whitewater). LA 4487 Pithouse 4 resembles Whitewater Structure 14 in that both were sub-rectangular, had ventilators, contained few interior features, and had four-post roof support systems. They both had adobe-lined hearths accompanied by ash boxes. The ventilator tunnel of Whitewater Structure 14 was significantly longer than that of LA 4487 Pithouse 4. LA 4487 Pithouse 4 had a wingwall extending from the hearth to one side of the structure, while Structure 14 had none. They both had floor areas of about 11 square meters. LA

4487 Pithouse 8 and Whitewater Structure 4 are similar for the same reasons, although in this case Structure 4 at Whitewater had a wingwall and lacked an ash box. LA 4487 Pithouse 8 may or may not have had an ash box. Finally, LA 4487 Pithouse 9 resembles Whitewater Structure 2, primarily because they both were slab-lined structures that have adobe-lined hearths with ash boxes, and wingwalls. Whitewater Structure 2 had a ventilator with a long tunnel, while LA 4487 Pithouse 9 had a passage or alcove entrance.

Those three relationships are the only ones that statistically exceed the 0.85 threshold when comparing Whitewater and LA 4487. A couple other instances are worth mentioning. LA 4487 Pithouses 8 and 10 resemble Whitewater Structure 18, in that they were round-to-oval shaped structures with four-post roof support systems and ventilators. Structure 10 at LA 4487 contained a hearth and ash pit while the pit structure at Whitewater did not. As mentioned above, LA 4487 Pithouse 8 may or may not have had an ash box.

The remainder of the similarities between LA 4487 and Whitewater are the kinds of things that appear to be common throughout much of the northern Southwest between AD 750-900, such as the presence of ventilators, or four-post roof-support systems. These distinctions appear to be trends that occur at very large scales, and taken alone, they are not particularly useful for defining cultural identity, and least on these two sites. In Sackett's (1982) terminology, they are "isochrestic" variables, and they probably carry little ethnic or cultural meaning because they are so common as to become background noise against which more meaningful distinctions stand out. The fact that these two sites do not resemble each other more suggests that they contain distinct architectural traits that do not significantly overlap, which may be a direct result of the backgrounds and histories of the inhabitants of these two sites. LA 4487 and Whitewater will be examined in greater detail in Part IV, where the relationships these sites have with regions beyond the Puerco Valley will shed light on why they are so different from one another. For now, suffice it to say that the eleven pit houses at LA 4487 had twice as many coefficients of similarity above 0.85 with the six pit houses at White Mound than they did with the twenty-two pit houses at Whitewater.

LA 4487-Twin Butte (NA 5065)

Pithouse 2 at LA 4487 and Structure F4 at Twin Butte (NA 5065) share a Gower's coefficient of 0.94. While they did have similar floor areas (18.6m^2 and 17m^2 respectively), four-post roof-support systems with perimeter posts, benches, ventilators and hearths with ash boxes, I think there are a few small distinctions which set these structure apart from one another

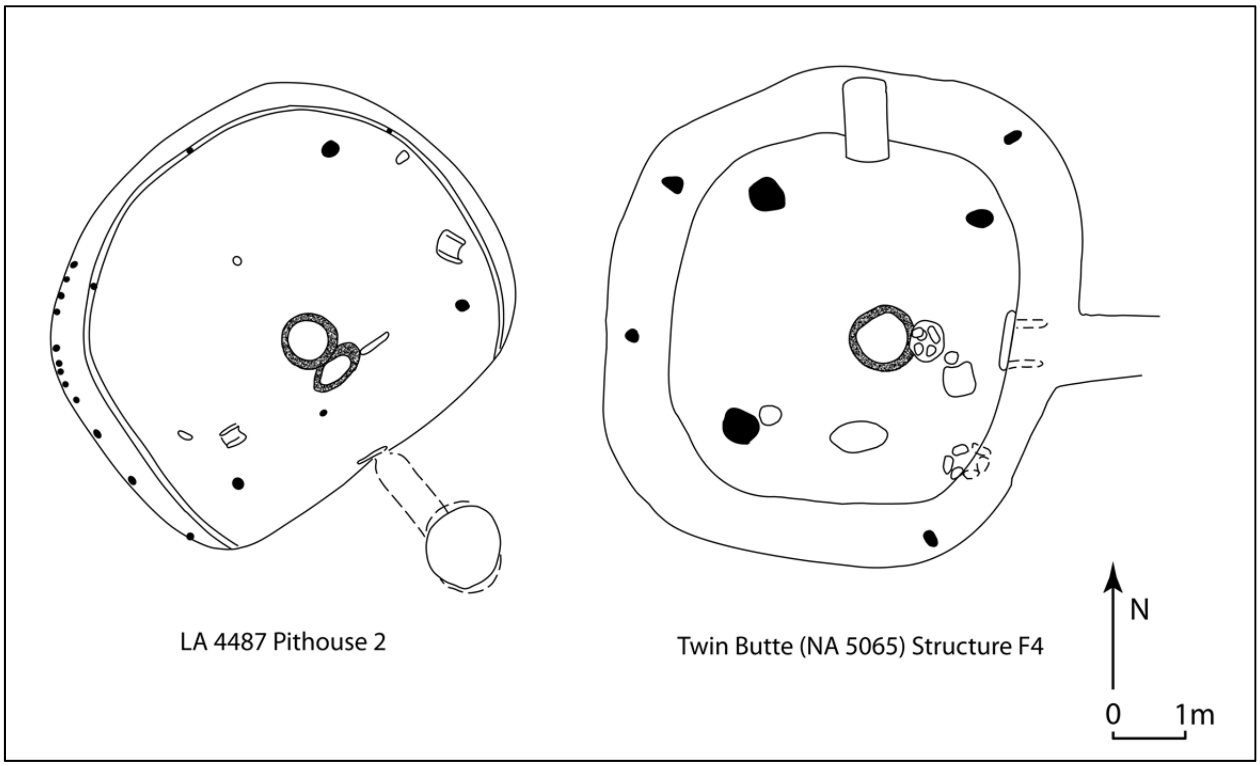

Figure 20: Comparison of LA 4487 Pithouse 2 and Twin Butte Structure F4.

more than the Gower's coefficient suggests. First of all, Structure F4 at Twin Butte had a wide, full encircling bench, while Pithouse 2 at LA 4487 had a narrower, three-quarters encircling bench. This rendered Structure F4 a sub-rectangular pit house and Pithouse 2 a D-shaped one. Pithouse 2 may have had wingwalls—there is at least one slab depicted on the map to suggest this, while Structure F4 had none. Pithouse 2 had three distinct sizes of postholes associated with its roof. Although postholes for only three primary upright posts are depicted on the map, it is likely a fourth existed given the location of the first three. Three secondary upright posts were adjacent to the bench, spaced around the perimeter of the structure. Tertiary postholes formed a veritable thicket of upright poles rising from the juncture of the bench and the wall of the pit house. These presumably extended the entire length of the bench. Structure F4 had a much simpler posthole pattern. Four primary upright posts (one of which appears to have been shored up with a second, smaller post) rose from the floor of the structure, while four secondary upright posts were seated on the wide bench. Each of these secondary posts is directly associated with a single primary upright post. They may have served to assist in the extension of a cantilevered primary beam over the edge of the pit house, although many roof reconstructions are possible based on the posthole pattern. This arrangement would not, however, have created a roof anything like the one on LA 4487 Pithouse 2. The construction techniques that went into each roof reflect radically different traditions, and they probably looked distinct on the outside when completed. Furthermore, it is very likely that LA 4487 Pithouse 2 was constructed around AD 845, while Structure F4 most likely dates to the late AD 700s or early 800s and they are 60 miles apart on opposite ends of the Puerco Valley. For these reasons, I think that despite the similarity suggested by the Gower's Coefficient, these two pit houses are actually rather different.

LA 4487-NA 6639

LA 4487 Pithouse 9 and the NA 6639 "Kiva" have a Gower's coefficient of 0.91, but it is unlikely that these two structures came from similar traditions of pit house construction. Pithouse 9 was slab-lined with a passage entry, while the "Kiva" had plastered walls and a shaft/tunnel-style ventilator. While both had adobe-lined hearths, the ash box on Pithouse 9 was also adobe, while the "kiva" at NA 6639 appears to have had a slab-lined ash box. The wingwall of Pithouse 9 was constructed of slabs, but the wingwall of the "kiva" was adobe. In short, although the form of the structures resemble one another as a final product, the methods used to reach this final product were divergent, which suggests that the builders of each structure had differing traditions of house construction.

Whitewater

This village-sized settlement shared surprisingly few architectural similarities with nearby sites, but had a significant internal network of similarities between pit houses. The majority of these are found in Group 1. Group and Group 2 have relatively low coefficients of similarity with each other, suggesting they may have been constructed at different times, or by different groups of people. Structure 12, located in Group 2, is the largest pit house in the Puerco Valley sample, and contains a number of complex floor features not seen in other valley pit houses.

Whitewater has an internal average Gower's coefficient slightly above the total Puerco Valley average (0.756 compared to 0.713). However, Roberts' Group 1 and 2 have very different coefficients of similarity (Table 26), and given their spatial separation, this may be important. Group 1 is a series of twelve pit houses located in front of a series of poorly preserved surface rooms. Group 1 has a Gower's coefficient of 0.821, a great deal higher than the Puerco Valley average or the Whitewater total site average, especially considering the number of structures this comparison is based on. Group 2 is a collection of six pit houses located at the north end of the site. Structure 13b was probably a Lupton phase pit house dating to the AD 500s, so I considered only five pit houses in the average Gower's coefficient of Group 2. The average coefficient of similarity for the pit houses in Group 2 is 0.705, a good deal lower that that of Group 1, and lower than the Puerco Valley average as well. Despite their proximity, Group 1 and Group 2 may have been very different cultural manifestations. Figure 21 provides a visual comparison of the layout of these two different groups.

All of the internal comparisons above 0.85 at Whitewater involved sub-rectangular (in one case circular) pit houses with four-post roof-support systems and ventilators (Table 25). For the most part, these structures were of medium depth and had floor areas between 8 and 11 square meters. About a third had wingwalls and half had ash boxes. While all of these structures were not significantly similar to every other structure, they do form a closed, internally related network of architectural relationships within the site. Visually, Structures 3, 9 and 13a could probably be included in this network as well, as they shared most of the characteristics that seem to govern the high coefficient of similarity found among these structures. The remaining pit houses (Structures 12, 15, and 16, Kiva A and Kiva B) apparently contain distinct enough architecture to not be significantly similar to any other structures on Whitewater, or elsewhere in the Puerco Valley, for that matter.

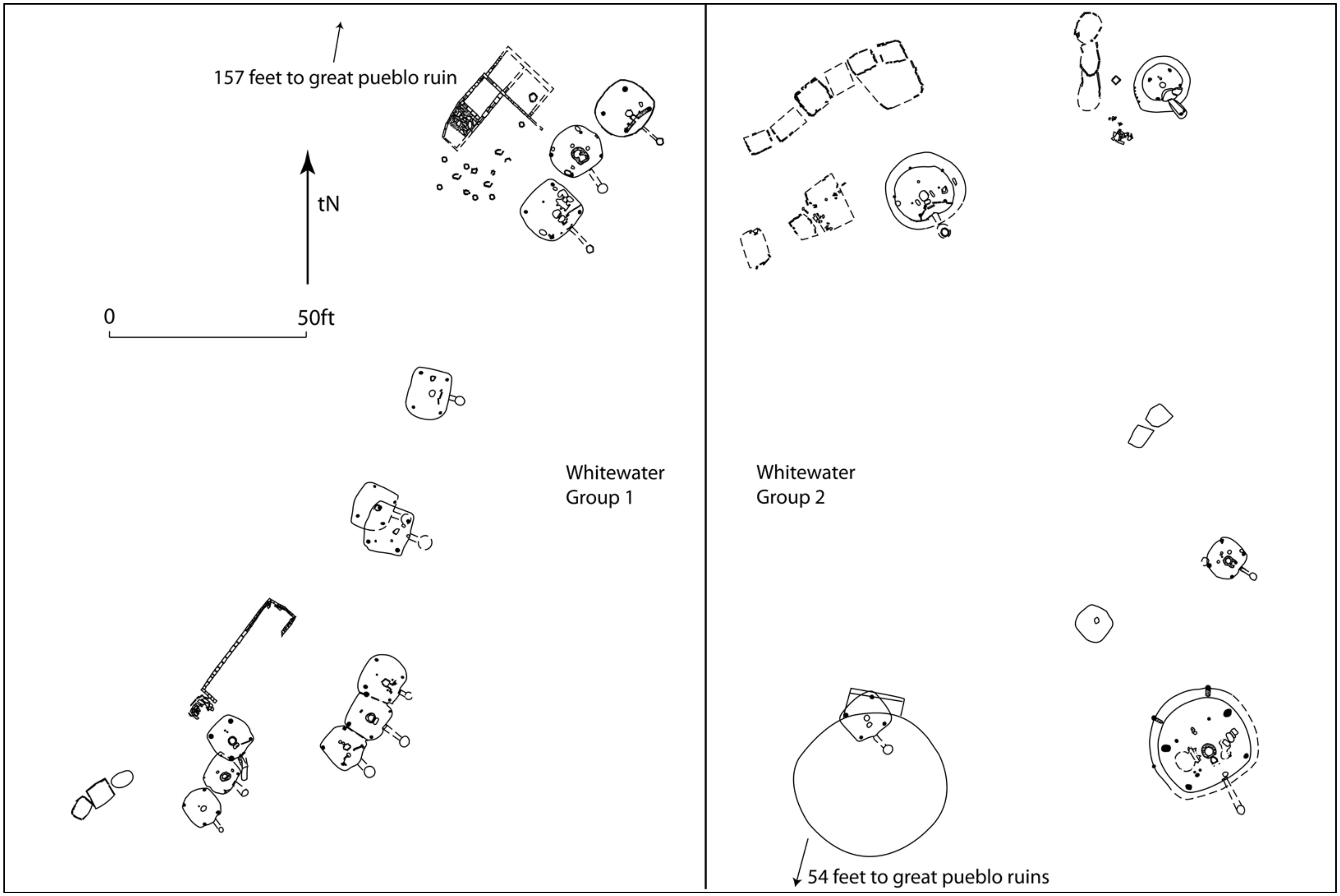

Figure 21: Comparison of Roberts' Groups 1 and 2 at Whitewater.

To understand the nature of this dense internal network of architectural relationships, I examined the location of the pit houses with significant coefficients of similarity with other structures at Whitewater. Aside from Structures 14, 17 and 18, they are all located within Roberts' Group 1. Structure 14 is located in Group 2, Structure 17 at a nearby roomblock "Unit 2", and Structure 18 is located about a mile from the main Whitewater site at "Unit 3." Nearly every pit structure located in Group 1 was sub-rectangular, contained a four-post roof-support system, and had a ventilator. The one exception is Structure 3, which could be classified as either oval or sub-rectangular, and possibly had a five-post roof support system, with some of the posts footed on masonry pilasters. Five of the pit houses in Group 1 lacked ash boxes, while seven contained this hearth elaboration feature. Five pit houses have evidence that they had wingwalls (not the same five that lacked ash boxes), although in some cases these wingwalls were fairly insubstantial and simply consisted of three of four upright slabs, or the footings for slabs that are now gone. Four of the pit houses had slab-lined hearths, while the remainder had adobe-lined or earthen hearths. Despite some variation in internal features, the pit houses of Group 1 show a great deal of internal homogeneity, especially when considering some of the features that carry the greatest potential for expressing cultural identity. They were almost all the same shape and size, and their roof construction methods were nearly identical. They all lacked benches but had ventilators, and their ventilators tunnels were, as a group, longer than others found at nearby sites. Group 1 exhibited a uniformity of construction that suggests that the builders of these structures learned their craft in the same place, or at least were attempting to adhere to a similar model.

Group 2, on the other hand, contained a great deal of variation. Structure 12 was a massive (27.73m^2) D-shaped pit house with a three-quarter-encircling bench and many complex floor features such as roofed subfloor vaults and sand-filled holes for looms or altars footings. Structure 13a was a much smaller (7.46m^2) sub-rectangular structure built into the fill of Structure 13b, the possible Lupton phase pit house. Structure 14 resembles Structure 13a, although it was a little larger. Structure 15 was a large (15.5m^2), circular pit house with a full-encircling bench and a five-post roof support system and wingwalls. Finally Structure 16 was a small (6.15m^2) circular or oval structure with a large, wide, full bench, a passage entry, and a "wingwall" that was actually two adobe partitions that separated the passage entrance from the main chamber of the pit house. The roof had four main support posts, but a tightly-packed series of substantial perimeter posts also rose from the wide bench, giving this structure a radically different roof than the other four-post roof-support designs on the site. Structures 13a and 14 are the only two structures in Group 2 that actually resembled each other.

