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FRONTIER LANDSCAPES, RESIDENTIAL MOBILITY AND THE ARCHAEOLOGY OF PLACE AT LOWER PESCADO VILLAGE, ZUNI, NEW MEXICO

by

SUSAN A. DUBLIN

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Date

Chair of Examining Committee

6/22/98
Date

Executive Officer

Nan A. Rothschild, Ph. D.

William J. Parry, Ph. D.

Paul D. Welch, Ph. D.
Supervisory Committee

THE CITY UNIVERSITY OF NEW YORK

Abstract

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by

Susan A. Dublin

Advisor: Professor Gregory A. Johnson

An interdisciplinary approach is used in this study of Lower Pescado, a seasonal farming village of the Pueblo of Zuni. This multi-component site, occupied and abandoned by Zuni ancestors in the fourteenth century, was reoccupied in the nineteenth century; separated by time and historic context, the components are linked by geography and ethnicity. Temporal emphasis is on the onset of United States colonial rule in the nineteenth century.

The historic settlement landscape at Zuni was a result of spatial decisions made in the context of a dynamic set of economic, social, and political stimuli. Residential mobility, allowing the exploitation of outlying resource areas and the maintenance of a central settlement with integrative functions, is adaptive in a colonial setting. Historical accounts, paleoclimatological data, and locational analysis identify four factors as instrumental in shaping this landscape. Relations of production associated with the phased addition of European domesticates to the traditional economy required changes in the locations and

configurations of sites. Defensive requirements selected for a clustered settlement configuration, while the development of American forts briefly provided a market for surplus Zuni grain, encouraging irrigated wheat agriculture at permanent springs. After 1870, non-Zuni encroachment probably contributed to continued growth of the farming villages, whereby the built environment and the association with Zuni ancestral sites marked use rights to land and important resources along the edges of the core settlement area.

Survey and archaeological testing at Lower Pescado Village documented the cultural (re)construction of place. Variables used in the comparative analysis of the farming village and the underlying fourteenth-century pueblo were architecture, site structure, and material culture. Differences were related to the role of the site in the regional settlement system and change over time. The reuse of structural elements of the underlying pueblo resulted in an archaic, formal configuration that contrasted with the informal arrangement of space. Overlapping activity areas, the lack of elaborate site furniture, and an "impoverished" material culture are in accord with expectations for seasonal sites. Functional differences in ceramic assemblages underscored differences in activities at the two components, while faunal differences reflected the commitment to sheep pastoralism during the Historic Period. Euroamerican artifacts were rare and stratigraphically late; the appearance of new ceramic vessel forms exemplifies the recasting of European introductions in Zuni material idioms.

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CHAPTER 1

INTRODUCTION

Statement of Problem

The dissertation examines the (re)construction of place in a changing social landscape. This is achieved through an archaeological and historic analysis of the political economy of the nineteenth-century Zuni farming village of Lower Pescado, located in western New Mexico. This site, occupied and abandoned during the fourteenth century, reoccupied during the nineteenth century, and largely unused since the early twentieth century. provides a unique opportunity to explore similarities and differences in how a place was used in two occupation periods that were separated by time and history. Since architecture. ceramics, and oral tradition point to an ethnic continuity in the Zuni area from before the fourteenth century through the present (Ferguson 1981), the two occupations are linked by ethnicity as well as by geography.

The research will focus on the nineteenth-century farming village, although material from the fourteenth-century pueblo and from historic contexts at Zuni Pueblo are used for comparison. Previous research (Ferguson 1993; Holmes and Fowler 1980; Kintigh 1985; Mills et al. 1982; Rothschild and Dublin 1995; Stone 1991) indicates that there were significant differences in the way the village was used during the two occupation periods, even though the later site quite literally builds on the earlier. These differences included the duration of occupation and the role of the site in a regional settlement system. While the nineteenth-century farming village was a seasonally-occupied satellite settlement of Zuni

Pueblo, the fourteenth-century site was occupied year-round by a presumably self-sufficient population. In accord with these structural differences, it is expected that the material culture and the use of space at the two components will also differ.

At Lower Pescado Village, the historic context is a key factor that structured the differences between the two occupations. Reoccupation placed the site in a radically different settlement system that was associated with the incorporation of Zuni in the Angloamerican colonial system of the late nineteenth century. The dissertation employs an integrated program of archeological and ethnohistoric research to evaluate the relationship between the larger historical context of colonialism and the local context of settlement pattern restructuring, land use, and residential mobility in this area.

Definitions and Concepts

Several basic concepts underlie this research, including the idea of "place" and "landscape," a notion of colonialism, and the relationship between past decision-making and archaeological material culture. Although these are discussed in greater detail in the following chapters, a brief introduction is in order here.

The concept of places and landscapes used here incorporates the physiographic setting but also recognizes that places are constructed (and sometimes reconstructed) through human experience and history (Basso 1996; Bender 1993). Thus, a single place may be perceived or defined in a number of ways, depending on the perceiver (Morphy 1993). Zuni Pueblo, the Middle-Place of the Zuni people, was seen as the edge of the western frontier by the United States military stationed at Fort Defiance on the periphery of the Zuni use area. While shifting economic or political exigencies may entail a redefinition of various kinds of land, conflicting definitions of land are also characteristic of the "contested landscapes" of colonial systems. It can be argued that colonial systems in the American Southwest were in place by the late sixteenth century under the Spaniards, and continued, despite the brief respite of Mexican independence, into the twentieth century under the United States.

In this dissertation, colonialism is conceptualized as a long term process (Wolf 1982; Paynter 1985), which involved indigenous New Mexican peoples in European political and economic regimes, initially a tributary system under the Spaniards (Kessell 1979; Spicer 1962), and later, an Angloamerican market economy (Nagata 1970; Spicer 1962). A distinction is made between the events of "Contact," which generated new sets of initial conditions on which later change was superimposed, and the processes of "Colonialism," which involved incorporation into new economic and social milieus. Colonialism in New Mexico, as in other areas of the Americas, was accompanied by massive depopulation, indigenous settlement shifts, and Euroamerican infilling, all of which also contributed to a restructuring of the social landscape. Although the Zuni, situated far from the seat of Spanish power in the Rio Grande valley, were somewhat less affected by the initial Spanish encounter than were the Eastern Pueblos, depopulation and settlement restructuring typified the early centuries of colonial rule. Key attributes of a colonial system are the expansion of a state level system and territorial and/or economic cooption (or attempted cooption) of existing polities; within these parameters, the United States territorial government in New Mexico is considered a colonial government. The focus of this dissertation is on this later period of United States control.

Colonial change was structured, not only by European goals, but by interactions among the various players and intersecting decisions and perceptions (Gutierrez 1991). The dissertation will evaluate areas of stability and change in historic Zuni society from the perspective of Zuni settlement decisions, which are visible in the archaeological and historical records. Variability in the kinds and distributions of archaeological material culture is considered a tangible residue of past decision-making. For example, the replacement of ceramic cooking vessels by metal pots represents a different kind of decision regarding the incorporation of introduced technology than does the reuse of the metal to fashion projectile points or ornaments. Relict decisions are also visible in discontinuities or shifts in land use and settlement patterns. Land may be used in new ways as groups incorporate new modes of production or become involved in market economies; perceptions of landscapes may shift as boundaries are imposed or threatened.

Potential Contributions of the Research

This research has the potential to provide information in a number of substantive and theoretical areas. There is a growing interest in the anthropology of places and landscapes (Bender 1993; Basso 1996; Ortiz 1969). Lower Pescado Village is especially interesting in this respect because the comparison of the two components can provide insights on the relationship between the historic context and the configuration, use, and material culture of a place. Several authors have suggested that there is an intrinsic relationship between landscape and identity, which may be especially relevant to the study of colonial landscapes (Spicer 1962).

The study of colonialism and its impact on indigenous peoples is a goal of Historical Archaeology (Schuyler 1970). The archaeology of Lower Pescado Village will contribute to this literature, as well as to the literature on the extent and nature of stability and change in historic Puebloan societies (Dozier 1970; Hall 1989; Spicer 1972; Thomas 1989; White 1983; Whiteley 1988;). Differing assessments of the extent of social and political change after the Spanish conquest form the basis of the debate on the degree of political complexity in Late Prehistoric Southwestern societies (Howell 1994). Therefore, information on historic stability and change in Zuni society also has ramifications for the "complexity debate."

The historical archaeology of Lower Pescado Village, a seasonally occupied satellite site, contributes to the archaeological literature on residential mobility and the role of small, seasonal sites in a regional settlement system. Residential mobility is a common settlement strategy among ethnographically-known agriculturalists and agro-pastoralists, including many Southwestern peoples. Archaeological correlates of seasonality or temporary occupation are not easily recognized in the archaeological record, although a number of recent studies have made gains in addressing this problem (Graham 1994; Kent 1992; Rocek 1995). The data from Lower Pescado may be helpful in developing an "archaeological signature" for this type of site.

To my knowledge, Lower Pescado Village is the only historic Puebloan farming village that has been archaeologically tested. The site is important in terms of the information it reveals about two crucial time periods in Zuni history--the nineteenth century during the turbulent years of the United States' expansion into this area, and the fourteenth-century era of nucleated pueblos. The nineteenth century, especially, is not well known archaeologically in this area (Holmes and Fowler 1980; Rothschild and Dublin 1995).

Organization of the Dissertation

The dissertation is organized in three sections. Chapters 2 through 4 establish the theoretical and culture historical background for the research. Chapters 5 and 6 present a regional analysis of the historic settlement system, while chapters 7 through 9 examine the use of place through survey and excavation data from Lower Pescado Village.

The theoretical framework of the dissertation, discussed in chapter 2, conjoins approaches to colonialism and interactions along colonial frontiers to the construction of places and landscapes. Two archaeological case studies illustrate the power of material culture studies in revealing aspects of past decision-making in colonial settings. Chapter 3 reviews previous research on Zuni culture history in order to present a background for the present study, while chapter 4 summarizes the literature on residential mobility in the American Southwest, including the use of limited activity sites and historic satellite villages associated with farming and pastoralism. Models of the dynamics of residential mobility among several groups are discussed and a basic structural model of satellite settlements (Holmes and Fowler 1980; Nagata 1970) is presented.

Chapter 5 examines the relationship between climate, aspects of the physiographic setting, and shifts in Zuni settlement patterns during the eighteenth and nineteenth centuries. Dendroclimatological data, pollen and botanical evidence, and historic accounts are used to reconstruct past environments. In chapter 6, documentary records, historical accounts, and ethnographies provide information on the social landscape of western New Mexico during the nineteenth century. Zuni settlement shifts are discussed in the context of social, economic, and geopolitical factors operating during this period.

The integration of historic accounts and archaeological information is used in chapter 7 to analyze the built environment of the nineteenth-century farming village at Lower Pescado. The architecture and configuration of the satellite village are then compared to the built environment of Zuni Pueblo during the late nineteenth century; distinctions between the two settlement types are thought to relate to differences in the respective roles of the two sites and the kinds of activities conducted at each. The nineteenth-century reformulation of architectural elements of the fourteenth-century pueblo is discussed; at Lower Pescado Village, site reuse had pragmatic and symbolic parameters. Chapter 8 analyzes differences in the arrangement and use of space at each component of the site. Aspects of the nineteenth-century site structure are interpreted in the light of ethnoarchaeological observations on the use of space at temporary sites (Graham 1994). In chapter 9, excavation data from Lower Pescado Village are used to compare aspects of the nineteenth- and fourteenth-century material culture repertoires. Ceramics and faunal remains constitute the most numerous classes of material culture in both assemblages. While similarities in the assemblages derive from the retention of a common cultural tradition, differences are thought to be associated either with change over time or with the role of the site in a larger settlement system. To distinguish between structural and temporal differences, aspects of the historic assemblage from Lower Pescado Village are compared to a historic assemblage recovered from archaeological monitoring at Zuni Pueblo (Ferguson and Mills 1982). The analysis of Euroamerican imports from Lower Pescado Village and Zuni Pueblo provide additional perspective on the nature of material culture change. Chapter 10 summarizes the results of the research and outlines some directions for future work.

CHAPTER 2

COLONIAL FRONTIERS AND CONTESTED PLACES: THEORETICAL CONSIDERATIONS

The conquest of America was not a monologue, but a dialogue between cultures, each of which had many voices that often spoke in unison, but just as often were diverse and divisive.

Gutierrez 1991:3

Introduction

The dissertation explores change at Zuni during the Historic Period by looking at the reuse/ re-construction of an ancestral place. In the previous chapter, I suggested that the differences between the fourteenth-century aggregated pueblo and the satellite village built on its footprint are related to historic conditions existing at Zuni in the mid-nineteenth century. When the United States conquered New Mexico in 1846, Zuni became part of an expanding Angloamerican colonial system that was initially signified by a military presence and, later by explicitly economic, political, and ideological intervention. At this time, the social landscape also became more complex, involving the Zuni in a network of relationships that required the development of strategies to cope with new peoples, situations, and events.

In this chapter, I will critique anthropological and historical perspectives on "culture contact," "acculturation," world systems theory, and the role of the "frontier." These perspectives contribute to a concept of colonialism and the workings of colonial systems, which is then exemplified in two case studies using archaeological and ethnohistoric information to elucidate the interactive and dynamic nature of the colonial encounter. My review is not exhaustive; rather, it is directed toward developing theoretical underpinnings that will be helpful in understanding historical change and cultural persistence) at Zuni. This in turn will contribute to an increased understanding of European expansion and the resulting interchange between native and Euroamerican societies participating in a colonial system, an explicit goal of historical archaeology (Deetz 1988:362; Schuyler 1970:88).

"Culture Contact," World Systems, and Frontiers

Anthropology has spilled much ink on the continuing discussion of the expansion of European societies into Africa, Australia, and the Americas and the subsequent effects on indigenous peoples. In general, this research has been conducted under the theoretical umbrella of "acculturation studies" or, more recently, world systems and dependency theories, approaches which tend to obscure the active roles of native peoples in colonial encounters.

"Culture Contact" and "Acculturation"

"Acculturation" is a vague and flawed term that conflates various processes associated with relationships between any sets of peoples, but usually applies mainly to native peoples and Europeans. The use of the term "contact" itself is unclear, referring sometimes to the events of first meeting and at other times to a series of interactions over very lengthy periods of time. The relationship between Europeans and natives is assumed to be hegemonic, and change in native societies is considered an inevitable outcome. The broadness of the concept serves to mask variation in the nature of the relationships and in the processes of change on the part of both participating groups.

"Acculturation" also incorporates many processes related to interaction, from borrowing through assimilation, as well as assumptions about these processes. Generally, the flow of goods and ideas is thought to move from Europeans to natives, and is associated with ongoing social and cultural change that ultimately results in assimilation, or the absorption of the native group into the "dominant" European society. Recently, some scholars have questioned these assumptions, as ethnohistoric and archaeological evidence demonstrates that native people are often quite selective and creative in adopting European trade items or ideas. In many cases, post-contact change in native societies is discontinuous and assimilation is not the inevitable outcome, although I think that most researchers would assert that change of some sort always occurs (Wolf 1982:3). Recent research has documented numerous examples of interaction which influenced native populations and European migrants alike (Deetz 1977; Janowitz 1994; Paynter 1985), indicating that "acculturation" is best characterized as a reciprocal process (Bradley 1987:167). Equally damningly, "acculturation" is conceived as a uniform cultural process, a group reaction and an interaction without individuals. As such the term is normative and reductionist, denying the "many voices" of the colonial encounter that comprise the internal "tensions of empire" (Cooper and Stoler 1989; Gutierrez 1991:3; Rothschild personal communication 1995).

World Systems and Dependency Theory

Processes associated with the mutual interactions described above occur at the edges of expanding colonial systems. A number of anthropologists, following Wallerstein's world systems approach (Wallerstein 1974), have been interested in the ways in which peripheral groups have been drawn into and participate in the political economy of these larger stratified systems (Frank 1966; Hall 1989; Paynter 1982; 1985; Wolf 1982). Dependency theory, an outgrowth of world systems approaches, emphasizes change in peripheries, focusing on the destruction of local human-land relationships and the ensuing economic dependency on an exploitative market economy (Kelley 1977; White 1983). Although world systems and dependency theories have been helpful in understanding colonialism on a macro-scale, they do not work as well for understanding trajectories of change among native peoples in peripheral areas. Change is theorized as determined by the center; there is no explanation for continuity or persistence and the active role of peripheral peoples in managing colonial relationships tends to be underestimated (Cooper and Stoler 1989; Ferguson and Whitehead 1992:4). World systems theory highlights the asymmetrical relationships typical of colonial systems, but at distant peripheries, control from the center can be attenuated.

During the Spanish colonial period in New Mexico, for example, Zuni Pueblo was essentially the periphery of a periphery (Santa Fe) of a periphery (Mexico City). At this distance, policies initiated at the center may have been significantly transformed before reaching this outpost (Ferguson and Whitehead 1992:7) and strategies developed in the periphery may have been more important in driving change. In this setting, world systems approaches may have little analytical value. Under the United States government, on the other hand, economic and political ties between core and periphery were closer, in part because of the development of a transportation and communication infrastructure that included wagon roads, and by the 1880s, the railroad. The development of the reservation system moved decision-making regarding land tenure and land use to the center, or metropole. By the late nineteenth century, the Zuni area gradually became part of a larger market economy, as Kelley demonstrates in her analysis of Navajo political economy during the late nineteenth and early twentieth centuries (Kelley 1977). The Navajo entry into a market economy after 1880, which focused on the export of blankets and silverwork, was a later phenomenon superimposed on an earlier one, the introduction and acceptance of domestic animals. The earlier event, the result of processes operating at the level of the periphery, altered the relations of production among the Navajo and ultimately had significant effects on the social and political landscape of the Plateau Southwest.

While world systems approaches have been influential, they do not work well to explain relationships in all colonial situations. It is important to understand the extent to which core processes have penetrated peripheral areas and to understand changes in relations between cores and peripheries over time, but it is also important to understand the active roles played by natives in negotiating colonial relationships and in altering the colonial landscape (Cooper and Stoler 1989; Hall 1989:247).

Frontiers

At the distant edges of colonial systems, it may be more appropriate to look at models of frontiers to understand relationships among the various players. Until recently, the concept of a frontier in American history (particularly the western frontier, the arena of "manifest destiny") connoted an empty, and therefore available, landscape (Turner 1920), the stage on which conflicting Spanish and Angloamerican colonial agendas were played out (Bannon 1964: 1974: Bolton 1921). In these scenarios, native strategies and actions were inconsequential.

In contrast, the ethnohistorian Jack Forbes (1968) and others (Paynter 1985:72; Green and Perlman 1985:9-10; Wolf 1982) wrote of frontiers as zones of intense interaction and rapid and extensive change. In these formulations, colonial frontiers are seen as open systems that exist at the edges of stratified societies; as such they become the point(s) of contact among diverse groups and modes of production (Wolf 1982). The many intersecting relationships that characterize these frontiers are not necessarily asymmetrical, but fluid. The concept of a frontier used here is a social as well as a spatial concept, involving shifting relationships among various groups; since the focus is on the movement of people, information, and goods across permeable boundaries, decision-making takes place at all levels of a frontier society.

Forbes (1968:222ff.) suggests that frontier relationships are dependent on certain variables. These are the initial conditions of contact; the physical geography and land use in an area; the extent of the social and ethnic differences among the various groups; and the character of the boundaries between the various groups. The concept of boundaries becomes particularly important in a colonial setting where one polity or group is expanding into the territory of another.

The identification of frontiers as open systems does not obviate the presence of sometimes overlapping and conflicting boundaries. Boundaries in open systems are relative; that is, they are defined differently by different groups addressing particular problems

(Justeson and Hampson 1985:17). The Zuni area provides a good example. In 1848, the frontier, or "edge" of the newly enlarged United States territory included the center, or "The Middle Place" of the Zuni people. In 1878, when the Zuni reservation was established, it did not include most of the Zuni land use area, which encompassed a much larger area than that defined by the United States government. In both cases, the definition of territory differed according to the group defining it. Since, to some extent, boundaries are defined by land use, different groups employing different techniques of land use might define different boundaries. The well known "trade and raid" relationship of pastoralists and agriculturalists is in part related to the presence of overlapping boundaries that are associated with different ways of using land. Pastoralists, who use land extensively and tend to move around, commonly encroach on farm land.

I suggest that change and continuity in a colonial system can be explained in terms of frontier processes such as intense interaction, permeable and shifting boundaries, and the movements of goods and people across ethnic or political boundaries. In North America, these processes were structured not only by Euroamerican goals but by the active participation of native decision-makers. The material residue of these decisions is visible archaeologically in artifact assemblages and settlement patterns, both of which also reveal how places are used.

A Concept of Colonialism

Colonialism is a term which is blessed (or cursed) with a large, ideologically laden literature that is fraught with simplistic assumptions about the nature of sociopolitical relationships in such systems. A sampling of the numerous edited volumes of anthropological case studies now available documents considerable variability in the events of colonial expansion and the range of responses on the part of participants, natives and colonizers alike (Champion 1989; Fagan 1984; Ferguson and Whitehead 1992; Fitzhugh 1985; Green and Perlman 1985; Leacock and Lurie 1986; Rogers and Wilson 193; Sevilla-Casas 1977; Spicer 1961; Thomas 1989).

In the dissertation, colonialism is seen as a long term, dynamic process (Paynter 1985; Wilson and Rogers 1993:3; Wolf 1982). Change is pervasive and elemental, although the arena of change may vary depending on the historical circumstances and the strategies adopted by the various players (Paynter 1985:171ff.). As other authors have pointed out, "cultures are transformed as they are reproduced in the ongoing historical processes of a society" (Wilson and Rogers 1993:6). The fluidity of inter- and intra-societal relationships in a colonial setting can be considered responsible in part for change (Wolf 1982). As Cooper and Stoler (1989:613) note, "race, class, and gender appear as moving categories whose political saliencies shift in relation to one another."

Features of colonial systems

Attempts to define colonialism (Horvath 1972) have proven unsatisfactory, not least because they do not adequately address the dynamic character of colonial systems. However, certain core concepts, such as the presence of territorial expansion accompanied by some level of control from outside and the emergence of a new set of power relations, do appear to be crucial in understanding colonial systems and their impacts on participants.

Territorial expansion is generally, although not always, achieved through conquest, which entails a military presence and alterations to the built environment to accommodate a system of fortifications. Two underlying sets of processes are incorporated in colonial territorial expansion. Demographic processes might involve changes in the population structure, land tenure, and land use of a colonized region. Political processes come into play with the development of mechanisms of colonial control that entail a shift (or attempted shift) in the relations of power and the strategies of response to the imposition of external control. Both demographic and political processes have implications for long-term social change.

Demographically, the character of a colonized area often changes radically as new groups of people enter the area, displacing older inhabitants. In the New World, European expansion was accompanied by massive depopulation (Dobyns 1983; Ramenofsky 1987) that intensified events of ethnogenesis, indigenous settlement shifts, and European infilling of areas that were often seen as empty landscapes. Military personnel who entered at the initial conquest were followed by other immigrants, administrative officials, merchants, missionaries, and settlers. In many cases, native peoples moved or were pushed out of newly colonized areas and they in turn "colonized" more distant areas, creating the advancing "colonial front". described in Forbes' frontier model. The effect was often a more crowded and contested social landscape .

In many Native American communities, new social or political entities developed out of the circumstances of depopulation and removal as remnant populations consolidated or recombined. Ethnogenesis, the emergence of a new ethnic group, occurred in many of these cases, a notable one being the Seminole of southern Florida (Sturtevant 1986). Among the

Pueblos, recombinations of displaced or decimated peoples occurred and reoccurred during the years after the Coronado *entrada* in 1540 and again after the Pueblo Revolt, as new villages were founded at Laguna, Isleta, and Hano (Dozier 1970; Gutierrez 1991; Spicer 1962). As late as 1832, migrants from Pecos Pueblo settled at Jemez, entailing redefinition and restructuring of the population to some extent (Kessell 1987). New political entities were born as nomadic peoples shifted from a dispersed to a more concentrated settlement pattern or were forced onto reserves. In the Southwest, foraging groups named in sixteenth- and seventeenth-century Spanish accounts as Jumanos or Querechos had disappeared from the records by the Pueblo Revolt. Although it is not entirely clear who these early hunter-gatherers were, it is not inconceivable that many were progenitors of the various Navajo, Apache, and Comanche bands described in later accounts.

Heterogeneity in colonial societies also contributed to change for both natives and colonists (Deagan 1985; Wolf 1982), and to unrest. Violence was an integral part of many colonial systems as groups shifted allegiances and as factions developed within communities, these latter often related to debates about alliance formation. Historically, violence in native societies has been expressed in many ways, by revolts against colonial governments, by raids on colonists, by internal conflict or factionalism, by native participation in colonial military actions or "ethnic soldiering" (Ferguson and Whitehead 1992). Hopi violence, for example, was directed against Spaniards during the Pueblo Revolt (Hackett and Shelby 1942), against other Indian groups, including the Zuni (Ferguson and Hart 1985), against the Hopi pueblo of Awatovi whose inhabitants were viewed as collaborators with the Spaniards (Turner and Morris 1970), and within pueblos, exemplified by the factionalism that resulted in the Oraibi split in 1904 (Whiteley 1988). Violence was not necessarily a short term effect of conquest; it often persisted long past the initial years of colonial rule. To use the Hopi example again, the continuing tension between the Hopi and the Navajo is a residue of United States meddling in what had been a long-standing conflict over land, while some scholars associate the circumstances surrounding the Oraibi split with the presence of pro- and anti-American factions at that pueblo (Titiev 1944; Whiteley 1988).

The heterogeneity typical of colonial frontiers also generated an exchange of goods and ideas that effected changes in native and European lifeways and material culture, which are generally visible archaeologically. Less frequently remarked upon in the literature on colonialism are shifts in native modes and relations of production that accompany economic participation in colonial systems. Following Wolf (1982:75), the relations of production are the "specific, historically occurring set of social relations through which labor is deployed to wrest energy through the use of tools, skills, organization, and knowledge." Although in many cases, native incorporation of new subsistence regimes may initially have been an intensification of older modes of production, over the long term social relationships were altered. Many scholars, for example, consider Native American participation in the fur trade an intensification of an already existing mode of production for the hunting peoples of the east and midwest; however, over time, as fur bearers became scarce and hunters ranged farther to capture them, seasonal rounds changed along with settlement patterns and gender roles (Leacock 1954). As trading posts became more important, native settlements began to cluster nearby and natives became involved in mercantile and, ultimately, market transactions (Cleland 1993). In these ways and others, the fur trade altered native relations of production, resulting in social and political, as well as economic change.

Interaction with colonial governments, traders, or other newcomers also generated social and political change, often in the direction of increasing inequality. The role of liaison, or "speaker," probably became important in a number of societies, while war leaders and warrior societies rose to prestige in other areas, notably the American Great Plains (Kehoe 1992:297ff.). Eggan (1950) associates the complexity of Zuni interlocking social organization with the demographic and political stresses of the colonial period, while the dual structure of Tewa political organization, with its secular and religious offices, is thought to have developed in response to the Spanish conquest (Ortiz 1969).

These are but a few examples of the documented change that has been associated with the imposition of colonial rule. While some change can be related to the cross-fertilization that accompanies a more crowded social landscape, some is more directly associated with attempted domination by expanding colonial powers, a basic feature of colonial rule (Horvath 1972). Initially, this control may be exerted by military garrisons or a police force which signify the imposition of state-level sanctions on what were in many cases non-state societies (Cooper and Stoler 1989).

In the later phases of colonialism, control may be more subtle, involving attempts to coopt political, economic or ideological systems of a conquered people. Political cooption entails efforts to undermine the existing power or status structure; during the early years of Spanish control in New Mexico, for example, the Franciscans intervened in the "gifting" relationships that characterized older/younger status relations among the Pueblo (Gutierrez 1991:chapter 3). Missionization can be seen as a form of ideological cooption, which is often resisted strongly and quite directly; the Pueblo Revolt ended a century of Franciscan efforts to eradicate traditional Pueblo belief systems (Hackett 1942; Kessell 1987; Sando 1979). In the classic instance of economic cooption, a colonial power draws a conquered people into the larger economy of the metropole, or "world system" (Wallerstein 1974; Wolf 1982). Extractive economies that used native labor, exported raw materials, and imported finished goods increased dependence on the metropole and, in many cases, inextricably altered native modes and relations of production (White 1983). The extent to which cooption works depends not only on the conditions of colonial rule but also on native strategies for coping with that rule (Bradley 1987; Paynter 1985; Rogers 1990). Attempted domination may be met by active or passive resistance, accommodation, or any of a range of responses, based on the intersection of native and colonial decision-making and perceptions of the other (Adams 1989; Gutierrez 1991; Miller 1988).

Finally, one more point needs to be made in discussing colonialism in relation to this dissertation. The core colonial features of territorial expansion and the imposition of control were characteristic not only of Spanish rule in New Mexico during the seventeenth and eighteenth centuries but also of American rule during the nineteenth and early twentieth centuries, although many researchers are loath to consider the American Period as a time of colonial rule.

Colonialism and the frontier

Processes of colonial expansion and control were not merely phenomena of early contact. In many places, including the American Southwest, they continued through the nineteenth and early twentieth centuries, several hundred years after the initial meeting of Indian and European. As a consequence, social and ethnic landscapes often remained fluid and dynamic over very long periods of time, and strategies and alliances often shifted as the definitions of the various social and ethnic groups shifted. The exigencies of expansion and control placed constraints on the extent of power that a colonial system could accumulate; in other words, the length of the colonial arm is limited and control over natives and colonists alike tended to become attenuated with distance. The colonial frontier as the "edge" of the system is the place where these constraints are most likely to be strongly expressed. Along distant frontiers, like New Mexico in the nineteenth century, power may not be consolidated in the hands of the colonial government but may be more evenly distributed among the various players. In such circumstances, natives are in a better position to exercise some control over the dimensions and domains of change. What appears to be a situation of "relative equilibrium" (Horvath 1972) in some historic colonial situations may actually be a balance of power existing at the edge of colonial control. Of course, this balance will change as the colonial frontier advances.

Native Decision-Making

Native responses can be arrayed along a continuum of options from submission (Wolf 1982:23) to resistance (Paynter 1985). Documented responses were complex and variable, and flowed from a variety of strategies for managing change on the local level, including the selective incorporation of European introductions, the retention of aspects of "traditional" lifeways, and the creative recombination of elements of indigenous and European lifeways (Bradley 1987; Deagan 1983; Fitzhugh 1985; Spicer 1982; Thomas 1990).

The active role of native decision-makers needs to be explored in order to understand change and continuity in native societies. As Ferguson and Whitehead (1992:4) point out, "indigenous peoples make pragmatic responses in order to maintain tolerable conditions." These responses are the outcome of decisions made within cultural contexts and according to cultural categories; these might include rules for warfare, definitions of groups both within and outside a given society, concepts of the role of various material items, or prophecies (Whiteley (1988:283). Native decision-making in a colonial setting is also influenced by the "sphere of contact," which describes the nature of the structural linkage between the two groups (Spicer 1956:525). Changes in the "sphere of contact" (as the military give way to traders, for example) will alter the nature of relationships and native perspectives as well. Geography and land use are equally important variables that affect native decision-making (Forbes 1968).

The residue of human decision-making is visible archaeologically in the structure of material assemblages and settlement patterns. Abrupt discontinuities in the material record signal catastrophic (or sudden) change, although not necessarily in the direction of "acculturation." For instance, the disappearance of Spanish motifs and vessel forms on eighteenth century Hopi ceramics may express resistance to the reintroduction to colonial rule after the Pueblo Revolt (Adams 1989). "Fighting with ceramics" at Hopi is paralleled in many native societies in the selective nature of acceptance of introductions and the various contexts in which introduced goods appear in native societies. Similarly, the periodic disappearance of certain categories of Angloamerican goods in Arikara assemblages during the nineteenth century was closely correlated with the history of shifts in the relations between the Arikara and the American fur traders (Rogers 1990:111). Nor does borrowing always signify assimilation; it has been noted that "the adoption of certain items and the abandonment of others may be part of a strategy to maintain group cohesion and identity, rather than an attempt to ... become identical with other groups" (Moore 1987:87). In most cases, the "dialectic of interaction" (Rogers 1990:12), or the interplay of colonial and native strategies, will produce a material record that mixes new and old elements.

As noted above, strategies of interaction are based on the perspectives of the various players (Gutierrez 1991; Rogers 1990), perspectives that can be expected to change over time as historical circumstances change. To understand the nature of colonial change, then, it is important to track these perspectives, decisions, and strategies. The case studies which follow provide examples.

Case Studies

Are past strategies and decisions visible in the archaeological and ethnohistoric records; if so, can they be measured, so that we might better understand the complexities of colonial societies? Two case studies from different parts of North America, *The Evolution of the Onondaga Iroquois: Accommodating Change, 1500-1655* (Bradley 1987) and *Objects of Change: The Archaeology and History of Arikara Contact with Europeans* (Rogers 1990), integrate archaeological and ethnohistoric information to examine colonial interaction and native decision-making. Bradley documented "acculturation," which he defined as "the process of reciprocal interaction" (Bradley 1987:167) among the Onondaga during the crucial years of early contact with Europeans, while Rogers examined the connection between native perceptions of Euroamericans and changes in the structure of Arikara material culture between 1680 and 1862.