Comparing coefficients of variation in floor area also highlights the dissimilarity of Group 1 and Group 2. The average floor area of Group 1 (twelve structures) was 10.8m^2, with a standard deviation of 2.7 and a coefficient of variation of 0.25. Group 2 (five structures) average floor area was 13.5m^2, with a standard deviation of 8.75 and a coefficient of variation of 0.65, demonstrating little standardization in floor area when compared with Group 1. Either the structures in Group 2 had different functions than Group 1, or they did not conform as strictly to principles of construction.

The fact that the Group 1 pit houses were arranged in a well-organized line in front of a long, linear series of roomblocks suggests that most of them were planned and executed as a unit. A number of Group 1 pit houses bisect each other, suggesting they were built sequentially. I do not agree with Roberts' contention that Structures 6 and 7 were a "bi-chambered" house, nor that Structure 9, 10, and 11 formed a "tri-chambered" house. The hypothetical roofs that he reconstructs for the massive and strangely shaped structures that result are probably beyond the engineering constraints of the materials available. The only date available for the entire series of pit structures is tree-ring date of 815 that ostensibly comes from Structure 2.

Group 2 was probably not constructed as a unit. Structure 14 is located beneath the "dance plaza" that Roberts excavated. Structure 16 was associated with a series of oval-shaped, slab-lined rooms oriented to the east while the adjacent Structure 15 was in front of an arc of rooms two deep that was oriented to the south. Oval-shaped, slab-lined rooms typically pre-date two-deep, masonry and jacal rooms. Structure 13a was located in the fill of an older, larger pit structure, while Structure 12 was all alone, not readily associated with any of the surface rooms Roberts depicted on the map. Whether there are more surface rooms present in Group 2 that were not excavated and therefore not placed on the map is unknown. Structure 15 may have originally been constructed around AD 888, based on tree rings, although there are tree-ring dates as late as 1015 associated with the structure. Whether this indicates ninth-century construction and a long history of repairs, reoccupation with salvaged timbers after a long hiatus, or simply construction in the early 11th century using a variety of salvaged timbers cannot be surmised from the available information. The surface rooms associated with Structure 15 are, however, fairly indicative of a late-AD 800s occupation. Structure 12 also has a long span of non-cutting dates associated with it, from 789vv-920v. This pit structure was built in the late AD-800s but saw occupation and repairs into the early 900s.

A later, 11th-12th century great house occupies the area between Group 1 and Group 2 so it is uncertain whether other early Pueblo pit houses exist there. What does seem certain is that

Group 2 was probably the result of a series of sequential occupations. While I can not provide an exact sequence due to the lack of associated dates in many of the structures, Structures 13a and 14 may have been built around the same time based on architectural similarity. Structures 12 and 15 have the potential for being contemporaneous as at least a few of the tree ring dates from those structures overlap in the late AD 800s and early 900s. I can only suggest that Structure 16 may have been built earlier than those other pit houses, based on its architectural similarity with AD 600-750-era structures in the Kayenta-Tusayan region. This relationship will be explored further in Part IV. Because of its planned layout and the great degree of homogeneity exhibited by the pit houses within it, Group 1 was probably conceived of as a unit, and built in the mid AD 800s. A few other structures on the site and nearby, such as Structures 13a and 14 in Group 2, and Structures 17 and 18, exhibit similar architecture to Group 1 and may also be contemporaneous.

Whitewater-White Mound

There are fourteen structure-to-structure comparisons between Whitewater and other sites in the Puerco Valley that exceed the 0.85 threshold. I already discussed the architectural relationships between Whitewater and LA 4487 in the subsection concerning LA 4487. A number of Whitewater pit houses resemble those at the nearby site of White Mound. Whitewater Structures 14 and 9 and White Mound House 2 have high similarity coefficients, and all had four-post roof-support systems and ventilators. However, the Whitewater structures were sub-rectangular and White Mound House 2 was oval-shaped. Whitewater Structure 9 and White Mound House 2 both had wingwalls, but Structure 9 had a slab-lined hearth and White Mound House 2 had an adobe-lined hearth. Finally, the Whitewater and White Mound pit houses may have been separated by a number of decades—House 2 was constructed in the late AD 700s, while the Whitewater structures post-date 815.

Whitewater Structures 6, 10 and 11 all have high coefficients of similarity with White Mound House 1. While all four pit houses could be considered sub-rectangular, the walls of White Mound House 1 were much more curvilinear than those at Whitewater, which are better characterized as rectangles with rounded corners. All four pit houses had four-post roof-support systems and ventilators, although the ventilator tunnels of the Whitewater structures were nearly twice as long as White Mound House 1. Whitewater Structures 6 and 10 had a hearth/ash box combination as did White Mound House 1, and Whitewater Structures 6 and 11 had wingwalls like White Mound House 1. As with White Mound House 2, the Whitewater pit houses probably post-date the White Mound House 1 by a few decades.

Whitewater-NA 8944

Whitewater Structure 6 was similar to NA 8944 Pithouse 3. They were both sub-rectangular in shape, had four post roof support systems, adobe-lined hearths with ash boxes, and wingwalls. The method of ash box and wingwall construction differed between the two pit houses. NA 8944 Pithouse 3 is not described as having a ventilator, but given the arrangement of floor features it seems hard to believe that it did not have one. Whitewater Structure 6 had a ventilator. Although Whitewater Structure 6 also has a high Gower's coefficient with NA 8944 Pithouse 5, this comparison seems less secure than that with Pithouse 3. NA 8944 Pithouse 5 was a small, sub-rectangular structure. It had four roof support posts, but they are contained within the walls of the structure. It had a ventilator, but no ash box, and while it had wingwalls, they comprised a small compartment enclosing just the ventilator opening, whereas Whitewater

Structure 6 has a wingwall that extended from the hearth to a roof post on a single side. Considering these differences, Whitewater Structure 6 is not that similar to NA 8944 Pithouse 5. NA 8944 Pithouse 2 is not very similar to Whitewater Structure 17, despite having a high coefficient of similarity. Pithouse 2 was oval-shaped, may have had perimeter posts supporting its roof, and may have had a passage entry rather than a ventilator. They both had hearths and ash boxes, but Whitewater Structure 17 did not have wingwalls, while NA 8944 Pithouse 2 did. I consider the relationship between Whitewater Structure 17 and NA 8944 Pithouse 2 tenuous at best.

Whitewater-NA 8939

Whitewater Structure 17 has a high coefficient of similarity with NA 8939 Pithouse 3, but closer examination of the structures shows that they only bear a superficial resemblance to one another. Whitewater Structure 17 was sub-rectangular shaped and had a ventilator, four-post roof design, and a hearth and ash box. NA 8939 Pithouse 3 also had a four-post roof support system, a ventilator, and hearth with an ash box, but it was oval-shaped and had a wingwall that was Structure 17 lacked.

Whitewater-NA 8968

Finally, Whitewater Structure 18 and NA 8968 Pithouse 2 have a high coefficient of similarity, but this appears to be an error. NA 8968 Pithouse 2 was a small, circular structure with a ventilator and a simple hearth. The excavators found no evidence of roof construction. Structure 18 was also circular, but nearly four times as big as NA 8968 Pithouse 2 and had a four-post roof support system. Any resemblance appears to be primarily due to the shared shape of the structures.

Whitewater: Conclusions

Whitewater was a large settlement with a complicated occupation history. Half of the coefficients of similarity above 0.85 are relationships between pit houses located on the site—of these most are located within Group 1. Group 1 was a very homogenous series of pit houses and surface rooms constructed as a unit. Other pit houses that are part of the internal network of high coefficients of similarity are located at two nearby “unit pueblos” and a third is located about a mile away. Group 2 was more variable, and may represent a series of sequential, and architecturally distinct, occupations. The most convincing relationships between Whitewater pit houses and other Puerco Valley pit houses are found at LA 4487 and White Mound Village—the nearest excavated sites. Other similarities between Whitewater pit houses and elsewhere in the Puerco Valley do not extend further than the cluster of sites to the west (NA 8939-8968), and many of these are not particularly convincing. Therefore, the architecture of Whitewater stands apart from most of the surrounding settlements. Kiva A, Kiva B, and Structures 12, 15, and 16 did not have coefficients of similarity greater than 0.85 with any structures in the Puerco Valley. They are among the most elaborate pit structures in the entire valley, although they are also among the latest constructed. Whitewater Structure 12 particularly stands out among Puerco Valley pit structures: its large floor area ($27.73m^2$) is a statistical outlier, far more than two standard deviations above the mean even when possible temporary structures are excluded from the total Puerco Valley average, and it contained floor features not seen in any other Puerco Valley structure, such as floor vaults. The origins of this structure are discussed more fully in a regional context in “Part IV.” The entirety of Group 1 is notable because of its degree of homogeneity: the floor area of these structures has a coefficient of variation of 0.25, much lower that the total for the site or Group 2, and the average Gower’s coefficient for the twelve pit houses in Group 1 is 0.821—generally much higher than average in the Puerco Valley. It is higher than LA 4487 (G=0.776) the only site that was really comparable to Whitewater in the immediate area.

Major unanswered questions surround Whitewater. Roberts excavated a total of eighteen pit houses in the immediate vicinity of the main architectural complex at Whitewater—the multi-story masonry great house—and three more at a nearby unit pueblo. The presence of small unit pueblos with early Pueblo period architecture (Unit 1 and Unit 2) in the vicinity of the main area of occupation (Groups 1 and 2) and the dance plaza suggests that a larger community existed around Whitewater. The site may be comparable to the community recorded around the Navajo Springs great house (Warburton and Graves 1992), where a Chaco-era great house appears to have developed directly out of a late AD 800s and early 900s cluster of pit houses and surface rooms. Only detailed resurvey and surface mapping of the Whitewater site will answer these questions.

White Mound

While the total size of White Mound is unknown, the portions that have been excavated are reminiscent of the Duckfoot Site (Lightfoot 1992; 1994) in terms of size and occupation history. The pit houses associated with each roomblock share similarities with one another that suggest each roomblock was continuously occupied. In the case of Section 3, the pit houses appear to have been built in sequence, beginning with a relative simple structure, followed by two more elaborate ones possibly built by the same person. Section 1 is not as easy to characterize, but House 3 represents a departure from the architecture of Houses 1 and 2.

Within the site of White Mound, House 2 shares significant coefficients of similarity with Houses 1, 4 and 6. While all these structures superficially resembled one another, the similarity between House 2 and House 1 was probably the greatest—House 2 as circular and House 1 could be considered either circular or sub-rectangular, while Houses 4 and 6 were both clearly sub-rectangular in shape. Furthermore, House 6 had a bench and an interesting, secondary ash box.

The pit houses excavated by Gladwin at White Mound are located in two clusters—Section 1 and Section 3 (although he mentions Section 2 and 4, Gladwin does not describe them or their relationship to the other sections in detail). Each section consisted of three pit houses and a series of slab-lined jacal and adobe storage rooms. Houses 1-3 are in Section 1, and Houses 4-6 are in Section 3. Gladwin felt that Houses 1 and 4 were the earliest pit structures in their respective sections because they contained trash fill and burials, and Houses 3 and 6 the latest because they contained only blown in sand. He does not place Houses 2 and 5 anywhere in the sequence.

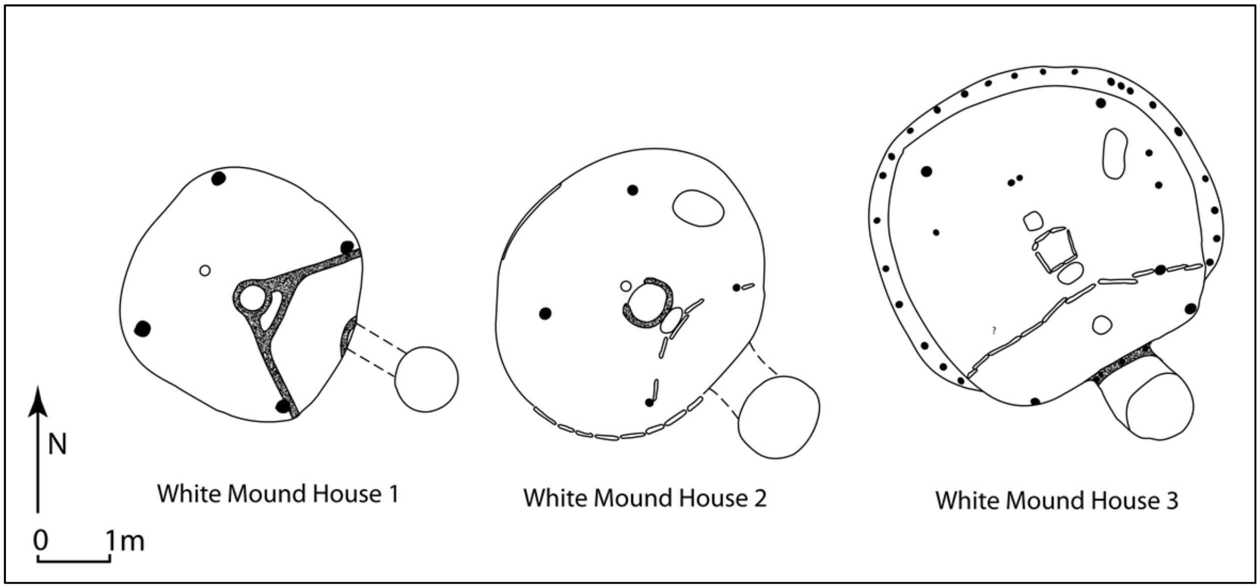

Figure 22: Comparison of Pit Houses in Section 1 of White Mound

In Section 1, Houses 1 and 2 are much more like one another (G=0.92) than they are like House 3 (Figure 22; House 1-House 3 G=0.74; House 2-House 3 G=0.82). This does not really say much about the order in which they were constructed, but it does suggest that Houses 1 and 2 are more likely to have been built by people who were steeped in the same architectural traditions of house construction. House 3 represents a significant departure from Houses 1 and 2 in pit excavation, structure shape, ventilator construction and roofing technique. For example, although House 1 had a low adobe ridge creating a partition and House 2 low slabs, in both cases the “wingwalls” extended from the ash box, nearly intersected the roof support posts, passing between them and the ventilator, and intersected the pit house walls close to the “corners” of the structures. In House 3, the wingwall was constructed of slabs, but it extended from the ash box almost longitudinally across the structure, intersecting the walls near where the three-quarters-encircling bench in the structure terminated. The wingwall bisects a secondary roof support post, but does not come anywhere close to the main roof support posts, which were tucked away in the corners of the structure over half a meter closer to the ventilator opening. The ventilator construction of House 3 was different than either House 2 or House 1, and it may even have functioned as a sort of passage entryway at times. The hearth of House 3 was slab-lined and almost rectangular, while those in Houses 1 and 2 were adobe-lined. In short, Houses 1 and 2 conformed to the same set of architectural rules and norms, whereas House 3 reflected a completely different set of underlying principles.

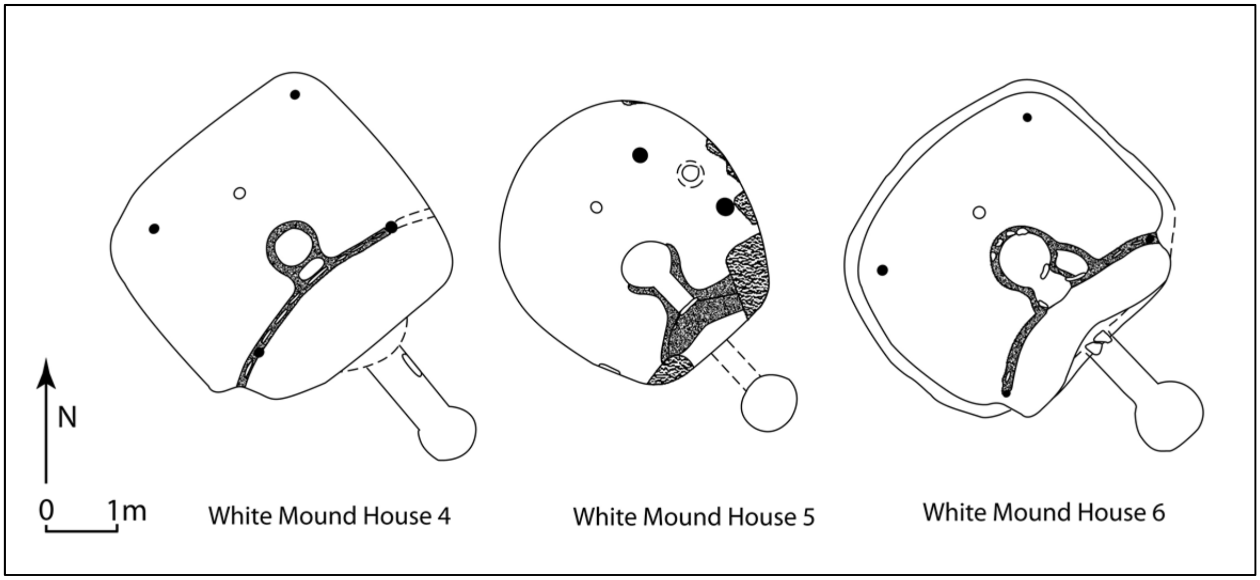

Figure 23: Comparison of Pit Houses in Section 3 of White Mound

Within Section 3, House 4 and 6 are more like each other (G=0.87) than either of them is like House 5 (Figure 23; House 4-House 5 G=0.84; House 5-House 6 G=0.71). The difference in coefficients of similarity between Houses 4 and 6 and Houses 4 and 5 are slight, but if the bench were not present in House 6 it would have been nearly identical to House 4. Their floor areas were extraordinarily similar—the area of House 4 was 13.87m^2 and the area of House 6 was 13.95m^2, while House 5 had a floor area of 10.94m^2. Houses 4 and 6 both had indentations in the pit house wall where they were intersected by the wingwalls (both made of slab and adobe). The wingwalls both incorporated two of the roof support posts. The construction of the hearth in House 6 was the only major difference between the two pit houses. The hearth and primary ash box were made of adobe and formed a key-hole shape, while an additional ash box was present between this “key-hole” and the wingwall. House 4 had much more typical hearth/ash box combination.

The extreme similarity of Houses 4 and 6 leads me to believe the same person may have constructed them. They certainly followed the same architectural methods and techniques, and used the same materials. Without better chronological control, it is impossible to accurately gauge the temporal relationship of these two pit houses, or their relationship to House 5. House 5 contained a mano, a metate, a rubbing stone, three bone awls, and broken pottery vessels on the floor—it may have been used primarily as a work area. The decision to form the southeast end of the House 5 around bedrock, which resulted in a oddly shaped hearth and ash box and forced the roof supports closer together than they might otherwise have been, may have been because this structure was intended to be a short-term habitation while either of the other two pit houses (Houses 4 and 6) in the group were being built. While House 5 was considered “more elaborate” it only scored 175 on the Elaboration Index; House 4 scored 250 and House 6 scored 320. After the completion of the other, more formalized pit houses (which adhere to clear architectural principles), House 5 may have been repurposed into a storage and work area. The Duckfoot site, a similar sized mid AD 800s-era hamlet in southwest Colorado, was occupied for about twenty years (Lightfoot 1992:226), which is a reasonable estimate for the occupation of White Mound as well. Given the approximately 15-year life span of pit house, it is reasonable that Houses 4 and 6 could have had overlapping occupations, and belonged to the same generation of “vernacular architects.” This is all extremely speculative, but it highlights the manner in which examining architecture can provide clues to occupation histories.

White Mound-Other Puerco Valley Sites

For the most part, I have already mentioned the significant coefficients of similarity between pit houses at White Mound and elsewhere in the Puerco Valley. White Mound and LA 4487 shared a great deal of architectural attributes, and the last pit houses constructed at White Mound (Houses 3 and 6) had the greatest degree of congruence with LA 4487. This may be simply because they are closer together chronologically. The relationship between White Mound and Whitewater has been discussed, too; there were roughly twice as many significant coefficients of similarity between White Mound and LA 4487 as between White Mound and Whitewater, despite the far greater number of potential relationships between White Mound and Whitewater.

The only other significant similarity between a pit house on White Mound and one elsewhere in the Puerco Valley is between House 4 and the NA 6639 "Kiva." These two structures were both sub-rectangular, had four-post roof supports, ventilators and wingwalls. The only major difference is that the "Kiva" from NA 6639 had a slab-lined ash box. NA 6639 "Kiva" is also similar to White Mound House 1 for the same reasons. The only real thing separating these three pit structures is the fact that Breternitz (n.d.) thought that the NA 6639 "Kiva" probably dated to the late AD 800s, whereas White Mound dates to the late AD 700s and early 800s.

NA 6639, NA 8939-8948, NA 8968, and NA 8969

This cluster of sites was located along the bluffs and hills immediately above the Puerco River floodplain (Figure 3). The pit houses at these sites exhibit a surprising degree of variability. This variability partially results from the fact that many of these pit houses could be characterized as “less elaborate” except for their large floor area; many do not conform to symmetrical plans and may have been intended for short-term use. There are some similarities within this cluster, as well as between this cluster and adjacent sites. In at least one case, NA 8968 and 8969, I believe that the people who built the pit houses migrated from a distance.

All of these sites were excavated by the Museum of Northern Arizona during highway salvage operations. In general, only one or two pit houses were inhabited at any given moment on these sites, so rather than examine internal relationships between structures on each site I will explore the similarities between these pit houses and others in the Puerco Valley.

NA 8939 Pithouse 3 has high coefficients of similarity with two pit houses—NA 8944 Pithouse 2 and Whitewater Structure 17. The relationship between these three structures has already been dealt with in the Whitewater section, but I will reiterate briefly in relation to NA 8939 Pithouse 3. In some ways, NA 8939 Pithouse 3 resembled NA 8944 Pithouse 2 more closely than Whitewater Structure 17. Both Pithouse 2 and 3 were circular to oval-shaped and they both had adobe wingwalls, two features lacking in Whitewater Structure 17. NA 8939 Pithouse 3 had a four-post roof design, however, while it is possible that NA 8944 Pithouse 2 had perimeter posts supporting the roof. Whitewater Structure 17 had four-post roof supports. Finally, NA 8939 Pithouse 3 and Whitewater Structure 17 both have ventilators, while NA 8944 may have had a passage entry. The interior features of NA 8939 Pithouse 3 and NA 8944 Pithouse 2 resembled each other much more closely than either of these structures resembled the interior of Whitewater Structure 17, but the roof construction of NA 8939 probably appeared more similar to Whitewater Structure 17 than to NA 8944 Pithouse 2.

A small network of Gower's coefficient relationships surrounds NA 8943 Pithouses 1 and 2. There were very similar to one another, and completely lacked floor features aside from circular adobe-lined hearths. They also lack any evidence of how they were roofed. Pithouse 1 was bi-lobed, (or perhaps has a large antechamber attached to the structure), while Pithouse 2 was tri-lobed. The excavators felt both structures may have been enlarged after initial construction. NA 8943 Pithouse 1 was similar to NA 8948 Pithouse 3, which was a simple oval-shaped pit structure with a slab-lined hearth and ash box and no other interior features and scant evidence of roofing. NA 8943 Pithouse 2 shares a high coefficient of similarity with NA 8968 Pithouse 1. They were both fairly large (18-21m^2), and had no internal features beyond an adobe lined hearth. NA 8968 Pithouse 1 was perhaps slightly more formalized than NA 8943 Pithouse 2 because although it had an irregular bulbous projection, it was surrounding by a bench and clearly functioned as an antechamber or alcove-style entry. There is no evidence of how NA 8968 Pithouse 1 was roofed. Finally, NA 8948 Pithouse 3 shares a high Gower's coefficient with LA 4487 Pithouse 4, but I think that architectural relationship is not as strong as the others mentioned. LA 4487 Pithouse 4 was a formalized pit structure with a ventilator and a slab wingwall and a four-post roof support system, none of which were found at NA 8948 Pithouse 3.

As described above in "Part II," I found that three of the pit houses within this network could be considered "less elaborate," even though they scored relatively high on the Elaboration Index because of their large floor area. NA 8943 Pithouses 1 and 2, and NA 8948 Pithouse 3 contained very few interior features, were not symmetrically constructed, lack ventilators, and had no evidence of roof construction. They may have only been intended for short-term occupation, possibly as part of a settlement system that saw occupants relocating to new areas every couple of years. Finally, while NA 8943 Pithouse 1 and 2 could have been built around the same time as they both contained ceramics indicative of a late AD 800s occupation, NA 8948 Pithouse 3 produced a tree-ring date from a “cross beam” of AD 758. The similarities between NA 8943 Pithouses 1 and 2 may have been the result of being built by related families, while the resemblance of all three of these structures was probably the result of them having similar functions and fulfilling similar anticipated short-term needs.

The relationships of NA 8944 Pithouse 2 have already been discussed. I also discussed NA 8944 Pithouses 3 and 5 and their relationship to Whitewater Structure 6 in the section concerning Whitewater. Briefly, the similarities between Whitewater Structure 6 and NA 8944 Pithouse 3 are more convincing than with NA 8944 Pithouse 5. Pithouse 3 and Structure 6 were of similar size and sub-rectangular shape, and contain wingwalls that extend from the hearth to the roof support posts, which were located in the structure corners. NA 8944 Pithouse 5 was smaller, with a slightly different posthole configuration, and a smaller “wingwall” that was really a partition or bin in front of the ventilator opening.

NA 8948 Pithouses 1 and 2 resembled each other greatly. They were little more than shallow circular to oval-shaped pits containing rectangular slab-lined hearths. The Elaboration Index considered them to be “less elaborate” structures, and together with NA 8948 Pithouse 3, they probably represent short-term housing on NA 8948. These three pit houses were among the first constructed in the Puerco Valley after the hiatus between the Early and the Late Period. Perhaps residents newly entering the valley or returning after many years were unsure of its agricultural potential, and thus these earliest pit houses do no represent a significant architectural investment.

NA 8968 Pithouse 2 and Whitewater Structure 18 have high Gower’s coefficients, but given that so little actual information is available on Pithouse 2 other than its shape, I think that this relationship is little more than chance. As discussed, NA 8968 Pithouse 1 appears similar to NA 8943 Pithouses 1 and 2, but it was a more formalized and elaborate structure.

Although it was not obvious from Gower's coefficient matrix, there is a striking resemblance between NA 8969 Pithouse 2 and LA 4487 Pithouse 9. These two pit houses were of similar size (12-14m^2) and were both circular to oval-shaped. NA 8969 Pithouse 2 clearly had a roof built on perimeter posts, while the roof of LA 4487 Pithouse 9 may have had either perimeter posts, a four-post roof design, or both. They both contained circular adobe hearths with attached ash boxes. Extending from the ash boxes to the walls of the pit house were slab-lined wingwalls. Both LA 4487 Pithouse 9 and NA 8969 Pithouse 2 shared the unique feature of having an extra bin constructed of slabs within the area delineated by the wingwall. This feature is not seen in any other Puerco Valley pit houses. There are a few differences; LA 4487 Pithouse 9 was slab-lined and NA 8969 Pithouse 2 was not, and LA 4487 Pithouse 9 may have had a passage style entry while NA 8969 Pithouse 2 clearly had a ventilator. Therefore some of the exterior-visible features such as roof construction and mode of entry may have differed between the two structures, but the interiors were strikingly similar.

Finally, NA 6639 "Kiva," as I mentioned previously, has a high coefficient of similarity with White Mound House 4, although it probably more closely resembled White Mound House 1. It also has a high coefficient of similarity with LA 4487 Pithouse 9, although I think this relationship is less secure. The roof construction of LA 4487 Pithouse 9 can not confidently be characterized as a four-post roof support system, which the NA 6639 "Kiva" clearly can be, and the "Kiva" contained a ventilator, not a passage style entry way.

NA 6639, NA 8939-8948, NA 8968, and NA 8969: Conclusions

The “highway salvage” cluster of settlements along the Puerco River itself and just to the north of it have a few similarities with LA 4487, Whitewater, and White Mound, although many of these similarities appear to be tenuous. There are surprisingly few similarities between structures within this cluster of sites, and seven of the twenty-three structures have no similarities at all with other pit houses. I think this may be a result of the variability found within these pit houses—although most of them can be considered “more elaborate,” very few of them conformed to “symmetrical” patterns of construction. Within these smaller settlements pit houses adhered less to standard designs and methods of construction. Furthermore, different architectural features were “mixed and matched” within the highway salvage pit houses, such as pit houses with wingwalls that lacked ventilators, two features that elsewhere were almost universally associated with one another.

I discuss the possible origins of these architectural tendencies more fully in “Part IV.” However, I think that the frequent occurrence of “less elaborate” structures in this area, the lack of evidence for substantial roofs, and the fact that pit houses often do not conform to “typical” architectural styles such as those exemplified at LA 4487, Whitewater, and White Mound, are evidence that architectural traditions were more weakly enforced in this part of the Puerco Valley. Many of the pit structures in this cluster were probably not intended for long-term occupation, suggesting the residents were comfortable with frequent residential moves. In these situations housing may not have held much significance for the expression of cultural identity.

In two cases, at NA 8968 and 8969, it appears that residents arrived from far enough away to require building short term housing for a single season while work on the main pit house or surface structure was completed. Elsewhere, however, this pattern does not seem as obvious, suggesting that site occupants had the ability to plan their residential moves from nearby, possibly staging needed materials, or constructing a new house a few miles away while still occupying an old one. Closer inspection of floor artifact inventories might help better understand the mode of abandonment and reoccupation at this cluster of sites. I feel that the architectural evidence points towards frequent abandonment and reoccupation, and as a result many of the pit houses exhibit unusual or atypical architectural style, because people familiar with a variety of architectural traditions may have been moving in and out of this part of the Puerco Valley.

NA 14674, NA 14676, NA 14681, 14682, and 14683

There are not as many structures at NA 14674 that can be accurately dated to the Late Period as the Early Period. However, many of the small, cribbed-log style pit houses that could not be dated to anything more precise than the whole AD 600-900 interval may have been built during the Late Period. In addition, while with few exceptions cribbed-log style architecture was confined to NA 14674 and 14675 in the Early Period, during the Late Period a number of nearby sites exhibit this style. Cribbed-log style architecture occurs as late as late as AD 880 at NA 14683.

There are only a few pit houses that are linked to one another by high coefficients of similarity, but the presence of cribbed-log style roof construction in conjunction with masonry chimneys is enough to demonstrate some relationship between all occurrences of this architectural tradition, given how rare the construction technique is. As described in previous sections, most cribbed-log style pit houses are practically identical to one another. The fact that the Gower's coefficient analysis did not identify more similarities is due to the varying degrees of preservation present. Visually, the presence of a round, well-plastered floor, the presence of one or two “cribbing” stones, and the presence of a pile of masonry slabs southeast of the pit house is enough to hypothesize that a structure is built in the cribbed-log style.

NA 14674 Feature 6 and NA 14682 Feature 5 have a high coefficient of similarity. While NA 14682 Feature 5 was poorly preserved, the presence of cribbing stones and part of a masonry chimney confirm that it was a cribbed-log style structure. NA 14674 Feature 6 was better preserved, and had two remaining cribbing stones, a hearth slab, and a chimney. NA 14681 Pithouse 1 and NA 14683 Pithouse 1 also have high similarity coefficients, and indeed both were similar-sized cribbed-log structures. NA 14681 Pithouse 1 contained a small storage bin appended to the back wall of the structure, opposite the chimney, which was the only real difference between these structures. Both structures produced somewhat unsatisfactory radiocarbon results and no tree-ring samples were datable, but ceramics indicated they were both occupied in the last decades of the AD 800s. NA 14676 contained two pit houses that shared similarities with other structures in the Coronado Cluster, they were so poorly preserved that missing data skewed the statistical measure of similarity.

The relationships shared by the four pit houses discussed above (excluding those at NA 14676) demonstrate that NA 14674 and NA 14681-14683 are all shared similar architectural attributes. Cribbed-log style architecture characterized most of the pit houses on these sites, which incidentally were all located within a few miles of each other. Further examination of other structures on these four sites shows that there were some pit houses that did not conform to this pattern, however. At least three pit houses from NA 14674 which could not be accurately dated did not have cribbed-log-style architecture. Pithouse 6, Pithouse 8, and Pithouse 9 were all shallow pit houses with floor areas between 10 and 13 square meters, typically twice the size of most cribbed-log structures. The roofs of these pit houses were supported by upright posts, but none exhibits a formal posthole pattern. In addition, they did not have chimneys or hearth slabs, further differentiating them from cribbed-log style pit houses. The original excavators felt that these structures dated to “Basketmaker III”—presumably placing them within what I consider the Early Period (Stebbins et al. 1986:587-589), although the complicated stratigraphy of the site makes establishing a date range for these structures problematic.

Better dates are available for non-cribbed log structures nearby at NA 14682. At least one pit structure (Pithouse 2/Feature 2) at this relatively small site contained slab-lined walls, a standard shaft/tunnel style ventilator, and a slab-lined hearth and ash box. A radiocarbon sample from the floor of this structure yielded a date of AD 770 +-55 (Stebbins et al. 1986:629), a date that is commensurate with ceramics recovered from the site. Pithouse 2 may have been associated with the possible jacal sunken floored structure (NA 14682 Pithouse 1/Feature 13) eliminated from further consideration in earlier analyses for being “less elaborate,” and most likely a surface storage room or activity area. Surface structures of this sort were not associated with any cribbed-log structures at other sites.