Two sets of factors influenced the direction of change and continuity in Onondaga society along the colonial frontier. Internal relationships included those within Onondaga communities and with other members of the Iroquois Confederacy; the second factor was "foreign affairs," relationships with non-Iroquois Native peoples and with three groups of Europeans, the French, Dutch, and English (Bradley 1987:5). Seventeenth-century demographics along the borders of Iroquoia, New Netherlands, and New France illustrate Forbes' "frontier complex," typified by sets of interlocking relationships. Through the study period, Onondaga communities themselves became more heterogeneous as war captives were adopted to make up for losses from epidemic disease and warfare.

Continuity and change existed side by side during this period in Onondaga history, demonstrating the active and selective nature of Onondaga decision-making. The "initial impact of European materials was conservative ... in that it promoted the maintenance of traditional cultural patterns instead of their change" (Bradley 1987:170). Onondaga acceptance of elements of European culture was a complex process that included the maintenance of traditional ways and values, along with the addition of new categories of material culture and the replacement of Onondaga goods with introduced ones. This approach to change can be characterized as creative and innovative, entailing the reuse, reformulation, and syncretic incorporation of European materials.

These impacts are visible in archaeological Onondaga settlement patterns and artifact assemblages. Demographic processes related to the increasing complexity of the social landscape are apparent in many aspects of the material culture. The number and variety of ceremonial artifacts increased, indicative of an intensification of ritual activities perhaps related to stresses associated with increased warfare and demographic change, including Onondaga deaths and the adoption of outsiders (Richter 1992; Wallace 1972). Ritual can serve to disseminate new information, to renew unity, and to initiate newcomers. Although the population remained relatively stable and there was apparently no pressure on the land base, the Onondaga expanded northward into previously unoccupied territory (Bradley 1987:118). Territorial expansion was a possible manifestation of boundary maintenance activities along what had become a contested frontier. Increased interaction with outsiders is evident in the appearance of non-local lithic raw materials as well as European-introduced metals.

Changes in Onondaga material culture were gradual. At first, European-introduced copper, brass and iron artifacts were reworked into Iroquois-style tools and ornaments. Even before European contact, copper had ceremonial associations for Iroquois and other Northeastern peoples, and the reworking of copper illustrates the application of a native "cultural logic" to European materials. Over time, copper kettles and iron tools entered Onondaga material cultural repertoires, replacing native items in domestic and manufacturing contexts. Ceramic variability increased at this time, perhaps reflecting increased ethnic heterogeneity within households and communities. Cooking pots were smaller than those made previously, indicating a basic change in domestic routine, perhaps associated with smaller group sizes or a shift from communal to single-family meals.

In the second case study, Rogers juxtaposed shifts in Arikara material culture with the ethnohistory of Euroamerican-Arikara relations to isolate five processes of material culture change associated in part with changing attitudes toward Euroamericans. The processes--maintenance, replacement, addition, rejection, and transformation--are signified by shifts in categories of material culture and in the use contexts of artifacts, which are seen as playing an active role in defining and reinforcing culture (Rogers 1990:13).

Maintenance, the retention of traditional material and cultural categories, will occur in a cultural system that is "maintaining coherence in the face of external pressures" (Rogers 1990:218). Among the Arikara, replacement, or the "exchange of an Arikara artifact category for a Euroamerican category of an equivalent functional nature" (Rogers 1990:218) co-occurred with maintenance and typified a social system that was undergoing relatively little change but was open to free exchange. Both these processes also occur at Onondaga sites, especially during the earlier phases of European contact. To the extent that artifacts and material assemblages act to structure or reinforce cultural identity, both the Arikara and the Onondaga balanced the economic advantage of increasing interaction and trade with the sociocultural value of maintaining cultural identity.

The addition of new material categories and artifacts accompanied increased Arikara participation in the fur trade. Like other fur-trading groups (Cleland 1993), Arikara involvement in the fur trade may have represented an intensification of a pre-existing foraging and trapping mode of production, but relations of production and scheduling patterns were altered as interaction with Europeans increased. The addition of new material categories indicates that the structure of Arikara material culture was changing along with the social system (Rogers 1990:218). The new categories of material culture appeared primarily in domestic contexts. Although some mortuary assemblages replaced native ornaments and beads with European manufactures, European goods were absent from ceremonial contexts. As Rogers says, "one way to maintain social coherence was to reduce the amount of change introduced into important ceremonial contexts, thus preserving a link with past social action" (Rogers 1990:112). Here we can see the importance of the past in maintaining identity in the face of change and the use of ritual to counter stress associated with colonial change.

In conventional scenarios of cultural change in native societies, European artifacts are readily accepted and proliferate as natives recognize their superiority to native manufactured goods. In the Arikara case, this did not occur. As the number of fur-bearing animals declined and Arikara dissatisfaction with the increasingly poor trade goods provided by Euroamerican traders, Arikara artifact assemblages yielded fewer imports. This is an instance of the process of rejection, whereby "artifact categories available for inclusion, or that were once part of an assemblage, are no longer being incorporated" (Rogers 1990:220). Rejection is associated with a high level of "cultural coherency, ... relatively little exogenous stress, or [the presence of] mechanisms for coping with various pressures" (Rogers 1990:109), but it is also a reassertion of identity that might imply increased concern with maintaining cultural boundaries, or resistance (Rogers 1990:220). The disappearance of Spanish motifs and forms from Hopi ceramics, cited above, might be considered an example of the process of rejection, in this case associated with the repudiation of Spanish rule after the Pueblo Revolt (Adams 1989).

Transformation characterized the period immediately before the consolidation of Arikara, Mandan, and Hidatsa remnant populations, which signalled increased dependency upon Euroamericans as participation in the fur trade waned. The process of transformation involves a fundamental change in the composition of an assemblage, a disjuncture in the structure of the material culture (Rogers 1990:220-1). At this point, significant social change has occurred, not only in the material culture, but in non-material aspects as well.

Writing on te Onondaga, Bradley emphasizes the multiplicity of colonial interactions and relationships within Iroquois society and between Iroquois and "outsiders," including other Native American societies. While Rogers deals with only one type of interaction, the fur trade, he convincingly demonstrates the interrelationship between the social landscape and Arikara material culture.

Spatial Strategies in a Colonial Setting

The Onondaga and Arikara case studies underscore the complex nature of colonial relationships and provide a link between theoretical approaches and archaeological practice, a mid-range theory, if you will. In each case, an understanding of the reciprocal relationship between material culture and non-material demography, economy, and social structure was facilitated by access to a historic record which provided a larger setting, or "foil," within which the full range of relationships can be seen. The complex interactions that characterize a colonial setting are often not visible in terms of material culture alone, while "natives" are generally not fully visible in the historic record alone. Therefore, the integration of both sets of records is crucial for an understanding of the social context of native decision-making in colonial settings.

In the Iroquois and Arikara cases, indigenous decision-making was characterized by selectivity and creativity directed by an internal "cultural logic" where continuity was as important as change. It is clear from these studies that continuity and change can co-occur in different domains of culture; for instance, domestic assemblages may change quite radically, while ceremonial assemblages remain essentially the same. Therefore, it is important to "contextualize" research findings (Hodder 1986:139) and to consider multiple aspects of material culture, including settlement patterns and changes in the composition of native material assemblages as well as the presence of introduced artifact types.

It might be expected that spatial decision-making is especially important along colonial frontiers, since access to or annexation of territory is frequently an objective of expansion. Colonial programs generally include implicit (and sometimes explict) concepts about territoriality and the transformation of landscapes associated with the "civilizing" of natives. In northwestern Australia, for instance, the white society characterizes landscapes along a continuum from "wild" to "frontier" to "outback" to "settled" (Morphy 1993:206), each category associated with different types of land use, Aboriginal social and economic roles, and degrees of "acculturation." In many colonized areas, European and native concepts of land and territory often differed quite radically (Ferguson and Hart 1985; Morphy 1993), one cause of the misunderstandings and conflicts over land that characterize colonial systems.

In the American Southwest, Spanish colonization was accompanied by a concept of territoriality that relegated all lands to the Crown. In the Rio Grande valley, Puebloan peoples were given grants of land corresponding to Spanish conceptions of Indian use areas

(Spicer 1962:389-90). which did not necessarily include the full extent of a group's sustaining area. although Spanish law guaranteed peoples the right to all lands that were "effectively planted and used" (Green 1990:407). Land grants were not allocated to nomadic peoples, and it is questionable whether even some settled peoples, including the Western Pueblos, possessed formal land grants (Green 1990:407; Murphy 1967:32), a situation that provided a rationale for annexation of unplanted lands during the colonial period.

Since land tenure in these settings was often contested and fluid, ideas about "landscape," "place," and what constituted an appropriate use of land or place were important in negotiating relationships along a colonial frontier. I suggest that this was not confined to a material valuation of the land as a sustaining resource (although this certainly would have been an element in assessing places), but also to the social and historical meaning of those places (Basso 1996). The notion of "meaning" in a shifting and dynamic setting might include a renewed relationship to history, perhaps exhibited in the preservation or reconstruction of "a link with past social action" (Rogers 1990:12) through landscape.

"Landscape" and "Place"

Since the dissertation examines how place is (re)constructed on the colonial frontier of nineteenth-century New Mexico, the notion of place is an important concept. The explicit study of place and landscape is relatively new in American anthropological archaeology, although there is a large European literature (Lekson 1996) and a growing literature in American sociocultural anthropology (Basso 1996).

As used in this dissertation, landscape and place are related, but slightly different, concepts. Landscape, here considered a larger entity than place, is characterized as an expanse of space that is segmented and defined by the interplay of topographic and built features (Tilley 1993). Place is considered a subset of a landscape; in other words, landscapes consist of places that are related in some way as well as the spaces in between those places. Relationships among places might include association with a particular ethnic group (Spicer 1962:576-7) or set of historical events (Basso 1996:7), or perhaps inclusion within a larger physiographic or geographic zone (for instance, the Colorado Plateaus Province, the Pescado valley). Chapters 5 and 6 deal with the Zuni landscape, while chapters 7 through 9 are more explicitly concerned with a place, Lower Pescado Village.

Places and landscapes exist, not only in topographic space but in the eyes of the various beholders; as noted above, Zuni Pueblo, the Middle Place of the Zuni people, was considered a periphery, or frontier, by the United States government. Places are defined functionally, physiographically, and sociopolitically; to understand how places are used, it is important to understand the larger setting of landscape. Basso (1996) identified three different "layers" of place, the physiographic and cultural setting; the role of a place in a larger landscape; and the "meaning" of a place. A key component of archaeological landscapes and places is the settlement pattern, the distribution of sites across a region and the configurations of individual sites. Additional dimensions include the paleoenvironment, the cultural setting seen through the lens of material culture (Hodder 1986:10), and the site structure, how space was arranged and used at a site (Graham 1994).

Theorists of place and landscape agree that these are culturally constructed concepts. As Bender (1993:1-2) pointed out, "landscapes are created by people--through their experience and engagement with the world around them." The creation of landscapes, then, incorporates the ideological and political roles of land as well as its economic potential and use. Ortiz (1969:17-25) has developed an elegant explication of Tewa cultural geography that meshes physiographic features, mytho-historical associations, and sociopolitical categories of people. Basso wrote of Cibecue Apache "place-making," a process that can be interpreted as the result of a series of decisions that structure the locations and configurations of places across a landscape and that are often associated with historical and mythological events. Another way of looking at the construction of place is through the lens of archaeological "significance." For the Zuni, a given site or locality is considered significant if it appears in the *chimik'yanapkya bena:we*, the traditional history of the migrations of the Zuni people (Holmes and Fowler 1980:273-7); here too a demonstrated historical association with the Zuni past is important in defining places on the Zuni landscape.

In the works of these authors, a place has a "context" that is defined by its associations with a particular people, a history, and a physical setting; function, or how a locality is used, may also play a role in the understanding of place. Paynter, for example, notes that places concentrate surplus by means of a built environment (Paynter 1982; 1985); places are also loci of production and labor. The economic role of places is evident in Western Australian Aboriginal views that see a landscape as a "grid" that "locates resources, camps, [and] hunting-grounds" (Bender 1993:3), all of which are places distributed across that "grid," or landscape. Aboriginal landscapes also incorporate a mytho-historical dimension that establishes links between the present and the ancestral past, or "Dreamtime;" in this way, continuity is established between ancestral beings, social groups, and the land

(Morphy 1993:234). Places, and especially the reuse or reworking of elements of places that were used in the past, are also seen as playing a role in social reproduction (Morphy 1993:234; Nowakowski 1987:52ff.; Thomas 1993:19ff.) and in legitimizing claims to contested land or scarce resources (Bender 1993:2; Dublin 1994; Head and Snead 1992; Kohler 1992).

Because of its close association with history, place can be used to maintain or signify identity, a role that might become crucial along colonial frontiers. Colonial landscapes often consist of contested places, localities that carry different, often conflicting, meanings and potential for the various groups interested in them. Such landscapes are usually in flux, as land is annexed, treaties are made, or boundaries are established that disrupt or dislocate existing relationships between people and land (Spicer 1962:577). Spicer (1962:567) noted that, in the colonial Southwest, the "maintenance of residence ... within traditional tribal ranges ... promoted continuance of a tribal identification which had strong sacred sanctions," a statement that addresses both the ideological and political dimensions of place. Like Spicer, Morphy (1993:205ff.) sees an association between the maintenance of an existing land base and the continuance of a group's identity. For the Ngalaka of northwestern Australia, their landscape, consisting of a set of named places and ancestral associations, was "integral to the development of concepts of Self and Other, and part of the way in which adaptive relations between people and land had been maintained" (Morphy 1993:206). A study of frontier landscapes and their constituent places should be useful in better understanding the development of colonial frontiers and the various strategies of the participants in this process.

Chapter Summary

The chapter explores theoretical perspectives on the intersection of colonialism, decision-making, and the construction and use of places and landscapes. Colonialism, a long-term, dynamic process involving changes in power relations and in the distribution of labor and resources, including land, characterized the political and economic systems initiated by Spain and the United States in the American Southwest. I argue that the study of the colonial frontier provides a fruitful avenue for the exploration of colonial systems which expand along a frontier, a spatial and social landscape typified by intense interaction among various peoples. The concept refocuses attention on all players in a colonial system and emphasizes the active role of native peoples in negotiating relationships in these areas where colonial authority has not yet been entrenched and where boundaries are fluid and shifting. Two case studies from North America (Bradley 1987; Rogers 1990) tracked the material record of indigenous decision-making and the resulting mix of change and continuity in frontier settings and material records.

The concept of frontiers and an understanding of spatial decision-making in these crowded and often contentious social landscapes are crucial in studying colonial systems where the annexation of land and resources is often an important objective. Although the theoretical study of archaeological landscapes is in its infancy, the literature indicates that the role of landscapes and places is multi-faceted and includes historical, ideological, and political as well as economic dimensions. Chapter 3 outlines the cultural historical background of the Zuni area, while the remaining chapters use historic and archaeological information to study the use of landscape and place during the nineteenth century.

CHAPTER 3

SETTING AND CULTURE HISTORY

Introduction

The chapter summarizes the environment and culture history of the Zuni area in order to place the research on Lower Pescado Village in perspective. The first section describes the boundaries of the study area, significant landforms, and environmental features; this is followed by an overview of the regional settlement history.

Anthropologists have worked at Zuni since the 1880s. Research has been conducted in every subfield and under a variety of theoretical programs (Pandey 1972). Currently, archaeology is managed through the Zuni Cultural Resources Enterprise, formerly the Zuni Archaeology Program, which is an arm of the Zuni Tribal Government; in this respect, the tribe has asserted "ownership" of its past. The anthropological literature on Zuni is immense; the summary presented here is intended to provide a historical framework that will contribute to an understanding of land use, settlement, and economy in the study area.

The Setting

The study area, located in west central New Mexico, covers about 3400 square kilometers, an area somewhat larger than the current Zuni Indian Reservation (figure 3.1). It is bounded on the east by the Continental Divide and the *malpais*, on the west by the Arizona border, on the north by the Puerco River, and on the south by the Mogollon Mountains. Although the traditional Zuni land use area is considerably larger (Ferguson 1981:344;

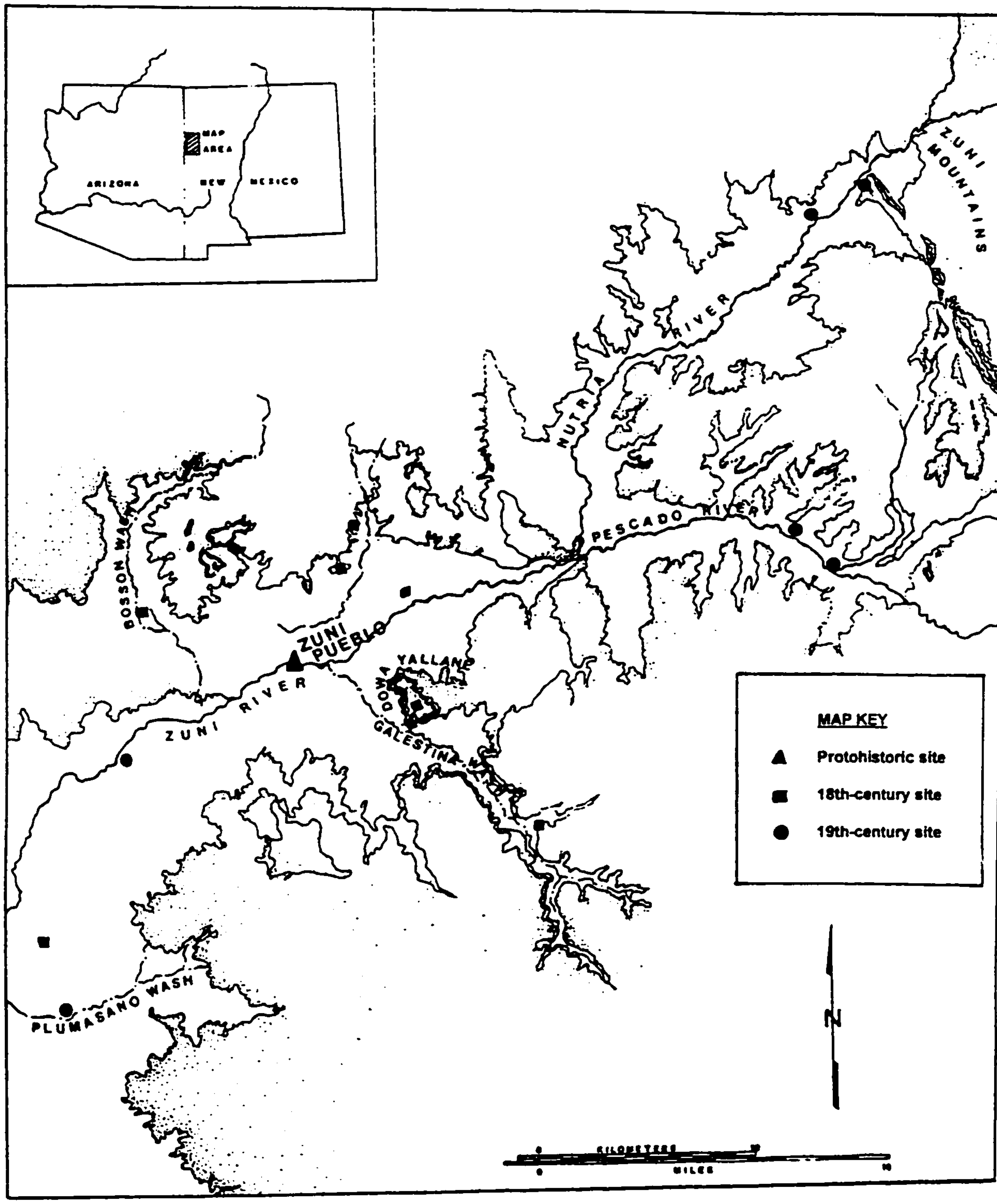


Figure 3.1. The Zuni area in west central New Mexico.

Ferguson and Hart 1985:35-51), the study area forms a coherent physiographic unit defined by the southern section of the Colorado Plateau province. These boundaries are roughly equivalent to the core area of Zuni prehistoric and historic settlement.

The Zuni area is topographically and ecologically diverse; the presence of distinct microenvironments can be attributed to differences in elevation and the proximity of water. Elevations range from approximately 9200 feet (2800 meters) at the crest of the Continental Divide to 6000 feet (1825 meters) in the southwestern corner of the study area. The land slopes from northeast to southwest. Dominant land forms include the massif of the Zuni Mountains in the north and northeast of the study area and the lava fields of the *malpais* and Mount Taylor along the eastern border. Much of the area consists of a dissected topography of mesa country cut through by the drainages of the Zuni River and its major tributaries, the Nutria and the Pescado Rivers. The rocky landscape has provided sandstone and basalt for building and cherts and petrified wood for the manufacture of stone tools.

The Nutria and Pescado Rivers, which drain the north and east sections of the study area, combine to form the Zuni River, which flows west into the Little Colorado River. Today, all three are intermittent streams, although this was not the case in the past. Since the late nineteenth century, the area has been experiencing a cycle of arroyo downcutting, which has been exacerbated by human activity, including the clear-cutting of forests in the Zuni Mountains, dam construction, and over-grazing. These natural and cultural processes have led to extensive erosion and a lowered water table (Ferguson 1985, 1988, 1989; Ferguson and Hart 1985:113; Tuan 1966).

The three major river drainages are important for agriculture in the Zuni valley; before the construction of the Black Rock dam in 1912, they supplied water for floodwater farming and for ditch, or *acequia*, irrigation. Large permanent springs along these streams also served as water sources; the location of fourteenth-century settlements at Pescado and Nutria and in the Ojo Caliente-Rainbow Springs area indicates that spring-fed irrigation was important during this earlier period as well (Kintigh 1985:114).

Vegetation, animal communities, and climate

Vegetation varies according to elevation. Plant communities in the higher zones (above 6500 feet or 1980 meters) are dominated by ponderosa pine forest; at middle elevations, pinyon-juniper scrub alternates with extensive areas of sage, a species often associated with overgrazing. The river valleys support a mixed prairie vegetation consisting of grasses and low shrubs with riparian plant communities immediately adjacent to streams.

Animal communities also vary according to elevation. Elk (*Cervus canadensis*) and mountain sheep (*Ovis canadensis*), among other species, were once common at upper elevations, while mule deer (*Odocoileus hemionus*) are indigenous to both upper and middle zones. Pronghorn (*Antilocapra americana*), coyote (*Canis latrans*), and white-tailed deer (*Odocoileus virginianus*) are common at middle elevations, as are a number of smaller mammals, most importantly cottontails (*Sylvilagus* sp.), jack rabbits (*Lepus* sp.), prairie dogs (*Cynomys gunnisonii*), wood rats (*Neotoma* sp.), and a number of different species of squirrels and other rodents. Sheep, introduced by the Spaniards, adapted well to the climate, vegetation, and terrain of this area, and became the predominant domestic animal during the Historic Period.

Annual rainfall and the length of the growing season (measured by the number of frost-free days) are considered the primary limiting factors for maize agriculture in the plateau Southwest (Cordell 1984:26-27; Cordell and Plog 1979), although Kintigh (1985) has pointed out that other variables, such as soils and the organization of labor, are also important. Annual rainfall tends to be greater at higher elevations, an observation that has been offered to explain shifts in settlement in many parts of the southwest, including the Zuni area (Watson et al. 1980). The reasoning is that during dry periods, people lived in upland settings to take advantage of higher rainfall; conversely, during periods of relatively high rainfall, people moved to lower areas to take advantage of the longer growing season. Other researchers have suggested that the effectiveness, rather than the amount, of rainfall is crucial. According to this scenario, shifts in seasonal rainfall patterns that affected the proportions of winter soaking rain to summer torrential rain might account for the widespread settlement abandonments seen at various times during Southwestern prehistory (Schoenwetter and Dittert 1968).

Although climate undoubtedly influenced settlement size and location, other non-environmental factors, including agricultural and pastoral strategies, social organization, and defensive requirements, also seem to have been equally important (Kintigh 1984; Stone 1992). Dendroclimatological records for the Cibola area (Appendix A) do not show an unvaried close correspondence between rainfall and major settlement shifts.

Culture History

The section will focus on the later periods of the culture history of the Zuni area.

Although the Pecos Classification is the "coin of the realm" in Anasazi time-space systematics, it does not conform well to Zuni area cultural sequences and will not be used here. The period from the onset of large aggregated communities, circa A.D.1175, to the Coronado *entrada* in A.D.1540, is understood in broad outline from a century of archaeological research at Zuni. This material has been presented and synthesized in a number of works (Anyon 1992; Anyon and Ferguson 1983; Caywood 1972; Duff 1992; Ferguson 1981; Fewkes 1891; Holmes and Fowler 1980; Howell 1992, 1994; Hodge 1937; Hunter-Anderson 1978; Howell 1994; Kintigh 1985, 1988, 1992; Kroeber 1916; LeBlanc 1978; Marquardt 1974; Saitta 1987; Smith, Woodbury, and Woodbury 1966; Spier 1917; Stone 1992; Watson et al. 1980). The period after the Spanish Conquest is not as well studied archaeologically, although there are a small number of reports of surveys and excavations (Caywood 1972; Dublin 1990, 1994; Dublin and Rothschild 1992; Ferguson 1993, 1996; Ferguson and Mills 1982; Frisbie 1991; Holmes and Fowler 1980; Mills et al. 1980; Rothschild and Dublin 1994; Rothschild et al. 1990; Spier 1903). The ethnographic and ethnohistoric literature provides a useful commentary on historic Zuni society and perspectives on change and continuity after the Spanish conquest (Bandelier 1892; Bunzel 1929; Cushing 1974; Eggan 1952; Eggan and Pandey 1979; Green 1981, 1990; Ladd 1979; Pandey 1967, 1972; Quam 1972; Roscoe 1991; Stevenson 1904, 1915; Young 1988). Much valuable information has been compiled in the testimony for the two Zuni Land Claims cases, on file at Zuni Pueblo, and which have been summarized in several reports and publications (Ferguson 1985, 1988, 1989; Ferguson and Hart 1985; Hart 1980).

Before A.D.1000

The study area was used sporadically by foraging peoples before the transition to village agricultural life (Stuart and Gauthier 1984:123; Tainter 1980:90-92). Paleoindian and Archaic presence, consisting of scattered lithic finds, is poorly documented. Ceramics appeared about A.D.400, associated with architectural evidence for sedentism, perhaps on a seasonal basis and probably related to the increasing importance of maize agriculture. Very few Basketmaker sites have been recorded, but the sparse evidence suggests the occupation of small pithouse villages in well-watered areas (Stuart and Gauthier 1984:123; John Rick, personal communication 1989). Surface architecture, in the form of small room blocks that may have been used for storage, appeared in pithouse villages at various points between A.D.850 and A.D.1000; the presence of storage facilities suggests that grain agriculture was becoming increasingly important in the subsistence regimen.

The Chacoan Period (A.D.1000-1175)

Settlement patterns during this period were dispersed (Kintigh 1988, 1990; Stuart and Gauthier 1984:123). The typical site was small, generally less than 50 rooms clustered in room blocks. Occasional larger settlements were characterized by the presence of "great houses" with Chacoan masonry, great kivas, and road systems; the best known of these is The Village of the Great Kivas (Kintigh 1990; Leonard et al. 1992; Roberts 1932). The relationship between the Chacoan outliers and the smaller communities is not clear, nor is the nature of the articulation between the Zuni area sites and Chaco Canyon.

Chacoan Period settlement was apparently concentrated in the western part of the study area, although the El Morro valley, which appears to have been unoccupied, may have housed less visible sites such as foraging camps, small settlements, or field houses. Some fourteenth-century pueblos in the El Morro and Pescado valleys overlay small, twelfth-century occupations (Kintigh 1985). Water control features, some of which may date to this time period, have been identified in the canyons south of the Pescado River and near the confluence of the Pescado and Nutria Rivers (Castellon 1991; Stone 1991). When the Chacoan system collapsed, outliers in the Zuni area were abandoned. The Village of the Great Kivas is thought to have dropped out of use by the end of the twelfth century, concurrent with initial aggregation in the Zuni area (Kintigh 1991:4).

Period of Initial Aggregation (A.D.1175-1275)

This period saw the onset of a pattern which continued into the Historic Period. It included the concentration of the population in large pueblos with many room blocks and public architecture, the development of an elaborate ceramic tradition incorporating imported design elements, the intensification of agriculture, and possibly increased conflict. Although there was apparently some migration into the area during the years between A.D. 1175 and A.D. 1540, the continuity of a core architectural and ceramic tradition indicates an ethnic continuity from the period of initial aggregation through the Historic Period (Ferguson 1981). Zuni oral history provides further support for ethnic continuity in the Cibola area over the last millenium (Ferguson and Hart 1985:21).

By the end of the twelfth century, the settlement landscape of the Zuni/Cibola area had changed dramatically. The numerous small dispersed sites were replaced by aggregated pueblos of one hundred or more rooms, arranged in multiple room blocks (Kintigh 1985; Stone 1992). Many early aggregated sites retained some Chacoan features, including berms, great houses, and unroofed great kivas, but they were not associated with the road systems typical of Chacoan sites. Not surprisingly, aggregated pueblos had substantial residential space, since most of the small sites of the previous time period were no longer occupied. For example, the Hinkson Ranch Site, near St. John's, Arizona, contained an estimated 400 rooms grouped in 24 room blocks; it also had an enormous, unroofed, great kiva, that lacked the floor features associated with true great kiva construction, and was surrounded by a berm (Kintigh 1991). This derivative architectural form may represent an attempt to maintain the integrative aspects of the Chacoan symbolic/ideological system after the collapse of the interaction sphere (Kintigh 1992). Ceramic production was organized on a local level, although the various pueblos shared a design style, further indicating the presence of a shared symbolic system (Stone 1992:157ff).

Early aggregated pueblos were frequently situated at the foot of mesas along the edges of major and tributary canyons (Kintigh 1991:4), ideal places for the distribution of water dispersed by features such as check dams. Survey data document the use of limited activity sites, such as field houses, and water control features (check dams, terraces, and gridded fields), suggesting that the inhabitants were relying to some extent on floodwater farming (Kintigh 1985:103; Stone 1992: 153).

Nucleation Period (A.D.1275-1400)

During this period, the process of aggregation intensified; Stone (1992) found that

93% of the rooms occupied between A.D.1250 and A.D.1325 were in aggregated pueblos. Sites also became larger, as the average number of rooms per community doubled, indicating a restructuring of the regional population. As Kintigh (1991:6) pointed out, "by A.D.1300 and perhaps earlier, small pueblos ... seem to disappear completely," although limited activity sites continued in use. These small sites, apparently related to subsistence activities, included water control features and field systems, as well as field houses and foraging stations. The map, figure 3.2, shows the locations of fourteenth-century sites in the study area. The fourteenth-century pueblo at Lower Pescado Village was founded during this period.

Some nucleated sites are quite large; Archeotekopa, for instance, contained over 1400 rooms (Kintigh 1985:37). Occupation spans tended to be relatively brief, ranging from 25 to 100 years, leading some researchers to suggest that the social structure was insufficiently developed during this period to support large dense populations for a lengthy period of time (Kintigh 1985:115). Others have suggested that this was a period of transition; Saitta (1987) suggests that a shift to a communal mode of production, occurring during this period, would have facilitated intensified production and eventually allowed longer occupations.

Nucleated pueblos were constructed as units rather than growing by accretion (Watson et al. 1980). They were planned communities, with room blocks laid out around a central plaza. This change in site configurations was apparent in the domestic architecture as well as in the public architecture. The number of room blocks per community declined while the number of rooms per room block more than tripled, suggesting that social group size had increased; as Stone pointed out, the "architectural shift may represent a change in the organization of the community as corporate or extended family groups become more tightly integrated." (Stone 1992:140). Some nucleated pueblos were walled; the perimeter wall at Lower Pescado Village, for example, was built during the fourteenth century, although it was reused during the nineteenth century (Rothschild and Dublin 1995:74-75; see below).

Pueblos founded during the early part of this time period tended to be situated at high elevations, on mesa tops or ridgelines above 2000 meters. By the mid-fourteenth century, settlement had begun to shift from the rugged side canyons and mesas of the El Morro-Ramah area to the relatively broad valleys of the Pescado, Nutria, and Zuni Rivers, in valley-floor settings adjacent to large, permanent springs. The shift from high to lower elevation settings has been ascribed to various historic and environmental factors. These include decreased conflict (LeBlanc 1978), a change in rainfall patterns that would favor agriculture at lower elevations (Watson et al. 1980), and shifts in agricultural strategy to incorporate the use of the springs for irrigation (Kintigh 1985). The evidence for conflict is inconclusive, consisting of inference based on site locations, features such as perimeter walls, and the burning of the Scribe S site during the twelfth century (Watson et al. 1980). There is no skeletal evidence for violent deaths, although mortuary data are generally rare. Differences in rainfall between the El Morro area and the Zuni River valley are not significant, although the length of the growing season is significantly longer in the river valleys (Kintigh 1985:92-93). This would certainly have affected the viability of maize agriculture in various parts of the Zuni area, although in itself it does not explain the focus on high elevation sites during the twelfth century. The locational evidence supports the occurrence of shifts in agricultural strategies during this period; unfortunately there is virtually no data on field locations or dated water control features that would lend additional support to Kintigh's hypothesis.

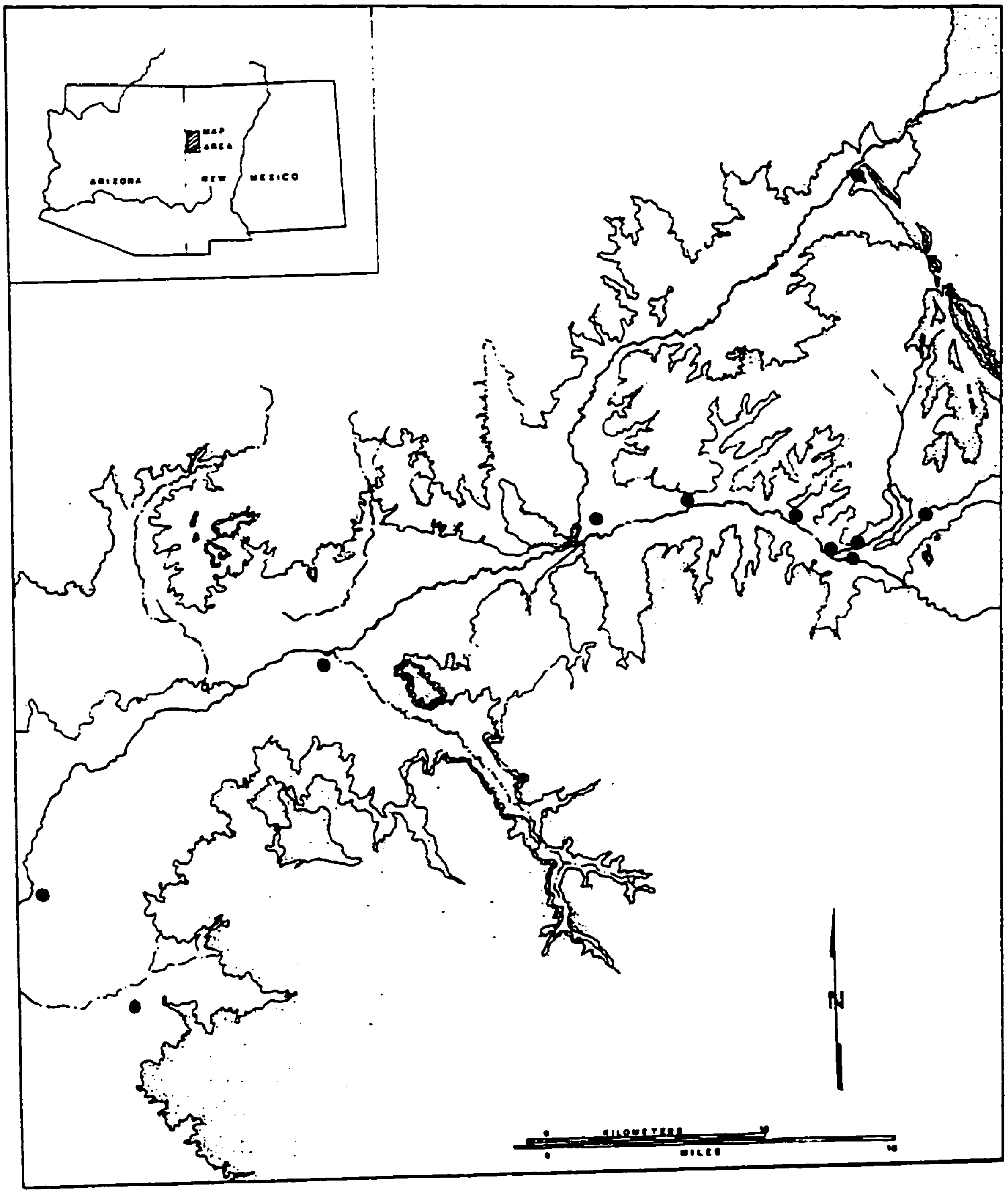


Figure 3.2. Fourteenth-century sites in the Zuni area (after Kintigh 1985).

The "Protohistoric" Period (A.D.1400- A.D.1540)

The term "protohistoric" is generally used to refer to the period from the beginning of the fifteenth century through the Coronado *entrada* in 1540 to the Pueblo Revolt in 1680, a period that has been documented in Spanish accounts and native oral histories and which, therefore might more properly be called "historic" (Penman 1996). Here the designation is used to refer to the period from A.D. 1400 to the Spanish *entrada*, a time that commenced with a spate of regional and site abandonments throughout the plateau Southwest. In the Zuni area, the nucleated pueblos in the Pescado valley were abandoned, and the focus of settlement shifted to multi-plaza pueblos in the broad floodplain of the Zuni River valley. The map, figure 3.3, shows the locations of Protohistoric sites in the Zuni area. Seven of these pueblos continued to be occupied after the *entrada*. This period and the succeeding Spanish Colonial Period separate the earlier and later settlements at Lower Pescado Village, which was unoccupied during these time frames; changes in the social and settlement landscape between the Nucleation Period and the nineteenth century need to be understood in considering different uses of the site.

Protohistoric settlement shifts involved a restructuring of the Western Pueblo landscape. This involved the creation of clusters of pueblos that were separated by apparently unoccupied zones; these clusters were roughly analogous to the modern Hopi, Zuni, and Acoma territories. Essentially, it was during this period that the cultural geography of the area was established, although the influx of Athapaskans and Europeans altered it somewhat after A.D. 1540.

Despite the site abandonments in the Zuni area, the total number of rooms increased

Table 3.1. Protohistoric Sites in the Zuni Area.

Site Name	No. of rooms	Estimated dates	Occupation span	References
Binna:wa	168	ca. 1375-ca.1500	125 years	Kintigh 1985:58-9
Ah:kya:ya	250	ca. 1400-ca.1500	100 years	Anyon 1992:78-81
Hawikku	800	1400-1680	280 years	Kintigh 1985:59-63; Smith et al. 1966
Mats'a:kya	901	1400-17th c.	+200 years	Kintigh 1985:63-4; Spier 1917
Kyaki:ma	250	1400-ca. 1630	+200 years	Kintigh 1985:64-5; Spier 1917
Kwa'kin'a	186	1400-17th c.	+200 years	Kintigh 1985:65-6
Chalo:wa	455	1425-mid-16 c.	125 years	Kintigh 1985:66-8
Kechiba:wa	824	1425-17th c.	+200 years	Kintigh 1985:68-9
Halona:wa North (Zuni Pueblo)	200	1425-present	+500 years	Caywood 1972; Ferguson and Mills 1982; Kintigh 1985;69-70

over the preceding period, from 3418 rooms in A.D.1350-75 to 4034 by A.D.1475 (Kintigh 1985:75). While the fourteenth-century villages were planned and constructed as large room blocks grouped around a central plaza, the Protohistoric villages included a larger number of separate room blocks, each associated with its own plaza; the settlements grew by accretion, or the addition of new room blocks. It has been suggested that this new settlement configuration may reflect a concomitant shift in social organization characterized by the

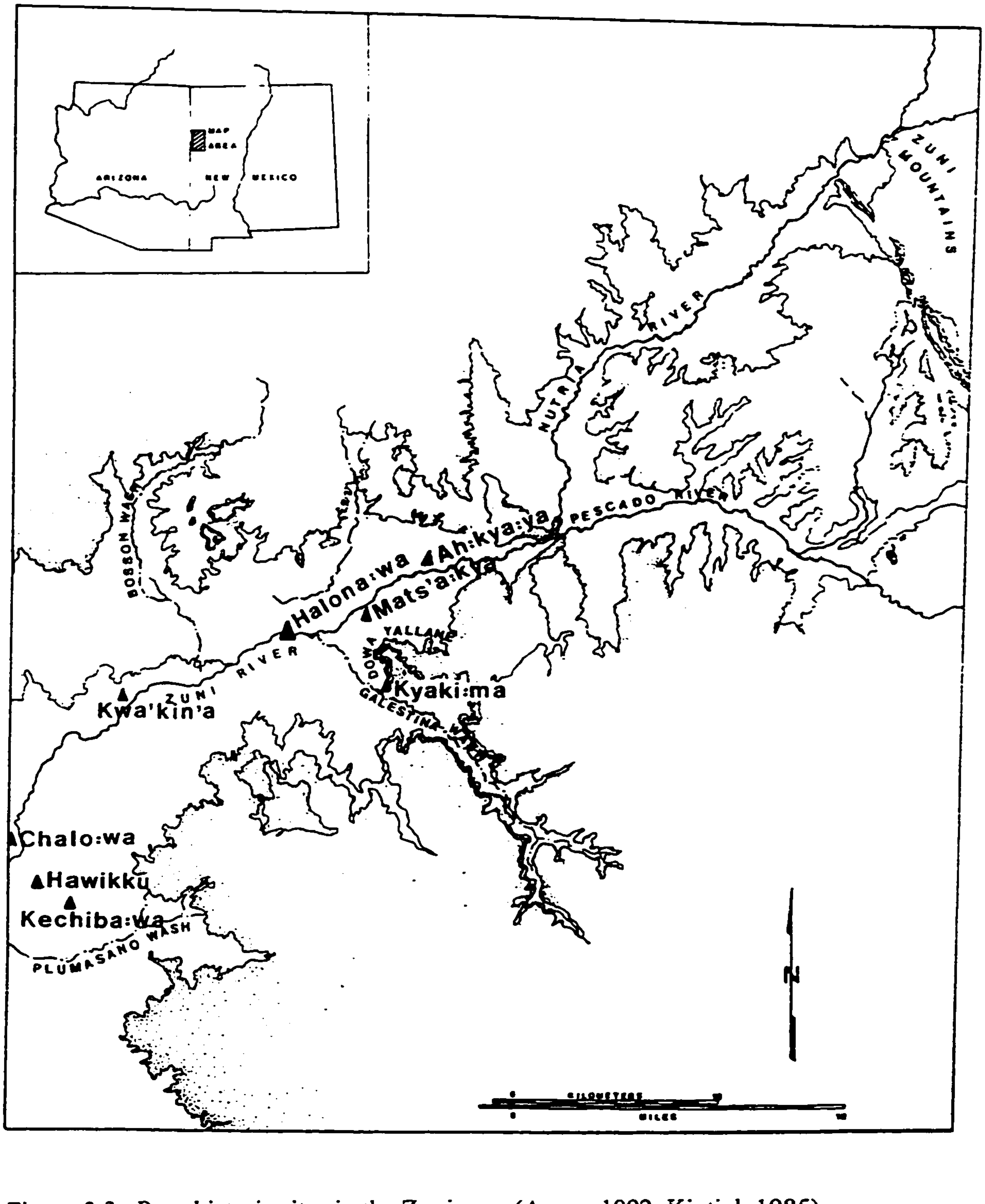


Figure 3.3. Protohistoric sites in the Zuni area (Anyon 1992; Kintigh 1985).

integration of diverse groups (Eggan 1950; Ferguson 1981; Kintigh 1985; Smith et al. 1966), each of which was associated with a room block-plaza complex.

Table 3.1 lists the known Protohistoric pueblos. Most of the temporal assignments are based on ceramics, after Kintigh (1985), although tree ring dates are available for Halona:wa North (Caywood 1972). The ceramic evidence indicates that all the Protohistoric pueblos were founded during the late fourteenth or early fifteenth century; most were occupied in A.D.1540 and abandoned during the seventeenth century. The estimated number of rooms is based on the size of the rubble mounds, using an average room size estimate of 7.9 square meters of rubble area per room that was based on data from the excavations at Hawikku (Kintigh 1985:61; Smith et al. 1966).

As the table indicates, the Protohistoric pueblos were occupied for lengthier periods of time than were previous sites. Settlement stability during the Protohistoric Period may have been facilitated by the development of integrative social structures that alleviated pressure for fission (Ferguson 1981:342; Kintigh 1985:117).

Mortuary evidence provides further information on Protohistoric social organization. At the Protohistoric site of Hawikku, eleven spatially discrete cemetery areas were apparently associated with separate kin groups, according to the dental evidence (Howell 1992; 1994). Differences in mortuary assemblages allowed the identification of two superordinate groups, one group of high-ranking males associated with artifacts related to ritual and warfare and a second group of high-ranking females associated with grave goods related to domestic activities. These high-ranking burials were concentrated in two cemeteries, suggesting that high status was linked to lineage.

The introduction of Salado wares and the practice of cremation during the fifteenth century suggests a migration into the Zuni area, perhaps from the Mogollon highlands or from the White Mountains, both of which areas were abandoned circa A.D.1400 (Ferguson 1981). A comparison of dental traits from burials at Hawikku and at the fourteenth century site of Heshota utla shows significant differences between the two burial groups, indicative of some influx of population and new genetic material (Howell 1994:18). This influx was probably not large, since the increase in total rooms was not great enough to accommodate large numbers of migrants (Kintigh 1991). Zuni ceramics and building styles demonstrate an overall continuity from the preceding Nucleation Period, suggesting that the migrants were assimilated into the existing society.

The movement to sites on the Zuni River floodplain has been attributed to agricultural intensification (Kintigh 1985:114). The Protohistoric sites are situated in the midst of the best agricultural soils in the area (Kintigh 1985:100; see below). A strategy that incorporated riverine irrigation would have supported the concentrated populations and longer site occupations of the Protohistoric period. Evidence for the use of canals for irrigation during this period is unclear (Hammond and Rey 1929); the Zuni, however, could have utilized a variety of technologies for irrigating fields such as *ak chin*, or floodwater, techniques or waffle gardens.

Political considerations also figured in settlement decisions during this period. Protohistoric sites tended to be situated on knolls or ridges overlooking the valley. The long sight lines thus established were useful for defense. Although there is little evidence for warfare, Zuni oral tradition and historic accounts of the Battle of Hawikku indicate that the

Zuni were no strangers to military tactics (Bolton 1949:125; Ferguson 1981:344). The presence of unoccupied zones between clusters of pueblos in the Western Pueblo area might signify the existence of warring regional polities, as has been suggested for the Mississippian Southeast (Ferguson 1981; Upham 1982), although it is also possible that the unoccupied zones may merely be resource areas or hunting territories that were shared by Acoma, Zuni, and Hopi ancestors (Anyon personal communication 1989). In the absence of more detailed information from this period, these intriguing questions remain unresolved, although it is clear that the Protohistoric Period represented a significant change from previous cultural patterns.

Several aspects of Zuni settlement patterns and economy, in place by the Protohistoric Period, continued across the "protohistoric" to "historic" transition. The continuity of occupation from the Aggregation Period reflects an ethnic continuity and the continued association of the Zuni people with a core settlement area centered on the drainages of the Zuni River and its tributaries. Regional changes in the settlement landscape after A.D.1400 resulted in the establishment of discrete settlement areas associated with the various Western Pueblo groups. These "territories" were separated by zones of less intensive use that may have supported limited activity sites used by the Hopi, Zuni, and Acoma; during the colonial period, these "empty" areas became the settings for Athapaskan, Spanish, and American encroachment. During the Protohistoric Period, the Zuni pueblos, especially Hawikku, had become important trading centers (Riley 1975); this continued through the nineteenth century (NcNitt 1962). Finally, a reliance on maize agriculture formed the basis of the Zuni economy; economic change was grafted onto this traditional lifeway.

The Spanish Colonial Period 1540-1821

The sphere of contact

The Zuni area was the site of the earliest Spanish contact in the American Southwest, although there was no permanent Spanish presence at Zuni until almost a century later. In 1539, the Moorish slave Estevan, a refugee from the shipwrecked Cabeza de Vaca expedition, was killed at Hawikku (Hodge 1937:5). One year later, in 1540, Francisco Vasquez de Coronado conquered the pueblo after a short siege (Bolton 1949; Hammond and Rey 1940; Winship 1990). Finding no wealth in the Zuni valley, Coronado remained in the area for only a brief time before moving eastward to the Rio Grande. During the years between 1540 and 1600, the Zuni area saw several brief visits by Chamuscado in 1581 and Espejo in 1583 (Hammond and Rey 1929; Hodge 1937). Onate, who established a Spanish colony in the Rio Grande valley in 1598, visited Zuni in 1604, leaving his signature on Inscription Rock as he passed through the El Morro valley.

The Onate colony inaugurated a period of mission colonialism in the Southwest that was signified by the presence of Spanish Franciscan missionaries, and, in some cases, a small garrison at many pueblos. By 1630, missions were built at Hawikku and Halona:wa, followed by *visitas* at Mats'a:kya, Kechiba:wa, and Kyaki:ma; during the 1630s, the mission at Hawikku was staffed by two Franciscans, Friars Letrado and Arvide, and three soldiers (Hodge 1937:35; Smith et al. 1966:99), who were killed by the Zuni in 1632. Another instance of overt resistance to Spanish control occurred in 1672 when Apaches, perhaps with Zuni complicity, burned down the mission at Hawikku, killing the resident priest, Friar Avila y Ayala (Bandelier 1890:338; Brugge 1969:193; Ferguson and Hart 1985:59; Hodge 1937).

Dissatisfaction with the Spanish presence culminated in Zuni participation in the Pueblo Revolt of 1680; the missions were again razed and the population took refuge on the mesa top settlement of Dowa Yallane (Ferguson 1992, 1993; Hackett 1942). After the Spanish *Reconquista* in 1692, only the mission at Halona:wa, now Zuni Pueblo, was rebuilt.

The historic record is not adequate to provide a detailed picture of Spanish involvement at Zuni. From the available evidence, it appears that the eighteenth-century Spanish presence was minimal, mostly religious and military in nature. The mission continued in use but was not always staffed. In 1703, for instance, the priest was removed after three Spaniards were killed at Zuni Pueblo (Jones 1966), while in 1730, the mission at Zuni shared a priest with Acoma and Laguna (Crespo 1953). The Zuni provisioned the mission, thereby encouraging Zuni adoption of some European domesticates, such as sheep (Adams and Chavez 1956:201; see below).

Military presence during the eighteenth century generally consisted of small temporary garrisons. During the early years of the eighteenth century, small Spanish garrisons were stationed at Zuni in response to reports of Zuni uprisings or reprisals against Spaniards residing at the pueblo (Ferguson and Hart 1985:59). Later in the century and during the early nineteenth century, Zuni Pueblo was occasionally a base of operations for Spanish campaigns against Apaches and Navajos. Zuni warriors participated in forays against the Navajo in 1705, 1747, and 1786, and provisioned the Narbona campaign in 1805 (Brugge 1969; Ferguson and Hart 1985:59-60; Jones 1966; McNitt 1972:74).

In general, actual Spanish presence at Zuni was less obtrusive than in the Rio Grande pueblos, which were situated closer to the seat of Spanish power. The historic record suggests that contact was sporadic: in 1776, Dominguez wrote that most Zuni did not speak Spanish and that those who did, spoke it "brokenly" (Adams and Chavez 1956:202). Indirect influence, however, was pervasive and long-term. The Coronado *entrada* signalled the onset of demographic and economic change as well as an altered social landscape, as other peoples moved or were pushed into the Zuni use area.

Demography

The Spanish conquest initiated a pattern of demographic change at Zuni. Depopulation, a result of epidemic disease, was most dramatic during the 150 years after initial contact, but epidemics continued into the nineteenth century (Foreman 1941:144). Figure 3.4 shows demographic trends at Zuni from the sixteenth through the twentieth centuries; these are tabulated in table 3.2. The graph is based on what are considered "reliable" population estimates (Ferguson 1993; Hart 1991); detailed (and sometimes conflicting) analyses of post-contact Zuni demography are presented in Hart (1991), Holmes and Fowler (1980:154-60), and Upham (1982:35-51).

The most dramatic decline, about 66%, occurred during the first sixty years after the Coronado *entrada*, before the establishment of a permanent European presence at Zuni (Holmes and Fowler 1980:159; but also see Upham 1982:40). The population continued to decline through the seventeenth century and stabilized at a relatively low level by the beginning of the eighteenth century. Zuni population began to rise again in the early twentieth century, reaching Contact Period levels by 1960.

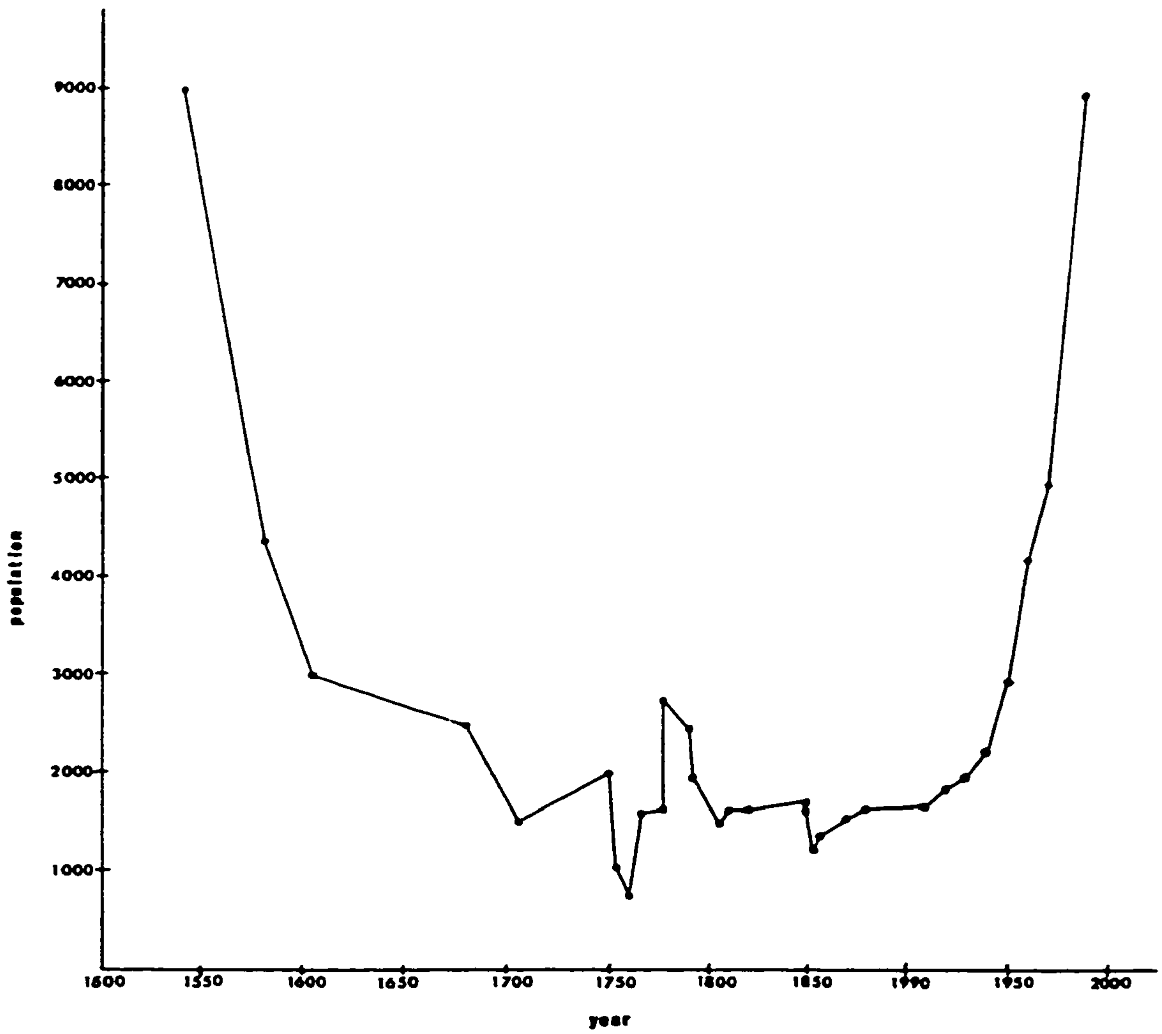


Figure 3.4. Zuni population during the Historic Period.

Table 3.2. Demographic Trends in the Zuni Area.

Year	Population	Reference
1540	9000	Hodge 1937:50; Holmes and Fowler 1980:157
1581	4372	Hodge 1937:60-3; Holmes and Fowler 1980:157
1604	3000	Hodge 1937:77; Holmes and Fowler 1980:157
1680	2500	Hodge 1904:286
1706	1506	Fr. Juan Alvarez cited in Gutierrez 1991:172; Simmons 1979:185
1749	2000	Fr. Andres Varo cited in Simmons 1979:185
1752	1004	General census of New Mexico cited in Gutierrez 1991:172; Simmons 1979:185
1760	728	Bishop Pedro Tamaron y Romeral cited in Simmons 1979:185
1765	1593	Anonymous Statistical Report cited in Gutierrez 1991:172
1776	1617	Fr. Francisco Dominguez cited in Gutierrez 1991:172; Simmons 1979:185
1777	2716	Hodge 1904:286
1789	2437	Gov. Fernando de la Concha cited in Gutierrez 1991:172; Simmons 1979:185
1792	1937	Report on Missions cited in Gutierrez 1991:172; Simmons 1979:185
1805	1470	Governor Real Alencaster cited in Simmons 1979:185
1810	1602	Census of New Mexico cited in Simmons 1979:185
1811	1610	Census of New Mexico cited in Gutierrez 1991:172
1821	1597	Fr. Jose Pedro Rubin de Celis cited in Simmons 1979:185
1849	1600	Simpson cited in McNitt 1964:114
1849	1800	Calhoun cited in Abel 1915:39
1853	1200	Whipple cited in Foreman 1941:142
1856	1350	Kendrick 1947
1870	1530	U.S. House of Representatives 1871
1880	1613	Cushing cited in Holmes 1983
1910	1640	BIA cited in Ladd 1979:492
1920	1813	BIA cited in Ladd 1979:492
1930	1952	BIA cited in Ladd 1979:492
1940	2205	BIA cited in Ladd 1979:492
1950	2922	BIA cited in Ladd 1979:492
1960	4190	BIA cited in Ladd 1979:492
1970	4952	BIA cited in Ladd 1979:492
1988	8929	Ferguson 1993

Settlement patterns

The earliest written descriptions of the Zuni and the "cities of Cibola" are found in sixteenth-century Spanish accounts, which describe a settlement pattern of six or seven compact multi-storied villages in the Zuni River valley (Bolton 1949; Hammond and Rey 1929, 1940; Hodge 1937; Winship 1990). During the seventeenth and eighteenth centuries, the settlement landscape was completely reorganized as a result of the mass abandonment of pueblos and the founding of satellite villages, temporarily-occupied communities that were politically subordinate to Zuni Pueblo (see chapter 4).

There is no information on the precise timing of pueblo abandonments at Zuni, but researchers suggest that most of the sites were abandoned during the seventeenth century (Bandelier 1892:108; Ferguson 1993:84; Holmes and Fowler 1980:160; Kintigh 1985:58-70). The Onate expedition in 1604 listed six Zuni villages (Hodge 1937:77), while in 1680, Betancourt counted four, including Hawikku and Halona:wa (Hodge 1937:100). By the end of the Pueblo Revolt, only Halona:wa (renamed Zuni Pueblo) remained. Depopulation played a major role in the consolidation of the Zuni population; pueblos were probably abandoned gradually as populations dropped to levels where they no longer formed a viable social or economic unit. Consolidation was useful for defense against both Spaniards and Athapaskans during the turbulent years of the seventeenth century (Ferguson 1993:84; Holmes and Fowler 1980:159-60). It may also have been encouraged by the Spanish policy of *congregacion* , the reorganization of native populations in a single mission settlement. Although this was not an overt policy in Spanish New Mexico in areas where Puebloan populations were not dispersed, there are some examples of what appears to be Spanish-encouraged (if not induced) aggregation in the Jemez area (Kulischek 1996). Pueblos without a mission would be particularly vulnerable to abandonment (Dublin and Rothschild 1996:3).

After the murder of Father Letrado in 1632, and at various times during the seventeenth and early eighteenth centuries, the Zuni temporarily abandoned their pueblos to take refuge in the inaccessible mesa-top village of Dowa Yallane. Ferguson (1992, 1993:128-141) has provided the most detailed description of this and other eighteenth-century satellite villages. The settlement at Dowa Yallane consisted of about 460 rooms, 433 of which are thought to have been occupied during the Pueblo Revolt; non-residential features included three reservoirs for impounding rainwater or snow melt, at least one kiva, and a number of unroofed enclosures, some of which may have been corrals (Ferguson 1993:133-6). The most notable aspect of this site, however, was its inaccessibility. Located on a high mesa overlooking the Zuni valley, Dowa Yallane was accessible via four foot paths that incorporated hand- and foot-holds on some of the steeper passages. Diego de Vargas, arriving at Zuni in 1692, described his ascent of the mesa.

> I reached the said Rock, its front being crowded with the multitude of the said village, and the only way up being so difficult and long, I was forced, on account of its bad places, to mount it on foot and, although it cost considerable effort, I succeeded, and ... being up there, saw the said table land to be very broad and spacious, extending apparently two leagues, and I mounted my horse to go and enter the said village where the natives received me with all its inhabitants

> whom I saw to be numerous. (Diego de Vargas 1914:
> 304-5)

Dowa Yallane was probably the only "true" Zuni refuge village. Other satellite villages, founded during the eighteenth century, combined inaccessibility (in some cases) with economic features such as good rangeland or favorable locations for cultivating peachesor practicing irrigated agriculture. Figure 3.5 shows the locations of late seventeenth- and eighteenth-century Zuni villages (Ferguson 1993:92; Ferguson and Hart 1985 :34-5). Several of the abandoned protohistoric pueblos were reused as sheep camps during this and the ensuing Mexican Period.

At least ten satellite villages (Ferguson 1993:88-94) were occupied at various points during the Spanish and Mexican Periods. Some may have been founded soon after the Pueblo Revolt. Ashiwi Polychrome, manufactured from 1700-1750 (Harlow 1990:plate 1), was collected from the surface at Kyaki:ma Refuge Site, placing the use of this site in the early eighteenth century (Ferguson 1993:143). Some villages persisted well into the nineteenth century, albeit with severely reduced populations. *Lai-iu-ah-tsai-lu* (Pedro Pino), the Zuni governor during the early years of the American Period, lived at Heshoda Luwal'a circa 1821 (Cushing cited in Ferguson 1993:152). Fewkes (1891:102) reported speaking with an old woman who told him that she was born at that peach orchard village, probably in the early nineteenth century. Zuni Polychrome sherds collected from the surface of several sites further indicate a nineteenth-century presence (Spier 1917; Ferguson 1993) .

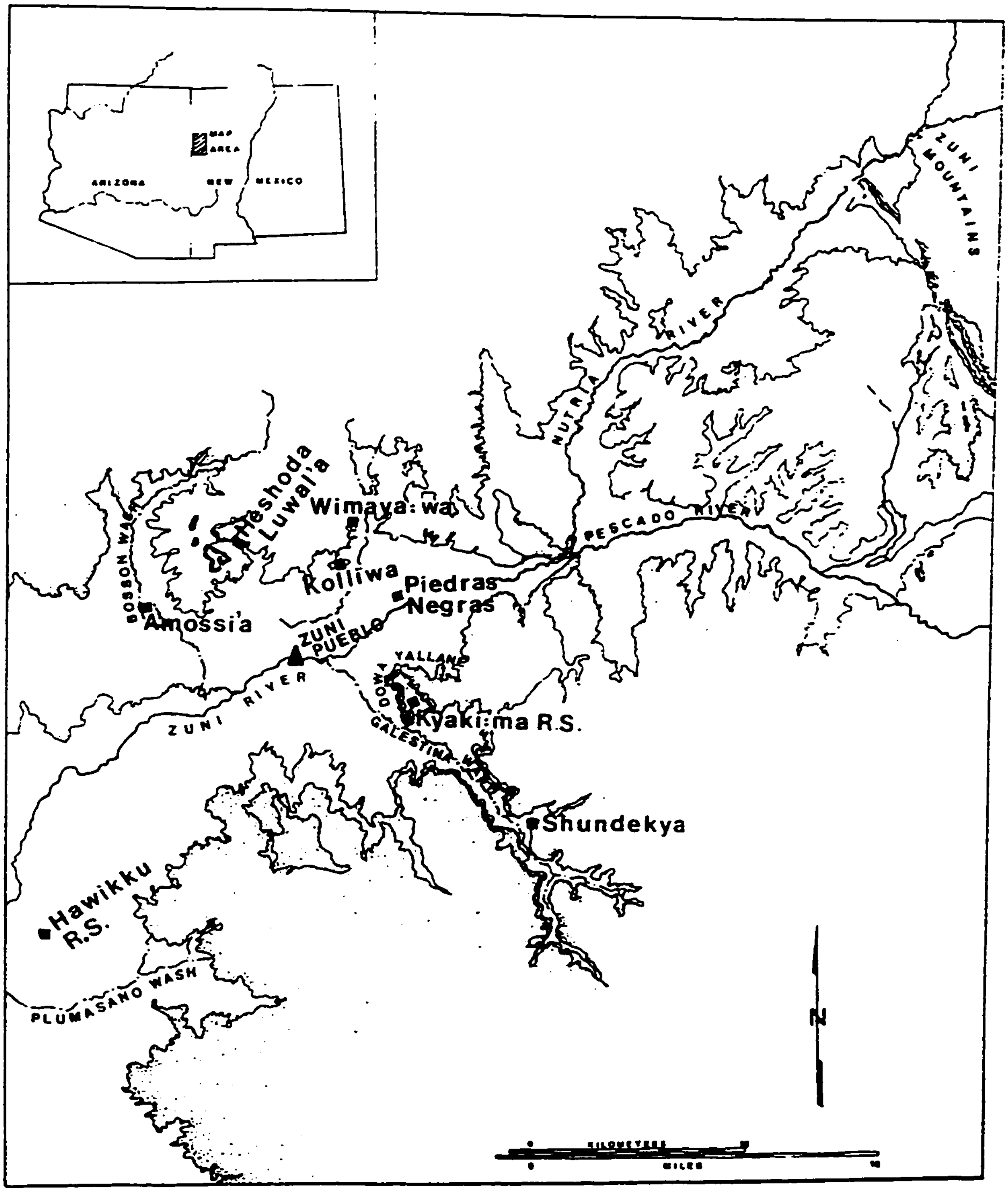


Figure 3.5. Eighteenth-century Zuni sites (Ferguson 1993).