Cribbed-log style architecture is only found at one other place in the Puerco Valley during the Late Period—NA 8941 Pithouse 1. This site consisted of a single, isolated cribbed-log pit house with a hearth slab and chimney; an intact log plastered into the wall-floor juncture yielded dates in the AD 850s. NA 8941 Pithouse 1 was larger than the average cribbed log structure with a floor area of 8.83m^2. A half-mile east of NA 8941, a chimney reminiscent of those found in cribbed-log structures was found in NA 8942 Pithouse 1. This structure was constructed in the AD 790s, and pre-dates the cribbed-log pit house at NA 8941.

NA 14674, NA 14676, NA 14681, 14682, and 14683: Conclusions

The presence of non-cribbed-log style architecture at NA 14674 and NA 14682 suggests that either the inhabitants of these settlements sometimes opted to build houses outside of their traditional architectural canon, or people from elsewhere with different methods of house construction occasionally occupied these settlements. Because cribbed-log structures may only have been seasonally occupied, and that many of these sites may have seen hiatuses in occupation, I am unsure whether cribbed-log structures and other styles of housings were simultaneously inhabited. The architectural variability and weak adherence to formal architectural styles at the nearby cluster of sites excavated during highway salvage implies that this central portion of the Puerco Valley may have been the scene of frequent population movement, and a single location could easily have been occupied by a variety of groups of people in succession. However, despite the potential for frequent population movement—especially considering that cribbed-log structures are interpreted as being seasonally occupied—the almost insignificant occurrence of this architectural tradition outside the Cottonwood Seep locality suggests that the use of cribbed-log architecture maintained a definite social boundary within the Puerco Valley.

The cribbed-log architectural tradition consists of the co-occurrence of cribbed-log roofs, well-plastered floors, masonry chimneys oriented to the southeast, and horizontal hearth slabs rather than excavated hearth pits. Cribbed-log architecture has the longest span of construction of any recognizable suite of construction traits in the Puerco Valley, aside from perhaps circular structures with ventilators and four-post roof designs, which is a general construction technique found throughout much of the northern Southwest between AD 600-900. The long-term maintenance of the cribbed-log architectural tradition suggests relatively little overlap between the inhabitants of the Cottonwood Seep area, or at least the people using this area, and other occupants of the Puerco Valley. Ceramic technologies such as the use of local grey-brown utility wares (common to many parts of the Puerco Valley), link the Cottonwood Seep locality to other Puerco Valley settlements (Hays-Gilpin and Van Hartesveldt 1998; Hays 1993:47), while the presence of La Plata and White Mound Black-on-white indicate that these settlements used similar decorative styles on pottery as well. Hays has rhetorically wondered whether pottery was used to signal ethnic identity at all at NA 14674 (1993:47), suggesting perhaps clothing or some other form of material culture set people apart as ethnically distinct. I suggest that the architectural tradition begun at this site in the early AD 600s and maintained up until around AD 900 would have marked the inhabitants as belonging to a distinctly different cultural heritage than other pit house builders in nearby settlements, such as White Mound, Whitewater or the highway salvage site cluster.

Twin Butte (NA 5065)

The last site I examined in detail and also the farthest west in the study area is Twin Butte. Despite the presence of nearly two-dozen discrete habitation areas, only two pit houses from the site have been excavated, and only one of those completely—Structure F4. Structure F4 shares a high coefficient of similarity with LA 4487 Pithouse 2, but as described previously, there are many reasons to suspect that the similarities are more apparent than real. Foremost among them are differing bench construction, roofing technologies and the lack of a wingwall in Structure F4. Structure F4 did not readily resemble any other pit house in the Puerco Valley. It was oriented to the east, rather than the more typical southeast, the "ash box" in this structure was filled with worn river cobbles, and other sub-rectangular structures in the Puerco Valley—such as those at Whitewater—generally lacked benches altogether.

Structure D4, a partially excavated pit house exposed at the bottom of a trench near the main core of the Twin Butte site, may be more characteristic of Puerco Valley house construction. Although the full extent of the structure was not exposed, it appears to have been a circular or oval pit house with a hearth and an ash box. It contained a couple of sub-floor pits within the area exposed by excavation. A single posthole near the wall of the structure does not provide enough evidence to suggest a roof construction style. However, aside from lacking a wingwall Structure D4 appears similar to White Mound Houses 1 and 2, with which it has coefficients of similarity of G=0.84 and 0.82, respectively. It also has high coefficients of similarity with a few of the structures in Group 1 at Whitewater, although those structures were all sub-rectangular and it is likely that Structure D4 was circular.

Structure D4 actually compares quite favorably with AZ-P-60-31 Structures 4 and 5, having coefficients of similarity of G=0.92 and 0.87, respectively. Those Early Period structures were circular, had hearths, ash boxes, and ladder supports, four-post roof designs with the posts located near the wall of the structure, and ventilators. While the roof design of Structure D4 at Twin Butte is unknown, as is the presence of absence of a ventilator, the structure exhibited similar placement of the hearth/ash box/ladder rest complex, as well as small subfloor storage pits. The only major difference between these structures is that AZ-P-60-31 was occupied at the end of the AD 600s into the early 700s. However, as previously mentioned, the chronology of Twin Butte is poorly established. Theuer (2011:110) suggests a date of Basketmaker III (AD 550-700) for structure D4. Based on similarities with the architecture of AZ-P-60-31, I agree that Structure D4 may date to the later end of that range, possibly in the late AD 600s to early AD 700s. Its location beneath the jumbled architectural complex that forms the core of the settlement and a focal point for other habitation areas at Twin Butte suggests that Structure D4, although not the first (Wendorf found evidence that Structure D4 had cut through an even earlier pit house), was one of the earlier structures on the site.

Conclusions

Two trends arise from the structure-to-structure comparisons within the Puerco Valley: places where architectural styles were strongly defined and formally expressed, and places where architectural styles were only weakly articulated. Architectural traditions could overlap between sites, or they could be isolated phenomenon confined to only a few settlements. During the Early Period, there was almost no overlap in architectural style between settlements. The two largest sites show the greatest internal homogeneity, especially after removing “less elaborate,” temporary pit houses from consideration. The architecture of NA 14674/14675 and AZ-P-60-31 were very different from one another in the Early Period despite their proximity, aside from two “cribbed-log” style structures built at AZ-P-60-31. Furthermore, only at these two larger settlements were well-articulated architectural traditions defined through the consistent co-occurrence of specific architectural attributes. The circular and oval shaped pit houses with four-post roof support systems, hearths, ash boxes, ladder rests, and vents that were constructed at AZ-P-60-31 conformed to underlying rules and codes. In the same manner, the cribbed-log style pit houses at NA 14674/14675 were part of a rule-bound architectural tradition. The rules of cribbed-log construction extended to materials and construction methods, whereas the pit houses at AZ-P-60-31 exhibited variability in construction materials, floor preparation, and wall treatment.

During the Late Period the patterning of architectural traditions became more complicated as the number of people in the Puerco Valley increased after AD 750, and social interaction between valley inhabitants intensified. A much greater number of significant similarity coefficients exist between settlements in the Late Period, although the area around Cottonwood Seep continued to be a pocket containing a unique, localized architectural style. The eastern portion of the study area, near the New Mexico/Arizona border, was an area of particularly architectural overlap—though it is, incidentally, also the best-studied part of the Puerco Valley. The number of high similarity coefficients between pit houses in this area reflects the fact that the inhabitants drew on the same canon of architectural attributes such as ventilators, roof construction, hearth construction and elaboration. In many cases, the prehispanic vernacular architects also assembled these attributes following the same underlying rules, reflecting the fact they were participants in shared learning frameworks or cultural traditions. As in the Early Period, common style between structures reflecting participation in similar architectural traditions was most clearly articulated at larger settlements like LA 4487 and White Mound. The cluster of smaller settlements excavated during highway salvage least clearly displayed strong patterns of architectural similarity, possibly because the inhabitants did not intend them to be long-term homes.

One exception to this pattern of interaction is Whitewater. At least one section of Whitewater, Group 1, contained pit houses that were conspicuous not only for their architectural style, but for the homogeneity and adherence to tradition as well. The great conformity in shape, size, and roof construction among the pit houses of Group 1 is not observed at any other settlement in the Puerco Valley, except, perhaps, in the area around Cottonwood Seep. Group 2 at Whitewater did not share the great degree of internal conformity found in Group 1, and most likely developed slowly as the result of multiple, sequential episodes of house building. At least one pit house in Group 2, Structure 12, contained architectural features that were unique in the

Puerco Valley, such as a roofed subfloor vault. The traditions followed by the vernacular architects of Whitewater were quite distinct from those followed by the inhabitants of the nearest comparable and contemporaneous settlement, LA 4487.

Further west in the Puerco Valley, NA 14674 maintained its distinct architectural style throughout the Late Period, although pit houses at a few surrounding settlements were built in the unmistakable cribbed-log style that first emerged in the Early Period. The actual methods of construction and materials changed very little over the 300-year period between AD 600-900. Furthermore, the boundary between settlements that used the cribbed-log style and those that did not was well defined. This may have been a reflection of major differences in subsistence strategy among the inhabitants of these sites. People building in the cribbed-log pit house tradition may have been more mobile, perhaps even leaving the Puerco Valley on a seasonal basis, whereas the inhabitants of the eastern valley constructed housing and settlements of greater permanence. This distinction may be rooted in different agricultural practice—farming dune fields and seeps may have been a significant agricultural technique of the groups around Cottonwood Seep, and one more amenable to seasonal movement. The inhabitants of the eastern Puerco Valley settlements may have relied on floodwater farming of the side drainages of the Puerco River, or the Puerco River itself, which would have required greater investment in check-dams and other water control features, encouraging longer-term residence.

Finally, far to the west, Twin Butte is difficult to categorize because it has so little architectural data from excavation, and because it is separated from the other excavated settlements by a wide gap. One pit house at the site resembles those built at AZ-P-60-31, and by extension those at LA 4487 that may be part of an earlier (but undated) occupation. Twin Butte Structure D4 may date to the Early Period, in which case the settlement was a participant in the more widely shared tradition of circular or oval pit houses with ventilators and four-post roof support systems. By the Late Period, the architecture of Twin Butte pit houses did not resemble other Puerco Valley pit houses, although the use of a four-post roof support system and a ventilator were common to many. The small distinctions in roof construction, such as the number and location of secondary upright support posts and the very wide, full-encircling bench set this structure apart from other Puerco Valley architectural traditions.

From the Early Period to the Late Period the relationships between the architecture of pit houses built at settlements in the Puerco Valley became more complex. On the one hand this is a reflection of the increased use of substantial materials and construction methods described in "Part II" of this chapter, but it also mirrors the greater complexity of social and cultural interaction found within the valley in the Late Period. The greater diversity in Late Period architecture results from the interaction of people from different architectural traditions. The divergent historical and cultural backgrounds of these people means that Late Period architecture is not just an amalgam of architectural attributes from different areas haphazardly included within a pit house; the social and economic status of these people mediated their interaction within the Puerco Valley, further complicating the architecture of the pit houses they built. Migration into the Puerco Valley from adjacent areas appears to be a hallmark of the Late Period. The next part examines the architectural traditions of surrounding regions of the northern Southwest to contextualize the structures found within the Puerco Valley.

Part IV: Puerco Valley Pit House Architecture in a Regional Context

Introduction

The Puerco Valley is a comparatively small area within the larger context of the northern Southwest. It is sandwiched between three major culture provinces: Kayenta-Tusayan, Chaco/Cibola, and Mogollon. Chapters 2 and 3 critiqued the assumptions of cultural uniformity that underlie the definition of these areas, but they are useful heuristic terms for geographic regions in which certain architectural and ceramic attributes predominate. I believe that if you travelled to the center of the Kayenta-Tusayan region in the early Pueblo period, it would look and feel distinct from the Chaco/Cibola region, or any of the other major culture provinces of the Southwest. The patterns by which these areas were first defined are stronger in some places than others, however. The edges of these culture provinces, such as the intersection of the Kayenta-Tusayan, Chaco/Cibola, and Mogollon at the Puerco Valley, typically exhibit weaker cultural patterns (in the sense of Herr 2001; 2012). However, far from being a backwater, the Puerco Valley may have had a cosmopolitan character as a result of the co-residence and interaction of groups from a variety of cultural and social backgrounds.

The following section situates the architectural traditions of the Puerco Valley within the larger context of the pit house architecture of the northern Southwest. I first surveyed the well-published literature from surrounding regions and beyond to identify regional styles based on the most visible or salient architectural attributes like shape, mode of entry, roof technology, or adobe ridges or wingwalls. In some areas of the northern Southwest certain architectural attributes almost never occur, and in others they almost always occur. Using this list, I identified a number of Puerco Valley pit houses that may have been built by migrants.

Next, I created a matrix of similarity coefficients for Puerco Valley pit houses as well as those from the comparative sample using the attributes depicted in Table 4 and described in Chapter 3. This allowed me to track changes in the relationship between the architecture of the

Puerco Valley and other regions of the northern Southwest. It shows that during the Early Period the Puerco Valley architectural traditions were most similar to those located to the south of the valley. During the Late Period, architectural traditions were more closely aligned with those found to the north. Architectural traditions in the Puerco Valley after AD 750 overlap in complex ways that reflect the variable permeability of social boundaries within the valley.

	Circular	sub-rectangular	D-shaped	oval	vent	alcove/ antechamber	four-post support	perimeter posts	no evidence of postholes	Three-Quarters Bench	Full Bench	adobe ridges	wingwalls	
Kayenta/Tusayan	**9**	**5**	**1**	**4**	**3**	**11**	**7**	**6**	**4**	**2**	**5**	**16**	**9**	**(n=19)**
	47%	26%	5%	21%	16%	58%	37%	32%	21%	11%	26%	84%	47%	
Mogollon Margins	**8**	**9**	**4**	**5**	**10-11**	**13**	**18**	**1-3**	**0**	**4**	**6**	**1**	**7**	**(n=26)**
	31%	35%	15%	19%	38%	50%	69%	4%	0%	15%	23%	4%	27%	
Hardscrabble Wash	**10**	**13**	**2**	**11**	**21-22**	**4?**	**26**	**0**	**4**	**0**	**13**	**1**	**0**	**(n=37)**
	27%	35%	5%	30%	57%	11%	70%	0%	11%	0%	35%	3%	0%	
Northern San Juan	**2**	**28**	**7-8**	**0**	**34**	**4-6**	**33**	**0**	**5**	**16**	**1**	**0**	**32**	**(n=38)**
	5%	74%	18%	0%	89%	11%	87%	0%	13%	42%	3%	0%	84%	
Chaco Canyon	**6**	**6**	**7**	**2**	**11-13**	**5-6**	**16-17**	**2**	**1**	**8**	**4**	**1**	**13**	**(n=21)**
	29%	29%	33%	10%	52%	24%	76%	10%	5%	38%	19%	5%	62%	
Puerco Valley (Early Period)	**23**	**1-3**	**0**	**9**	**16***	**1**	**8**	**1**	**1**	**1**	**0**	**0**	**2**	**(n=38)**
	61%	3%	0%	24%	42%	3%	21%	3%	3%	3%	0%	0%	5%	
Puerco Valley (Late Period)	**29**	**21**	**7**	**14**	**55**	**7-8**	**41**	**1**	**15**	**7**	**7**	**5**	**30**	**(n=77)**
	38%	27%	9%	18%	71%	9%	53%	1%	19%	9%	9%	6%	39%	
Puerco Valley (Indeterminate)	**36**	**1**	**0**	**0**	**22***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**(n=38)**
	95%	3%	0%	0%	58%	0%	0%	0%	0%	0%	0%	0%	0%	
Puerco Valley (Total)	**88**	**23-25**	**7**	**23**	**93***	**8-9**	**49**	**2**	**17**	**8**	**7**	**5**	**32**	**(n=153)**
	58%	15%	5%	15%	61%	5%	32%	1%	11%	5%	5%	3%	21%	

Table 27: Frequencies of Select Architectural Attributes by Region

Identifying Structures Built by Migrants

In this section I build a "trait list" for architectural styles outside of the Puerco Valley. Table 27 shows the frequencies of different architectural attributes derived from selected sites within five areas of the Southwest: Kayenta-Tusayan, Northern San Juan, Chaco Canyon, the Mogollon Margins, and the Hardscrabble Wash region. Hardscrabble Wash is not a traditionally recognized area—it is often folded into a "Puerco/Zuni River" region or "Little Colorado" region. I separated it out because I wanted to determine whether the Puerco and Zuni River drainages contain similar architectural styles, or if they should be considered separate entities. Once again, I want to stress that these areas are meant as heuristic devices that mainly refer to geographic areas.