Seasonal residential mobility was well established by the end of the eighteenth century. According to a census recorded by Juan de Sisneros in 1790 (table 3.3), 404 Zunis, or 36.2% of the total population, were listed as residents of five satellite settlements (Minge 1980:51ff, cited in Ferguson 1993:90). The eighteenth-century satellite villages are further discussed in chapters 4 and 6.

Table 3.3. Populations of Zuni Satellite Villages in 1790.

Village	Population
Rancho Colorado	96
Rancho de Piedras Negras	28
Rancho de Galisteo	105
Rancho de Canon	160
Rancho del Senora Santa Ana	15

Note: Data are from Ferguson (1993:90).

Economy

Early historic accounts describe an economy that was based on maize agriculture and the cultivation of squash, beans, gourds, and sunflowers (Hammond and Rey 1929, 1940; Hodge 1937:41ff; Winship 1990:52). Foraging also contributed to Zuni subsistence; gathered foods included pinyon nuts, acorns, and greens (Winship 1990:52). Turkeys and dogs were kept at the pueblos, the former being used mostly for feathers (Hodge 1937:75). The Zuni hunted deer, pronghorn antelope, mountain sheep, elk, bear, and a variety of smaller game and birds (Ferguson and Hart 1985:43). Rabbits, the most common game animal described by the Spaniards, were taken in communal drives, a technique that continued into the nineteenth century (Bloom 1939:195; Cushing 1974; Hammond and Rey 1929).

Direct archaeological evidence of Zuni subsistence during the sixteenth and seventeenth centuries consists entirely of finds from the site of Hawikku, which was excavated during the early years of the twentieth century. Some botanical specimens were identified in the field (Smith et al. 1966:227), while faunal remains were listed (but not tabulated by specimen) at the Smithsonian Museum and at the American Museum of Natural History (Smith et al. 1966:231). To the best of my knowledge, neither collection has been preserved. The incomplete list of botanical remains included maize, squash, beans, gourds, sunflower seeds, pinyon nuts and a number of unidentified seeds (Smith et al. 1966:227-30). The faunal list included small and large game animals and the indigenous domesticates, dog and turkey. The small mammals identified in the collection were cottontail and jackrabbit, woodrat, prairie dog, pocket gopher, and badger, while the large game animals were white-tailed and mule deer (the two species probably distinguished by size), pronghorn antelope, bison, grizzly bear, coyote, wolf, and bobcat (Smith et al. 1966:231-32). Fragments of cotton fabric from Hawikku support the Spanish descriptions of Zuni cotton clothing; other trade goods, including turquoise and marine shell, were present, attesting to Zuni participation in a long-range trade network that spanned the greater Southwest (Riley 1975).

There are few descriptions of field locations or farming technology, neither of which were probably of much interest to the Spaniards. There is no archaeological evidence for water control features, waffle gardens, or irrigation canals, although this aspect of sixteenth-century lifeways has not been well-studied archaeologically. The only possible reference to ditch irrigation is found in Luxan's 1583 description of fields near Hawikku (probably at Ojo Caliente) as a "large marsh with many water holes ... [used to] irrigate some fields of maize" and two canals (Hammond and Rey 1929:92). It is not clear from the wording used by Luxan, whether these "canals" were man made or whether they were natural watercourses (Holmes and Fowler 1980:154).

The Spaniards introduced a number of domestic animals (sheep, goats, cattle, horses, and burros) and plant foods, including peaches, wheat, chiles, and some herbs, that were incorporated into the Zuni economy over the succeeding years. A discussion of the rate of incorporation of introduced plant and animal foods can be found in chapter 6, although I will briefly note here the evidence for the presence of these species at Zuni during the Spanish Period. The incomplete data from Hawikku support the presence of some introduced economic species, horse, domestic goat, and watermelon (Smith et al. 1966:93, 231ff.). Since the collection was neither quantified nor preserved, there is no way of evaluating the relative importance of introduced domesticates from this, the only existing Contact Period collection.

Indirect evidence indicates that some Spanish introductions had been incorporated into the Zuni economy by the eighteenth century. The ubiquitous stone corrals found at sites of the Spanish Period attest to the importance of herding; in 1779, Zuni sheep herds were reported to total 15,736 animals (Adams 1954). Sheep herding altered the built environment as corrals and sheep camps were built on the extensive grasslands of the Zuni sustaining area.

It also chnaged aspects of Zuni relations of production, although the tiiming of this shift is not clear. Today, herds are generally inherited through the male line and are tended by groups of male relatives, an anomaly in this once matrilineal society (Ferguson 1996:120; Ladd 1979:497).

The social landscape

As noted above, Spanish presence at Zuni was relatively small through most of this period. The effects of the Spanish presence in the Rio Grande valley, however, reverberated throughout the area, resulting in shifting populations and alliances. The most notable of these latter, of course, was the pan-Puebloan alliance that culminated in the Pueblo Revolt. Because of the location of Zuni Pueblo at the edge of the Spanish sphere of influence, Euroamerican encroachment on Zuni lands did not become a serious problem until the nineteenth century.

An indirect consequence of Spanish control was an influx of Athapaskans, Apaches and Navajos who were being pushed southward and westward out of the Rio Grande valley during the seventeenth and eighteenth centuries. The presence of Athapaskans in the Zuni area is first noted in Spanish records of the mid-seventeenth century (Gutierrez 1991; Hodge 1937). Apache raids presented a problem by the late seventeenth century, and the Hawikku area was generally considered to be dangerous because of the Apache threat (Hodge 1937:99; Howell 1994:19).

Contact between Navajo and Western Pueblo groups increased in frequency after the Pueblo Revolt. The Dinetah Navajo took in Puebloan refugees during the Pueblo Revolt and after the *Reconquista*, and Navajo clan legends mention Zuni immigrants as well as members of other Puebloan groups (Brugge 1969:491). Through the eighteenth century, as Hispanic farmers and herders moved west from the Rio Grande valley into the middle Puerco and San Juan valleys (Ellis 1979; Garcia-Mason 1979), Navajo bands continued to move west, closer to the Zuni sustaining area. Documents, oral history, and archaeological evidence place Navajo groups in the Canyon de Chelly by the beginning of the eighteenth century (Brugge 1972; Kelley 1986; Reeve 1958); by 1714, there were Navajo encampments at Ojo del Oso, fifty miles northeast of Zuni Pueblo (McNitt 1972). Navajo movement into this area meant that band territories would have overlapped the Zuni sustaining areas north of the pueblo.

The early years of the eighteenth century were characterized by Spanish and Puebloan conflict with Athapaskan bands over produce, livestock, and slaves (Hall 1989:68). Much of the raiding during this period occurred in the eastern Dinetah and its environs; the use of Pueblo auxiliaries, including warriors from Zuni, in campaigns against the Navajo was common (Hendricks and Wilson 1996; McNitt 1972:12). A period of relative peace between 1720 and 1770 was followed by intensified hostilities and conflict over trespassing, land claims, and the slave trade (Kelley 1986; Reeve 1959, 1971). The Zuni, who were situated "between the anvil and the hammer with the Navajo to the north and the Apache to the south" (Reeve 1971:125), participated in and provisioned Spanish-led campaigns against Navajos and Apaches, and served as a base of operations. The relationship between Zunis and Athapaskans was complex, however, and incorporated trade partnerships, intermarriage, and alliances between some Zunis and Athapaskans, as well as conflict (Brugge 1972; Dorr 1871; Green 1981; Hall 1989:101; McNitt 1972); this is further discussed in chapter 6.

The Mexican Period 1821-1846

The Mexican Period is not well known. The available documents provide an overview of the region, but not much detail about events in the Zuni area, situated at the northwestern edge of what was then the remote northern frontier of the new Mexican republic.

The secularization of government under the Mexican Republic resulted in the withdrawal of clergy and the abandonment of mission churches throughout the Southwest; at Zuni, the mission was no longer used and gradually fell into disrepair (Caywood 1972). The concern of the new republic with internal affairs in Mexico City generally resulted in a declining Spanish-Mexican presence in the hinterland areas, including the Southwest (Gutierrez 1991:337; Hall 1989). Zuni population remained stable through this period. The use of seasonal satellite settlements for herding and the cultivation of orchards and outlying fields continued (Ferguson 1993). During this period, seasonal settlement expanded outward into the valleys of the Nutria and Pescado Rivers, areas that had not been occupied since the fifteenth century. Tree ring dates for the farming villages at Ojo Caliente and Upper Nutria (tables 3.4 and 3.5, below) indicate that there was some construction of field houses, during this period (Ferguson 1993:162, 170; Mills et al. 1982; Rothschild and Dublin 1995).

There was a marked increase in Athapaskan raiding after 1800 (Brugge 1972; Reeve 1960, 1971), and a corresponding increase in Zuni participation in military campaigns against the Navajo and Apache. A factor thought to have contributed to the increased violence was the breakdown of control during the waning years of Spanish colonial rule and the early years of the new Mexican government. Most raids seem to have involved the theft of livestock and the increased incidence of complaints from various peoples about encroachment on grazing land (McNitt 1972). Raiding for livestock, an easily augmented, mobile, and visible measure of wealth, is thought to have contributed to the reported emergence of economic class distinctions among the Navajo during the late eighteenth and early nineteenth century (Kelley 1986:18-19). Other contributing factors included the availability of superior firearms as the Angloamerican trade was generated by the opening of the Santa Fe Trail and Ute-Comanche incursions from the north that pushed Navajo bands southward into Pueblo and Hispanic use areas (Brugge 1980; Kelley 1986; McNitt 1972).

The American Period, 1846 to the present

Kearney's conquest of New Mexico in 1846 inaugurated the American Period, although two years were to pass before the territory was formally ceded to the United States by the Treaty of Guadalupe-Hidalgo. Information on Zuni during the American Period is available through a number of primary sources, including United States government records, travellers' accounts, oral histories, and ethnographies. Secondary sources, notably Holmes and Fowler (1980) and Mills et al. (1982), provide valuable syntheses and interpretations of this period through the compilation of social histories of the nineteenth-century farming villages. I have drawn heavily on these latter sources for this summary.

The sphere of contact

Spicer (1962:547) noted that the American "view of conquest" was significantly different from that of the Spanish, who encouraged political and social incorporation of transitional mission communities. The American superintendency system, on the other hand, fostered isolation of Indian and Angloamerican communities and, by creating a system whereby accountability flowed upward, to the U.S. government, undermined indigenous community organization and authority.

During the early years of the American Period, contact between the military government and Zuni was sporadic. A major concern of the newly formed government was the "pacification" of Athapaskan groups who had continued raiding activities through the territory. Zuni Pueblo was an intermediate destination for several military and fact-finding expeditions into Navajo and Apache country. Among these were the expeditions of Doniphan in 1846 (Edwards 1848), Walker in 1847 (McNitt 1972:126), and Washington in 1849 (Abel 1915:30; McNitt 1964; U.S. Congress 1849:60ff.). Like other Puebloan groups, the Zuni were perceived by the United States as allies in the struggle against the Athapaskans, and there is documentary evidence that the Zuni saw the United States as favorable to Zuni interests in the area (Abel 1915:56; McNitt 1964:151-2; McNitt 1972:121,126). As they had during the Mexican Period, the Zuni participated in military campaigns against the Navajo and Apache and provisioned United States troops.

The establishment of Fort Defiance in 1851 marked the beginning of a permanent American military presence within a day's journey of Zuni Pueblo. Fort Fauntleroy was founded at Ojo del Oso, 15 miles north of the Zuni farming village at Nutria, in 1861 and dismantled one year later, as the American Civil War turned military attentions away from Athapaskan concerns. Fort Wingate, founded in 1862 at Ojo del Gallo some 35 miles from the Zuni farming village at Pescado, served as a base of operations for military campaigns into the Dinetah and the Chuska Mountains (Utley 1967). In 1868, Fort Wingate, relocated to its current location at Ojo del Oso, was the point of decampment for Navajos returning from Bosque Redondo. During the late nineteenth century, it was a major stopover for American travellers in the area (Bloom 1936; Curtis 1883; Green 1981, 1990; Lange and Riley 1970). During the 1850s and 1860s, a number of American exploratory expeditions and travellers passed through Zuni, en route to the gold fields in California and surveying possible routes for a railroad (Foreman 1941; Lesley 1929; Mollhausen 1858; U.S. Senate 1853; Whipple 1855). Zuni farmers supplied "corn and forage" to the military and to travellers in the area (Ferguson 1993:97-8; Hart 1980:25-85; Mills et al. 1982). The extent of this provisioning is not known, nor is it clear how the trade was organized.

The American presence during these early years of the conquest of New Mexico was geared toward establishing control of the area, which entailed not only the pacification of the Athapaskans but the formalization of boundaries among the various groups in the area. A series of treaties between the United States and the Navajo was directed toward this end; the net result for Zuni was the diminution of the land base (Ferguson and Hart 1985:88-9), a process which continued through the nineteenth century.

With the defeat of the Navajo and the resulting reduction of hostilities by the 1870s, the sphere of contact shifted from a military to a civilian presence characterized by increased American settlement and development. By the end of the 1870s, Mormon settlers had founded ranches in the Little Colorado and Ramah valleys, east and west of Zuni Pueblo (Bender 1984:107). The opening of the railroad line through to Gallup in 1881 brought additional settlers, who founded railroad towns along the Wingate valley and lumber camps in the Zuni Mountains (Telling 1953). The Zuni reservation was laid out in 1877 without including the farming village of Nutria, an omission that was corrected only after a public outcry initiated by Frank Hamilton Cushing in the early 1880s (Curtis 1883:47; Green 1990:279ff.). Starting in the late 1870s, there were American citizens living at Zuni Pueblo, including missionaries (Bender 1984; Roscoe 1991:42ff.), traders (McNitt 1972:240-43), and the ethnographer Frank Hamilton Cushing (Green 1979, 1990).

The presence of Fort Wingate, as well as the above individuals and a stream of visitors to the area, set a pattern for contacts between the United States and Zuni that shifted from entirely military to commercial, religious, educational, and scientific endeavors. There were corresponding effects at Zuni. The establishment of the reservation and conflicts over land resulted in further reductions of the Zuni land base and restrictions on Zuni use of their sustaining area and springs (Ferguson and Hart 1985:89; Green 1990:280). The opening of the railroad brought an influx of American goods and increased participation in the American market economy (Kelley 1977). Zuni provisioning of the forts declined as goods could be shipped more easily from the east (Crampton 1977; Hart 1980). Clear-cutting of timber in the Zuni Mountains resulted in deforestation and soil erosion throughout the area (Ferguson 1985, 1988; Robinson 1994). Increased United States meddling in Zuni's internal affairs was related to increasing political unrest at the pueblo, and a spate of witchcraft accusations, which ultimately led to the United States Army's occupation of the pueblo at the turn of the twentieth century (Eggan and Pandey 1979:477; Pandey 1967; Roscoe 1991;117ff.; Simmons 1980:106-26).

The establishment of the Zuni subagency of the Bureau of Indian Affairs at Blackrock in 1902 was accompanied by a significant American influence in a number of areas, including health care, technology and industry, education, and public works. The construction of public works during the early years of the century and housing after World War II changed the face of the reservation (Holmes and Fowler 1980; Mills et al. 1982), while land management policies inaugurated during the late nineteenth and early twentieth centuries contributed to the degradation of farm and range land and the destruction of water resources across the reservation.

The construction of dams on the Zuni, Nutria, and Pescado Rivers between 1904 and 1940 contributed to the alteration of hydraulic regimes across the reservation and to changes in the land tenure system that eventually led to the abandonment of the Zuni farming villages and centralization at Zuni Pueblo. The initial dam at Blackrock, completed in 1909, was intended to provide water for a network of irrigation units in the Zuni River valley, which were to be allotted to Zuni men, ignoring the fact that Zuni land tenure was organized matrilineally (Ferguson 1993). The dam was a failure; by 1930, siltation had destroyed 70% of the water storage capacity, thereby rendering the irrigation units virtually useless; subsequent dams at the farming villages also failed, further contributing to the degradation of farmland across the reservation (Ferguson 1985, 1988). Erosion related to clear cutting in the steep and heavily dissected Zuni Mountains contributed to a lowered water table and downcutting of the channels of the Zuni, Pescado, and Nutria Rivers, which are now entrenched and virtually useless as sources for irrigation.

Soil erosion was exacerbated by overgrazing, a problem throughout the plateau Southwest by the early twentieth century (White 1983). At Zuni, voluntary efforts to curb herd sizes after 1910 were instrumental in lessening the economic hardship of United States imposed herd reduction in the 1940's (Holmes and Fowler 1980:241ff; Ferguson 1988), but the livestock industry at Zuni declined in importance through the century. Fencing the reservation in 1934 contributed to a net loss of range land and the institution of grazing allotments assigned according to estimates of the carrying capacity of the range (Ferguson and Hart 1985:102-3).

During the twentieth century, poor land management practices created a net decrease in the land base at the same time as the Zuni population was increasing. This decrease was superimposed on losses incurred by the removal of land from the Zuni sustaining area since 1849, a process that resulted in a loss of 89% of the Zuni aboriginal land base (Ferguson 1993:104). This situation is directly related to changes in land tenure, land use, and settlement patterns after 1846.

Demography

Zuni population, which had remained relatively stable during the nineteenth century, soared during the twentieth century. It doubled between 1930 and 1960 and doubled again between 1960 and 1990, so that the current population is more than four times what it was in 1900 (see figure 3.4). This increase occurred concurrently with a decrease in the Zuni land base and the disuse of the Zuni farming villages. A severe housing shortage has resulted despite the construction of Housing and Urban Development (HUD) housing on the outskirts of the pueblo and at Blackrock (Ferguson 1993).

Settlement patterns

The map, figure 3.6, shows the location of the major nineteenth- and twentieth-century settlements in the Zuni area. This period saw two major shifts in Zuni settlement patterns, occurring during the first few decades of the American occupation, and during the mid-twentieth century. Historic accounts written during the 1850s described settlements in the Pescado and Zuni River valleys, along the major route into Zuni Pueblo. The settlement pattern consisted of a single year-round settlement, Zuni Pueblo, and a number of limited activity sites associated with farming, herding, and defense. At least one eighteenth-century peach orchard village (at Heshoda Luwal'a) maintained a relict population into the late nineteenth century (Fewkes 1891:102). Peach orchard localities on the slopes of Dowa Yallane and outlying fields supported field houses, "lightly built houses which seemed to be intended only for occasional occupation at harvest time, and other seasons when there was work to be done in the neighborhood" (Foreman 1941:144; Mollhausen 1858:90) and farming camps. Sheep camps that included corrals and shelters for herders were described at Ranchos de Zuni, twelve miles west of Pescado Springs near the confluence of the Pescado and Nutria Rivers (Foreman 1941:138) and in the Pescado valley (McNitt 1964:123). Watchtowers were placed atop Dowa Yallane and on other high points overlooking the Zuni River valley, "wherein shepherds and cultivators keep watch lest they be surprised by the roaming Apaches" (Domenech 1860:210; Foreman 1941:140).

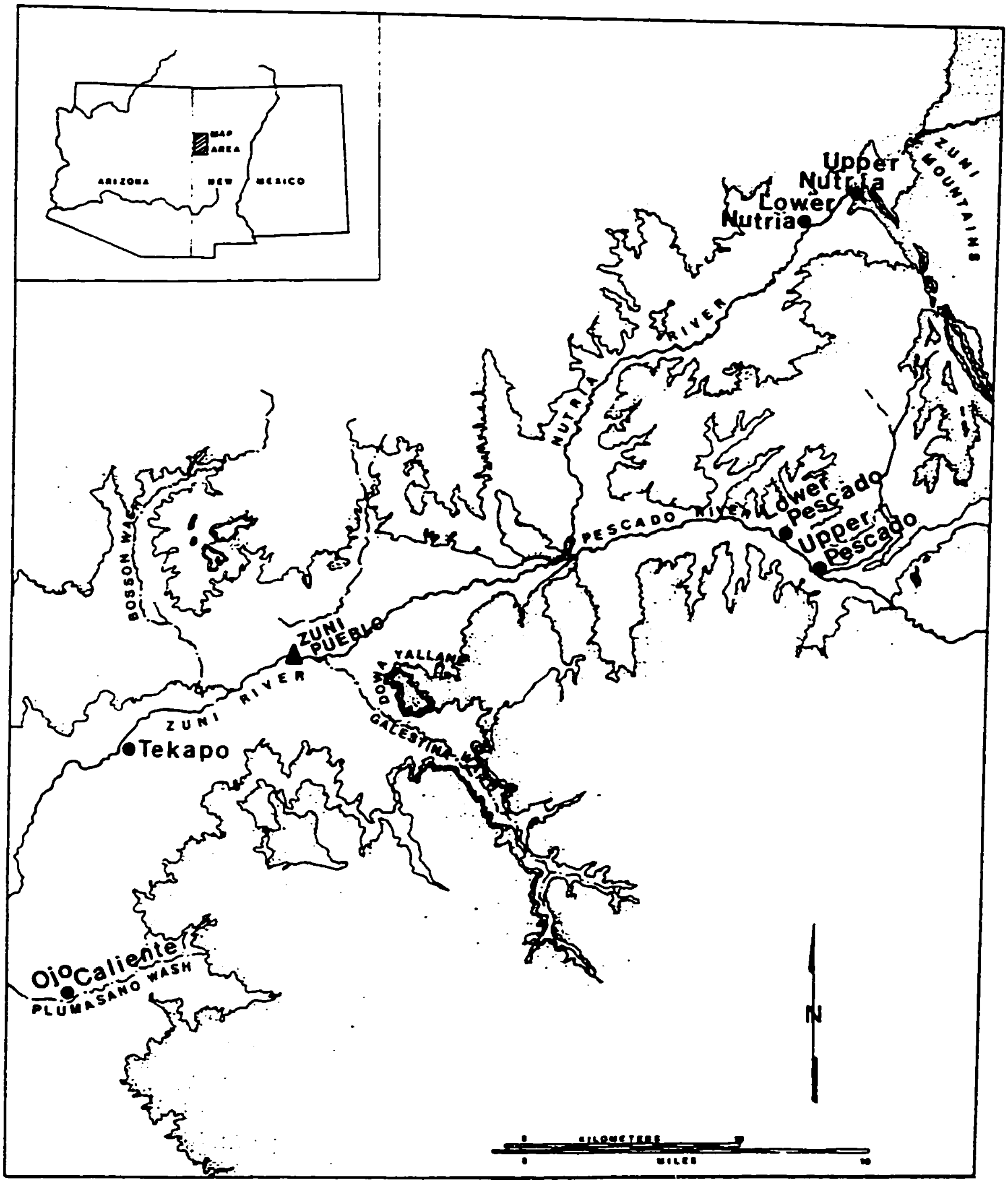


Figure 3.6. Nineteenth- and twentieth-century Zuni sites (Mills et al.1982; Rothschild and Dublin 1995).

A significant transition that occurred during the first decades of the American Period was the development of sizable river valley farming villages near large permanent springs at Upper Nutria, Lower Pescado, and Ojo Caliente. During the 1850s, these were described as "farming camps," (United States Senate 1853:5) or "planting grounds" (Kendrick 1947, 1950), implying that large settlements did not yet exist at these localities; in 1857, Beale described Pescado as an important farming area where "the fine wheat of the Zunians is principally raised" (Lesley 1929:227-8). Additional information on the development of villages at these locations comes from tree ring dates on a total of 439 structural timbers at these sites (Mills et al. 1982; Rothschild and Dublin 1995); tables 3.4 and 3.5 present stem-and-leaf plots of dates from Ojo Caliente and Upper Nutria (Ferguson 1996:66, 70); those from Lower Pescado Village are discussed in chapter 7. While the tree ring dates from Ojo Caliente range from 1726 to 1953 and those from Upper Nutria extend from 1771 to 1953, the graphs show two peaks in construction activities during the 1850s through the 1890s, and again from 1910 until 1930. The 1880s and the 1890s appear to be periods of the most intense construction activities at these two villages, suggesting (as does the historic record) that the villages were quite small in the early years of the American Period, expanding later in the century.

The period from 1880 to 1930 is considered the "heyday" of the Zuni farming villages (Holmes and Fowler 1980:180; Mills et al. 1982). The Cushing census, conducted in 1880 (Ferguson 1996:35; Holmes 1983), listed 1493 seasonal residents at the three farming villages (table 3.6). Since the Zuni population totalled only 1613 persons, this meant that 92.6% of the population moved to the satellite villages during the farming season. During

Table 3.4. Stem-and-Leaf Plot of Tree-Ring Dates from Ojo Caliente.

Decade	Year (cutting dates are underlined)
172	6
173	
174	7
175	37
176	4678
177	2256
178	
179	44
180	3456
181	13
182	88
183	4678
184	056899
185	015555688
186	02233356677788999
187	01244555666677778888899999
188	000122233344555566777888888889999999
189	000000011111122222244555555666666677777777778888888888888999
190	01111112222223355577
191	000112222233334445555555666666667777799
192	01223456666667899
193	3
194	122
195	3

Note: Data are from Ferguson (1996:66).

Table 3.5. Stem-and-leaf plot of tree ring dates from Upper Nutria.

Decade	Year (cutting dates are underlined)
177	112
178	044
179	36
180	47
181	366667
182	28
183	13488
184	4
185	000357999
186	00256788
187	0347
188	0134445555589999
189	000111222333334444555566666677777888888999
190	58
191	02347799
192	002234467778899
193	1222445555555677788
194	13336779
195	0011222333

Note: Data are from Ferguson 1996:70.

Table 3.6. The Population of the Zuni Farming Villages in 1880.

Farming Village	Population
Upper Nutria	473
Lower Pescado	580
Ojo Caliente	440

Note: Data are from Ferguson (1993:35).

the 1880s, additional clusters of field houses were built at Pescado and Nutria (Lange and Riley 1970), expanding seasonal settlement outside the closed circles of the two earlier farming villages; the Zuni consider Lower Nutria and Upper Pescado part of the old Nutria and Pescado villages, even though they are spatially distinct (Mills et al. 1982). The village of Tekapo was founded in 1912.

By the turn of the twentieth century, some Zunis had begun to use the farming villages year round, returning to Zuni Pueblo only for very brief periods during ceremonials (Fewkes 1891). The occurrence of social dances and foot races at the villages (Quam 1971) indicates that these communities had become more than solely economic entities, although ceremonials continued to be held only at Zuni Pueblo and individuals who died at the farmingvillages were returned to the pueblo for interment (Culin 1903). Trading posts were opened at Upper Nutria and at Ojo Caliente (McNitt 1972; Mills et al. 1982), weakening economic ties between those villages and Zuni Pueblo, perhaps associated with more intensive use of the villages. When the Tribal Council system was adopted at Zuni in the 1930's, there were slots for councilmen from the farming villages; in this non-traditional political sphere, the farming villages were being accorded equal recognition with the pueblo.

By the late 1940s, the once thriving farming villages were virtually uninhabited. A system of land allotments inaugurated by the Bureau of Indian Affairs altered patterns of land use, as farmers accepted allotments in the Zuni River valley, relinquishing their claims to fields near the farming villages. Environmental degradation and economic change after World War II further accelerated settlement change. Abandonment was gradual, beginning in the 1930s and continuing through the 1950s. By this time, none of the farming villages were being used in the way that they had been earlier. Upper Pescado, located along a major road accessible to good transportation and utilities, currently supports a string of farmsteads, most of which are occupied year-round. At the other villages, some structures remain, which continue to be used in a variety of ways, as sheep camps, as field houses and for day or weekend use (Rothschild and Dublin 1995; Rothschild et al. 1992). While the outlying villages have declined, the area around Zuni Pueblo has become more crowded, as the old pueblo has expanded in all directions with the construction of new housing to accommodate the growing population. The community at Blackrock, which houses tribal and government offices and services has also grown, and the Route 53 corridor between Zuni and Blackrock is dotted with houses and subdivisions. With this suburban growth and the abandonment of the farming villages, the core area of Zuni settlement has again contracted, now encompassing an area very similar in size to that of the early eighteenth century.

Changes in the land base and patterns of land use also characterized this period. The establishment of the reservation in 1877 theoretically bounded the Zuni land base, removing large portions of the Zuni sustaining area (Ferguson and Hart 1985:56). Using ethnographic accounts and oral histories, Ferguson (1993) reconstructed patterns of land use in pre-1846

Zuni. The concentric pattern consisted of a core settlement area including Zuni Pueblo, the farming villages, and intensively cultivated fields and orchards. This core area in turn was surrounded by dispersed farm fields and open range. An extensive foraging area which also contained religious places and shrines formed an outer tier extending west as far as the San Francisco Peaks, north to the line of the Puerco River, south into the Mogollon Mountains, and east to the Continental Divide. Only the settlement core has been retained into the late twentieth century.

During the twentieth century, the Zuni built environment was altered as both herders and farmers constructed permanent facilities in outlying areas; outlying fields and orchards were converted into grazing land as pressure on the range increased. Today, 94% of the reservation land is allotted to grazing; only 1% is used for irrigated farming, and 5% is allocated to dry farming and other activities (Ladd 1976:492).

Economy

The Zuni retained an agro-pastoral economy into the twentieth century, although there are some questions about the relative importance of various cultigens or technologies. Many of these questions are discussed in chapters 5 and 6; the following paragraphs contain a brief summary of Zuni subsistence economy during the American Period.

Maize, the staple crop of the Zuni in 1850, was cultivated on the Zuni River floodplain and in fields located on slopes and at the mouths of canyons where they could be watered by diversion dams (Domenech 1860:213; Ferguson 1988; Lesley 1929:278; United States 1853:5; Whipple 1855:22). The Zuni also cultivated vegetable gardens at Zuni Pueblo and the farming districts (Foreman 1941:139; Lesley 1929:278; Mollhausen 1858; United States Senate 1853:5). It is not clear whether these were the famous "waffle gardens" of the Zuni, networks of hand-irrigated, earthen- walled plots described by visitors in 1880s and later (Bloom 1936:121; Green 1979:49; Bohrer 1960). Peaches were grown in a number of locations, as noted above.

Wheat, probably spring wheat (Holmes and Fowler 1980:160) was grown near Zuni Pueblo (McNitt 1964:112) and at the springs at Pescado, Nutria, and Ojo Caliente (Lesley 1929:227-8; Mollhausen 1858). There is some controversy about the importance of wheat during the early years of the American Period, particularly since its cultivation requires plowing and ditch irrigation (Toll 1992:53). It is not clear that ditch irrigation was in use at Zuni before 1880. Accounts from the 1850s through the 1870s state that ditch irrigation was not practiced at Zuni (Domenech 1860:213; Foreman 1941:140; Murphy 1967:32; Whipple 1855:22), and plows were not common as late as 1879 (Bender 1984:120; Kendrick 1947, 1950). By the 1880s, extensive networks of irrigation ditches were in place at the farming villages (Bloom 1936:112; Cushing 1974:355-67; Lange and Riley 1970:56; Stevenson 1904:351). It has been suggested that a growing interest in the cultivation of wheat at Zuni was spurred by the development of a market for grain at the American forts that were being built in the late 1850s and 1860s (Crampton 1977; Ferguson and Hart 1985).

Table 3.7 presents a tabulation of Zuni stock from 1879 to 1978 (Holmes and Fowler 1980:242). These figures indicate that sheep and goats made up the major part of Zuni herdsduring this period. Declining figures after 1920 indicate the results of voluntary stock reduction associated with the reduction of the range (Ferguson 1993). That herding became

Table 3.7. Zuni Stock during the American Period.

Year	Sheep/goats	Horses	Cattle
1879	20.000-30,000	310	200
1914	58,000	888	695
1920	40,000	1800	600
1925	35,000	1710	585
1930	28,600	1300	520
1934	25,455	730	300
1942	25,808	798	788
1947	18,665	1192	813
1952	16,426	800	510
1957	20,156	650	653
1961	18,118	466	804
1972	19,370	400	847
1978	15,874	400	607

Note: Data are from Holmes and Fowler (1980:242).

increasingly more important during the American Period can be seen by comparing herd counts from 1779, 1879, and 1914. In 1779, the total Zuni herd numbered 15,736 sheep and goats, about seven animals *per capita*. One hundred years later, in 1879, this number had almost doubled, to 25,000; since the Zuni population had remained relatively stable over this time, the *per capita* figure more than doubled, to 15.2 animals. Both figures doubled again in35 years to 35.4 animals *per capita* in 1914.

Two factors might have influenced herd sizes at Zuni. One was the cessation of raiding and conflict over herds (Ferguson 1981); another the appearance of resident traders at

Zuni. This latter has been associated with economic change during the late nineteenth-century. Traders provided a market for wool, and introduced credit buying and the concept of cash value for certain types of goods, thereby establishing livestock as a commodity (Eggan and Pandey 1976:476; Kelley 1977; Ladd 1976:493). These factors encouraged the growth of the livestock industry as they did the development of craft production for market, endeavors which would further be stimulated by improved transportation, available with the arrival of the railroad at Gallup in 1881. Kelley (1977; 1986) considers these variables crucial for Navajo entry into a market economy by the turn of the twentieth century.

The late twentieth century saw a restructuring of the Zuni subsistence base, as the agropastoral economy was replaced by an economy that stressed wage labor and, to a large extent, accomplished the final incorporation of Zuni into the larger American market economy. In 1967, 72.3% of Zuni income was derived from wage labor of various sorts, while 19.7% derived from crafts sales. Herding and agriculture together comprised only 5.6% of total Zuni income, although these figures do not take into account the value of livestock and crops that were not sold at market but used by individual Zuni families (Ladd 1979:495). It is clear that Zuni subsistence has changed dramatically.