The Kayenta-Tusayan region exhibited a number of distinctive architectural traits. Almost 70% of the structures were circular or oval shaped, pit houses were far more likely to have an alcove or an antechamber rather than a ventilator, and four-post roof support systems were not as common as in other areas. Perimeter posts occurred almost as frequently, and structures often showed no evidence of roof construction at all. Where evidence of roofing is scant, excavators have often suggested that roof beams were placed directly on adobe walls built up from the lower walls of the pit house. Finally, most Kayenta-Tusayan area pit houses contained adobe floor ridges—features not as substantial as wingwalls but which delineated space within the floor of the pit house, and probably served to structure movement through the structure or define specific areas for specific activities. Given that adobe ridges are very uncommon in other regions of the Southwest, this feature was a hallmark of Kayenta-Tusayan region interior construction methods. The presence of perimeter posts or the lack of postholes could also be a marker for this regional style, although this was not a secure a distinction as adobe floor ridges.

During the early Pueblo period, the Northern San Juan region was characterized by high frequencies of sub-rectangular structures with ventilators, four-post roof-support systems, and wingwalls. Pooling all early Pueblo period structures masks a number of established architectural changes in the Northern San Juan, such as the presence of shallow sub-rectangular pit houses with antechambers during the AD 600s. There was no single attribute that stood out as distinctly as those from the Kayenta-Tusayan region, but sub-rectangular structures were far more common in the Northern San Juan than other regions.

The Chaco Canyon region had fairly equal frequencies of circular or oval, sub-rectangular, and D-shaped pit houses. Ventilators were common, although alcoves and antechambers occurred as well. Four-post roof-support systems were common, as were wingwalls. The single most distinctive aspect of the Chaco Canyon region was a greater tendency for pit houses to be D-shaped than any other region.

No single architectural attribute stood out in the Mogollon Margins region. Herr (2012) considers the area a “Transition Zone” much like the Puerco Valley, where architectural traditions were weakly defined. There was a preference for circular or oval structures, but sub-rectangular pit houses were also common. Alcoves and antechambers were slightly more common than ventilators, and there was a strong preference for four-post roof-support designs. There were few distinctive traits that stand out as a “marker” for Mogollon Margin architectural style, so it is hard to isolate structures possibly built by migrants. The Gower’s coefficient (below) had more luck determining the degree of similarity between Puerco Valley pit houses and pit houses in the Mogollon Margins.

Finally, the Hardscrabble Wash area had a clear preference for oval or circular pit houses. Ventilators were far more common than alcoves and antechambers, and four-post roof-support systems were very common. Adobe ridges and wingwalls almost never occurred. As with the Mogollon Margins, there were few distinctive architectural attributes that occured in this area, although circular pit houses with four-post roof support systems and full-encircling benches were common.

Structures in the Puerco Valley Possibly Constructed by Migrants

Because the Kayenta-Tusayan had such distinctive architectural attributes, it is easiest to identify possible connections between the Puerco Valley and this region. It is also one of the closest regions to the Puerco Valley. Due to the exceptionally high frequency of adobe floor ridges in the Kayenta-Tusyan sample (84%—the next highest total is 5% in the Chaco Canyon region), any structure in the Puerco Valley with adobe floor ridges could have been influenced by Kayenta-Tusayan architectural traditions. Structures lacking evidence of roofing, with roofs supported by perimeter posts, or that had alcoves or antechambers instead of ventilators are also candidates. Of course, the co-occurrence of these attributes increases the likelihood that a Puerco Valley pit house was constructed following architectural principles common in the Kayenta-Tusayan region.

Thirteen pit houses from the Late Period in the Puerco Valley had architectural attributes reminiscent of the Kayenta-Tusayan style; they are listed in Table 28 and depicted in Figure 24. Two of the pit houses from LA 4487—Pithouses 1 and 6—contained adobe floor ridges. The ridge in Pithouse 6 divided the structure in half, running perpendicular to the main axis of the structure from wall to wall behind the hearth. Pithouse 1 contained a floor ridge in a similar location, as well as one that extended from the perpendicular ridge to the adobe wingwall. Although the adobe floor ridges can be considered a “general” attribute, the location of the ridges in these two structures compares well with Feature 39 at AZ-I-61-27, (the Turtleback Adobe Site—Drake 2007). The remaining architecture of Pithouses 1 and 6 was not particularly similar to Kayenta-Tusayan area structures. If anything, these D-shaped pit houses with three-quarters encircling benches appeared similar to a number of Chaco Canyon area pit houses in their external attributes.

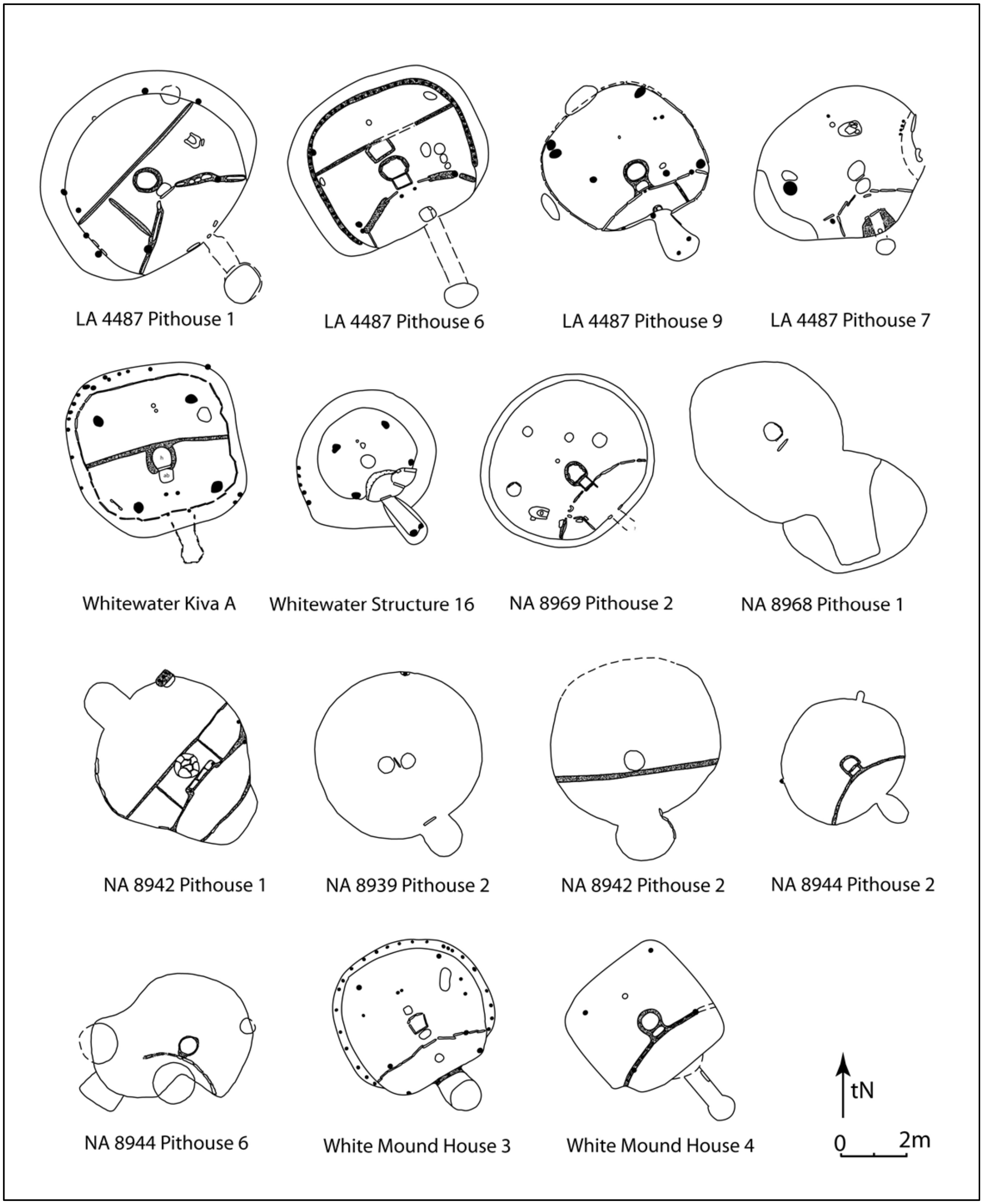

Figure 24: Puerco Valley Pit Houses Exhibiting Architecture Characteristic of the Kayenta-Tusayan Region

Site	Structure	Floor Ridge?	antechamber/ alcove?	extra bins or partitions?
Whitewater	Kiva A	x		
LA 4487	Pithouse 6/Feature 36	x		
NA 8942	Pithouse 1	x	x?	x
LA 4487	Pithouse 1/Feature 4	x		
NA 8969	Pithouse 2			x
NA 8968	Pithouse 1		x	
NA 8939	Pithouse 2		x	
NA 8942	Pithouse 2	x	x	
LA 4487	Pithouse 7	x		x
NA 8944	Pithouse 2		x	
LA 4487	Pithouse 9		x	x
Whitewater	Structure 16		x	x
NA 8944	Pithouse 6		x	

Table 28: Puerco Valley Pit Houses Containing Possible Kayenta-Tusayan Architectural Features

Pithouses 7 and 9 at LA 4487 contained a few features that may have marked them as Kayenta-Tusayan influenced structures. Pithouse 7, while not exhibiting adobe floor ridges did have an odd “double wingwall” or wingwall and raised dais in front of the ventilator opening which is found at a couple of Kayenta-Tusayan area structures. This effectively created a “double barrier” between the hearth and the outside of the structure—if the hearth is considered linked in some way to the ventilator. This “double barrier” feature was found in Park Wash Feature 1 (Ahlstrom 2000) and Jeddito 264 Pit House A (Daifuku 1961). Pithouse 9 contained an extra partition within the confines of its slab-lined wingwall, which was occasionally seen on Kayenta-Tusayan area structures, although it also occurred among some Mogollon Margin structures. Pithouse 9 also had evidence of a passage entry way and possibly a perimeter post roof support system, both common in Kayenta-Tusayan region. Ceramic evidence also supports the idea that Pithouses 7 and 9 at LA 4487 were built by Kayenta-Tusayan region migrants. The highest percentages of Tusayan white ware sherds at the site were found in the fill of Pithouse 8—a structure located between Pithosues 7 and 9 that was used as a trash dump. Pithouse 9 contained a high percentage of Tusayan white ware sherds in above floor fill as well.

Both the internally and externally visible aspects of the Pithouses 7 and 9 suggest cultural affiliation with the Kayenta-Tusayan region, whereas only the interior features of the D-shaped Pithouses 1 and 6 displayed Kayenta-Tusayan traits. Further ceramic evidence concerning the affiliation of these structures is contradictory. Sciscenti included Pithouses 1 and 6 within a group he termed “Type I” structures and Pithouses 7 and 9 within a “Type 2” group. “A cursory examination of the pottery as it was excavated indicates possible cultural and/or temporal differences between the two types of houses. The pottery of the D-shaped houses [Type I] seems to be affiliated with cultural groups to the west and south, while the circular houses [Type 2] seem to have affiliations with groups further north” (Sciscenti 1962:10). Just what aspects of the pottery from these structures Sciscenti was referring to is unknown. North from LA 4487 could refer to the Chuska slope, while south and west could refer to either the Mogollon Margin region or the Kayenta-Tusayan region. If anything, I think the D-shaped houses architecturally had more in common with areas to the north, aside from the presence of adobe floor ridges in two of them, and that Pithouses 7 and 9 had more in common with the areas to the west and northwest, in the Kayenta-Tusayan region.

Whitewater Kiva A contained an adobe floor ridge that extended perpendicular to the main axis of the structure from wall to wall behind the hearth. The remainder of this structure did not appear particularly similar to Kayenta-Tusayan region structures: it was sub-rectangular with a full encircling bench, a ventilator, and a four-post roof support system. Therefore, the interior of the structure was most reminiscent of Kayenta-Tusayan style architectural features, while the exterior is more akin to other Puerco Valley structures.

Whitewater Structure 16 had a passage entryway as well as two adobe partitions located where the entryway entered the main chamber of the structure. It lacked an ash box. Two postholes at the end of the entry may have seated a ladder or provided support for a roof over the entry. In addition, Structure 16 had a full encircling bench with a number of perimeter posts, although there were also four primary postholes in the floor of the pit structure. This structure—which is undated, although Roberts felt that it was “earlier” than nearby structures (1939:149)—shared many similarities with Kayenta-Tusayan structures in general, and specifically resembled Jeddito 264 Pit House D (Daifuku 1961:27). Structure 16 was associated with a series of circular and oval slab-lined storage cists, as was Pit House D at Jeddito 264, rather than rectangular rooms found elsewhere on Whitewater. Structure 16 may not even date to the main occupation of Whitewater—Pit House D at Jeddito 264 dated to the early AD 700s (Ahlstrom 1985), and perhaps Whitewater Structure 16 did as well. I believe that Structure 16 was constructed by actually migrants from somewhere to the northwest or west in the Kayenta-Tusayan region.

NA 8939 Pithouse 2 was a large, circular pit structure with a small alcove entrance and very little evidence of roof construction other than a single posthole located adjacent to the structure wall. It therefore shared with the Kayenta-Tusayan style a lack of clear evidence of roof support, as well as an alcove entry. Comparable structures in the Kayenta-Tusayan region were Jeddito 264 Pit Houses A and E. The biggest difference was the simplicity of NA 8939 Pithouse 2; it did not have the bench that was present in both Pit House A and E, or the evidence of masonry construction in some places. The overall effect was similar, however: a large, round pit structure entered by a ladder located near the structures wall rather than in the center.

NA 8942 Pithouse 1 was a similar structure to NA 8939. It was roughly circular, although it had both an antechamber as well as a bulbous protrusion that rendered the structure somewhat egg-shaped. It contained a wide array of adobe floor ridges, one of which spanned the structure parallel to the pole and adobe wingwall, others that connected this ridge to the wingwall. It had another adobe ridge segregating the bulbous protrusion from the remainder of the structure. Finally, as described above, it contained a jacal and adobe chimney. There were two postholes in the floor adjacent to the wall, but little other evidence of the roof construction. While the adobe floor ridges were a general attribute common in the Kayenta-Tusayan region, the bulbous protrusion is seen specifically in Features 7 and 39 at the Turtleback Adobe site (AZ-I-61-27). Both of these structures may or may not have had the separate adobe ridge that separates out the bulbous protrusion, but they both also contained the adobe floor ridge behind the hearth.

The chimney in NA 8942 Pithouse 1 was unusual, and could have been related to the "chimneys" constructed at the Cottonwood Seep cluster. However, there may have been precedent for such a feature in the Kayenta-Tusayan region. Feature 12 at the Sam Bia site (AZ-I-61-38) contained a cylindrical plug of masonry and adobe located above roof fall in the northeast quadrant of the structure, which could be interpreted as a sort of chimney or flue, located in a similar position to the one in NA 8942 Pithouse 1.

Pithouse 2 at NA 8942 was similar to both Pithouse 1 at NA 8942 and NA 8939 Pithouse 2. It was a large, circular pit structure with an antechamber entry and an adobe floor ridge that spanned the diameter of the structure, passing just to one side of the hearth.

NA 8944 Pithouse 2 exhibited some attributes of the Kayenta-Tusayan region. It was a circular or oval-shaped structure that most likely had an alcove or antechamber style entry. Only two postholes were visible, and they were immediately adjacent to the walls of the pit structure. They could have been part of a four-post roof support system, or they could have been all that remains of a perimeter post support system. The main thing linking NA 8944 Pithouse 2 to the Kayenta-Tusayan region was the presence of the antechamber or alcove entryway.

NA 8944 Pithouse 6 was a very irregularly shaped structure. There was no evidence of roof construction within this pit house, and it contained two storage pits, one of which was enclosed behind a slab partition wall. An “alcove” style entrance, probably accessed by ladder, was present in the southwest portion of the structure. The lack of evidence for a roof and the presence of the alcove entrance are the attributes of this structure that most resembled the Kayenta-Tusayan style, although Pithouse 6 was so unusually shaped and configured that it is difficult to gauge what sort of architectural influences might have been present within the structure.

NA 8968 Pithouse 1 was a large, oval-shaped pit house with very few internal features and no evidence of roof construction. It had an attached antechamber surrounded by a small bench. This structure was most reminiscent of Feature 1 at the Park Wash site in south central Utah. Otherwise, the lack of a roof entry or evidence of roof construction were features that this structure shared with many from the Kayenta-Tusayan region.