The social landscape

Until about 1870, interethnic relationships in this area were dominated by conflict among the various groups, Athapaskans, Pueblos, Mexicans, and Angloamericans. The Zuni participated in a number of United States campaigns against Navajo and Apache bands and also took part in actions by civilian militias that included both Mexicans and Pueblos (Abel

1915; McNitt 1972). Zuni was also a target of Athapaskan raiding for livestock, grain, and prisoners. Raiding increased markedly through the late 1850s and 1860s; efforts to subdue the Navajo culminated in Kit Carson's scorched earth campaign and the removal of many Navajos to the Bosque Redondo in eastern New Mexico (Brugge 1980; Correll 1979; Kelley 1986). After their return in 1868, the incidence of Navajo raiding at Zuni declined significantly; by 1875, most Apache bands had moved south of the Mogollon Mountains, and Apache raiding also declined.

Zuni Pueblo during this period was described as "a sort of neutral ground where Apaches, Navajoes [sic], Moquis &c. go to trade" (E.O.C. Ord cited in McNitt 1972:241), a continuation of an ancient Zuni role (Riley 1975). The pueblo was a center for the trade in arms and liquor, much of which was conducted by Mexicans and Angloamericans (Abel 1915:53; Kendrick 1950; United States 1871:806). The Zuni also traded grain to the military and to American expeditions as well as to the Navajo and Apache (Crampton 1977; Hart 1980:45; Kendrick 1947, 1950; Lesley 1929:280). The Athapaskan trade included crafts as well as foodstuffs and continued through the 1880s (Dorr 1871; Green 1979:297-301). As noted in chapter 6, the Zuni-Athapaskan relationship was quite complex and included periods of rapprochement as well as conflict.

The enactment of treaties between the United States government and the Navajo formalized boundaries in this area and served to reduce the Zuni land base, a process that was to continue through the nineteenth into the twentieth century (Ferguson and Hart 1985:86-90; McNitt 1972:121,361). With peace, the establishment of Navajo populations west, east, and north of Zuni and Angloamerican settlements in the Ramah and Little Colorado valleys exacerbated conflicts over scarce land and water resources (Bender 1984:107, 119; Green 1990:246-77, 280). These were foreshadowed in 1882 by the attempted annexation of Nutria by United States Army officers from Fort Wingate (Curtis 1883; Green 1990:409ff.).

The late nineteenth century and the first half of the twentieth century saw the development of a comparatively crowded social landscape. The establishment of reservations allowed the privatization and sale of non-reservation lands and an increasing non-Zuni population in the Zuni sustaining area. The railroad brought commercial development and Zuni participation in the American market economy.

Chapter Summary

This dissertation is predominantly concerned with the American Period, although in order to understand the changing use of place at Lower Pescado Village, an understanding of the full sweep of Zuni settlement history is necessary. Previous research has provided an outline of settlement history and land use that spans the last millenium and reveals areas of significant continuity and change. Despite the evidence for migrations into the area during the Protohistoric Period and then in the eighteenth through twentieth centuries, there is an ethnic continuity in the core area of Zuni settlement from at least as early as the twelfth century. Flexible settlement strategies that emphasized aggregation and dispersion at various times were a successful adaptation to environmental (and perhaps political) constraints that allowed long-term use of this area. The period after A.D.1680 saw an increased emphasis on residential mobility and an increasingly crowded and complex social landscape.

Based on the history of the social landscape during the nineteenth and twentieth centuries and following Mills et al. (1982), it is possible to subdivide the American Period as follows:

1846-1870	Period of conquest and exploration
1871-1902	Period of settlement and development
1902 on	Bureau of Indian Affairs (BIA) Period

Residential mobility was an important aspect of Zuni settlement strategies during the American Period; chapter 4 discusses concepts of residential mobility and its expression in the American Southwest.

CHAPTER 4

RESIDENTIAL MOBILITY IN THE AMERICAN SOUTHWEST

Introduction

In chapter 2, I discussed the theoretical relationship between colonial frontier processes and the use of places in a settlement landscape. The chapter emphasized the idea that what has been termed "acculturative change" generally results from the interplay of strategies that weighed perceived values associated with tradition, and received values associated with change, or innovation. For this reason, the historic archaeological record of indigenous peoples after European contact indicates that introductions are not necessarily quickly accepted, and that acceptance is generally selective. Often, introduced ideas or items of material culture are reframed in a "native" idiom, or framework, and solutions for dealing with problems incurred with colonial contact may incorporate new ways of using old strategies.

Chapter 3 outlined the settlement history and land use in the Zuni area over the past millenium in order to provide a historic context for this study. The chapter emphasized continuity in the maintenance of a core land base, and flexibility in settlement strategies. This latter was expressed archaeologically by shifts in or additions to a repertoire of site types, and by changes in site configurations, some of which were possibly associated with the accommodation of migrants into the area.

This chapter reviews the role of small, temporarily occupied sites in Southwestern settlement systems and evaluates structural and processual models of such settlements in the

Puebloan Southwest. While this is crucial to an understanding of the various uses of place at Lower Pescado Village, the nineteenth-century farming village built on the footprint of a fourteenth-century nucleated pueblo, it also provides a perspective on Puebloan settlement strategies during the Spanish and American colonial periods.

Mobility Patterns and Site Types

Most researchers agree that residential mobility continued to be a feature of Puebloan settlement strategies even after the onset of agriculturally based sedentism (Bradley 1997; Castellon 1991; Cordell 1984; Cordell and Plog 1979; Johnson 1989; Kent 1992; Kohler 1992; Plog 1989; Powell 1983; Preucel 1988; Stone 1997; Upham 1984; 1988; Ward 1978; Wilcox 1978 Wilshusen 1997; and others). Mobility has been expressed in different ways. Archaeologically documented examples include field systems and associated water control features; limited activity sites; field houses or other isolated structural remains; and farming villages. The following paragraphs define the concept of residential mobility as it is used in this dissertation and the various site types discussed in the chapter.

Mobility Patterns

Two types of mobility patterns are important to this dissertation. "Residential mobility" has been defined as "the regular planned movement of a household from one residence to another" (Graham 1994:24). Preucel (1988) described a type of residential mobility, "seasonal agricultural circulation," that is especially germane to this study. Seasonal agricultural circulation entails the "repetitive and cyclical movements of individuals, families, and groups across a landscape from a single permanent location" (Preucel 1988:31). In this specific subtype of mobility patterning, movement is associated with farming outlying fields beyond daily commuting distance from a main settlement.

Site Types

The various site types discussed below can be considered archaeological or material manifestations of mobility patterning that exist within what are generally considered "sedentary" adaptations. The broad terms used here mask variability within each site type in aspects of the built environment, site size, and the duration and regularity of occupation. The definitions, however, serve to distinguish the major characteristics of each type.

"Limited activity sites" are probably the most common small site in Puebloan settlement systems; following Upham (1988:248), these can be defined as "artifact scatters ... without [associated] architecture." Limited activity sites are the residue of a specific type of activity; examples might include gathering stations, hunting camps, and shrines, as well as isolated field systems and water control features (Wilcox 1978). The key element is the lack of residential architecture.

Field houses are "one- or two-room structures near fields and away from habitation sites, that were used seasonally" (Stone 1997:1-2; Wilcox 1978). Other authors have pointed out that field houses are used by a small, cooperating group, generally a kin group, in the performance of subsistence-related activities (Preucel 1988:93). If the defining feature of this site type is small size, the presence of a dwelling sufficient to house a small group, then many functional subtypes of field houses might be identified, including isolated small structures, sheep camps, and farmsteads, which differ functionally but might be rather hard to distinguish architecturally.

Farming villages, as opposed to farmsteads, are communities, in the sense that a farming village will incorporate a group of habitation structures and associated features. Preucel (1988:75) describes a farming village as a "cluster of individual field houses grouped together for social, economic, or security reasons," a definition which does not adequately characterize the position of farming village within settlement systems or describe the relationship between farming villages and pueblos. Existing Puebloan farming villages were founded by segments of the population of a particular pueblo and they are generally tied ritually, politically, and socially to the mother community (Nagata 1970), although they are potentially economically self-sufficient and may participate in regional economic systems (Holmes and Fowler 1980:220; Stone 1997:2).

Farming villages may be occupied seasonally or year-round. The key feature of this settlement type is the preeminence of the economic role and the absence of a political or ritual role in a settlement system. Farming villages manifest a limited range of activities (and presumably artifact types) compared to pueblos. The subordinate role of farming villages in regional political systems is reflected in the terms "satellite village," which is applied to the Zuni farming villages (Ferguson 1995; Holmes and Fowler 1980; Mills et al. 1982) and "colony village," which refers to certain Hopi settlements (Nagata 1970). In this dissertation, the term "farming village" is used to refer to the nineteenth-century river valley villages, while the term "satellite village" refers to the entire corpus of Zuni temporary settlements, some of which were not strictly "farming villages."

The term "pueblo" was applied by the Spaniards to the settlements of contiguous masonry structures that were encountered by Coronado in the northern Southwest and to the inhabitants of these villages, who represented a number of diverse political and dialectical groupings. The term, as used here, refers to a settlement that is occupied permanently, in the sense that at least a segment of the population is in residence through the year. Preucel (1988:90) noted that pueblos house "relatively large population aggregates which possess large-scale integrational institutions." In contrast to farming villages, pueblos manifest a full range of social, economic, political, and ceremonial activities germane to the functioning of the society. They therefore demonstrate greater complexity, variability, and permanence in architectural forms and in material culture than do farming villages.

Southwestern Residential Mobility

Researchers have documented a lengthy tradition of small, apparently temporary sites across the Pueblo Southwest, generally considered indicative of a degree of flexibility in settlement strategies (Cordell and Plog 1979). Although such sites have continued to comprise an understudied "underclass" of Southwestern settlements (Upham 1984), several recent studies have been useful in understanding the roles of small sites in Puebloan prehistory.

Plog (1978) and Upham (1984) associated the presence of limited activity sites with shifts in subsistence activities, notably an increased emphasis on foraging, during various periods in Puebloan prehistory. More recently, a number of studies have documented the presence of small sites at the edges of settlement systems on the Pajarito plateau during the

Rio Grande Classic period and in the Dolores area of southern Colorado. These are thought to be associated with increased pressure on the existing land base and efforts to safeguard use rights to land (Head and Snead 1992; Kohler 1992; Preucel 1988). In the Zuni area, the evidence of prehistoric small sites includes a number of undated water control features, and some scattered structural remains, probably field houses (Castellon 1991; Kintigh 1985; Stone 1991; Zuni Cultural Resources Enterprise site files), but no farming villages until the seventeenth century.

Whatever the function(s) of small sites, limited activity sites and field houses were a common feature of prehistoric Southwestern settlement landscapes. Clearly, seasonal agricultural circulation and the built environment that supported it were integral to many Southwestern settlement systems; farming villages, however, may be unique to post-European Contact settings.

Puebloan Farming Villages

Farming villages were established at six pueblos, Santa Ana, Isleta, Laguna, Acoma, Zuni, and Hopi; tables 4.1 and 4.2 list some structural and historical features of these villages. Factors that seem to be important at all or most of the farming villages include distance from the central pueblo; access to a reliable water source; site size; and historic conditions during the period when the village was founded. The ethnographic record documents the association of economically-oriented farming villages with ritual ties to a main pueblo with conflict and an increasingly crowded social landcsape.

All the villages are more than four kilometers from the central pueblo; this constitutes

Table 4.1. Features of Historic Pueblo Farming Villages.

Pueblo (No. of farming villages)	Distance from center[1]	19th-century population	Setting	Economy	Public buildings
Acoma (2)	24	582	river valley	dry and irrigated farming	church, schools
Hopi (1)	64	about 800	wash valley, spring	irrigated farming	kivas
Laguna (5)	6 - 11	about 1000	river valleys	dry and irrigated farming	none
Santa Ana (2)	16	340	river valley	dry and irrigated farming, orchards	church
Zuni (6)	16 - 39	1493	river valleys, large springs	dry and irrigated farming, herding	none

Notes: Sources are listed in Table 4.2.
[1]Distances are in kilometers.

a "critical distance" beyond which point it becomes more cost effective for farmers to remain than to commute (Preucel (1988:35, 275). It is worth noting that this "critical distance" is not fixed, but should increase as transportation improves; today, some Zuni farmers commute by car or truck to farming locations where their parents or grandparents stayed for the season. Irrigated farming is the major activity at the villages, although dry fields, orchards, and vineyards are cultivated at some. All the recorded Pueblo farming villages are situated along streams or springs which provide an abundant and reliable water source for *acequia*, or ditch irrigation. Digging and maintaining *acequia* systems requires considerable communal labor

Table 4.2. Historical Circumstances Related to Pueblo Farming Villages.

Pueblo	Initial use	"Social lndscape"	Occupation[1]	Reference
Acoma	farming camps	Spanish *ranchos* in San Jose valley	year-round	Garcia-Mason 1979
Hopi	field houses	Mormon settlement	year-round	Nagata 1970
Laguna	*ranchos*	Spanish and Navajo ranchers, law suits	year-round	Ellis 1978, 1979
Santa Ana	field houses	purchased from Spaniards	year-round	White 1942 Strong 1979
Zuni	field houses	Navajo encampments, Anglo settlers	seasonal/ occasional	Mills et al. 1982

[1]Refers to current occupation period ; all the farming villages (except perhaps the Hopi village of Moenkopi) were founded as seasonal villages.

input, thought to be a condition for the presence of farming villages rather than field houses (Preucel 1988:75).

There is a relationship between the presence of farming villages and warfare. Most of the villages were founded in the late eighteenth or early nineteenth centuries, periods of increased Athapaskan raiding on Pueblo and Spanish settlements (Brugge 1969; Jones 1966; McNitt 1972; Reeve 1960; 1971). Raiding was especially intense along the western and southern frontiers of the territory, in the vicinities of the Western Pueblos of Acoma, Laguna, Zuni and Hopi.

Farming villages were part of dynamic settlement systems. Many were built in localities where there had previously been farming camps or isolated field houses. For example, the eighteenth-century farmsteads at the Santa Ana farming district of Ranchitos had grown into a farming village by the early nineteenth century (Strong 1979; White 1942), and farming camps along the San Jose River near Acoma were replaced by villages during the early nineteenth century (Garcia-Mason 1979). In these instances, the development of farming villages appears to represent a form of seasonal aggregation related to protection. At Laguna Pueblo, an abundance of survey data on the locations and chronologies of small settlements supports this interpretation. During the eighteenth and nineteenth centuries, the number of small seasonal settlements associated with that pueblo fluctuated from 48 in the eighteenth century to 26 in the early nineteenth century and then back up to 42 by the late nineteenth century (Ellis 1979:441-2). These fluctuations can be correlated to an increased occurrence of raiding during the late Spanish and Mexican Periods and a dropoff after 1870. Small, relatively unprotected sites might be expected to fall out of use during periods of heavy raiding when populations coalesced at larger defended settlements, and to increase again during times of peace. More clustered farming villages would be easier to defend, and therefore preferable during unsettled times.

Preucel (1988:37, 85) suggested that the establishment of farming villages might constitute a phase in a sequence of settlement system development, whereby seasonal residents spend more time each year in the villages, ultimately staying the year round. A final break is made when public and ceremonial structures are built in former farming villages, thus eliminating the need to return to the central pueblo for ceremonials. This process was occurring at most pueblos by the end of the nineteenth century, and all the villages listed in table 4.1, except for those at Zuni, are now year-round settlements. At Acoma and Santa Ana Pueblos, the erstwhile farming villages are now the primary settlements, while the main pueblos serve as "ceremonial centers," although most families maintain a residence there. At the Hopi farming village of Moencopi, ceremonial activities take place in the farming village, which has several kivas (Frigout 1979:576; Nagata 1970). Although residents of Moencopi remain ceremonially associated with the pueblo of Oraibi, this association may have become tenuous and the process of fissioning may be almost complete.

Satellite Villages at Zuni

As noted in chapter 3, the Zuni farming villages have been the subject of several major research efforts under the aegis of the Zuni Archaeology Program. The Zuni Farming Village Study, directed by T.J. Ferguson and Barbara J. Mills, used informant accounts and archival records to develop an ethnohistory of the villages (Holmes and Fowler 1980; Mills et al. 1982). Architectural surveys of all six villages were conducted as part of this effort; Upper Nutria, Ojo Caliente , and Tekapo were surveyed by Mills and her colleagues (Mills et al. 1982), while the villages of Lower and Upper Pescado and Upper Nutria were surveyed by the Barnard/Columbia Field School directed by Nan Rothschild and Susan Dublin (Rothschild and Dublin 1995). Using the methods of space syntax, T.J. Ferguson analyzed site configurations at Zuni Pueblo, several Protohistoric pueblos and seventeenth-, eighteenth- and nineteenth-century satellite sites (Ferguson 1993, 1996), revealing some interesting differences among the various types of sites.

The history of the Zuni farming villages is summarized in the preceding chapter; this section emphasizes only those aspects which are useful in developing a generalized model of farming villages as a site type. The nineteenth-century Zuni villages are similar to other Puebloan satellite settlements in size and setting, economic orientation, and the presence of political and ceremonial ties to a central pueblo. At Zuni, there were three very distinct groups of satellite villages, each group associated with a particular time period and set of historical circumstances. Unlike their counterparts at other pueblos, the Zuni farming villages did not become permanent settlements and remained in a satellite relationship to Zuni Pueblo throughout their history. The following paragraphs use documentary sources to summarize some of the differences, also listed in table 4.3, between the eighteenth- and nineteenth-century villages.

Eighteenth-century satellite settlements at Zuni were associated with sheep herding, gardening, and the cultivation of orchards. A pattern of transhumance associated with pastoralism was in place by the time of Bishop Tamaron's *visitacion* in June, 1760. Tamaron did not visit Zuni; he was warned against making the trip because the road was quite arduous, and, besides, "I should not find even half of the inhabitants because they are so dispersed in their *ranchos*. They breed livestock, and large flocks of sheep come from there" (Adams 1953:296). Sheep and goats, well suited to the terrain and the quality of forage in New Mexico, were far more numerous than cattle in the Zuni area during the eighteenth and nineteenth centuries (Adams 1954; Holmes and Fowler 1980:242). Tamaron's use of the term *rancho*, generally translated "cattle ranch" in Latin American Spanish, indicates that the

Table 4.3. Attributes of Early and Late Zuni Satellite Villages.

Attribute	18th-century villages	19th-century villages
soil type	aeolian, colluvial sands	alluvial clays
water source	small springs, runoff	abundant springs
distance from Zuni	8-11 km	24-40 km
site location	mesa benches and ridges	valleys
accessibility	remote locations	near main routes into Zuni
sheep corrals	present	present
subsistence activities	orchards, gardens, herding	irrigated fields; herding
population	15-160	440-580

Note: Table is based on Mills et al. 1982).

pastoral sites were small, isolated sheep camps. Archaeological and ethnohistoric descriptions range from the village at Heshoda Luwal'a, which had 49 rooms, peach orchards, and numerous corrals (Ferguson 1993:152), to corral complexes on the abandoned Protohistoric sites of Hawikku and Kechiba:wa (Kintigh 1985:59-63, 69; Smith et al. 1966:119).

A small complex of irrigated fields located three leagues east of Zuni along the *Calle del Obispo* was reported by Fray Francisco Atanasio Dominguez, visiting the pueblo in 1776 (Adams and Chavez 1956:96). Features of the terrain, characterized by lava beds, fit the area around Blackrock, where a satellite settlement, Rancho de Piedras Negras, was reported in 1790 (Sisneros census cited in Ferguson 1993:90). Most likely, the field complex described by Dominguez and the "farming village" enumerated by Sisneros are the same site. The "village" was small; Sisneros counted the population at 28 persons, while Dominguez described the fields as "little patches." The fields served in part to supply the mission priest (Adams and Chavez 1956), and different crops may have been raised there under a different agricultural regime than on the fields closer to Zuni Pueblo. Produce raised for friars in the Rio Grande valley included wheat, broad beans, vetch, and sometimes chick peas and green vegetables, introduced species which required irrigation (Adams 1953). The crops raised on the outlying plots at Zuni were irrigated, whereas fields near Zuni Pueblo were "dependent on rain" (Adams and Chavez 1956:201). The description identifies a second type of eighteenth-century satellite settlement, much smaller than the later nineteenth-century farming villages. These earlier villages were associated with dispersed fields, irrigation and with the cultivation of European-introduced crops in addition to indigenous cultivars.

A third type of eighteenth-century satellite settlement was associated with the cultivation of peach orchards on areas of sandy soil on the slopes of Dowa Yallane and in the mesa country north and west of the main pueblo (Mills et al. 1982; Ferguson 1993). Relict orchards and field houses were described by a number of observers in the late nineteenth and early twentieth centuries (Cushing 1920:142ff; Fewkes 1891:111ff; Spier 1917).

These accounts identify several different types of eighteenth-century satellite settlements at Zuni, each associated with a particular subsistence activity or constellation of activities. A number of the villages also exhibit refuge characteristics, in that they are located in hidden or impregnable places (Dublin 1990). Environmental and locational aspects of these early villages are further discussed below, in chapter 5.

The development of the relatively large, river-valley farming villages during the American Period represents a shift in the practice of residential mobility. At this time, the

Zuni expanded their core settlement area into places that had not been used for villages since the fourteenth century, areas near large permanent springs suitable for *acequia* irrigation that were also on or alongside ancestral pueblos. These aspects are reflected in the synonomy of the earlier American Period villages. *Doya'a* (Upper Nutria Village) translates as "the planting town," and *K'yapkwayina'a* (Ojo Caliente) as "the town whence flow the hot waters." These are names that suggest favorable farming conditions, while the Zuni name for Lower Pescado Village, *Heshoda Ts'in'a*, or "pictured house" underscores its connection with nearby ancient sites (Cushing 1974).

By the 1890s, people were staying longer at the farming villages and the villages had expanded outward from the initial settlements. At Ojo Caliente, several families had begun to stay year round at the village (Fewkes (1891). A trend toward settlement decentralization was also apparent in the changing layout of that village, as residents moved from the mesa to room blocks strung out along the road, and in the layout of Upper Nutria Village, where new room blocks were built outside the circle of initial settlement (Mindeleff 1989). The trend continued with the development of Upper Pescado and Lower Nutria Villages and with the founding of Tekapo circa 1912. By the beginning of the twentieth century, then, the commitment to farming villages at Zuni (as at other pueblos) had intensified, and the pattern of settlement system change outlined by Preucel (1988:85) was underway. However, the Zuni farming villages continued in a satellite relationship to Zuni Pueblo through the mid-twentieth century, by which time the villages were no longer used as residences, although some people continued to commute to fields or sheep camps there.

These capsule accounts indicate that there are clear differences between the two sets of Zuni satellite villages and that residential mobility at Zuni formed part of a dynamic settlement strategy that was responsive to both internal and external stimuli. Contrary to expectations based on population pressure models of settlement change, the Zuni villages were not founded during periods of growth, but rather during a lengthy period of demographic stability. The satellite settlements are functionally different from Zuni Pueblo, and the nineteenth-century farming villages differ from the earlier set. These observations are corroborated by Ferguson's spatial analysis of historic Zuni settlements.

In his seminal study of historic Zuni settlement patterns, Ferguson (1993, 1996) examined the spatial structure of thirteen historic and Protohistoric Zuni sites, including four eighteenth-century satellite villages (Shundekya, Kyaki:ma Refuge Site, Wimaya:wa, and Heshoda Luwal'a) and four later villages (lower Pescado Village, Ojo Caliente, and Lower and Upper Nutria). Using the techniques of space syntax (Hillier and Hanson 1984), he defined social correlates of the observed spatial configurations and then compared these.

Organizationally, each eighteenth-century village consisted of combinations of units that included room clusters, corrals, and unroofed activity areas. These were strongly bounded, suggesting that it was difficult to move from one unit to another within a given community just as it was difficult for outsiders to enter these communities, which were often located in remote, inaccessible terrain (Ferguson 1993:274). The primary difference among the early satellite villages was scale, which ranged from one architectural unit to fourteen units (Ferguson 1993:274). The spatial arrangement of these villages manifested a relatively high degree of asymmetry, a feature associated with social segregation, and the structure of the open space within the villages limited the potential number of chance encounters among residents. As Ferguson (1993:266) points out, these settlements would have been "hard to get to" and "hard to get inside," conditions suitable to the contentious climate of the time. Relatively "hidden" communities were useful for safeguarding resources during periods of heavy raiding, while periodic dispersion of the pueblo's population would provide relief from tensions associated with crowding and factionalism. These issues are discussed in chapter 6.

The river valley farming villages of 1885 demonstrate a different spatial structure, characterized by a relatively high degree of symmetry, a feature that is related to more diffuse social control, and an open space structure that tends to encourage encounters among residents (Ferguson 1993). As Ferguson notes, the spatial structure of these villages expresses the classic Zuni social structure comprised of household lineages cemented by the presence of transspatial cross-cutting groups (Eggan 1950; Kroeber 1917).

A Structural Model of Satellite Villages

Based on ethnohistorical research at Zuni farming villages and on Nagata's (1970) ethnography of the Hopi farming village of Moencopi, Holmes and Fowler (1980:220-25) developed a structural model of satellite villages. Table 4.4 outlines the basic tenets of this model and some implications for the archaeological record of satellite villages.

This model has additional and more specific implications for the locations of satellite villages, as well as their layout, architecture, site structure, and material inventory. Since many of these features of satellite villages are evaluated in comparison to similar aspects of centers, it is important to have some understanding of the settlement system in general.

Table 4.4. Structural Model of Satellite Villages.

Feature	Implications
The satellite is colonized from a central location to exploit a scarce resource.	greater occupation span and building complexity in the center
The satellite is economically independent of the center.	similar variability in subsistence-related artifacts at center and satellites
The population of the satellite is permanent or transhumant but the population of the center is never completely dispersed.	in some cases, seasonality according to the agricultural or pastoral cycle
The satellite is a social microcosm of the center.	
The internal power of the satellite is subordinate to that of the center.	if legitimation is religio-ceremonial, then artifacts and features associated with these activities should be found only at the center and not at the satellites

Note: Table is based on Holmes and Fowler 1980:220-5.

If satellite villages are founded to exploit specific resources, and since they are economically self-sufficient, they should be located in areas that are rich in subsistence-related resources or that possess a unique resource that is considered important to the population of the center. In the Pueblo Southwest, such resources might include an abundant and reliable source of water, soils that are suitable for farming or the cultivation of tree fruits, good forage for domestic animals, *et cetera.* In addition, these economically desirable resources should be scarce or nonexistent in the area of the center.

Since they are founded from a central pueblo, satellite villages have shorter occupation spans than do pueblos, and in some cases they are occupied for only a part of the year, as noted above. Because the population of the pueblo is never completely dispersed and because residents of satellite villages may return seasonally or maintain a residence at the center, centers should be larger than satellites in the sense that there should be more residential structures. Satellite villages, primarily economic in nature, are expected to present a less diverse built environment than centers. The built environment at satellite villages might include residential buildings and economic features such as corrals or storage facilities, but not ceremonial structures such as kivas, or features such as dance floors or plazas. The kinds of public space at satellite villages should differ significantly from that at pueblos, which are political and religious centers as well as residential. Because a satellite village is a "social microcosm" of the center, architectural styles should be similar at both types of settlements, but buildings or rooms in the central pueblo might be more ornate and than those at satellite villages, where one might expect the architecture to be "utilitarian," or rather plain.

The structural distinctions between the two settlement types have implications for the material inventory at satellite villages as well. Because of the shorter occupation span and the limited range of activities at satellite villages, artifact densities should be lower at satellite villages than at pueblos (also see Preucel 1988:189). Very few activity classes, mostly artifacts related to domestic activities and to subsistence, should be represented in artifact inventories from satellite villages. Artifacts related to religious or ceremonial activities are not likely to be found at satellite villages (Holmes and Fowler 1980:224); although a Barnard/Columbia Field School survey team recorded the presence of a part of a kachina headdress near a burned house foundation at Upper Pescado Village (Dublin and Rothschild 1995), this was a unique find. If ceremonial feasting is associated with ritual activities, ceramic inventories should differ between the two settlement types as well, with fewer and smaller painted serving vessels in evidence at satellite villages than at pueblos (Preucel 1988:189). Researchers have also suggested that rare, exotic, or valuable items are unlikely finds at satellite villages (Graham 1994:99; Preucel 1988:189).

Processual Models of Satellite Villages

Structural differences between satellite villages and pueblos are intrinsically related to the nature of the activities conducted at each type of settlement and to factors such as size of the resident population and length and duration of occupation. Equally interesting are factors that are thought to contribute to the development of satellite villages. It is in this sense that the term "processual model" is used to elucidate conditions that might contribute to the viability or adaptive advantage of this type of site in a settlement system. Ethnographic and archaeological research indicates that residential mobility and the presence of satellite villages are related not only to economic requirements, as might be expected but also to social and political factors. Factors that have been cited as important in the development of satellite villages include demographic pressure on land; changing modes of production associated with introduced domesticates; the alleviation of factionalism; and the maintenance of use rights to contested areas.

Demographic pressure on "close-in" land

According to Preucel (1988), residential mobility might become a favored settlement strategy in situations where population growth or aggregation resulted in a shortage of farmland near existing pueblos. In the arid Southwest, Pueblo farmers also protect themselves against crop failure by establishing fields in a number of different locations, some of which might be far from the main pueblo (Ferguson 1985, 1988; Hack 1942). Using ethnographic analogy, Preucel suggested that travel to fields more than 1.5 miles from residences would not be feasible on a daily basis and would therefore require the construction of field houses in the vicinity of the outlying fields. Farming villages would be more likely (rather than field houses) in situations where larger groups of people were needed for defense or to fulfill labor requirements.

Although Pueblo populations declined during the early Colonial Period and remained stable at a low level of population density through the nineteenth century, the seventeenth and eighteenth centuries were periods of demographic reshuffling in the wake of widespread pueblo abandonments and the consolidation of populations in new or existing settlements. This aggregation might have placed demands on close-in lands, as Preucel suggests, although there is not very good evidence for a proliferation of small sites (except for refuge villages) during the seventeenth century. As noted above, the growth of farming villages does seem to coincide with periods of heavier raiding.

Modes and relations of production

These terms and their relationship to residential mobility at Zuni are discussed in chapter 6. New domesticates brought by the Spaniards entered Puebloan subsistence systems slowly during the sixteenth through nineteenth centuries; in most cases, these required access to different types of land, water and labor resources than did traditional Puebloan cultigens. Pastoralism in particular has been associated with residential mobility among both Pueblos and Navajos (Ellis 1978; Kelley 1986), as herding populations moved periodically according to seasonal requirements for forage and shelter (Graham 1994:89). Change in the expression of residential mobility might be expected as new domesticates were brought into production. In these cases, the emergence of satellite villages is part of a process of "modernization," a compromise between the requirements of the "traditional" subsistence economy, which presumably could be met by farming close-in localities, and opportunities offered by the developing market economy (Preucel 1988:43).

Factionalism and "social distance"

Some researchers have suggested that the development of outlying "colony villages" was an effective response to pressures toward fissioning among Pueblo groups (Nagata 1970; White 1942; Whiteley 1988). Such tensions or stresses might be expressed as factionalism, which often intensifies under colonial conditions (see above, chapter 2). Ferguson and Whitehead (1992) document numerous instances of conflict developing in a colonial setting, including demographic stresses (population loss from epidemic disease, crowding caused by infilling and dislocations of neighboring peoples), economic pressures (subsistence stress related to loss of labor or tribute demands), and political conflict associated with political restructuring or shifting alliances. In many Native American communities, these stresses continue to be expressed in the emergence of "traditional" and "progressive" parties who may vie for control of a village or polity. In some cases, this has led to fissioning; the best known instance is the Oraibi split, which occurred at that Hopi village in 1906 after decades of factionalism (Titiev 1944; Whiteley 1988).

Residential mobility serves to alleviate tensions by allowing the population to disperse for periods of time and thereby alleviating crowding. At Ranchitos, the farming villages of Santa Ana Pueblo, Leslie White found that the room blocks were smaller, housed fewer people, and were set farther apart than at the pueblo. This more dispersed settlement pattern created greater "social distance" between residents. White also noted that the increased use of farming villages might create a tendency toward decentralization. The maintenance of a central pueblo where integrating ceremonials occurred would mitigate tendencies toward fission and serve to maintain a "national identity," a factor which is considered important in maintaining viability in the face of colonial incursions (Spicer 1962).

Use rights to contested or marginal lands

On the Pajarito Plateau and in the Dolores area of southern Colorado, the construction of field houses and field complexes in marginal areas was apparently associated with efforts to secure claims to scarce farmland or contested border areas (Head and Snead 1992; Kohler 1992; Preucel 1988). Structural or built elements provide a visual reinforcement that a given area is being used and therefore is not available for development. On the Pajarito Plateau during the Rio Grande Classic Period, inhabitants reused elements of ancient masonry in a symbolic statement of association with past inhabitants (Head and Snead 1992).

To some extent, the development of farming villages in many parts of the Pueblo world appears to be related to changes in the social landscape and encroachments by non-Puebloan peoples on Pueblo use areas. As early as the sixteenth century at Acoma, villagers maintained farming camps in the San Jose valley; "since the late sixteenth century these camps gradually acquired more permanent residential structures, perhaps in reaction to the encroachment of early Spanish colonizers upon the village of ?a k'u [Acoma]" (Garcia-Mason 1979:450). The Laguna farming villages at Paguate and Mesita were founded in the early nineteenth century, during a period of increasing Navajo and Mexican incursions into Laguna farming areas and a high incidence of Laguna lawsuits over land claims (Ellis 1979). The Hopi farming village at Moencopi grew from a farming district with a few field houses into a village with clusters of room blocks and a plaza area during a period when Mormons had begun to establish a settlement at nearby Tuba City (Nagata 1970). In each of these cases, farming villages represent a sort of "structural intensification," whereby residents created a more visible built environment at already existing farming districts in contested areas.

At Zuni, there is additional evidence that structural improvements are used to express use rights to land. During the 1930s, access to rangeland became more restricted after the reservation was fenced; during this period, Zuni stockmen began to built permanent ranch facilities on the range to mark use rights (Ferguson 1993:104). In 1989, a Zuni informant stated that the presence of three courses of standing masonry secured use rights to land in the Zuni farming villages, now in partial decay (Barbara Mills personal communication; Rothschild et al. 1993:125). The use of the built environment to claim rights to land might be expected to have become more important through the Historic Period as Spanish, Navajo, and

Angloamerican encroachment increased.

Chapter Summary

Examples from both pre- and post-Conquest Puebloan societies suggest that satellite villages represent a significantly different use of place than pueblos, a use that may be particularly appropriate in a colonial frontier setting. Mobility was adaptive to the colonial situation in the historic Southwest, and social and political conditions seem to have been as important as demographic factors and economic concerns in structuring the form that residential mobility took at the various historic pueblos. The following two chapters discuss the role of the nineteenth-century Zuni farming villages in the regional settlement system, as well as factors that were associated with the establishment of farming villages and change in Zuni residential mobility over time.

CHAPTER 5

SETTLEMENT PATTERNS AND ENVIRONMENT

Introduction

Settlements are one way in which a society constructs "places" by subdividing and organizing the cultural landscape. Settlement systems develop and change in accord with the exigencies of making a living and with a people's understanding of existing social and political forces. In this chapter, I will look at eighteenth- and nineteenth-century settlement patterns with a view toward understanding how environmental factors structured the Zuni cultural landscape. The chapter deals with the core area of Zuni settlement rather than with the Zuni use area, which is considerably larger (Ferguson and Hart 1985:34-5, 56-7). The maps, figures 3.3, 3.5, and 3.6, show how this core settlement area changed during the Historic Period, initially contracting and later expanding in response to requirements of the various time periods.

The chapter draws on historical and environmental research conducted as part of the Lower Pescado Village project and on information collected by the Zuni Archaeology Program in support of the Zuni land claims cases (Ferguson 1985, 1988, 1989; Ferguson and Hart 1985; Hart 1980; 1991; 1995). There is a large body of descriptive literature on eighteenth- and nineteenth-century Zuni settlements (Ferguson and Hart 1985; Holmes and Fowler 1980; Mills et al. 1982), but, aside from Ferguson's seminal analysis of the spatial syntax of several sites (Ferguson 1993, 1996), very little analysis of these late sites has been done. Broad differences in the settings of the early and late satellite villages have been tied to changes in production (Mills et al. 1982), while some aspects of settlement locations and configurations have been associated with sociopolitical factors, such as defense (Green 1979; Mindeleff 1891). Locational and site catchment analyses of the Protohistoric Zuni settlement system support a close relationship between settlement location in the fertile Zuni River valley and an emphasis on irrigated farming (Kintigh 1985). Although some discussion of the Protohistoric pueblos is included here as a baseline for discussion of later sites, the chapter will focus on the eighteenth- and nineteenth-century satellite settlements.

The Core Area of Zuni Settlement During the Historic Period

The core area of Zuni settlement during the period from 1540 to 1900 conforms roughly to the current reservation boundaries. The Zuni Mountains, the Continental Divide, and the *malpais* were barriers to settlement as early as A.D.1200, while aridity may have precluded settlement west of the Arizona border as the Zuni intensified agricultural production after A.D. 1400 (Kintigh 1985:114-5).

The boundaries of the core settlement area enclose three river systems--the Zuni, the Pescado and the Nutria--and their floodplains, as well as diverse types of land used for farming, grazing, and foraging, and a number of localities with religio-symbolic associations. The most significant of these latter is Zuni Pueblo, *Itiwana* or the Middle Place, which has been continuously occupied since the fourteenth century (Kintigh 1985:70) and holds considerable historic and sacred meaning for the Zuni people. The concept of Zuni Pueblo as the center of the Zuni world was recognized in the fraudulent Cruzate Grant[1] which defined Zuni territory extending two leagues in all directions from the center at Zuni Pueblo (Green

1990:369). Historically, the Zuni people have held exclusive rights to a much larger sustaining area, without villages but supporting fieldhouses, sheep camps, temporary campsites and archeological sites and landforms with sacred or historic associations (Ferguson and Hart 1985:56). Although the Zuni notion of "territory" includes this sustaining area, the Angloamerican notion might be construed to include only areas associated with settlements, as it has in other localities. From this perspective, the Zuni sustaining area would be considered "empty" land, available for use and settlement.

Characteristics of the Sample

Table 5.1 lists the settlements that are included in the regional analysis. Although a few other sites are mentioned in historic records, I have included only those for which there are data on location, timing, and site size; although some small settlements have been left out of this analysis, all the known large villages are included. For the purposes of this analysis only, several of the periods delineated in chapter 3 have been collapsed or truncated. Sites designated as "Protohistoric" include those occupied in 1540, the date of the Coronado *entrada*, through 1680, the Pueblo Revolt. The "Revolt Period" extends from 1680 until 1692, the date of the *reconquista*. Only two sites, Halona:wa and Dowa Yallane, are included in this category; the end of this period is marked by the consolidation of the Zuni population at Halona:wa, renamed Zuni Pueblo. The "Spanish/ Mexican Period" extended from 1692 to 1846, the date of Kearney's conquest of New Mexico. The "American Period" continues to the present.

The table conveys the dynamic quality of Zuni settlement during the Historic Period.

Table 5.1. Sites included in the Regional Analysis.

Site	Period	References
Hawikku	Protohistoric	Howell 1992; Kintigh 1985; Mindeleff 1891; Smith et al. 1966
Kechiba:wa	Protohistoric	Kintigh 1985; Mindeleff 1891; Spier 1917
Kwa'kina	Protohistoric	Kintigh 1985
Kyaki:ma	Protohistoric	Ferguson et al. 1977; Kintigh 1985; Mindeleff 1891
Mats'a:k'ya	Protohistoric	Kintigh 1985; Mindeleff 1891; Spier 1917
Halona:wa (Zuni)	Protohistoric-present	Caywood 1972; Ferguson and Mills 1982; Kintigh 1985; Kroeber 1916; Mindeleff 1891
Dowa Yallane	Pueblo Revolt	Ferguson 1992; 1993, 1996; Mindeleff 1891
Ranchos de Hawikku	Spanish/Mexican	Ferguson 1993, 1996; Ferguson and Hart 1985; Minge 1980; Smith et al. 1966
A'mossi'a	Spanish/Mexican	Ferguson 1993, 1996; Ferguson and Hart 1985
Kyaki:ma Refuge Site	Spanish/Mexican	Ferguson 1993, 1996; Ferguson et al. 1977
Shundekya	Spanish/Mexican	Ferguson 1993, 1996; Kroeber 1916; Spier 1917
Kolliwa	Spanish/Mexican	Ferguson 1993, 1996; Kroeber 1916; Spier 1917
Wimaya:wa	Spanish/Mexican	Ferguson 1993, 1996; Kroeber 1916; Spier 1917
Heshoda Luwal'a	Spanish/Mexican	Ferguson 1993, 1996; Fewkes 1891; Kroeber 1916; Spier 1917
Ranchos de Piedras Negras	Spanish/Mexican	Ferguson 1993, 1996
Ojo Caliente	American	Mills et al. 1982; Rothschild and Dublin 1995
Lower Pescado	American	Holmes and Fowler 1980; Mills et al. 1982; Rothschild and Dublin 1995
Upper Nutria	American	Mills et al. 1982; Rothschild and Dublin 1995
Upper Pescado	American	Holmes and Fowler 1980; Mills et al. 1982; Rothschild and Dublin 1995
Lower Nutria	American	Mills et al. 1982; Rothschild and Dublin 1995
Tekapo	American	Mills et al. 1982; Rothschild and Dublin 1995

The only site that persisted through the entire study period was Zuni Pueblo, although even that settlement was abandoned briefly during the Pueblo Revolt, when the populace moved temporarily to the refuge village atop Dowa Yallane. Some Protohistoric sites were reused later, with a reduced population or for a special purpose.

Timing

The sites were assigned to periods corresponding to the dates of the major occupation based on dendrochronology where available, or on ceramic associations. Some sites or parts of sites were used during several periods; for these sites, only the major occupation period is listed, except for Zuni Pueblo, which remained the primary settlement throughout the period. For instance, Heshoda Luwal'a, a satellite village, was founded during the Mexican Period or perhaps earlier (Ferguson 1993:152); although it was still in use in the 1890s, it was greatly reduced in size (Fewkes (1891:102). Features of many historic sites remain in use to this day, although no one may be living there: building materials may be stockpiled for future use, gardens may be cultivated, or people may use a place as a picnic area (Barbara Mills personal communication 1990; Rothschild and Dublin 1995; Rothschild et al. 1993). These places are not considered "abandoned," rather the uses of the places have changed; although this is an important distinction, only residential settlements are considered in this analysis.

Tree ring samples collected at the nineteenth-century farming villages of Lower Pescado, Ojo Caliente and Upper Nutria are listed in appendix B and tables 3.4 and 3.5. Although some building had occurred at these locations prior to 1846, major construction post-dated 1850, peaking in the 1890s and dropping off by the 1940s. Tree ring dates for

Table 5.2. Stem-and-Leaf Plot of Tree-Ring Dates from Lower Nutria.

Decade	Year (Lower Nutria)	Year (Tekapo)
184	6	4 6
185		6 7 8 8
186	1 5	4 5 7 8
187		1 1 2 4 4
188	4 5 6	8
189	5 5 8	9
190	8	
191	0 0 2 4 4 4 4 5 5	5 6 6 6 8 9 9
192	3 3 4 7 8 8 9 9	1 1 3 3 5 5 6 6 6 6 6 6
193	0 0 0 1	

Note: Data from Rothschild and Dublin (1995) and Mills et al. (1982).

Lower Nutria and Tekapo (Mills et al. 1982; Rothschild and Dublin 1995) are listed in table 5.2. The peak of construction activity at both sites appears to have been in the early twentieth century, although the presence of dates in the latter half of the nineteenth century suggest some earlier activity. Historical accounts record construction at Lower Nutria and at Upper Pescado during the 1990s, while Tekapo was founded about 1912 (Ferguson 1993:173; Mills et al.1982). The tree ringdata, the archaeological testing at Lower Pescado Village, and historic accounts all indicate that the major occupation of the river valley farming villages occurred after the onset of the American Period (Bloom 1936; Mills et al. 1982; Mollhausen 1858; Rothschild and Dublin 1995; Whipple 1855). The earliest historic account, Whipple's and Mollhausen's description of a visit to Pescado in November of 1853, describe a small, ephemeral settlement (Foreman 1941; Mollhausen 1858; United States Congress 1854). In 1856, Kendrick noted that the Zuni were slowly (emphasis mine) enlarging their planting grounds at the springs at Nutria, Ojo Caliente, and Pescado (Kendrick 1947, 1950). By the 1880s, the villages at Nutria and Pescado had grown substantially, as the Cushing census of 1880 attests (Baxter 1883; Bloom 1936; Holmes 1983). For these reasons, the villages are assigned to the American rather than to the Spanish/Mexican Period, although there probably was some earlier use of these localities.

Site types

The Protohistoric pueblos were year-round settlements that supported a full range of economic, sociopolitical, and ceremonial activities. Except for Zuni Pueblo, these villages had been abandoned by 1680 or earlier; the consolidation of the population at Zuni Pueblo effected a major restructuring of the Zuni landscape, accompanied by a restructured social organization (Eggan 1950; Ferguson 1993). The Pueblo Revolt settlement at Dowa Yallane, in effect a "dress rehearsal" for consolidation (Wilcox 1991:107), served as a refuge from Spanish reprisals during the fractious seventeenth century. Little is known about the duration of occupation and the range of activities occurring at Dowa Yallane, although it is likely that the Zuni continued to use the floodplain for farming since there was little space for fields on the mesa top (Kroeber 1916:28-30). De Vargas (1914:304-5) reported that there were three kivas at the refuge village, suggesting that ceremonial activities did indeed take place there. Ferguson's survey found evidence of one possible kiva, and two plazas, which may have been used for ceremonials (Ferguson 1993:138).

Eighteenth- and nineteenth-century satellite villages at Zuni were the foci of seasonal circulation associated with subsistence activities--agriculture, cultivating orchards, and sheep herding. Residents of the satellite villages returned to Zuni Pueblo during the winter months, the period during which most integrative and ceremonial events occurred. The shift from several year-round pueblos to a single central pueblo and satellite settlements represented a reorganization and a new conception of the landscape, melding "old" (Zuni Pueblo) and "new" (satellite villages) places. In this new scheme, various types of land took on new meanings. Rangeland is a good example; poorly watered grasslands that were not suitable for maize agriculture became valuable as pastoralism became more important in the Zuni subsistence economy. During the farming season, sheep could not be grazed in the river valleys, which were used for agriculture, but the animals also required supervision and protection, particularly during periods of heavy raiding. As a result, sheep camps were established in parts of the Zuni foraging territory and land categories were redefined to suit this new use.

Models of Settlement Change at Zuni

The Zuni settlement system was reorganized and redefined at least three times during the Historic Period. The initial reorganization occurred in the seventeenth century with the abandonment of most of the Protohistoric pueblos and the consolidation of the population at Zuni Pueblo, the second with the establishment of small satellite settlements, many of which were associated with pastoralism. The third reorganization occurred during the mid-nineteenth century, as the river valley farming villages became larger and more important.

What were the factors that underlay the development of satellite villages and changes in the nature and locations of the villages?

Consolidation and the advent of historic seasonal circulation were related to economic and political changes associated with the European conquest and subsequent colonial rule, initially under Spain and later under the United States. Previous researchers have cited a number of factors (summarized in table 5.3) that are thought to be instrumental in these settlement shifts. None of these are mutually exclusive, and the very number of possible explanations indicates the complexity of settlement decisions during this period.

As noted above, the locations of the Zuni satellite villages reflected economic decisions associated with the incorporation of European cultigens and domestic animals that had different environmental requirements than maize. The villages also have been interpreted in sociopolitical terms, as defensive sites. Also, Cushing suggested that the villages were initially refuges where the Zuni could practice their religion, which had been curtailed or outlawed by the Spanish (Green 1979); the refuge village at Dowa Yallane was also used during periods of warfare or when the Zuni feared revenge for violence against the Spanish or their institutions. Defensive features of the nineteenth-century villages have been attributed to the need for protection from raiding (Mindeleff 1989:227).

While I agree in part with these interpretations, I would argue that places can have many "meanings," and that many forces contributed to the restructuring of the Zuni settlement system. These can be accommodated in three broad categories: 1) economic decisions associated with new domesticates, modes of production, and entry into a nascent market economy during the mid-nineteenth century (Crampton 1977; Mills et al. 1982); 2)

Table 5.3. Models of Zuni Settlement Change during the Historic Period.

Model	Test Implications for satellite villages
Socioeconomic factors	
economic change related to incorporation of European products	presence of European-introduced domesticates site locations in areas suitable for orchards, grazing, and/or raising wheat
change in modes of production	more complex scheduling different composition of work groups
entry into a market economy, initially through grain trade	surplus production; Euroamerican goods at sites access to transport routes
External relations	
religious refuge	religious structures; ritual artifacts
defense	defensible location of sites; defensive architecture
boundary maintenance	location at "pressure points;" increased settlement by non-Zunis
Internal relations	
coping with stress related to consolidation and factionalism	increased "social distance" at satellite villages; historic evidence for factionalism

geopolitical factors, including defense and boundary maintenance, related to the increased complexity of the social landscape during periods of Athapaskan and Euroamerican expansion; and 3) internal social stresses associated with consolidation and, later, with factionalism.

The Historic Settlement System

Researchers have documented differences in the settings, architecture, sizes, and configurations of various historic Zuni settlements (Ferguson 1993, 1996; Mills et al. 1982; Mindeleff 1989; Rothschild and Dublin 1995). This variability demonstrates the complexity of the settlement decisions that were being made at Zuni during the Historic Period. The chapter explores environmental aspects of variability among the eighteenth- and nineteenth-century Zuni settlements. The Protohistoric villages, discussed by Kintigh (1985:58-70), provide a baseline for the discussion of the post-Revolt period. Very little is known about the earliest satellite site, the refuge village at Dowa Yallane, and access is restricted because of its sacred associations for the Zuni people.

The map, figure 3.1, shows the locations of the Protohistoric and Historic Zuni settlements, major landforms, and water courses. The patterning of sites is generally linear, following the major watercourses; although the Zuni River valley remained the focus of settlement throughout the period, the valleys of the Pescado and Nutria Rivers became more important during the nineteenth century.

Size of the Core Settlement Area

The historic settlement area extended about 55 kilometers on a southwest to northeast axis; at its widest point, it was about 15 kilometers. Zuni Pueblo is located at the approximate mid-point of the core area during the Spanish/ Mexican and American Periods.

There is a relationship between the linear dimensions of the settlement system and historic accounts of travel in the Zuni area, which suggest that the extent of the settlement system may have been constrained by travel time. In the eighteenth century, 55 kilometers was close to the maximum distance covered during one day's travel on horseback. Members of the 1776 Dominguez-Escalante expedition travelled from 19 to 58 kilometers daily (Bolton 1950; Warner 1995). In 1881, John Bourke estimated that the trip by buckboard from Fort Wingate to Zuni, a distance of about 65 kilometers, took an entire day (Bloom 1936:108). That this was not an appreciable difference from travel times of a century earlier may have been because of the rough terrain through the Zuni Mountains. When roads were better, travellers made accordingly better time. Baxter and Cushing, also in 1881, travelled on horseback from Pescado to Zuni, a distance of 26 kilometers, in about 2 hours, from "late morning" until noon (Baxter 1882:29). The *Calle del Obispo*, which connected the two settlements, was a well-travelled wagon road; the trail between Fort Wingate and Nutria was rough and travel would have been accordingly slower (Curtis 1883:10; Lange and Riley 1970:57). Extrapolating from this figure of 13 kilometers per hour on horseback, I estimated that one day's travel, unencumbered, along a good road, would cover a maximum distance of about 75 kilometers. The nineteenth century estimates are reasonably close to the linear extent of the Zuni core settlement area.

Distribution of Water Resources and Soils

Relationships between site locations and the distribution of resources are useful in isolating functional differences among sites and temporal differences in the criteria for locating settlements. Kintigh's analysis of the Protohistoric settlement pattern underscored the importance of agricultural productivity, measured by water and soil quality, for determining site locations during the fifteenth and sixteenth centuries in the Zuni area (Kintigh 1985:108). Between A.D.1175 and A.D.1630, shifts in settlement location were directly related to changes in agricultural strategies. Not surprisingly, water and soil quality remained important determinants of settlement location during the Historic Period.

Settlements and water resources

Water is a major limiting factor for human occupation, agriculture, and pastoralism in this semi-arid environment. The Zuni area is relatively well-watered, although water resources are not evenly distributed across the landscape or over time (Ferguson and Hart 1985:110-113; Orr 1982; Rose et al. 1982). The three major streams (now intermittent but previously permanent), five permanent springs, and a number of seasonal washes, springs, and seeps that are fed by six aquifers comprise the various types of water resources depicted on the map, figure 5.1.

Of the six aquifers, only one, the shallow alluvial aquifer, would have been accessible before the advent of machine drilling of deep wells. Hand-dug wells into this aquifer, located in the beds and valleys of the Zuni, Pescado and Nutria Rivers ranged from about five to forty feet (Ferguson and Hart 1985:111). Bohrer described wells dug into the bed of the Zuni

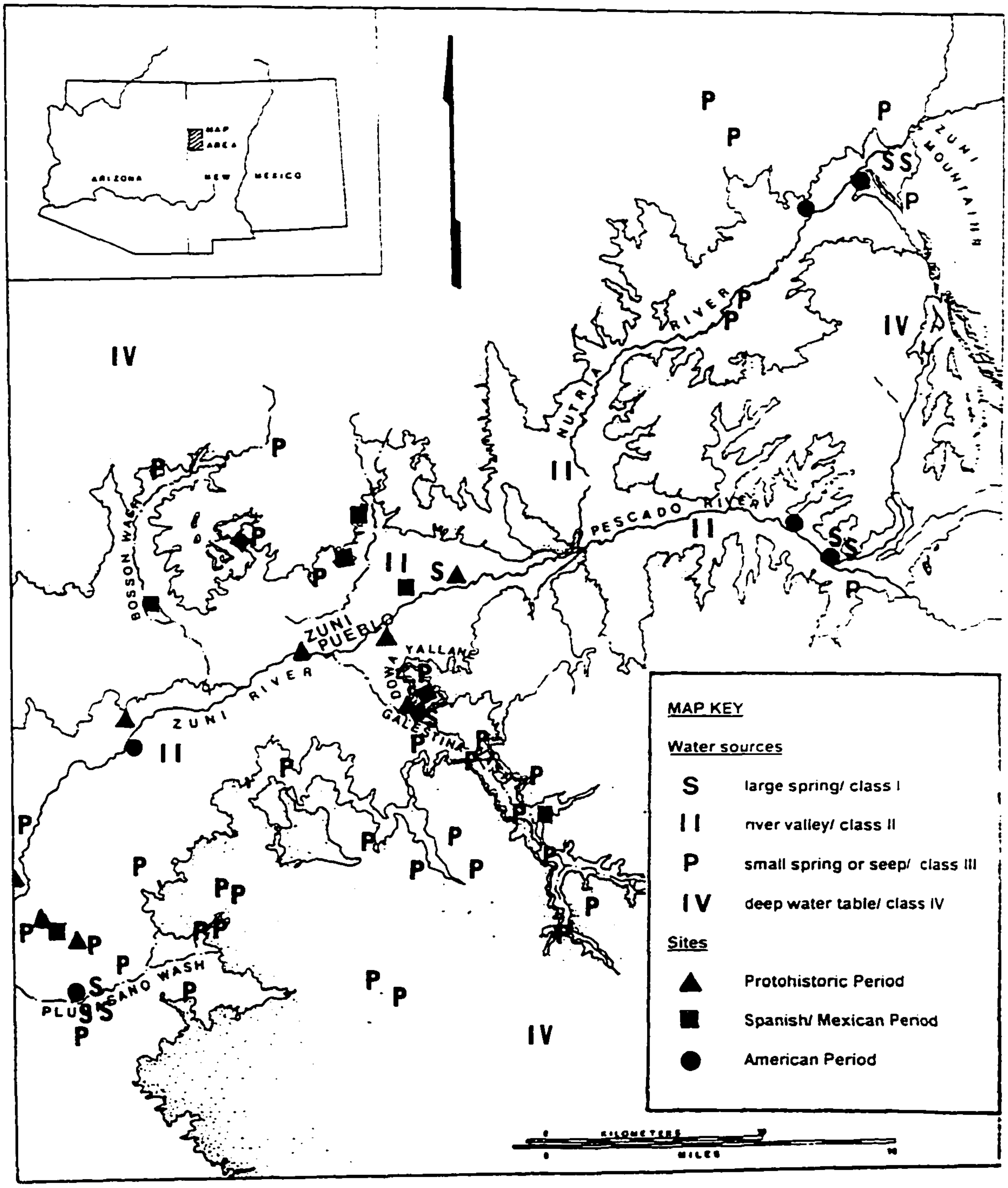


Figure 5.1. The distribution of historic Zuni sites and water resources.

River to a depth of about six feet; these were accessible via a ramp or earthen staircase (Bohrer 1960:182). Figure 5.2 is a photograph of the north wall of a historic walk-in well that was excavated at Lower Pescado Village (Excavation Unit 6). The well was slightly more than six feet deep and was lined with clay (Rothschild and Dublin 1995:87-92). The deep aquifers feed numerous seeps and springs, most of which are small and seasonal.

Figure 5.2. The north wall of Excavation Unit 6 at Lower Pescado Village. This feature was identified as a walk-in well.

The five large perennial springs or groups of springs, at Pescado, Ojo Caliente, Nutria, Kyaki:ma, and Blackrock, each have annual flows exceeding 100,000 cubic meters per year (Kintigh 1985:91); flows were more copious before dams were constructed in the twentieth century, changing the hydrology of the reservation and surrounding areas (Ferguson 1985, 1988). The Zuni consider these water sources sacred because of their relationship to Zuni survival. As Pedro Pino, the governor, told Major Whipple in 1853, the Zuni make offerings at springs because "we live in a country without acequias, and, for the growth of our crops, depend upon rain" and the replenishing of the springs (Whipple 1855:22). The springs continue to be symbolically and spiritually important, even as agriculture wanes as a major source of Zuni livelihood. Reservoirs have been built at four of the five large springs (Pescado, Nutria, Blackrock, and Ojo Caliente); the spring at Kyaki:ma and the Sacred Springs at Ojo Caliente are shrine areas.

The streams were good, somewhat less reliable, sources of surface water. Stream flows varied, being generally higher in the spring and early summer when recharged by snow melt. Sometimes water volume increased briefly during late summer rainstorms, although much of the water that fell during these violent and brief storms was lost in rapid runoff.

Historical accounts, written between 1776 and 1916 (table 5.4) depict river flows as variable. Even though flows were higher in the eighteenth and nineteenth centuries, the rivers do not seem to have been reliable sources of surface water, although wells could be dug into the high water tables. The Zuni and Pescado Rivers, the most frequently described, were wide but shallow, and flows varied seasonally and annually. Seasonal variation is evident in the contrast between Simpson's description of the Zuni River in late summer, "a

Table 5.4. Historic Descriptions of Water Resources at Zuni.

Date	Subject	Description
11/1776	springs	Two springs are mentioned in Escalante's journals, Ojo del Pueblo Redondo (Pescado Springs) and a spring about three leagues from Zuni (Blackrock?); both supported irrigation (Adams and Chavez 1956:96).
11/1776	Zuni River	"The pueblo has no river, but an arroyo, which flows only in a very rainy season or when the snows melt. And when this does not occur, they open a number of wells in it" (Adams and Chavez 1956:96).
8/1849	Pescado Springs	Simpson described Ojos del Pescado, "bubbling from basaltic rocks" (McNitt 1964:114).
8/1849	Zuni River	Zuni River was about six feet wide but only "a few inches" deep in late summer (McNitt 1964:114).
11/1853	Nutria valley	Whipple described valley from Ojo de Oso to Zuni Pueblo as "extensive [and] well-watered" (U.S. Congress 1854:21)
11/1853	Pescado valley	Pescado River, a "pretty stream" with many fish, flowed underground for a distance, "re-emerging" at the confluence of the Pescado and Nutria rivers. The river was probably entrenched, since Whipple and Mollhausen had to ascend steps into the village. The river, a "rapid strean," was wide but shallow, and was crossed on stepping stones (Mollhausen 1858:83; U.S. Congress 1854:135).
11/1853	Blackrock	Whipple wrote that the springs, "below the *ranchos* water numerous patches of cultivated gardens" (U.S. Congress 1854:139).
11/1853	Zuni River	twelve feet wide but shallow. (Mollhausen 1858:90)
8/1857	Pescado and Zuni Rivers	Beale wrote that "[t]he spring bursts a lively brook from under the rocks and runs a bold stream at this season beyond Zuni" (Lesley 1929:227-8).
1879-83	Zuni River	Cushing noted that the river was about two inches deep and one foot wide in most places, and disappeared about 1/8 mile below the pueblo. It had been totally dry twice between 1879 and 1883 (Green 1990:299).
5/1881	Zuni River	Bourke's journals note that the river had "cut-banks" of clay but was dry save for a few pools of standing water. Bourke thought that the valley probably had water several months of the year (Bloom 1936:112).

Table 5.4, continued

6/1881	Pescado Springs	"a fine large spring full of little fish [which] gushes out beautifully from beneath a great lava rock giving fertility to a large district" (Baxter 1882:77)
6/1881	Zuni River	so shallow that "in most places the water would hardly reach above the ankles" (Baxter 1882:79)
3/1883	Zuni River	according to Bandelier, "a turbulent valley stream ...., almost not to be forded" (Lange and Riley 1970:56)
3/1883	Pescado R.	high and turbulent (Lange and Riley 1970:57)
3/1883	Nutria R.	pools of water (Lange and Riley 1970:57)
1916	Nutria River	"of considerable size" and irrigated an area two miles long (Spier 1917:216)
1916	Pescado Springs	two groups of "large copious springs, ... gushing from under the lava fault, ... [that] constitute the perennial source of the Zuni River" (Spier 1917:216)
1916	Ojo Caliente Springs	of "great quantity," allowing irrigation of a large area (Spier 1917:216).

few inches deep," (McNitt 1964:114), and Bandelier's description of the Zuni River in March 1883 - "a turbulent valley stream, ... almost not to be forded" (Lange and Riley 1970:56). Ironically, Bandelier's description of the Zuni River in near flood was made during a dry year (Rose et al. 1982). In 1883, Cushing wrote that the shallow Zuni River had been totally dry on two occasions since his arrival at the pueblo in 1879 (Green 1990:299). On the other hand, the descriptions concur in their assessment of the springs as reliable and abundant water sources. In 1882, Baxter characterized the spring at Pescado as "a fine large spring ... which gushes out beautifully ... giving fertility to a large district" (Baxter 1882:77). The springs at Ojo Caliente were "of great quantity," and irrigated a large area, according to Spier (1917:216).

Runoff was an important seasonal source of surface water, which was diverted onto

Table 5.5. Classes of Water Resources on the Zuni Reservation and Agricultural Uses.

Class	Description	Examples	Agricultural Uses
I	permanent springs with flows >100,000cu. m	Pescado Springs; Rainbow Springs and Sacred Springs at Ojo Caliente; Nutria Springs; springs at Kyaki:ma and Blackrock	*acequia* irrigation
II	intermittent streams	Zuni, Pescado, and Nutria Rivers	wells; hand irrigated gardens
III	washes, arroyos, and seeps	Galestina, Bosson, and Oak Washes; side canyons	runoff farming
IV	no surface water; deep water table	northwest, southeast reservation	not suitable

fields by deflecting dams; historically, maize fields in the Zuni River valley were irrigated in this fashion (Bohrer 1960:181; Cushing 1974; Ferguson 1988:6-11; Kintigh 1985:97). Topography was an important factor in setting up *akchin* (or floodwater) fields, which needed to be on sloping land at the base of arroyos and along the edges of the river valleys. Annual rainfall and snowfall affect the abundance of water from runoff; since these amounts varied over time, runoff was not a reliable source of water.

The several different kinds of water resources that were available during the Historic Period can be classified according to abundance and reliability, listed in table 5.5. Most important (class I) were the permanent springs with large flows that were suitable for *acequia*, or ditch irrigation. The major streams comprised the second category (class II); surface water was available seasonally and wells could be dug into the alluvial aquifer. The third category (class III) consisted of small, seasonal springs and seeps, and runoff water in the washes and arroyos in the major drainages and along the valley edges. These sources supplied fields watered by deflecting dams and were also used for watering livestock. In the northwest and southeast corners of the reservation and in the Zuni Mountains between Pescado and Nutria, water was virtually unavailable until the advent of machine-dug wells with windmill-powered pumps.

Water sources, subsistence requirements, and site locations

As noted above, the quality of water sources varied spatially and temporally across the core settlement area. Table 5.6 lists the classes of water sources associated with the various protohistoric and historic Zuni sites, while the map, figure 5.1 (page 126), shows the distribution of land areas watered by these different sources. That proximity to an accessible water source was a requirement for locating sites is evident in the table; all the sites are located in areas watered by permanent springs, rivers, or washes and seeps. Although all the sites were near a water source, the quality of those sources varied, and the importance of access to an abundant and reliable water source (classes I and II) differed during the various periods.

Table 5.7 compares the expected and observed frequency of sites that were associated with the various classes of water resources. If there were no association between site location and the quality of water resources (the null hypothesis), then sites would be equally likely to occur in the vicinity of any water source. Expected values, therefore, were derived from the percentages of land associated with the various classes of water resources on the reservation.

Table 5.6. Major Water Sources Associated with Protohistoric and Historic Period Sites.

Site	Period	Primary Water Source	Class[1]
Hawikku	Protohistoric	Zuni River/ Plumasano Wash	II
Kechiba:wa	Protohistoric	Plumasano Wash	II
Kwa'kina	Protohistoric	Zuni River	II
Kyaki:ma	Protohistoric	Kyakima spring	I
Mats'a:k'ya	Protohistoric	Zuni River	II
Halona:wa (Zuni)	Protohistoric-present	Zuni River	II
Dowa Yallane	Spanish/Mexican	Zuni River	II
Ranchos de Hawikku	Spanish/Mexican	Zuni River/ Plumasano Wash	I/ II
A'mossi'a	Spanish/Mexican	Bosson Wash	III
Kyaki:ma RS	Spanish/Mexican	Kyakima spring	I
Shundekya	Spanish/Mexican	Galestina Wash	III
Kolliwa	Spanish/Mexican	Oak Wash	III
Wimaya:wa	Spanish/Mexican	Oak Wash	III
Heshoda Lu wal'a	Spanish/Mexican	small spring	III
R. de Piedras Negras	Spanish/Mexican	Blackrock spring	I
Ojo Caliente	American	Ojo Caliente springs	I
Lower Pescado	American	Pescado springs/ Pescado River	I
Upper Nutria	American	Nutria springs/ Nutria River	I
Upper Pescado	American	Pescado springs/ Pescado River	I
Lower Nutria	American	Nutria springs/ Nutria River	I
Tekapo	American	Zuni River	II

[1]For a definition of soil classes, see Table 5.5.