NA 8969 Pithouse 2 is one of the most convincing examples of a Kayenta-Tusayan style structure built in the Puerco Valley. It was the only one that clearly had perimeter post roof supports. It also had an extra partition within the confines of the slab and adobe wingwall, similar to many Kayenta-Tusayan area structures as well as LA 4487 Pithouse 9. Feature 5 at the Park Wash site had a very similar roof construction technique, as did Pit House F at Jeddito 264. Feature 12 at the Sam Bia site exhibited extra partitioning within the wingwall in the same manner as NA 8969. The biggest difference between NA 8969 Pithouse 2 and most of these Kayenta-Tusayan comparisons was that Pithouse 2 contains a ventilator.

As discussed in Part II, both NA 8968 and 8969 appear to have contained a juxtaposition of a pit house with relatively simple "less elaborate" architecture near one with "more elaborate" and formalized architecture. In addition these two sites contained the highest percentages of Kana'a Black-on-white in the entire Puerco Valley, comprising 78% and 73% of their total decorated ceramics assemblages, respectively. Kana'a Black-on-white is a Tusayan White Ware, exhibiting carbon painted decoration (Hays-Gilpin and Van Hartesveldt 1998). Most, if not all decorated pottery manufactured within the Puerco Valley seems to be made with mineral-based paint (Hays 1993). In fact, most Tusayan White Wares may have been manufactured near the Hopi Buttes region, to the west of the Puerco Valley (Hays-Gilpin personal communication 2009), so its occurrence within the Puerco Valley either signifies trade and exchange or migration. Despite the fact that after AD 800 Kana'a Black-on-white became one of the most common trade wares found in the Puerco Valley, the amount occurring at NA 8968 and NA 8969 is much greater than found elsewhere, and suggests that the occupants had a clear preference for Tusayan pottery.

Gumerman and Olson (1968:119) felt that NA 8968 and NA 8969 were "border villages" between the Puerco Valley and Kayenta-Tusayan peoples further west. I agree with this assessment: combined with the architectural evidence that the occupants of the site constructed temporary housing before commencing work on more substantial habitation and storage rooms, the ceramics evidence suggests that the inhabitants of NA 8968 and NA 8969 were individual households (not villages) that emigrated from somewhere to the west and north of the Puerco Valley. They either brought a significant amount of their own pottery with them, or continued to maintain ties to households manufacturing pottery within the Kayenta-Tusayan homeland. Alternately, they could have continued to use paint recipes that reflected their knowledge of the Tusayan ceramics tradition. Examination of the ceramics recovered from this site, and sourcing studies could establish whether they imported ceramics from their homeland, or made their own ceramics using technologies learned there.

The occupants of NA 8968 and 8969 signaled their cultural identity more strongly than the inhabitants of other Puerco Valley settlements that contained Kayenta-Tusayan architectural attributes. Although Tusayan wares are found at a number of the other Puerco Valley sites with Kayenta-Tusayan architectural attributes, they are never found in such high frequencies. However, the history of the settlement at NA 8968 and 8969 suggests that other inhabitants of the Puerco Valley may have perceived the occupants as outsiders.

The inhabitants of NA 8968 and 8969 appear to have been the victims of violence that killed a number of members of the settlement, and may ultimately have ended occupation at the site. The floor of Pithouse 2 at NA 8969 contained the partially articulated remains of at least two individuals, arranged so that two disarticulated skulls faced each other. Photos of the excavation reveal that the tibia and fibula of at least one leg were articulated at the time the deposit of human remains was made, as was a spine and pelvis (but not the ribs). North of this structure a hastily and shallowly excavated pit contained the informally buried remains of perhaps three other individuals. Pithouse 1 at NA 8969 contained the burial of two individuals, both face down. Based on photos of the remains during excavation, their hands appear to have been tied behind their backs. The burial was in fill above the floor of the structure, which may already have been abandoned at the time the burials were made.

Unfortunately, I did not have access to the unpublished skeletal analyses of the highway salvage collections, so whether further evidence of violence was present on the skeletons is unknown. However, the mode of burial in all cases was haphazard and unconventional. No burial goods were mentioned in any instance. It seems likely that most of the seven individuals recovered from this site were the victims of a raid. Perhaps survivors, who then abandoned the site and moved elsewhere, hastily buried some of the bodies. I do not think it is any coincidence that the settlement that most actively advertised its non-local affiliation is also the one that presents the most convincing evidence that the settlement was abandoned following an act of violence.

The other regions of the northern Southwest did not contain architectural attributes as distinctive as the Kayenta-Tusayan region. Structures constructed by immigrants to the Puerco Valley are not as easily identified from the Northern San Juan, Chaco Canyon, and Mogollon Margins. Therefore, rather than seeking individual attributes typical of a region—as could be done with adobe floor ridges, perimeter posts, and non-roof entries for the Kayenta-Tusayan region—I returned to the analysis undertaken in "Part III" and looked for structures that stood out significantly compared to other Puerco Valley architecture. I then looked to these surrounding regions for similarities in architecture that would suggest a possible origin for "non-typical" cases in the Puerco Valley.

Group 1 at Whitewater as well as Structure 12 (which is found in Group 2) stood out significantly compared to other Puerco Valley settlements. There was far greater architectural conformity among Group 1 than the Puerco Valley as a whole; a coefficient of similarity of 0.821 among twelve pit houses compared to an average of 0.713 for the whole Puerco region. All of the structures within Group 1 were sub-rectangular pit houses with four-post roof support systems and ventilators. There were a few differences in interior feature construction, as some of these pit houses had ash boxes in addition to hearths while others did not, and some contained wingwalls that others lacked. While these are attributes that were at least present throughout most of the northern Southwest between AD 600-900, particularly after AD 750, the Northern San Juan exhibited the highest frequency of these attributes as a package. Seventy-four percent of Northern San Juan pit houses in the comparative architectural sample were sub-rectangular, while 89% had ventilators, and 87% contained four-post roof support systems. During the Late Period in the Puerco Valley, excluding "less elaborate" structures only 28% of pit structures were sub-rectangular, only 63% had four-post roof support systems, while 81% contained ventilators (Table 27). Every pit house in Group 1 exhibited all of these features, a very small statistical chance.

Using the criteria selected for the regional comparison with Gower's coefficient, Group 1 at Whitewater was still conspicuous against the backdrop of other Puerco Valley architecture. The Puerco Valley during the Late Period has a coefficient of similarity of G=0.67. The Northern San Juan has the highest coefficient of similarity of any region, with G=0.76, which includes structures that pre-date AD 750. Using the same criteria used for the regional comparison, Group 1 at Whitewater has a coefficient of similarity of G=0.81, demonstrating that its degree of internal conformity was more similar to the degree of conformity in construction seen in the Northern San Juan than in the Puerco Valley. In addition, the layout of Group 1 was similar to the long, linear roomblocks found at Dolores River villages like Grass Mesa. The location of the dance plaza at Whitewater—located some distance to one side of the roomblock—is also analogous to the location of great kivas at some Northern San Juan villages.

Structure 12 at Whitewater was unique in the Puerco Valley. Its floor area, 27.73m^2, is about two standard deviations above the Late Period mean. It contained a three-quarters encircling bench, one of only seven structures that had this feature during the Late Period. Finally, it contained ritual floor features such as sub-floor vaults similar to those described by Wilshusen (1988c:653-655) as characteristic of oversized pit structures at McPhee village in Southwest Colorado. The similarity between Structure 12 and Dolores-area pit structures that may have had ritual functions has been noted before (Wilshusen 1988c:654; Schachner, Gilpin, and Peeples 2012). I agree that the floor features in Structure 12 were similar to Northern San Juan examples. To these other citations I can add that no other excavated pit structure in the Puerco Valley exhibited a similar combination of large size and complex floor pits.

Structure 12 may date to the late AD 800s or early AD 900s (Roberts 1939:108), although as stated before the tree-ring proveniences at Whitewater are suspect. Group 1 could not be accurately dated to anything other than post-AD 815, but it may date to the middle AD 800s, or perhaps even the late AD 800s. Although I did not undertake a detailed study of the pottery that Roberts published images of, most appears to be Kiatuthlanna Black-on-white, Kana'a Black-on-white, and later pottery types associated with the great house. There are very few pieces that could be White Mound Black-on-white, suggesting most of the pottery on the site post-dates approximately AD 850.

The relationship between Structure 12 and Group 1 is difficult to establish. Within the Northern San Juan during the AD 840-880 interval, there are two primary village layouts: those that contain oversized pit structures (like Structure 12 at Whitwater) located within the plaza of tightly arced masonry roomblocks, and those that lack oversized pit structures and consist of long linear roomblocks associated with great kivas (Wilshusen and Potter 2010:176). In the few villages where these two features co-occur, they do not appear to have been contemporary. The storage of ritual and comestible goods within these larger-than-average size arced roomblocks may have been the basis of power held by the inhabitants of these “early great houses” (Schachner 2010). That being the case, where are the arced roomblock accompanying Structure 12? And what ritual role or purpose does an over-sized pit structure serve adjacent to an unroofed great kiva or dance plaza? In the Northern San Juan during the mid-AD 800s, great kivas had largely fallen out of use, but none were ever associated with communities that had oversized pit structures (Wilshusen and Ortman 1999:386). It is as if the two Northern San Juan Village patterns both occur at Whitewater.

The position of the dance plaza, a short ways away from the long linear roomblock of Group 1 is similar to the position of great kivas from the east side of the Dolores River. Perhaps the first arrivals to the Whitewater area originated on the east side of the Dolores River and arrived in the mid-AD 800s, constructing an unroofed great kiva. Later migrants during the last decades of the AD 800s may have arrived, and attempted to build an arced “proto great house,” but found they had little support from other members of the community, and did not complete the project. Or did the oversized pit structure supplant the unroofed great kiva? A reanalysis of Whitewater artifacts excavated by Roberts may help increase our understanding of the relationship of all these features.

Population in the Northern San Juan decreased from a peak of perhaps 12,000 to less than 2,000 by the early AD 900s (Wilshusen 1999), although the drawdown in population in the region may have been occurring as early as AD 840 or 850, even as the largest villages were still growing (Varien et al. 2007). Migrants from the Northern San Juan have been implicated in the early origins of some Chaco Canyon great house communities (Van Dyke and Wilshusen 2006), as well as other great house communities in the San Juan Basin (Windes and Van Dyke 2012). I believe that Northern San Juan immigrants can be implicated in the formation of Group 1 of the Whitewater site, although they may not have been associated with the large exodus from north of the San Juan River that occurred after AD 880. What tree-rings are available suggest a major episode of construction at Whitewater during the AD 840-860 interval (Figure 9), or around the time of final phase of village formation in the Northern San Juan. Further studies of the Whitewater ceramics might highlight important aspects of this migration into the Puerco Valley. However, I will note that it is probably a lot easier to carry the plans of a pit house in the mind than it is to carry many pots in the hand from the Dolores River, across the San Juan Basin, and into the Puerco Valley.

The Puerco Valley and the Northern Southwest: A Diachronic View of Architectural Traditions

The Early Period

Table 29 depicts the coefficients of similarity between the Puerco Valley and the other regions of the Southwest during the Early Period. It must be remember that the sample used to derive these values is not complete, but a selection of sites was taken to be indicative of a traditional “culture area.” Where possible, Early Period Puerco Valley pit houses were compared to structures that date to between AD 600-750.

Puerco Valley compared to:	Average Gower's (G=)
Kayenta-Tusayan	0.4682

Mogollon Margins	0.6397
Hardscrabble Wash	0.775
Northern San Juan	0.554
Chaco Canyon	0.4694

Table 29: Average Gower's Coefficient Between Early Period Puerco Valley Pit Houses and Contemporary Pit Houses in other Regions

As can be seen, the Puerco Valley shows the greatest similarity with the Hardscrabble Wash area, which also happens to be the closest area. The Hardscrabble Wash comparative sample consists of a cluster of sites is in the immediate vicinity of Kiatuthlanna (Roberts 1931), a large, late AD 800s era village. The close similarity between the Puerco Valley and the Hardscrabble region in the Early Period may be misleading because only two substantial structures could be confidently dated to the Early Period in the Hardscrabble Wash sample. Settlement prior to as late as AD 800 appears to be scant in the Hardscrabble Wash region, and the Elaboration Index would probably class many of the pit houses as "less elaborate;" prior to AD 800 or even 850, most structures occupied in the Hardscrabble Wash region are probably "less elaborate." Looking more broadly, seasonal occupation and limited architectural investment continued later in the Zuni River drainage (into which Hardscrabble Wash runs) than elsewhere in the Little Colorado Region (Schachner, Gilpin and Peeples 2012; Peeples, Schachner, and Huber 2012).

The next highest coefficient of similarity is found between the Puerco Valley and the Mogollon Margins. Two sites represent the Mogollon Margin region: Bear Ruin in the Forestdale Valley of Arizona and Cerro Colorado near Quemado, New Mexico. The relationship between the twenty-six pit houses from these two sites and the twelve "more elaborate" structures included in the Puerco Valley sample is more secure than the that with the Hardscrabble Wash region, because most of the twenty-six pit houses date prior to AD 750.

There are a handful of non-cutting dates at Bear Ruin that demonstrate that the site was occupied after the later AD 600s. Haury though that the site had an occupation range of AD 600-800 (1940:122), although Bullard (1962:82) points out that the only reason Haury pushes the dates of the Forestdale phase back as far as AD 600 were because the dates of White Mound Black-on-white—an intrusive sherd in the Forestdale Valley useful for cross-dating—were not well-defined in the 1940s. Most of Bear Ruin post-dates AD 700—commensurate with current manufacture dates of White Mound Black-on-white—and continued up until around AD 800. Bear Ruin therefore cross cuts the Early and Late Periods. Cerro Colorado primarily dates from the mid-AD 600s to the early AD 700s (Ahlstrom 1985:165), and is therefore mostly contemporary with Early Period Puerco Valley pit houses. Most, if not all of the structures at Cerro Colorado and Bear Ruin probably qualify as “more elaborate” pit houses.

Of the structures in the Puerco Valley during the Early Period, “more elaborate” pit houses from AZ-P-60-31 and Structure D4 at Twin Butte (if it pre-dates AD 750) bore the closest resemblance to Mogollon Margin structures, specifically those at Cerro Colorado. AZ-P-60-31 Structures 4 and 5, and Units 39 and 41 were the best preserved of the more elaborate structures on the site, and they were all oval or circular pit houses with four-post roof-support systems, circular earthen hearths and ventilators (Structure 5 may not have had a ventilator). Structures 2, 3, 103, 208 and 211 at Cerro Colorado generally shared these attributes. Structure 103 is described as “D-shaped” although it was really an oval flattened on one side, and distinct from other D-shaped structures that tended to be much larger and have ¾ benches. Although the four pit houses from AZ-P-60-31 had circular earthen hearths, Structure 103, 208 and 211 at Cerro Colorado had adobe-lined circular hearths. Structures 208 and 211 are interpreted to have had antechambers connected to the main pit house by a short passage, rather than ventilators.

The distinction between large ventilators and small antechambers may be rather subjective. Unit 41 at AZ-P-60-31 contained just such a scenario: nearby Unit 7 may in fact have been an antechamber added to this structure's ventilator, or may have been a preexisting "less elaborate" structure used as a ventilator shaft or antechamber (Latady 1991:33). One hallmark of many of these structures at Cerro Colorado was the presence of a single wingwall that extended from the wall of the pit house towards the hearth, but did not quite meet it. Unit 41 at AZ-P-60-31 had such a wingwall. Structure D4 at Twin Butte is more problematic because only a portion of the floor was uncovered, so whether it had a ventilator, wingwalls, or partitions is left to speculation. However, the location and layout of what interior features were uncovered resembles Cerro Colorado.

The structures at Cerro Colorado and at AZ-P-60-31 were nearly exact contemporaries. They shared shape (being mostly round or oval), and roof construction technology (four-post roof supports), and the general layout of interior features was similar. The presence or absence of a ventilator is slightly more equivocal, but it is likely that during the AD 600s ventilators and small antechambers existed along a continuum largely left up to the interpretation of the excavating archaeologist. The biggest difference between the structures at these two sites was size: Puerco Valley pit houses in the Early Period rarely, if ever, exceeded 4 meters in diameter whereas most pit houses at Cerro Colorado are at least this size, if not a full meter larger. Structure D4 at Twin Butte may or may not date to the Early Period, although its great depth in the deposits and the presence of burials stratigraphically above it suggest that it is one of the older pit structures on the site.

The pit houses at Bear Ruin resembled Early Period Puerco Valley pit houses less than those at Cerro Colorado. They had a significant frequency of four-post roof-support designs, but they tended to have passage entries rather than ventilators. However, House 6 at Bear Ruin was similar to NA 8942 Pithouse 3, which dates to AD 734. They were relatively shallow, oval pit houses with four-post roof-support systems and ventilators. NA 8942 Pithouse 3 contained an adobe-lined hearth whereas House 6 at Bear Ruin had an unlined pit filled with stones which presumably were heated somewhere outside the pit structure. Furthermore, House 6 at Bear Ruin contained seven metates on the floor, while Pithouse 3 at NA 8942 contained four metates and many manos, suggesting these architecturally similar structures served similar food processing functions.

The Northern San Juan, the Kayenta-Tusayan region, and Chaco Canyon have much lower coefficients of similarity to the Puerco Valley than do Hardscrabble Wash and the Mogollon Margins. In fact, the scores of the Kayenta-Tusayan and Chaco Canyon regions are below 0.5—they were more dissimilar to the Puerco Valley than they were similar. Perhaps the biggest factor behind this dissimilarity was the prevalence of large antechambers among the AD 600-750 era pit house in the three comparative regions. The Kayenta-Tusayan was further distinguished by perimeter post roofing designs, which were never all that common in the Puerco Valley. The Chaco Canyon region and the Northern San Juan generally shared roofing techniques with the Puerco Valley during the Early Period, but Chaco Canyon pit houses lacked ash boxes in the Early Period and frequently had three-quarter-encircling benches not found in the Puerco Valley until the Late Period.

With the caveat that almost all comparisons are hampered by low sample sizes, the Puerco Valley most resembled the regions to the south during the Early Period: the Mogollon Margins and Hardscrabble Wash. The greatest degree of similarity was between AZ-P-60-31 and Cerro Colorado, with the exception that Cerro Colorado pit houses were typically larger than those found in the Puerco Valley. The similarities between the Puerco Valley and Hardscrabble Wash are found mainly among the “less elaborate” structures built by seasonally mobile farmers who inhabited those two regions. During the Early Period, the Hardscrabble Wash had little evidence of permanent settlements such as AZ-P-60-31, or NA 14674 for that matter, despite the fact that these two areas are only about a days walk apart. Differences in the availability of groundwater, the presence of springs, and different surface runoff gradients may have greatly affected the agricultural potential of these two seemingly similar areas. Furthermore, where Puerco Ridge quickly descends to the Puerco River, the Bidahochi shale formation is exposed, forming an interface where seeps and springs frequently occur (Arizona Department of Water Resources 2009:8). The sandy sediments surrounding these seeps and springs promotes the retention of snow melt and winter rains, which may have been a primary source of early season moisture for prehistoric farmers (see Hack 1942).

The Late Period

During the Late Period, a reversal of the trend seen in the Early Period seems to be in progress (Table 30). The Puerco Valley’s highest coefficient of similarity is with the Northern San Juan region (G=0.69), even after Whitewater is removed from consideration (G=0.67) since migrants from the Northern San Juan may actually have settled there. The next highest coefficient of similarity is found in Hardscrabble Wash (G=0.66), closely followed by Chaco Canyon (G=0.65). The Mogollon Margins are problematic because there are few structures in the sample that are definitely contemporaneous with Late Period structures in the Puerco Valley. Cerro Colorado clearly is too early, but some pit houses from Bear Ruin may date as late as AD 800. Comparing Puerco Valley Late Period pit houses to Bear Ruin yields a coefficient of

G=0.58. Finally, the Kayenta-Tusayan region (G=0.50) appears to be the least similar to the Puerco Valley. With the exception of the Kayenta-Tusayan region, the Puerco Valley becomes much more similar to areas to the northeast.

Puerco Valley compared to:	**Average Gower's (G=)**
Kayenta-Tusayan	0.5045
Mogollon Margins*	0.5796
Hardscrabble Wash	0.6565
Northern San Juan	0.6912
Chaco Canyon	0.6501
NSJ without Group 1	0.6703
* Bear Ruin Only	

Table 30: Average Gower's Coefficient Between Late Period Puerco Valley Pit Houses and Contemporary Pit Houses from Other Regions

The direction and magnitude of the change in coefficient of similarity is also informative. Following the hiatus in occupation between approximately AD 710 and 750, both changes in coefficients of similarity to the south are negative numbers (that is, the Puerco Valley became *less* like the Mogollon Margins and Hardscrabble Wash regions) and the changes to the north are all positive numbers (that is, the Puerco Valley became *more* like the Kayenta-Tusayan, Chaco Canyon, and Northern San Juan regions). In the north, the increase in similarity between the Puerco Valley and the Kayenta-Tusayan region was surprisingly small, given the number of structures identified above that exhibited Kayenta Tusayan architectural attributes. The magnitude of change towards the Northern San Juan and Chaco Canyon regions was large, although this effect may be magnified by the low coefficients of similarity those regions had with the Puerco Valley during the Early Period. Although the sample size from the Early Period is small, the magnitude of change between Puerco Valley and the Hardscrabble Wash area shows that those areas became decidedly less similar over time.

The paradox resulting from the high number of Puerco Valley pit houses displaying architectural attributes from the Kayenta-Tusayan style, and the relatively low degree of similarity between those regions as a whole, as implied by the Gower's coefficient analysis, may not be as strange as it first seems. The Kayenta-Tusayan region was not any more similar to the Northern San Juan (G=0.51) or to Chaco Canyon (G=0.51) than it was to the Puerco (G=0.50). In addition, the Kayenta-Tusayan has one of the lower internal coefficients of similarity (G=0.64) of all the northern Southwest regions during the Late Period, so there was a good deal of architectural variability within the region itself. This was mostly manifested in variation in structure shape and roof construction. Most, if not all, of the Puerco Valley pit houses that exhibited some Kayenta-Tusayan attributes were circular or oval-shaped, and they had a smaller degree of variability in shape and roof construction than pit houses actually built in the Kayenta-Tusayan region. Specific Kayenta-Tusayan architectural attributes, most commonly adobe floor ridges but occasionally antechambers, alcoves, and roofing techniques, appeared in Puerco Valley pit houses. When they did appear in the Puerco Valley, they were often imperfect copies of more substantial pit houses in the Kayenta-Tusayan region. In only two cases were there pit houses that unequivocally would have blended in if built on a settlement in the Kayenta-Tusayan region—NA 8969 Pithouse 1 and Whitewater Structure 16.

As population levels in the Puerco Valley increased during the AD 700s and 800s, the "hybrid" nature of most of the pit houses showing Kayenta-Tusayan influence suggests that small groups, possibly individual households, were moving back and forth between the Puerco Valley and the Kayenta-Tusayan regions. The mechanisms responsible for this low-level migration may have been similar to those described by Bernardini (2005a), particularly the idea that these small groups may have been lower status households that were only weakly attached to more centrally positioned lineages in their homeland. In addition, from the perspective of the Kayenta-Tusayan region, the Puerco Valley represented a borderlands or transition zone situation in the Late Period, where strong patterns of behavior and tradition dissipate in a land-rich and labor poor landscape (Herr 2012, 2001). A clear social boundary between the two regions did not exist, resulting in architectural styles that, while clearly exhibiting certain attributes from either one area or the other, could not be described as representative of either.

On the other hand, to the south of the Puerco Valley, a different situation developed. As I discussed, there are problems with comparing the Mogollon Margins and the Puerco Valley during the Late Period due to a lack of contemporaneous pit houses in the sample. However, the population of the Hardscrabble Wash area increased significantly during the AD 800s, and the area became densely settled after AD 850 (Schachner, Gilpin, and Peeples 2012; Throgmorton nd). While the Hardscrabble Wash has a higher coefficient of similarity with the Puerco Valley than does the Kayenta-Tusayan region, the degree of similarity dropped significantly between the Early and the Late Period. A localized architectural tradition, exemplified by pit houses at Kiatuthlanna and surrounding settlements such as NA 14650 and 14654 developed after AD 850, characterized by circular or oval-shaped pit structures with full-encircling benches, ventilators, four-post roof support systems, and *no interior partitioning*. There is a single excavated pit house in the Hardscrabble Wash region that had either adobe ridges or wingwalls, which suggests that despite similarities in the methods excavating pits and building roofs, interior space was treated differently south of Puerco Ridge.

There was not a great degree of architectural overlap between Puerco Valley sites and those in the Hardscrabble Wash area. Although there were fewer distinctive aspects to the Hardscrabble Wash architecture, there was a tendency towards oval-shaped pit houses with full-encircling benches and no interior partitioning. At Whitewater, Structure 15 and Kiva B, both built late in the AD 800s and probably remodeled in the early AD 900s, were the only Puerco Valley pit houses that greatly resembled those from the Hardscrabble Wash area, although they had different interior features and roof construction. A boundary developed by the Late AD 800s that separated the Zuni drainage and its tributaries (such as Hardscrabble Wash) from the Puerco Valley and points further north and west. In historic times, Zuni traditional use areas typically only extended as far as the south bank of the Puerco River (Ferguson and Hart 1985), especially for economic activities such as farming and grazing. Archaeological evidence suggests that a borderland may have developed between Hopi and Zuni following the abandonment of Kin Tiel (located a short distance north of the Puerco River) and surrounding areas after AD 1300 (Wilcox, Gregory, and Hill 2007:184). While a number of ancestral Hopi villages are known from the Petrified Forest area (Hough 1903; Theuer 2011), there is scant evidence of AD 1300-1500 occupation in most of the Puerco Valley by either ancestral Hopi or Zuni (Hays-Gilpin and Van Hartesveldt 1998). At least some Zuni clans recognized the Puerco Valley as a contested landscape: Cushing describes how the Winter People “fought their way fiercely in the valley of snow-water river [Rio Puerco of the West]” in Zuni origin stories (Cushing 1904:426). Admittedly Cushing aimed for an Anglo-Saxon alliterative half-line in his translation, but perhaps there is a kernel of truth in the sentiment.

Based on the architecture, I would argue that by AD 900, differences in pit house architectural style separated the Puerco Valley from areas to the south and east, such as the

Hardscrabble Wash area. Whether these differences were maintained in the following years, or whether the influence of Chaco Canyon in subsequent centuries ameliorated social differences in the region, is beyond the scope of this study.

The major shift during the Late Period towards similarities with Chaco Canyon and Northern San Juan pit house architectural traditions is a little more difficult to explain. Some of the shift is actually a result of those two regions ceasing to construct antechambers and adopting the use of the ventilator— after AD 750 *they* become more like the Puerco Valley in that regard. Proximity to the Chaco region in general may be responsible for some of the similarities that appeared after AD 750. The Puerco Valley pit houses that most resemble those of Chaco Canyon are located at LA 4487—which also happens to be the closest settlement to Chaco Canyon. Another reason for the increased similarity between the regions is that after AD 750, sub-rectangular pit houses more than quadrupled in frequency in the Puerco Valley. Sub-rectangular pit houses have long been recognized as a hallmark of the "eastern Anasazi area" (Bullard 1962:174), which primarily refers to the Chaco Canyon and Northern San Juan regions. That said, sub-rectangular pit houses are also a hallmark of the Mogollon region after AD 700 (the San Francisco and Three Circle phases). Given the proximity of the Puerco Valley, I think that it is more likely that at least some of the people who began to populate the valley after AD 750 probably moved there from nearby areas to the northeast, such as the Chuska slope, and they brought a preference for sub-rectangular pit houses with them. Throughout 10th and 11th century, the Puerco Valley continues to be at least a nominal participant in the kinds of architectural changes, and presumably social events, that occurred in Chacoan outlier communities. As I have mentioned, great houses developed out of at least three large Late Period villages.

Conclusions

I have examined Puerco Valley pit house architecture from four different perspectives. In "Part I" I looked at changes in attribute frequency over time, and concluded that Late Period pit houses are much more formal than those of the Early Period. I also found that the hearth/ash box/ventilator combinations became prevalent during the Late Period, though it was present in the Early Period at AZ-P-60-31. A variety of new architectural styles burst onto the scene after AD 750, which may indicate the arrival of new social groups with different architectural traditions. In "Part II" I sought to quantify some of the changes noted in attribute frequency in "Part I" with the help of the Elaboration Index. I scored pit houses based on the amount of architectural elaboration they exhibited. During the Early Period, two classes of architecture were present in the Puerco Valley—"less elaborate" and "more elaborate" pit houses. "Less elaborate" pit houses probably fulfilled short-term needs, and they are found at small settlements as well as large settlements. "More elaborate" pit houses involved a greater degree of energy investment on the part of the builders, and they also adhered more strictly to architectural traditions, conforming to recognizable styles. "More elaborate" pit houses were only found at the largest Early Period settlements in the Puerco Valley. This demonstrates that large sites during this period could be more than just palimpsests of repeated visitations; a combination of social processes at multi-family settlements resulted in stronger expressions of architectural tradition. Finally, between the Early Period and the Late Period the ratio of "less" to "more" elaborate pit houses reverses in the Puerco Valley, suggesting a greater degree of architectural investment accompanying a shift to agricultural practices that encouraged decreased mobility.

"Part III" used a statistical measure of similarity to compare structures within the Puerco Valley. During the Early Period, I found no statistically significant matches between pit houses on different sites. Despite this, I did identify a few shared architectural attributes between the adjacent sites of AZ-P-60-31 and NA 14674/14675. The lack of significant overlap in architecture between settlements could be a result of small sample size. In addition, a number of poorly-dated structures assigned to the Late Period by proximity to better-dated structures (such as Structure D4 at Twin Butte and Pithouses 4, 8, 10, and 11 at LA 4487) might actually date to the Early Period, and they share a number of similarities with the circular pit houses with four-post roof-support systems and ventilators built at AZ-P-60-31 at the end of the AD 600s. Comparing Late Period pit houses, I found far more links between structures at different sites. The greatest contrasts were between LA 4487 and Whitewater, sites that are located very near one another and were contemporaneous, but whose occupants participated in very different architectural traditions. LA 4487 contained a variety of architectural styles that overlapped with those found at White Mound village, as well as with some of the sites in the highway salvage cluster. The pit houses of Group 1 of Whitewater were very similar to one another, but not that similar to any other structures in the Puerco Valley. The pit houses of the highway salvage cluster were difficult to characterize, because they appear to have been built for shorter-term use, and they contained mixture of architectural attributes. They did not conform to a strong pattern or architectural tradition in the manner of Group 1 at Whitewater, or select structures from White Mound and LA 4487. The Coronado cluster of cribbed-log style pit houses continued to be an isolated architectural tradition, and overlapped very little with any other settlements in the valley. Finally, the Late Period architecture at Twin Butte, at the west end of the Puerco Valley, had superficial similarities with other parts of the valley, but exhibited many construction techniques that set it apart from other valley pit houses.

Expanding inquiry to a regional scale in “Part IV” helped make sense of the patterns that emerged from Parts I-III. I identified a number of pit houses that may have been built by migrants to the Puerco Valley. Architecture from the Kayenta-Tusayan region was most noticeable, with a strong tradition of partitioning space with adobe floor ridges found there. I identified pit houses constructed within the Kayenta-Tusayan tradition primarily at LA 4487, White Mound, and within the highway salvage cluster of sites along the Puerco River. Among the highway salvage sites, the pattern was somewhat obscured by the fact that often single attributes common in the Kayenta-Tusayan region appeared in a structure that otherwise could only be weakly categorized as belonging to any particularly style or tradition. This may be the result of a weakly constructed social boundary and frequent residential mobility. It suggests that different parts of pit houses were built by different people. The settlements along the Puerco River in the highway salvage cluster may have been multi-cultural households that moved frequently.

I believe that migrants from the Northern San Juan region built Group 1 at Whitewater. The degree of conformity to tradition was much greater than elsewhere in the Puerco Valley, where there was considerable latitude in the interpretation of traditions that resulted in architectural variability within single roomblocks. If Group 1 dates to the AD 840-880 interval, then ties with other Northern San Juan groups may have been maintained because Structure 12 is also a clear case of a Dolores-style oversized pit structure—but it was probably not built until after AD 880.

Looking at Puerco Valley architectural traditions between AD 600 and 900 demonstrates a number of patterns. During the Early Period, the Puerco Valley was probably a participant in the wider “Transition Zone” identified by Herr (2012) to the south along the Mogollon rim.

Weak patterns of architectural style are an indication that social boundaries were not rigidly maintained. Puerco Valley pit houses most resembled those found in the Hardscrabble Wash area, and at Bear Ruin in the Forestdale Valley and Cerro Colorado, near Quemado, New Mexico.

Following AD 750, there was a realignment of Puerco Valley architectural traditions. People from the Kayenta-Tusayan region spent more time in the valley, and this is reflected in the appearance of specific Kayenta-Tusayan region traits in Puerco Valley pit houses. At a more general level, during the Late Period the Puerco Valley became much more similar, architecturally-speaking, to that of Chaco Canyon and the Northern San Juan region. This is most evident in the eastern portions of the Puerco Valley. Cribbed-log structures continue to represent a unique architectural tradition around Cottonwood Seep, and (on limited evidence) Twin Butte continues to be part of the "Transition Zone" to the south. Most interestingly, a boundary appears to be developing between the Puerco Valley and the Zuni River drainage—Puerco Valley architecture became much less like that found in Hardscrabble Wash. This is most evident in the pit houses built at Kiatuthlanna and surrounding settlements, which display very limited evidence of internal partitioning of space, decidedly unlike the Puerco Valley where adobe ridges and wingwalls are very common. In addition, villages like Kiatuthlanna appear to be oriented around clusters of pit houses with limited surface architecture, while Puerco Valley Late Period villages like Whitewater and LA 4487 are formed around the concept of linear, jacal and masonry roomblocks.