Table 5.7. Expected vs. Observed Distributions of Sites and Water Resources.

Class	All Periods		Protohistoric		Spanish/Mexican		American	
	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs
I	2.2	9	0.6	2	1.0	3	0.6	5
II	2.6	6	0.7	4	1.1	1	0.7	1
III	7.3	6	2.1	0	3.1	5	2.1	0
IV	8.9	0	2.5	0	3.8	0	2.5	0
Totals	21	21	6	6	9	9	6	6

Table 5.7a. Results of the Kolmogorov-Smirnoff One-Sample Test on the Distributions of Sites and Water Resources.

Values	All	Protohistoric	Spanish/Mexican	American
D_{max}	.4857	.7797	.4222	.7797
N	21	6	9	6
probability	<.01	<.01	<.10	<.01

The formula used to calculate expected values was

$$r_i = N\,a_i / A$$

where r_i is the expected value for a particular class of land; N is the total number of sites; a_i is the area of the class of land for which expected values are being derived; and A is the total area (Hodder and Orton 1976:224-5).

The Kolmogorov-Smirnoff One-sample Test was used to test the null hypothesis for each time period and for all the sites. This non-parametric test evaluates the goodness of fit between expected and observed distributions that are grouped in three or more ordered categories. The test statistic (D_{max}) is the maximum difference between the expected and observed cumulative frequency distributions expressed as proportions of the total sample size (Blalock 1972:262-4). The statistic is keyed to a table of critical values to evaluate significance. Table 5.7a lists the values of the statistic and the associated probabilities for each time period.

The highly significant statistical association between Protohistoric and American Period site locations and availability of a high quality water source suggest that the presence of an abundant and reliable water source was a factor in making settlement decisions during these two time periods. The Protohistoric pueblos were all located in the well-watered Zuni River valley. an area that was considered suitable for ditch irrigation, if the flow was perennial so that water would be available during the summer, and if the river was not entrenched (Kintigh 1985:102). It is not clear, however, that the Zuni practiced ditch irrigation on a large scale before the late nineteenth century. There is no archaeological evidence of canal systems, although a sixteenth century observer, Diego de Luxan, described what may have been canals near Hawikku (Hammond and Rey 1929; Holmes and Fowler 1980:154). Historic accounts written from the eighteenth and mid-nineteenth centuries are clear in their assertions that the Zuni did not use canal irrigation at these times (Adams and Chavez 1956: Whipple 1855:140); whether this was because of changes in the river regimes, because they were unfamiliar with the technology, or because the writers did not see canals is not known. Canal irrigation was used in the Rio Grande pueblos throughout this period. Since the Zuni would have been familiar with agricultural techniques used in other parts of the pueblo world, I would surmise that canal irrigation was not feasible or cost-effective in the Zuni area before the late nineteenth century.

The lesser importance of access to classes I or II water sources during the Spanish/ Mexican Period reflects the presence of upland sites, which were used predominantly for herding. Access to water for herds and shepherds was important, but the availability of water for *acequias* was not, since fields, gardens, and orchards at these settlements were probably watered by runoff channelled by diversion dams (Ferguson 1988). Many of these satellite villages were situated near class III water sources--washes and small, seasonal springs. Access to abundant and reliable water does not predict settlement locations during this period, although abundant water was available in the farming districts, for example at Ranchos de Piedras Negras. By the mid-nineteenth century, proximity to class I water sources had become a criterion of site location, as the three summer villages at the springs of Pescado, Nutria, and Ojo Caliente grew in size and importance. The large springs at Blackrock and Kyaki:ma, which were closer to Zuni Pueblo (7 and 8km respectively), did not support summer villages, although there were fortified fieldhouses at Blackrock, and on the slopes of Dowa Yallane. By the 1850s, the focus of seasonal settlement had shifted to the large perennial springs, which could, and did, support canal irrigation. Access to abundant and reliable water does predict settlement locations during this period

Rainfall and hydrological sequences

The quality of water resources varied over time, seasonally and annually. River flows were highest in the spring when the rivers were recharged by snow melt, while in the height of the summer or during a drought, they might have been dry, as Cushing noted in 1883 after a period of drought (Green 1990:299). The amount of precipitation affects aquifer levels as well as surface water, so reduced river and spring flows would continue for a time after a series of severely dry years, until aquifers were recharged.

Estimates of annual precipitation reconstructed from tree-ring sequences for the southeastern Colorado Plateau, including the Zuni area, during the period from A.D.1540 to A.D.1936 are listed in Appendix A (Rose et al. 1982). Annual precipitation varied, often significantly, from year to year. Figure 5.3 charts the Palmer Drought Severity Indices (PDSI) for the same period. The PDSI, which is based on the dendroclimatology of the area, "measures the cumulative effect of ... drought on the growth of crops" (Robinson et al. 1982); values that fall below -1 indicate "potentially significant" dry conditions (J. Dean, personal communication 1991).

These data demonstrate that the occurrence of dry years was unpredictable, not a particularly startling conclusion. Since rainfall and river flows varied from year to year and decade to decade, the rivers were not a reliable source of surface water for irrigation, although wells could be dug into the alluvial aquifers as long as the water table remained high. In fact, surface water in general--washes, seeps and ephemeral springs--was an unpredictable resource. Historically, the Zuni coped with this unpredictability by storing a two years' supply of grain against drought, by planting in various areas of the reservation, and by using different kinds of water control (Bohrer 1960; Ferguson 1988; Stevenson 1904).

Table 5.8 is a summary of rainfall and drought conditions based on PDSI values for each decade from A.D.1600 to A.D.1959. The presentation of these data also reflect efforts to manage climatic unpredictability. The table lists decade totals of the number of clusters of

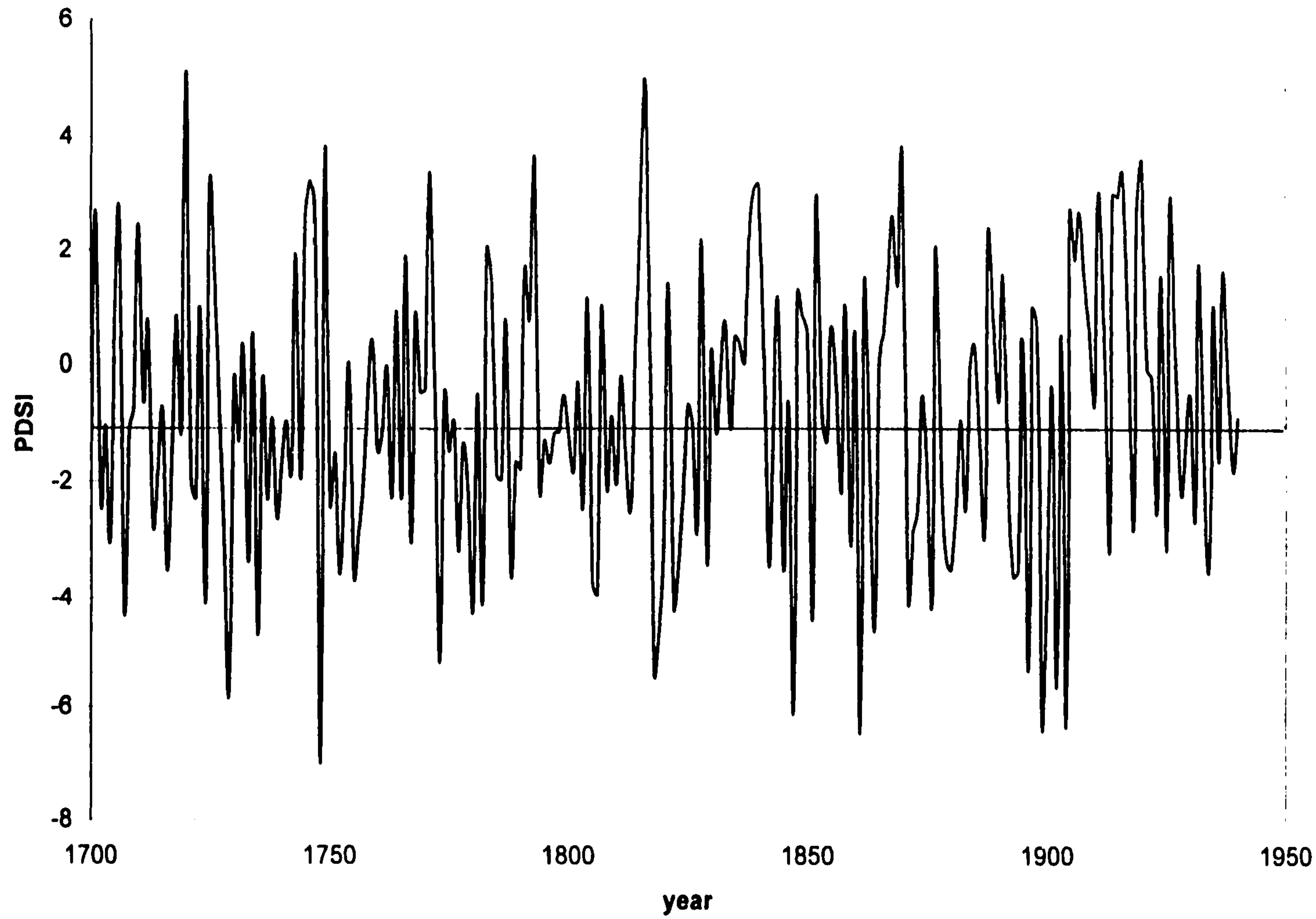


Figure 5.3. Graph of the Palmer Drought Severity Indices (PDSI) for the Zuni area, A.D.1700-1950. Data are from Robinson et al. 1982. Values below -1 (indicated by the horizontal line) indicate potentially severe drought conditions.

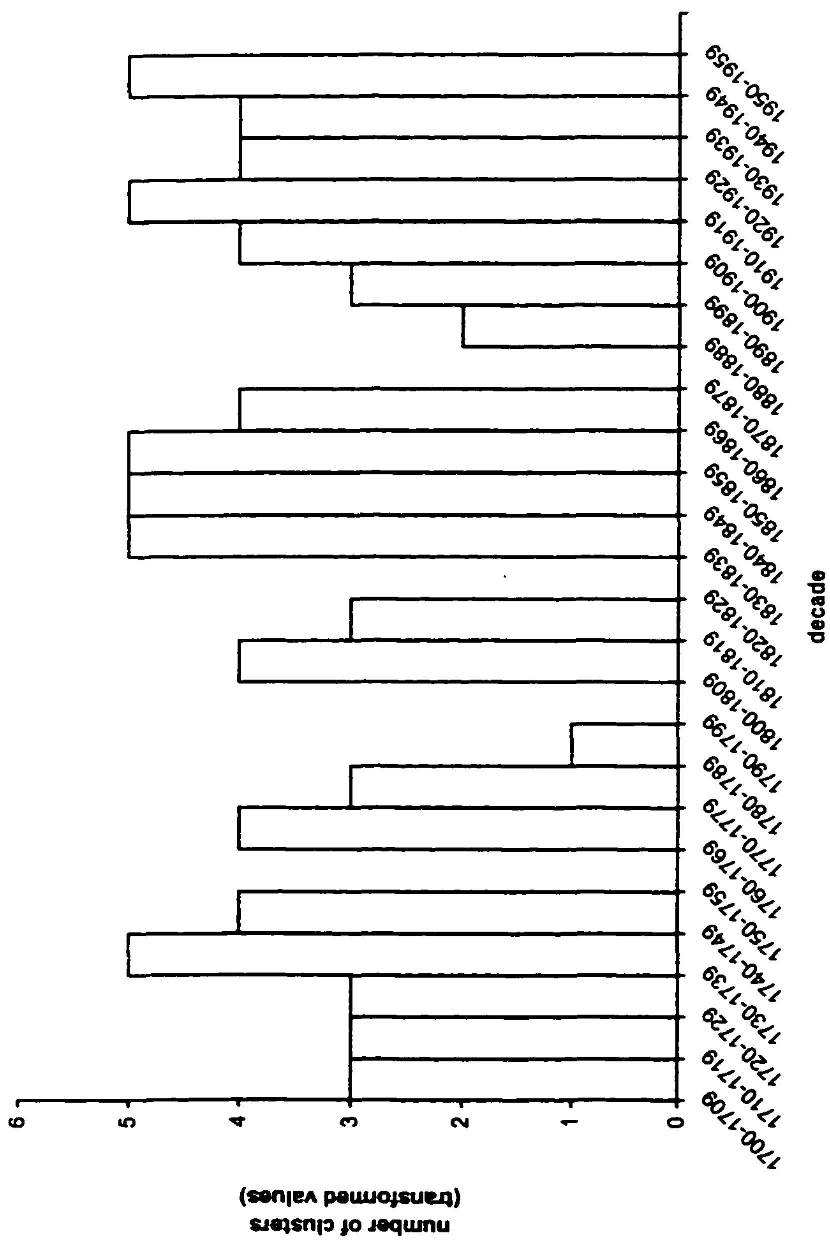


Figure 5.4. Decade summaries of rainfall in the Zuni area, 1700-1959.

Table 5.8. Decade Summaries of Clusters of Drought Years, 1600-1959.

Decade	No. of clusters of "bad" years	Decade	No. of clusters of "bad" years
1600-1609	1	1780-1789	4
1610-1619	0	1790-1799	5
1620-1629	4	1800-1809	1
1630-1639	3	1810-1819	2
1640-1649	0	1820-1829	5
1650-1659	2	1830-1839	0
1660-1669	6	1840-1849	0
1670-1679	2	1850-1859	0
1680-1689	1	1860-1869	1
1690-1691	0	1870-1879	5
1700-1709	2	1880-1889	3
1710-1719	2	1890-1899	2
1720-1729	2	1900-1909	1
1730-1739	0	1910-1919	0
1740-1749	1	1920-1929	1
1750-1759	5	1930-1939	1
1760-1769	1	1940-1949	0
1770-1779	2	1950-1959	5

two dry years. Clusters are grouped in sets of two years because the Zuni stored sufficient grain to see them through two years of drought. While one dry year would deplete these stores, a second would carry an increased threat of privation which would be exacerbated with each consecutive dry year. To reflect this factor, two dry years are counted as one cluster, three dry years are counted as two clusters, four dry years are counted as three clusters, and so on. The histogram, figure 5.4, presents these data graphically. So that the histogram will conform visually to the line graph of PDSI values (figure 5.3), the cluster data were transformed by subtracting each number of clusters from an arbitrary integer (5); by doing this, decades with a smaller number of dry year clusters appear as peaks on the bar chart, while drier decades appear as valleys.

The PDSI identify two decades during the seventeenth century that were characterized by more than four clusters of dry years; drought during the 1660s is thought to have contributed to the unrest leading to the Pueblo Revolt (Gutierrez 1991). During the eighteenth century, the 1750s were dry, and conditions worsened toward the end of the century, from the late 1770s until the beginning of the nineteenth century. After a dry period during the 1820s, conditions improved through the beginning of the American Period, coincident with the development of the river valley farming villages, but worsened in the 1870s, as visitors to the area, including Cushing, noted (Green 1990:299). Conditions again improved during the twentieth century.

Long-term cycles of erosion and aggradation also affected hydrology, although the effects and timing of these cycles are hard to interpret. Erosion is linked to a lowered water table and cutting of arroyos, both of which are detrimental for agriculture. In turn, lower water tables decrease the amount of water available in hand-dug wells, and arroyo cutting results in incised streambeds which cannot be used to supply *acequias* without pumping. Although researchers agree that these cycles are tied to rainfall patterns, they are not clear on the nature of the relationship. Research on the long term hydrology of the Four Corners area demonstrated that drought and subsequent lowered water tables reduced vegetation cover, thereby contributing to arroyo cutting (Euler et al. 1979). Other studies have indicated that arroyo cutting also occurs during periods of heavy summer rainfall, whereas, in dry years, sheet erosion leading to streambed aggradation is more likely (Tuan 1966). What is clear, however, is that long term hydrological cycles are not congruent with the tree ring record and that the dendroclimatological record cannot be used to reconstruct hydrological sequences (Dean cited in Kintigh 1985:96).

Hydrological sequences developed for Black Mesa and the Chaco drainage are considered applicable to the Colorado Plateaus as a whole (Euler et al. 1979; Tuan 1966). The onset of a period of arroyo cutting in the Chaco Basin followed a period of aggradation during the second half of the nineteenth century (Tuan 1966). This cycle, coincident with the growth of the river valley farming villages, would have adversely affected the utility of the rivers for irrigation and enhanced the attraction of the springs. As noted above, some nineteenth-century observers wrote that both the Zuni and the Pescado Rivers were entrenched (Bloom 1936:112; Mollhausen 1858:93; Whipple 1855:135). The demise of the river valley farming villages coincided with a period of severe erosion and arroyo cutting that resulted in part from clear-cutting of timber in the Zuni Mountains and the construction of dams in the early twentieth century (Ferguson 1985, 1988; Holmes and Fowler 1980; Mills et al. 1982).

The locations of satellite settlements reflect these changing rainfall and hydrological patterns in a rather unexpected way. During the relatively dry eighteenth century, a number of the satellite sites were situated in poorly watered upland areas along the washes north and south of Zuni Pueblo. The mid-nineteenth century, a period of favorable precipitation, saw the onset of agricultural villages associated with wheat cultivation and *acequia* irrigation near the large permanent springs at Ojo Caliente, Pescado, and Nutria. Contrary to expectations, then, the Zuni focused on drier areas during a dry period and on wetter areas during a (relatively) wet period. I think that this is related to changes in perceptions about the use of satellite villages and the relations of production rather than to shifting rainfall patterns. The Zuni, whose ancestors had lived in this semiarid area for at least one thousand years before Coronado's *entrada*, had developed effective ways of compensating for unpredictable water supplies. Many of the earlier satellite settlements are in areas that are suitable for pastoralism, while the later villages are near more reliable water sources that could be used to supply *acequias* to irrigate fields. In fact the springs are still used for this purpose, although alfalfa for feed, rather than wheat, is a major crop today. Although the Zuni may have been using *acequias* in a small way earlier in their history, it was not until the American Period that they began to develop large networks of *acequia*- irrigated fields, which were used for wheat cultivation (Bunzel 1932:474; Lopinot 1986; Toll 1992:53). The commitment to irrigated wheat agriculture, then, occurred during a favorable climatic period, when it had a better chance of succeeding than during the drier eighteenth and early nineteenth centuries.

Distribution of soils

Soil associations include groups of co-occurring soil types. In the Zuni area, these have been classified according to irrigability, using criteria of soil texture (including gravel and stone content); depth; water holding capacity; salinity; alkalinity; permeability; erosion;

Table 5.9. Soil Associations in the Core Settlement Area.

Class	Soil Association	CPV[1]	Area[2]	Productivity under irrigation
I	Sanson-Barnum	0.78	14.5	high productivity
II	Penistaja-Clovis-Palma	0.56	3.6	moderate productivity
II	Lohmiller-San Mateo	0.54	14.5	moderate productivity
II	Penistaja-Valent-Palma	0.56	14.8	moderate productivity
III	Ponil-Travesilla	0.36	18.8	low-moderate productivity
IV	Thorloni-Savoia-Concho	0.21	2.5	low-productivity
IV	Litle-Clovis-Travesilla	0.23	2.6	low-productivity
V	Rockland-Travesilla	0.07	28.5	not irrigable

Note: Data are from Maker et al. (1974).
[1] Composite Productivity Value (after Kintigh 1985:106)
[2] Refers to the percentages of land in the study area that are associated with each soil class

surface smoothness; slope; internal soil drainage; surface drainage (Maker et al. 1974). Kintigh (1985:106) developed a Composite Productivity Value (CPV) that measures the productivity of the various soil associations for agriculture. The CPV is calculated by assigning a weight from 1.00 to 0.00 based on the relative productivity of each soil type within a given association; these weights were then multiplied by the percentage of that soil type present within the soil association, and the products of the weightings for each type were then summed to produce a composite value ranging from 0.00 (not irrigable) to 1.00 (excellent for irrigation). Table 5.9 lists the soil groupings in the study area; their geographic distribution is shown on the map, figure 5.5, based on Ferguson and Hart (1985:119).

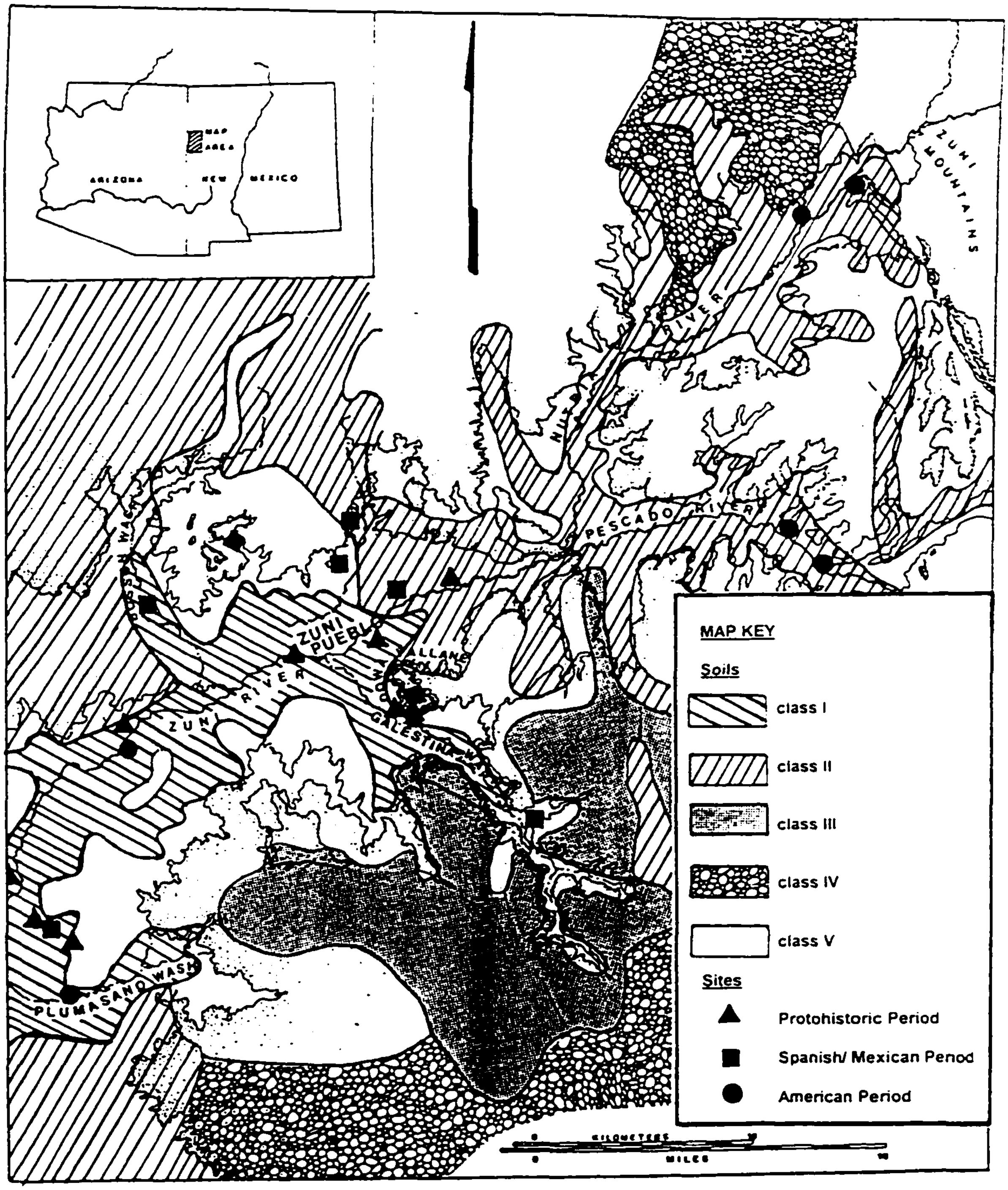


Figure 5.5. Historic Zuni sites and the distributions of soils. Soil distributions and rankings are based on Maker et al. 1974 and Kintigh 1985.

Most soils on the reservation fall in the moderate to low moderate range of productivity; only a small amount of land is considered highly productive and more than one-quarter of the land is considered not irrigable. There is no information on changes in the distribution or composition of soils over time. Although soil erosion and gullying caused by timbering, dam siltation and breaching, and overgrazing after the 1880s reduced the amount of irrigable farm land available to the Zuni (Ferguson 1988), it is unlikely that the relative concentration of productive soils in the river valleys was very different in the 1850s. Historic accounts written during the early years of the American Period emphasize the fertility of the river valley soils and the excellence of the range in upland areas (Foreman 1941:140; Lesley 1929:227; Mollhausen 1858:85; Whipple 1855:40). In 1849, soils in the Zuni River valley and the mesa country to the north were described as sandy or composed of a mix of clays and sands (McNitt 1964:114), similar in composition to the silty clay loams and loamy sands that constitute the major soils in the Sanson-Barnum and Penistaja-Valent-Palma soil associations that characterize the area today (Maker et al. 1974:14-19).

Table 5.10 lists the distributions of sites and soil associations. Expanses of the most productive soils are located in the Zuni River valley near Zuni Pueblo and at the confluence of the Zuni River and the Plumasano Wash, near the farming village of Ojo Caliente. Moderately productive soils occur in the Pescado and Nutria valleys and in the northwest corner of the reservation, while most of the soils across the southern tier are of low or low moderate productivity. The distribution of water resources and productive soils indicates that the most favorable areas for agriculture are on the floodplains of the Zuni, Nutria, and Pescado Rivers and in the Plumasano and Galestina Basins. Most sites were situated near

Table 5.10. Edaphic Attributes of Protohistoric and Historic Period Sites.

Site	Period	Soil Association	Class [1]
Hawikku	Protohistoric	Sanson-Barnum	I
Kechiba:wa	Protohistoric	Sanson-Barnum	I
Kwa'kina	Protohistoric	Sanson-Barnum	I
Kyaki:ma	Protohistoric	Sanson-Barnum	I
Mats'a:k'ya	Protohistoric	Sanson-Barnum	I
Haiona:wa (Zuni)	Protohistoric-present	Sanson-Barnum	I
Dowa Yallane	Spanish/Mexican	Sanson-Barnum	I
Ranchos de Hawikku	Spanish/Mexican	Sanson-Barnum	I
A'mossi'a	Spanish/Mexican	Sanson-Barnum	I
Kyaki:ma RS	Spanish/Mexican	Sanson-Barnum	I
Shundekya	Spanish/Mexican	Rockland-Travesilla	V
Kolliwa	Spanish/Mexican	Penistaja-Valent-Palma	II
Wimaya:wa	Spanish/Mexican	Penistaja-Valent-Palma	II
Heshoda Lu wal'a	Spanish/Mexican	Rockland-Travesilla	V
R. de Piedras Negras	Spanish/Mexican	Penistaja-Valent-Palma	II
Ojo Caliente	American	Sanson-Barnum	I
Lower Pescado	American	Lohmiller-San Mateo	II
Upper Nutria	American	Lohmiller-San Mateo	II
Upper Pescado	American	Lohmiller-San Mateo	II
Lower Nutria	American	Lohmiller-San Mateo	II
Tekapo	American	Sanson-Barnum	I

[1] Soil classes are defined in Table 5.6.

Table 5.11. Expected and Observed Distributions of Sites and Soil Associations.

Class	All Periods		Protohistoric		Spanish/Mexican		American	
	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs
I	3.0	11	0.9	6	1.3	3	0.9	2
II	7.0	6	2.0	0	3.0	2	2	4
III	3.9	0	1.1	0	1.7	0	1.1	0
IV	1.1	0	0.3	0	0.5	0	0.3	0
V	6.0	4	1.7	0	2.5	4	1.7	0
Totals	21	21	6	6	9	9	6	6

Table 5.11a. Results of the Kolmogorov-Smirnoff One-Sample Test on the Distributions of Sites and Soil Associations.

Values	All	Protohistoric	Spanish/Mexican	American
D_{max}	.3810	.8500	.1888	.5166
N	21	6	9	6
probability	<.01	<.01	>.20	<.10

areas of highly or moderately productive soils; upland sites of the Spanish/ Mexican Period, including Shundekya and Heshoda Luwal'a, both surveyed by (Ferguson 1993, 1996), are exceptions. Shundekya appears to be a defensively-situated sheep camp (Ferguson 1993:145-7), while Heshoda Luwal'a, also defensively situated, was used for herding and cultivating peaches (Ferguson 1993:150-6; Fewkes 1891:102; Spier 1917:230).

I tested the null hypothesis, that site locations were not related to the presence of productive soils, by comparing the expected site distributions and to the actual, or observed distributions, as listed in table 5.11. Expected values for site frequencies in each soil class were derived from the percentage of land associated with that soil group. As noted in the discussion of the association between site location and water resources, under the null hypothesis sites would be equally likely to occur on any soils (Hodder and Orton 1976:225). Table 5.11a lists the results of the Kolmogorov-Smirnov One-Sample Test and the associated probabilities. Although most sites from all the periods were located on moderately to highly productive soils, the strength of the association between site location and productive soils varied. Proximity to productive soils were especially important during the Protohistoric Period, when all the pueblos were situated on or near areas of highly productive soils (Kintigh 1985:108-9). During the American Period, access to irrigable soils was important, but access to a reliable and abundant water source was even more so, since the farming villages occurred in areas of moderately, as well as highly productive soils. During the Spanish/ Mexican Period, the tendency to locate sites on highly productive agricultural land was much less pronounced, as sites were distributed among various soil groups, including the poorer upland soils.

Topography and Settings of the Historic Period Sites

The core settlement area is dominated by three broad topographic settings--the river valleys; heavily-dissected mesa and canyon lands; and the foothills and massif of the Zuni Mountains. The land grades from northeast to southwest, with the highest elevations (about 2600 meters above sea level) occurring in the Zuni Mountains and along the Continental Divide, and the lowest (about 1900 masl) in the southwest. During the Historic Period, the

Table 5.12. Settings of the Protohistoric and Historic Period Sites.

Site	Elevation[1]	Landform	Biotic Communities
Hawikku	1899	ridge overlooking floodplain	plains grassland
Kechiba:wa	1966	mesa top	plains grassland
Kwa'kina	1887	ridge overlooking floodplain	plains grassland, riparian
Kyaki:ma	1969	base of mesa	plains grassland, riparian
Mats'a:k'ya	1932	hilltop overlooking floodplain	plains grassland, riparian
Halona:wa	1920	knoll overlooking floodplain	plains grassland, riparian
Dowa Yallane	2192	mesa top	desert scrub
R de Hawikku	1899	ridge overlooking floodplain	plains grassland
A'mossi'a	1932	mesa bench	plains grassland
Kyaki:ma RS	1948	mesa bench	plains grassland, riparian
Shundekya	2012	mesa bench	pinyon-juniper
Kolliwa	2010	hill top	plains grassland, pinyon-juniper
Wimaya:wa	1998	hill top	plains grassland, pinyon-juniper
H. Lu wal'a	2036	mesa bench	pinyon-juniper
Piedras Negras	1950	mesa bench	plains grassland, pinyon-juniper
Ojo Caliente	1908	mesa top and base	plains grassland, riparian
L. Pescado	2048	knoll overlooking floodplain	plains grassland, riparian, pinyon-juniper
Upper Nutria	2079	top and slope of ridge	plains grassland, riparian, pinyon-juniper
Upper Pescado	2068	floodplain	plains grassland, riparian, pinyon-juniper
Lower Nutria	2067	slope of ridge	plains grassland, riparian, pinyon-juniper
Tekapo	1900	floodplain	plains grassland, riparian

[1] Elevations are recorded in meters above sea level.

Zuni had settlements in or near each of these physiographic zones, although certain areas were preferred at certain times. The settings of the Historic Period sites are summarized in Table 5.12. Virtually all the sites are built on knolls, rises, or mesa tops that stand above the surrounding area, defensive settings that limit access to the settlements and command long views of the surrounding countryside. At the archetypal "refuge village" on Dowa Yallane, the slope is so steep that access can be gained only by a narrow footpath (Diego de Vargas 1914:304). Its summit commands a wide view of the Zuni valley, the route from which any invasion was likely to come.

The floodplain pueblos of the Protohistoric Period were situated at lower elevations than later settlements which reflect the expansion into upland areas near Zuni Pueblo and into the high valleys of the Nutria and Pescado Rivers. Many of the villages founded during the Spanish/ Mexican Period were built in rugged mesa and hill country north and south of the Zuni valley, a significant departure from the valley floor settings of the earlier Protohistoric sites. As previous researchers have noted, the inaccessible or hidden situations of these upland communities were useful for defense during the unsettled eighteenth century (Kroeber 1916; Mindeleff 1891; Spier 1917). This is certainly an accurate assessment as far as it goes, but inaccessibility was not the sole advantage of these upland locations, which all contain remains of numerous corrals (Ferguson 1993; 1996) and are situated amidst excellent rangeland. These early satellite settlements were founded to incorporate new lifeways, including pastoralism and the cultivation of orchards. Expansion was necessary, not only for defense, but because much of the Zuni valley was already being used for fields. While native crops like squash and beans could be interplanted with maize, orchards could not, and keeping sheep in the vicinity of fields would have been destructive to crops.

Site Catchments

By expanding settlement outside the Zuni river valley after the Pueblo Revolt, the Zuni incorporated more diversity in their settlement landscape. Site catchment analysis is used here to understand the environmental and economic aspects of eighteenth- and nineteenth-century changes in the settlement pattern, including the increasing commitment to satellite villages.