Chapter 6: Conclusions

During the early Pueblo period the Puerco Valley was a point of intersection for groups of people who built houses indicative of a variety of architectural traditions. In some situations pit house architecture was a strong expression of group identity, while in others it was a less important material aspect of social negotiation. The expression of identity through architecture is, of course, dependent on the nature of what is being built. As housing became more substantial in the Puerco Valley over AD 600-900 interval, expressions of cultural identity were increasingly defined through architectural style. Studies of Puerco Valley ceramic traditions have suggested that multiple cultural or ethnic groups inhabited the valley during the early Pueblo period (Mills 2007; Hays-Gilpin and Van Hartesveldt 1998; Hays 1993). The evidence I have presented of multiple, co-existing architectural traditions supports this claim.

In the next few pages, I provide a brief history of occupation in the Puerco Valley between AD 600-900, emphasizing the architectural relationships between settlements. I do not mean to suggest that architectural traditions discerned in the archaeological record are a direct reflection of the cultural, ethnic, or linguistic relationships of past persons. However, I do believe that architecture is a more direct measure of group affiliation because houses do not move: people do. Furthermore, the close ties between housing and culture imply that architecture can communicate identity (Rapoport 2001:148). Following a narrative presentation of changing architectural styles in the Puerco Valley, I present a few of the key points and themes that can inform early Pueblo period research more generally.

A Culture History of the early Pueblo period in the Puerco Valley

During the AD 600-750 interval, settlement in the Puerco Valley is densest in the area around modern Petrified Forest National Park and Cottonwood Seep. At this time at least two and probably more groups of people lived in the valley. The best example of this comes from the excavated sites NA 14674/14675 and AZ-P-60-31, two large, contemporaneous settlements located a short distance from one another. The occupants of these two settlements drew on different architectural traditions when they constructed their houses. At NA 14674/14675, cribbed-log style pit houses predominated, and they may be an indication that the inhabitants of the site were seasonally mobile, residing somewhere else during the winter months, possibly even outside the Puerco Valley. The unique nature of this architectural tradition and the minimal amount of overlap with adjacent settlements implies a firm social boundary between the inhabitants of NA 14674/14675 and other people in the Puerco Valley.

At AZ-P-60-31, on the other hand, architecture conforms broadly to a larger tradition of circular or oval-shaped pit houses with four-post roof support systems and ventilators; this tradition may have been common across most of the Little Colorado River drainage (Bullard 1962). The formality exhibited by these pit houses, and their conformity to a pattern suggests that they were an expression of a relatively strong architectural tradition, and signaled affiliation with a particular cultural group. However, these formal pit houses are just one portion of the housing built on AZ-P-60-31. Other architecture within the settlement is more indicative of seasonal or short-term in habitation.

In general between AD 600-750, most housing is “less elaborate,” meaning that the builders invested little energy in creating a lasting, maintainable structure. They also invested less energy in creating structures that reflected cosmologies and world-views. Low population density and frequent population movement probably contributed to the lack of strongly diagnostic patterns indicative of affiliation with a particular cultural group. When strong architectural patterns emerged, they invariably did so at only the largest settlements, like NA 14674/14675 and AZ-P-60-31. Apparently, the desire to conform to architectural traditions was greatest within multi-family settlements.

Looking at the Puerco Valley through a "wide-angle lens" reveals that throughout the AD 600-750 interval architectural patterns adhered most closely to the regions found immediately to the south. At this time, identity expressed through architecture by Puerco Valley residents linked them to groups in the "Transition Zone" (Herr 2012) between the Mogollon area and the Anasazi. By extension, to understand the social identities of AD 600-750 Puerco Valley residents requires the perspective offered by Herr (2012:90): "perhaps we need to stop looking for the uniform patterns used to define "cultures," and instead explore the actions of households and individuals." Motivations for developing well-defined architectural traditions may have been quite low when the economic unit was the household or family, and larger cooperative units may have formed infrequently. Furthermore, there is little evidence in the Puerco Valley during this time of ritual or communal structures that would have fostered allegiances above the household. The essence of traditions resides within the concept of "practice" (Pauketat 2001:10)—for a strong tradition to develop requires frequent interaction between the practitioners of that tradition, with all the commentary, emendation, and negotiation that interaction implies. Research has questioned whether "communities" even existed in the Little Colorado River drainage during the early Pueblo period (Herr 2012; Schachner, Gilpin, and Peeples 2012; Peeples, Schachner, and Huber 2012; Schachner 2008), so it is unsurprising that it is difficult to identify strong traditions of pit house architecture in the Puerco Valley, especially prior to AD 750.

Radiocarbon and tree-ring dates indicate a hiatus in activity in the Puerco Valley between approximately AD 710 and 750. I doubt that the valley was completely uninhabited. However, the plethora of new architectural traits that became common after AD 750—such as sub-rectangular and D-shaped pit houses and adobe floor ridges—suggests that population growth was at least partially driven by immigration. In addition, the new architectural traditions had historical precedent in surrounding regions, but not in the Puerco Valley. Mobility (and possibly subsistence strategy) also changed in the post-AD 750 interval. Where people had before built mainly "less elaborate" pit houses indicative of short-term settlement strategies, they now constructed "more elaborate" dwellings, many of which contained architectural features—like the roof entry/hearth/ash box/ventilator combination—that reflected religious symbolism or cosmological principles. Like the AD 600-750 interval, the most elaborate houses constructed after AD 750 were those built on multi-family settlements like LA 4487, Whitewater, White Mound, and Twin Butte.

The area of highest population density in the Puerco Valley after AD 750 may have been in the area between modern-day Sanders, Arizona and Manuelito, New Mexico. Within an area approximately twenty-five miles in length along the Puerco River, at least two villages (LA 4487 and Whitewater), a possible village (White Mound), and many small settlements were newly established after AD 750. The opportunities afforded by villages such as LA 4487 appear to have attracted people from a variety of social and cultural backgrounds. For example, roof construction techniques and the distinctive D-shape created by the use of a three-quarter bench seen in some pit houses are an indication that the builders were familiar with architectural styles more commonly found to the northeast in the Chaco Canyon area. These same pit houses contain adobe floor ridges that were a hallmark of Kayenta-Tusayan area pit houses. Nearby pit houses more closely approximated Kayenta-Tusayan models, and were located within an area where a high number of Tusayan White Ware sherds were excavated, and in front of surface architecture that was constructed differently than other roomblocks on the site. People building in different architectural traditions appear to have lived side-by-side in this settlement.

In other cases, villages were largely comprised of a single cultural group. The series of pit houses constructed in Group 1, at Whitewater, conformed almost without exception to a well-bounded architectural tradition. They were all sub-rectangular, roughly the same size, and had four-post roof support systems and ventilator shafts longer than those typically found in the Puerco Valley. Some contained wingwalls and ash boxes, while others did not. A circular "dance plaza" or unroofed great kiva was located a couple hundred feet north of this long, linear roomblock. The degree of pattern and conformity seen in Group 1 of Whitewater is an indication of the effect that the different social processes of the Northern San Juan had on the vernacular architecture of the inhabitants of that region. The "unit intrusion" appearance of Group 1 also highlights that ways in which these processes differed from those that occurred in the Puerco Valley. Within the densely populated landscape of the Northern San Juan region, the emergence of villages was a symptom of a need for security in numbers, a way of legitimizing claims to areas of key agricultural resources, and a means to achieving greatly needed social solidarity at a time when population growth may have been rendering previous social structures inadequate (Wilshusen and Potter 2010:169-170). In the Northern San Juan region, villages not only were a reflection of social identity, they became crucibles of identity creation in which adherence to architectural principles served to reinforce the perception of unity and belonging.

The Puerco Valley allowed a greater degree of reinterpretation of architectural form within both dispersed and aggregated settlements. As Kayenta-Tusayan households established short-term farming settlements in the Puerco Valley after AD 750 in the area between modern-day Sanders and White Mound, Arizona, their architectural styles became a muted reflection of traditions found further north and west. Ephemeral pit house roofing techniques were a tradition brought from that region, but were also a response to short intended stays at these Puerco Valley farmsteads. The actually shape of pit houses and the mode of entry set many of these structures apart, whether or not they contained internal features like adobe floor ridges that marked the occupants as inheritors of Kayenta-Tusayan interior construction traditions. There is also always the chance that hybrid pit houses with a combination of clearly Kayenta-Tusayan features alongside more general architectural attribute may have been the result of mixed households. Roofs built in the Kayenta-Tusayan tradition can be indicated by a *lack* of clear evidence of roof construction—hardly a solid fact on which to build an argument—but many of the single-household settlements in the Puerco Valley with equivocal roofing evidence may have been comprised of a male from north and west of the valley and a local female.

In only a few cases do interior decoration, roof construction, and structure shape coincide in ways that present a strong pattern of Kayenta-Tusayan-region vernacular architectural traditions. The most salient example of this is found at a settlement (NA 8968 and 8969) that ultimately may have been the victim of a raid. Signaling non-local affiliation too strongly may have isolated the inhabitants of this site, and they may have been perceived as “others” in a way that people from the Kayenta-Tusayan region who mediated their architectural style were not.

Further to the west in the Puerco Valley, the cribbed-log architectural tradition was an immediately recognizable style, but rather than signaling outsider status it indicated people who had association with the Puerco Valley. It is still unclear whether people building in this architectural style resided elsewhere in the valley outside of the agricultural season, if they left the valley entirely, or these were in fact small, year-round settlements built by people who did not leave behind a lot of trash. Regardless, there may never have been very many people building within this tradition—the long span of occupation around Cottonwood Seep suggests that only a few of the 300 estimated pit houses there were lived in at any given moment. The tradition is also surprisingly static compared to other pit house architecture in the Puerco Valley. Unlike most other pit houses in the valley, which demonstrate a clear trend of increasingly "more elaborate" architecture, cribbed-log structures score the same on the Elaboration Index in between AD 750-900 as they did between 600-750. The builders of cribbed-log style architecture may not have dramatically changed their subsistence strategy and mobility patterns throughout most of the AD 600-900 period.

However, the distribution of the architectural style spread over time. During the AD 600-750 interval, the cribbed-log tradition was largely confined to the area immediately surrounding Cottonwood Seep, although between 750-900 was being built at a number of smaller settlements to the north of that area. Use of areas beyond Cottonwood Seep itself may be an indication that the spring dried up during the ninth-century. Given the ephemeral nature of cribbed-log pit houses, there is also a very good chance that smaller habitation sites that date to the 600-750 interval have just not been found in the area surrounding Cottonwood Seep. By the late AD 800s, NA 14674 was no longer used as intensively as it previously had been, and after AD 900 it seems likely that people building cribbed-log structures had been largely absorbed into adjacent populations, ceased to build cribbed-log pit houses, or had moved elsewhere.

Finally, the area around modern-day Petrified Forest National Park is poorly represented by excavation data from the AD 750-900 interval. Twin Butte is the best-studied settlement in the area dating to that period, but it is also a couple orders of magnitude larger than surrounding farmsteads and small sites and is not representative of settlement as a whole in the area. The single fully excavated pit house from Twin Butte does not immediately resemble others in the Puerco Valley. The western end of the Puerco Valley was also the closest to the "Transition Zone" north of the Mogollon Rim, and perhaps this region never lost its sense of belonging to that area of relatively weakly defined architectural traditions. In addition, pit house architecture in the eastern valley realigned itself after AD 750 with the north, east, and northwest—either because eastern valley residents were migrants from those directions, or because they came to see themselves as cultural affiliated with those areas as a result of increased interaction after AD 750.

In some ways, the subsequent history of the Puerco Valley highlights the importance of developing differences in cultural and social identity during the late AD 800s and early 900s. The eastern Puerco Valley participated in the great house architectural tradition to a much greater extent than the western Puerco Valley. Between Navajo, Arizona and Gallup, New Mexico, numerous great houses communities formed after AD 1000, such as the Navajo Springs great house (Warburton and Graves 1992), the Sanders and Chambers great houses (Hays-Gilpin and Van Hartesveldt 1998:41; Marshall et al. 1979), Allentown (Roberts 1939, 1940; Powers et al. 1983; Marshall et al. 1979), Houck (Powers et al. 1983), and Kin Hocho'i (Powers et al. 1983; Fowler et al. 1987; Stein and Lekson 1992). If the Red Mesa Valley is joined to the Puerco Valley (together, their low elevation creates a more convincing geographic province to the prehispanic farmer than the high-elevation reaches of the Puerco River itself), then an unbroken line of Chaco-era great houses stretched from Navajo Springs to beyond San Mateo, New Mexico. There were far fewer great house-like sites dating to the AD 1020-1150-era west of the Navajo Springs, and most of these only poorly fit the "great house" pattern, such as McCreary

Pueblo in Petrified Forest (Theuer 2011). The area around Navajo Springs appears to have been the effective limit of Chacoan control (Wilcox 2004:176), or at least the boundary beyond which populations no longer felt a connection to Chacoan ideology. The architectural trends that tied the eastern Puerco Valley to the north and east after AD 750 laid historical foundations that had lasting consequences into the Chacoan era. It is no accident that significant great house communities overlie the largest late AD 800s settlements in the eastern Puerco Valley, like LA 4487 and Whitewater. Positioning Classic Bonito phase outliers atop major early Pueblo period centers was an important facet of the construction of Chacoan social memory (Van Dyke 2007:191-192, 197). It is also likely not an accident that a significant Early Pueblo settlement like Twin Butte is untouched by later, AD 1020-1150 architecture. Areas in the western Puerco Valley drew on different historical models, architectural traditions, and social values in subsequent centuries.

A Few More General Conclusions

I believe that this study demonstrates a number of things beyond cultural-historical narrative on the changing identities of Puerco Valley residents. First, I feel that the concept of architectural style as applied to pit houses has been poorly theorized in the past. I do not claim to have made much progress on this topic, but I hope that my discussion of pit house architectural attributes in Chapter 4 can provide a foundation for further debate concerning high and low visibility traits in pit houses and what aspects of pit houses display technological style. The hidden nature of masonry wall fabric, or the underlying technological differences between adobe and stone in later Puebloan surface structures are nearly taken-for-granteds in Southwest archaeology, but only because a great deal of thought and inquiry has developed shared understanding amongst archaeologists. I am unsure that a similar consensus has been reached regarding salient aspects of pit house architecture that may communicate identity. In my opinion structure shape, entry style, and above all roof construction are the aspects of pit house construction most likely to be high visibility traits or emblemic style (Wiessner 1983). Hearth construction, small details in ventilator or antechamber/passage entry construction, and the partitioning of interior space may be low visibility traits (Clark 2001; Van Dyke 1999) indicative of early enculturation. However, Puerco Valley structures are not as deep as those found elsewhere in the northern Southwest, meaning that my high visibility variables may not have been noticeable aspects of construction elsewhere. Also, the important aspects of roof construction may only have been visible from the inside, making them low visibility traits. Finally, it is very likely that some variables are dependent on other variables; for example the presence of a bench and roof construction are related, as are depth and roof construction, and depth, entry style, and hearth construction. The interdependence of these relationships may render some statistical explorations problematic.

Most approaches to identity and material culture assume that there is a community to whom affiliation must be signaled, or from whom identity derives. A great deal of recent literature (chapters in Varien and Potter 2008; Herr 2012; Young and Herr 2012; Shachner et al. 2012; Peeples et al. 2012) has questioned the reified concept of community, particularly in pit house communities or pre-pueblo social situations. I agree that community should be a variable rather than a constant, and I think that the Puerco Valley during the early Pueblo period is indicative of this. Even within a cluster of settlements such as are found in the vicinity of White Mound, Whitewater, and LA 4487, a great deal of architectural variability arose as a result of the co-mingling of peoples from different cultural backgrounds. Did they identify as a community?

Or did they see greater affinities between themselves and the architectural traditions from which their housing took inspiration?

Finally, the social meaning of the patterns only became clear at the largest scales of inquiry. Without regional-scale contextualization, I would have been left with a series of temporal trends and a series of amorphous relationships between sites within a valley. The great amount of territory over which early Pueblo period architectural traditions played out necessitates a region-wide approach. I believe that such a large-scale approach could be extremely productive for recognizing weak and strong patterns in the expression of cultural identity across the northern Southwest.

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