Kintigh's catchment area analysis of the Protohistoric pueblos underscored the agricultural orientations of these sites that were situated amid the most extensive expanses of irrigable floodplain soils (Kintigh 1985:91-102). The duration of the various stays at the refuge village on Dowa Yallane are not known from ethnohistoric or archaeological evidence, but this village was a specialized short-term site that most likely was used differently than the earlier Protohistoric pueblos or the later, economically-oriented satellite villages. As Ferguson (1993:134) noted, the lack of space on the mesa top meant that fields could not be located there. Ferguson recorded several unroofed enclosures, one of which may have been a corral, indicating that livestock may have been kept at the village. However, most economic activities probably continued in the vicinities of the various home pueblos on the floodplain.

The incorporation of introduced domestic animals and plants required some alterations in land use to meet requirements of new domesticates and to avoid overlap; thus, it is not surprising that sites were founded in new locations. Many crops introduced by the

Spaniards--melons, chilies, and various herbs, for instance--could be cultivated alongside indigenous plants, and are common components of Zuni waffle gardens today. Peaches and wheat, however, required more space and special conditions. Domestic animals required forage and, often during the turbulent eighteenth and nineteenth centuries, protection from raiding parties.

Assumptions of the site catchment model

Critics of site catchment analysis point out that its assumptions of concentric patterns of land use in an unchanging environment limit its utility for reconstructing economic organization (Hodder and Orton 1976:231). However, site catchment analysis can provide an summary of what kinds of land are available in a settlement's sustaining area and what kinds of activities are feasible (Higgs and Vita-Finzi 1972). In this case, it highlights similarities and differences among the various sets of sites used by the Zuni during the Protohistoric and Historic Periods. To circumvent the assumption of an unchanging environment, documentary information has been used to reconstruct catchment areas.

Site catchment analysis assumes that travel time is the primary constraint on the size of the daily sustaining area around a settlement. Beyond a certain distance, generally less than one hour's walk (Chisholm 1968:131; Preucel 1988), land use will fall off unless fieldhouses, sheep camps, or other temporary shelters are constructed. A second assumption used in this analysis is that people will minimize conflicting demands on land; what this means is that specific uses can be associated with specific parcels at specific times. Historical and ethnographic accounts of Zuni herding provide a good example of this.

During the growing season, farmland was not used for sheep, except after harvest, when animals were allowed to graze on the stubble remaining in fields (Ferguson 1988:22). Non-overlap in this case was temporal rather than spatial.

Because there have been significant documented changes in the environment of the Zuni area during the twentieth century (Ferguson 1985, 1988; Ferguson and Hart 1985), it is not suitable to use current conditions uncritically in assessing site catchments. Table 5.13 reconstructs the biotic communities associated with the river valley, valley edges, and upland zones during the middle and late nineteenth centuries. The reconstruction is based on paleoethnobotanical and palynological analysis of materials from sites in the Zuni River valley (Brandt and Ruppe 1990) and at Lower Pescado Village (Rothschild and Dublin 1995) and historic descriptions. These historic accounts document environmental conditions along the major roads and trails through the Zuni region, but do not provide descriptions of the back country. Areas covered include the Zuni Mountains between Fort Wingate and Nutria and the Nutria valley (Bloom 1936:108; Curtis 1883:10; Lange and Riley 1970:56-7; Whipple 1855:21); the Pescado valley (Domenech 1860:209; Lesley 1929:227-8; Mollhausen 1858:84-5; Whipple 1855:46); the uplands north of Zuni along the trail to Fort Defiance (McNitt 1964:114); and the Zuni valley as far as the confluence of that river with the Little Colorado (Foreman 1941:140, 149; Lesley 1929:227-8; Sitgreaves 1853; Whipple 1855:59).

Hydrological changes resulting from timbering and dam construction as well as the effects of overgrazing have altered the vegetation communities of the area. Although many species present today were also present in the nineteenth century, plains grassland (typified by grama and other grasses) was more dominant, and desert scrub (characterized by

Table 5.13. Nineteenth-Century Biotic Communities.

Zone	Biotic communities
floodplain	riparian plants, grasses, sage, greasewood, chamiso, prickly pear, cottonwoods, waterfowl, small mammals, beaver, wolf, coyote, deer
slopes	pinon pine, juniper ("cedar"), grasses, greasewood, chamiso, mesquite, deer, antelope, coyote, bear
uplands	pinon pine, ponderosa pine, NM yellow pine, balsam, scrub oak, grasses, deer, antelope, mountain sheep, bear, eagle

Note: Constituents of biotic communities have been reconstructed from historic accounts, botanical, and palynological analyses.

greasewood, big sage, and rabbitbrush) less so. Small animals continue to be common, but larger game has diminished significantly and some animals, including mountain sheep, bear, and pronghorn, have all but disappeared (Brown and Lowe 1980). During the nineteenth century, timber for construction was probably obtained from the Zuni Mountains, since a number of historic accounts comment on the lack of timber in the river valleys. Today, stands of old growth timber are rare even in the Zuni Mountains.

Size of the catchment area

The term "catchment area" used here is defined as an area of "intensive," or daily, land use around settlements. Historic and ethnographic accounts (Baxter 1882:77; Bloom 1936:108; Bunzel 1932: 474-5; Cushing 1920:355-67, 1974:153; Lange and Riley 1970:72; McNitt 1964:112; Mills et al. 1982; Sitgreaves 1853; Stevenson 1904:351) were used to reconstruct the size of catchment areas at Zuni; these are summarized in table 5.14.

According to the historic accounts, the lengths of floodplain field systems during the nineteenth and early twentieth centuries, ranged from 1.5 kilometers recorded at Ojo Caliente in 1883 (Lange and Riley 1970:56) to 3.5 kilometers recorded in 1849 in the Zuni valley near Zuni Pueblo (McNitt 1964:112). The variability recorded by the various observers can be attributed to a number of factors, including the season when the information was recorded, the area, and differing levels of accuracy in the recording. The mean radius derived from the documentary records is 2.4 kilometers upstream and downstream from a site, a figure that compares favorably with ethnographically documented agricultural catchments (Chisholm 1968; Prothero 1957). This distance would be less than one hour's walk over the relatively level ground of the river valleys, although in more rugged areas the distance that could be covered in the same amount of time would be commensurately smaller.

There are no similar descriptions of Zuni rangeland, although some observers have commented on the general characteristics of the range (Bloom 1936:108; Curtis 1883:74; Lesley 1929:278; United States Senate 1853:6; Whipple 1855:21,59). Nineteenth-century herding practices have been reconstructed from interviews (Ferguson 1985; Ferguson and Hart 1985:40; Holmes and Fowler 1980). Uplands supporting grasses and open pinyon-juniper woodland were used for herding sheep; in the fall, the flocks were brought in from remote pastures to graze on the stubble remaining in harvested fields. A commitment to pastoralism would have required that the Zuni incorporate rangeland within the intensively used daily catchment areas of their sites or that they construct sheep camps on the range, a

Table 5.14. Estimates of Catchment Radii at Nineteenth-Century Settlements.

Date	Area	Description	Radius[1]
1849	Zuni valley	Simpson wrote that the area between Zuni Pueblo and Dowa Yallane was "extensively planted in corn."(McNitt 1964:112)	3.5
1852	Zuni valley	Sitgreaves wrote that cornfields extended "several miles" down the Zuni River. About 10,000 acres (15.6sq.mi. or about 5 miles long by 3 miles wide) were planted (U.S.Congress 1853:6).	2.4
1879-84	Nutria	Cultivation extended 1.5 miles downstream, since Nutria backs on Mexican Hill (Cushing 1920:355-67).	2.4
1881	Nutria	Bourke wrote that 400 acres (.626 sq.mi.) were under cultivation; since the valley is .6 mile wide, the length would have been about 1 mile (Bloom 1936:112).	1.6
1883	Ojo Caliente	Bandelier wrote that fields extended as far as Hawikku (Lange and Riley 1970:56).	1.5
Late 19th century	Ojo Caliente	the longest *acequia* watered an area 2.5 miles by 3.5 miles; since the width of the valley ranges from 2 to 2.6 miles, 3.5 miles (5.6 km) is assumed to be the length of the catchment (Stevenson 1904:351)	2.8

[1]Estimates of catchment radii, measured in kilometers, were derived from acreages by 1) ascertaining total area in square miles; 2) extrapolating the length of a planted area based on the assumption that the width of the valley formed one dimension; 3) converting to kilometers; 4) dividing the total by one-half under the assumption that a given settlement is located in the center of its farming area. Step 4 is eliminated if the text states that the acreage given extends for only one direction from a settlement (e.g., "downstream") or, in the case of Upper Nutria, if the agricultural catchment could only extend in one direction.

practice that occurs today (Ferguson 1993:104). The use of some satellite settlements as sheep camps is noted in eighteenth-century accounts (Adams and Chavez 1956), and has been documented by archaeological survey (Ferguson 1993, 1996). During the nineteenth century, sheep were kept at the farming villages as well as at fortified sheep camps in the Zuni valley.

Categories of land use

Although hunting and gathering formed an important part of Zuni subsistence, agriculture and pastoralism were unquestionably the primary subsistence activities during the Historic Period. Land can be categorized according to its use by mapping ethnographic and historic accounts of Zuni subsistence activities onto the reconstructed microenvironments.

Kintigh (1985:101-2) demonstrated that rainfall farming would not have been possible at Zuni. Historic and ethnographic accounts agree, defining several methods that were used to bring water to Zuni fields. Fields situated on the sloping sides of mesas and canyons, in arroyo beds and on floodplains were watered by runoff which was spread by deflecting dams. Mud walled, or waffle gardens, were watered by hand from wells dug into the river beds (Bohrer 1960:182), while in certain areas, acequias were used to water fields. For an areas to be suitable for hand watering or *acequia* irrigation, it would need irrigable soils as well as a permanent and reliable water source or a high water table. Deflecting dams only worked on sloping land where gravity was instrumental in moving water onto fields; there are, however, numerous places in the Zuni area that meet this topographic condition, including the edges of the river valleys and washes, side canyons, and arroyos. Rangeland requires an abundance of grasses and other forage. I expect that grazing would have been restricted to upland or rocky areas that were not suitable for cultivation. Incidentally, the use of upland areas would have served to protect flocks from raiding to some extent since roads and trails tended to follow watercourses, leaving many upland areas little travelled or relatively inaccessible.

Site catchment analysis

The maps, figures 5.6 and 5.7, show the estimated site catchments for Zuni Pueblo and the eighteenth- and nineteenth-century satellite sites. Several general conclusions might be drawn from these analyses. After the population consolidated at Halona:wa, the Zuni could not have exploited the full extent of the agricultural land in the Zuni valley without the use of field houses or satellite villages. The catchment areas of Zuni Pueblo and the eighteenth-century satellite villages encompassed almost the entire Zuni valley from the confluence of the Pescado and Nutria Rivers to the Plumasano Wash, as well as upland areas along the Bosson and Galestina Washes. If other poorly recorded and undated *ranchos* at Binnawa (Ferguson 1993), Hampassa'wa, and at the confluence of the Nutria and Pescado Rivers were occupied during the eighteenth century, then the coverage is extended to the entire upper Zuni valley and its surrounding uplands.

The reconstructed catchments of the Protohistoric sites (Kintigh 1985) included expanses of floodplain and bottomland suitable for irrigated fields and smaller areas along valley edges of sloping land that could be watered by runoff, but no uplands. The incorporation of upland areas into site catchments occurred with the founding of the satellite villages. Since upland areas are suitable for herding and since it is unlikely that the Zuni would have allowed grazing in the vicinity of agricultural fields, it is likely that expansion

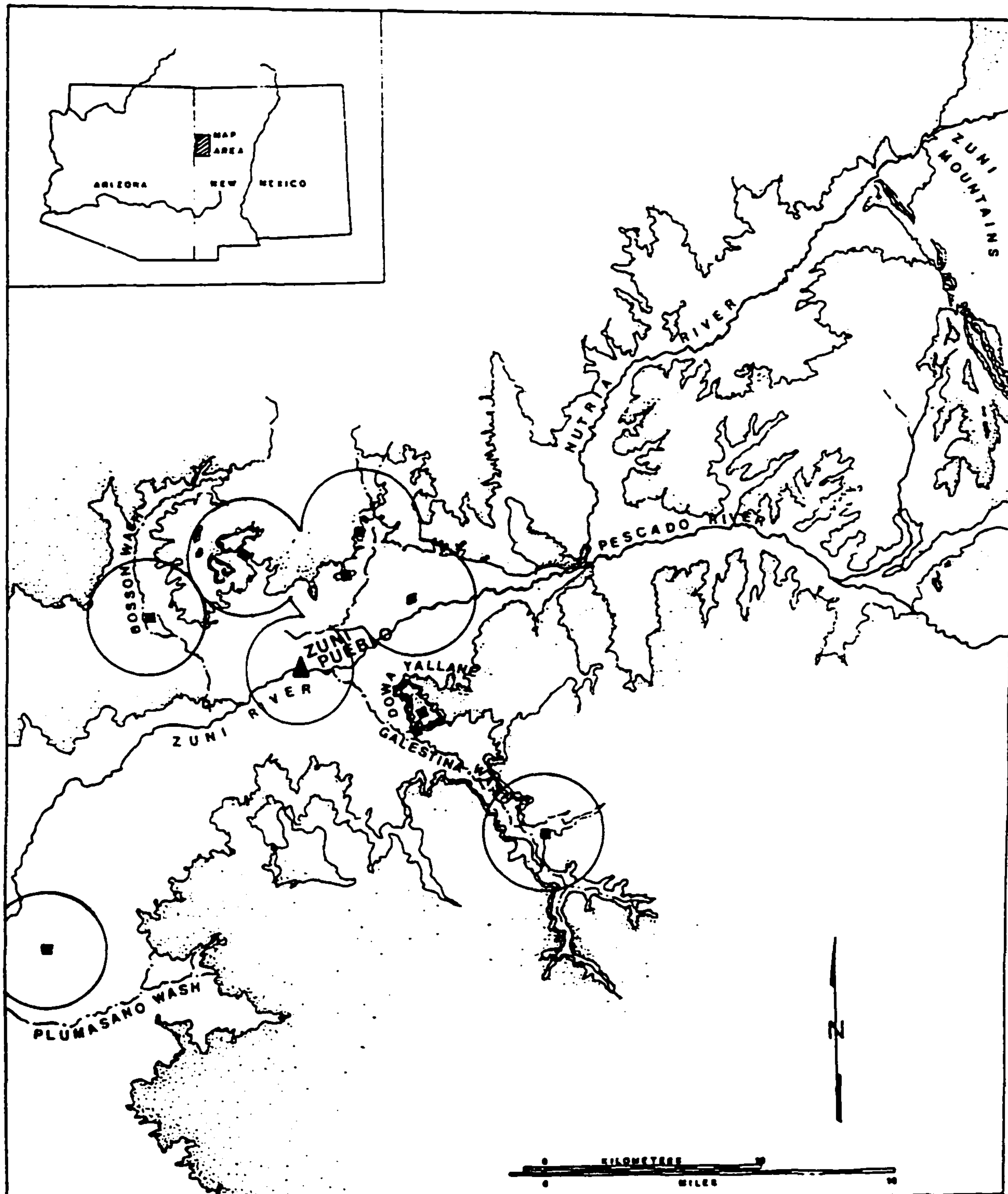


Figure 5.6. Estimated catchment areas for eighteenth-century Zuni sites. The catchment radius of 2.6km is based on historic accounts.

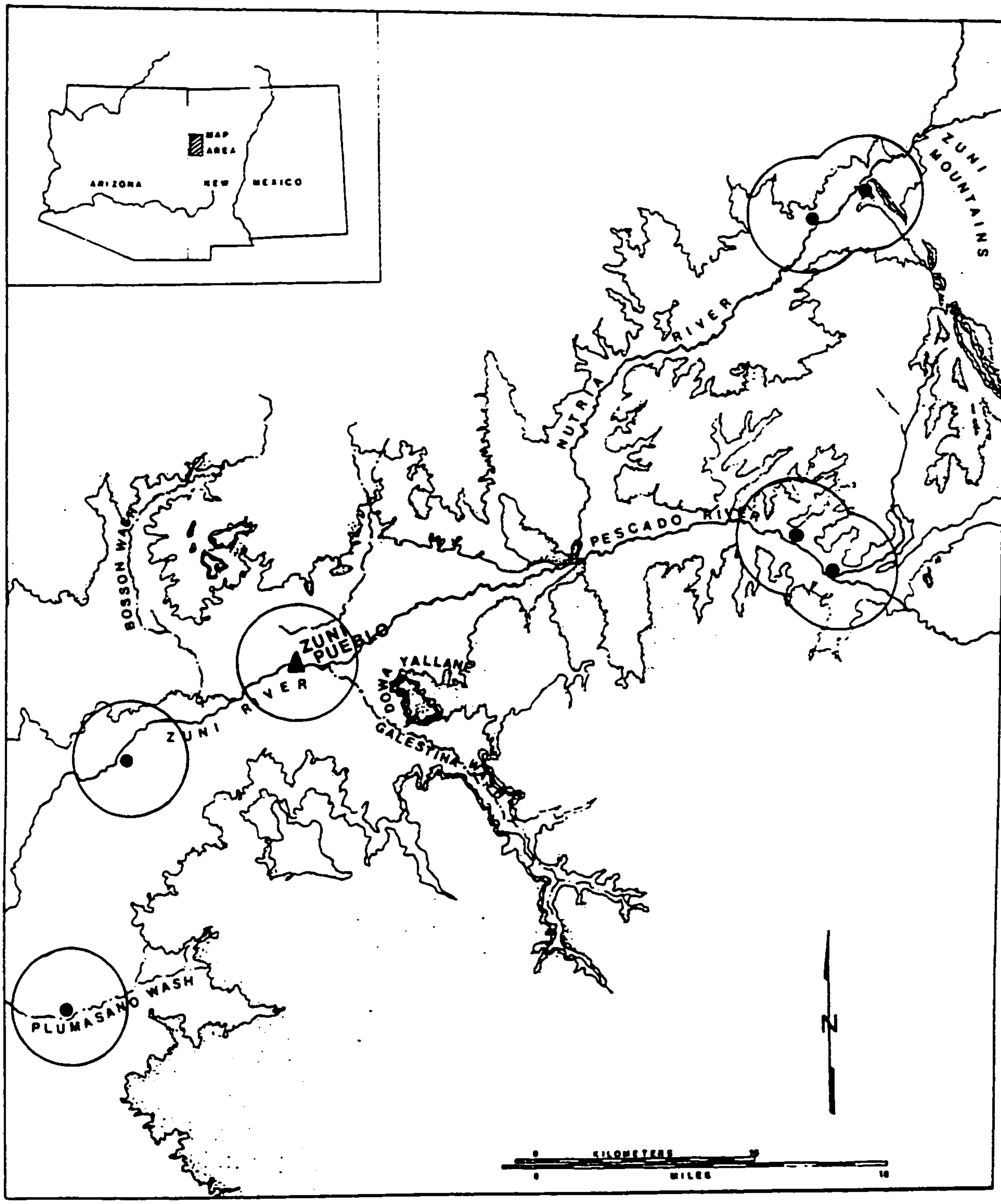


Figure 5.7. Estimated catchment areas for nineteenth-century Zuni sites. The catchment radius of 2.6km is based on historic accounts.

Table 5.15. Percentages of Land Types in Catchments of Spanish/Mexican Period Sites.

Site	Uplands	Floodplain	Slope
Ranchos de Hawikku	24.6%	52.3%	23.1%
A'mossi'a	22.1	43.0	34.9
Kyaki:ma Refuge Site	42.0	18.9	38.2
Shundekya	88.9	0	11.1
Kolliwa	50.4	0	49.6
Wimaya:wa	88.5	0	11.5
Heshoda Lu wal'a	90.4	0	9.5
Ranchos de Piedras Negras	39.5	31.5	28.9

Table 5.16. Percentages of Land Types in Catchments of American Period Sites.

Site	Uplands	Floodplain	Slope
Ojo Caliente	16.7%	64.8%	18.5%
Lower and Upper Pescado[1]	41.3	33.9	24.8
Upper and Lower Nutria[1]	46.5	31.7	21.8
Tekapo	15.5	69.0	15.5

[1]Catchment areas for Lower and Upper Nutria and Lower and Upper Pescado are combined since they overlap.

Table 5.17. Summary Percentages of Land Types in Catchments of All Historic Sites.

Period	Uplands	Floodplain	Slope
Zuni Pueblo	0	77.5%	22.5%
Spanish/ Mexican	56.8	17.8	25.4
American (19th century)	37.6	40.2	22.2
American (19-20th century)	33.0	46.2	20.8

into upland satellite sites was associated with herding. What is interesting here is not that the Zuni expanded their settlement system in response to requirements of sheep herding, but rather, why the commitment to herding occurred so late, well after the introduction of domestic sheep.

Tables 5.15 and 5.16 list the percentages of the various types of land that were included in the catchments of the eighteenth- and nineteenth-century satellite villages. Table 5.17 summarizes this information and compares it to the distribution of land types in the catchment area surrounding Zuni Pueblo.

The site catchments of the various satellite villages differed during each period. During the Spanish and Mexican Periods, upland zones were the most prevalent kind of land at many of the satellite villages, whereas during the American Period, the kinds of land contained within the catchments of the farming villages were more evenly divided among uplands, river valley, and sloping land suitable for runoff farming or for orchards. This suggests that the earlier satellite settlements were more specialized than the later. Upland settlements such as Kolliwa or Wimayawa were situated in the midst of grasslands that supported sheep herding through the Historic Period, even after the villages were no longer being used. The remains of numerous stone corrals at Heshoda Lu wal'a attest to its use for pastoralism; peaches were also grown at this village (Fewkes 1891). Ranchos de Piedras Negras, near the springs at Blackrock, was used for farming. The account of the 1776 Escalante expedition reports that irrigated fields at or near this location supplied the mission; the springs would have provided ample water for irrigation even during this period when the Zuni River was often dry (Adams and Chavez 1956:96).

The more diverse types of land in the catchment areas of the American Period villages could have supported a wide range of economic activities, including herding and irrigated agriculture. The increased amount of well-watered agricultural land adjacent to the large springs at the late villages demonstrates a shift in emphasis from predominantly pastoral to mixed pastoral and agricultural orientations at the Zuni satellite villages. While upland range constituted about one-third of the land in the vicinity of the American Period satellite villages, irrigable valley floor locations comprised more than 40% of the combined site catchments of these villages in the nineteenth century.

The association of American Period satellite villages with irrigable farmland became more pronounced early in the twentieth century with the establishment of the village of Tekapo on the floodplain of the Zuni River. The completion of the dam at Blackrock allowed irrigation water to be diverted onto fields in the Zuni valley and opened more bottomland to irrigated agriculture, albeit briefly until reservoir capacities diminished because of silting. Tekapo can be considered a specialized satellite village, associated with irrigated agriculture; almost three-quarters of its catchment area consisted of irrigable farming land. This may reflect an increased emphasis on irrigated agriculture for market as well as for subsistence, under the impetus of the Bureau of Indian Affairs (Holmes and Fowler 1980:184ff.).

Site catchments and agricultural production

Zuni expansion into satellite villages allowed different types of land--rangeland at first, and later, irrigable farmland--to be brought into production after the population had consolidated at Halona:wa. Was expansion necessary for Zuni subsistence?

The development of rangeland was necessary if pastoralism were to be a part of Zuni subsistence organization. In some areas--at Hawikku and Kyaki:ma, for instance--sheep camps were set up at abandoned Protohistoric pueblos, altering previous patterns of land use in these areas. The grasslands north and south of Zuni Pueblo were also suitable for herding; because of constraints of travel time, satellite villages--often no more than sheep camps containing animal pens, a corral, and a room block--were founded in these areas as well. The initial expansion of settlement and the transhumance associated with it were related to changes in the mode of production from agriculture to a mixed agricultural- pastoral adaptation. The second shift entailed the increased use of outlying areas suitable for spring-fed *acequia* irrigation, and increased production which, I argue, was not necessary for subsistence. Although Zuni population fluctuated between 1100 and 2500 during the eighteenth and early nineteenth centuries (see table 3.2), it remained relatively stable after 1820 through the beginning of the American Period.

There are no figures for Zuni agricultural production before 1880, but Cushing (1920:356-7) wrote that, at Nutria, 575 hectares planted in wheat fed the population of that farming village, which was 473 persons in 1880. According to this estimate, then, production requirements for irrigated wheat would be 1.2 hectares *per capita*. Maize yields were probably higher (Lopinot 1986). At Hopi during the early twentieth century, one hectare *per capita* planted in maize was adequate to support the population (Bradfield 1971:20-1). If we assume similar production requirements for Zuni, the population, even at a high of 2500, could have maintained itself by farming the Zuni River valley between Rancho de Piedras Negras and Amossia, an area of 3126 hectares.

Chapter Summary and Conclusions

The importance of particular environmental factors in locating Zuni settlements changed as the Zuni redefined their settlement landscape at different times during the Historic Period. The most dramatic redefinition occurred after the Pueblo Revolt as the six or seven Zuni pueblos consolidated at Halona:wa. Seasonal expansion into satellite villages allowed the Zuni to remain politically centralized but to intensively exploit not only close-in valley floor resources, but also surrounding environmental zones that were too far for daily commuting. Many early satellite settlements represented a move into upland areas suitable for herding, while late nineteenth-century river valley farming villages were located in more diverse environments, characterized by abundant and reliable water sources for irrigation as well as excellent range land for herding.

Settlement change was associated with new modes of production. Differences between the early and later villages suggest that the incorporation of innovations occurred over a lengthy period of time. Sites clearly designated for pastoralism became prevalent during the eighteenth century, well after the introduction of sheep. The expansion of agricultural production into areas suitable for *acequia* irrigation occurred even later, during the nineteenth century, apparently in conjunction with increased cultivation of wheat, which requires irrigation in this area.

Agricultural change took place during a period of demographic stability and relatively high rainfall, so it is unlikely that the intensification of production was related to stress on the resource base, either because of increasing population or unfavorable climatic conditions. Rather, the Zuni were experimenting with new technologies during a period of lower risk for failure. It is interesting that intensification did not occur at the closer springs of Blackrock and Kyaki:ma, but rather involved expansion into the valleys of the Pescado and Nutria Rivers. The following chapter addresses social and political criteria for settlement pattern change.

END NOTE:
1. The Cruzate Grant to the Zuni was one of a series of land grants allegedly made in 1689 (during the Pueblo Revolt) which ceded to the Zuni a two-league (six-mile) area centered on Zuni Pueblo. It is generally considered to be a forgery that understates the the amount of land within the domains of various Pueblos (Green 1990:370).

CHAPTER 6

THE SOCIAL CONTEXT OF SETTLEMENT CHANGE

Introduction

This chapter and the previous one explore the concept of a "place" as part of a settlement landscape. an integrated settlement system encompassing the physiographic and cultural features, functions, and "meanings" that are unique to a particular locality. As noted in chapter 5, the locations and physiographic settings of the early and late groups of Zuni satellite villages differed. The eighteenth-century sites were situated in varied types of terrain. including upland areas that were suited to pastoralism, while the nineteenth-century villages were uniformly located on alluvial terraces near large permanent springs. The presence of irrigable soils and an abundant and reliable water source were important for the siting of these later villages, which were founded during a period of relatively high rainfall and good supplies of water for irrigation. The catchment areas of these river valley farming villages also included uplands that were used for herding and they may have been less specialized economically than the eighteenth-century seasonal.

The historic satellite villages were founded during a period of changing social, economic, and political relationships, a context characteristic of colonial frontier settings. Although it is clear that changes in the Zuni settlement landscape were related to economic factors, I suggest that the increasingly complex and crowded social landscape of the eighteenth and nineteenth centuries played a role in the siting and configurations of the satellite villages, which represented a relatively new settlement form (Kintigh 1985:105).

Factors that are useful in understanding settlement change during this period include the social requirements of new modes of production as well as internal and external stresses associated with the developing frontier complex and endemic warfare. In this chapter, I will explore these relationships as they are expressed in the historic record and in changing Zuni settlement patterns.

Modes of Production

The physiographic settings of the various satellite villages are suited to the different requirements of important introduced domesticates, sheep, peaches, and wheat. The available evidence indicates that the incorporation of introduced plants and animals into the Zuni economy occurred over a lengthy period of time, beginning after the Pueblo Revolt and continuing into the mid-nineteenth century, and that it entailed changes in the traditional mode of production, which are reflected in distinctive settlement configurations.

The phased incorporation of introduced domesticates

The pastoral orientation of many of the eighteenth-century satellite settlements is demonstrated by their locations in areas where forage was plentiful, including uplands and river valley areas that were not farmed, and by the prevalence of corrals at these sites. In contrast, the nineteenth-century river valley villages were predominantly farming communities; their situations amid expanses of alluvial soils near large permanent springs made them particularly suitable for wheat, which required a reliable and abundant source of irrigation water (Toll 1992:53). The presence of corrals and the proximity of good range indicate that these villages were also used for herding.

Information on the presence of introduced species at historic Zuni sites is sparse, but what there is indicates that the acceptance of European introductions was gradual. The incomplete data from Hawikku support the presence of some introduced economic species quite early. Fauna recovered from that site include the remains of horse and domestic goat, but not sheep (Smith et al. 1966:93, 231ff). The absence of sheep remains, surprising considering the later importance of this species, should not be considered definitive, since the faunal collection is not complete and also since sheep and goat are notoriously hard to differentiate from faunal remains. The burials at Hawikku yielded woolen yarn and part of a wool blanket, suggesting that sheep were indeed present. The later importance of sheep was underscored by the prevalence of that species in the faunal assemblages from nineteenth-century midden deposits at Lower Pescado Village (Etnier 1997; Rothschild and Dublin 1995; see chapter 9, below) and from undated historic deposits at Zuni Pueblo (Ferguson and Mills 1982:390ff.).

Botanical evidence from historic Zuni sites supports the phased acceptance of introduced plant foods. Watermelon seeds were identified in the Hawikku assemblage (Smith et al. 1966:231), but not peach stones or wheat. Peach stones, however, were present at every recorded eighteenth- and nineteenth-century Zuni site and were recovered from excavated contexts at Lower Pescado Village and at Zuni Pueblo (Ferguson 1993; Ferguson and Mills 1982:429-38; Rothschild and Dublin 1995:appendix M). A series of flotation samples from historic sites in the valleys of the Zuni River and the Bosson Wash yielded peach stones, cantaloupe and watermelon seeds (Ferguson and Mills 1982:429-38: Brandt and Ruppe 1990). The only direct evidence for wheat in the Zuni area comes from a nineteenth-century room floor and underlying room fill at Lower Pescado Village (Dublin and Rothschild 1996; Rothschild and Dublin 1995).

These data suggest a phased sequence of Zuni acceptance of introduced species. While melons were cultivated quite early, peaches may not have become important until the eighteenth century, and wheat may not have been grown in quantity until the nineteenth century. Based on documentary accounts (Adams 1953:296) and on the prevalence of corrals at eighteenth-century sites, sheep appear to have been quite important by the eighteenth century.

Phased acceptance and the production requirements of introduced species

The phased acceptance of some cultigens at Zuni may be related to production requirements. Melons, for example, had similar water and soil requirements as squash and were cultivated in the same way. Other introduced cultigens, such as herbs and chilies, could be (and were) grown in kitchen gardens or waffle gardens at the main pueblo alongside traditional Zuni cultigens (Bohrer 1960; Brandt 1997). Incorporating these crops into Zuni agriculture probably represented a very minor change in subsistence behaviors (Lopinot 1986:78). Sheep and wheat, on the other hand, required large labor inputs at various times during the year. These were probably the critical introductions requiring new production behaviors and the advent of seasonal satellite villages.

Peach trees needed to be planted in sandy soil on an adequate slope for diverting runoff onto the orchards (Ferguson 1988:10). These conditions existed on the slopes of

Dowa Yallane, and at some of the satellite villages where historic observers report the presence of peach orchards (Baxter 1882; Fewkes 1891; Sitgreaves 1854; Whipple 1855). Caring for orchards did not require a large labor force, although the trees needed expanses of land, which may have precluded their presence in or around Zuni Pueblo. If land in the valley floor was devoted to maize fields, orchards had to be planted at a distance from the main pueblo. This element of distance and the associated travel time to care for trees would have figured in the development of "peach orchard villages," some of which consisted of no more than one or two fieldhouses (Mollhausen 1858:90; United States Senate 1853:5). Wheat may have been present early in the Historic Period, but it was apparently not prevalent until late. The cultivation of wheat in this area required "intensive" irrigation and new technology, including the use of plows and draft animals (Toll 1992:53). Draft animals were scarce. Fray Dominguez reported that there were no draft animals at Zuni in 1776, while Kendrick wrote that the Zuni had no "proper" draft animals: in 1856 (Adams and Chavez 1953:201; Kendrick 1950:331). There were few plows, even as late as 1878 (Bender 1984:120).

The phased acceptance of new domesticates was accomplished through the process of addition (Rogers 1990:106-7), whereby sheep, peaches, and wheat were added to a Zuni productive repertoire that emphasized the cultivation of maize and other "traditional" crops. With the addition of new species with differing environmental and labor requirements, food production became more complicated, necessitating an intensive use of land outside the floodplain of the Zuni River and requiring changes in the allocation of labor and in the yearly round of subsistence activities. These elements of the mode of production contributed to the restructuring of the settlement pattern.

The concept of production

Production can be construed as a social process, essentially the interface between human labor, "mobilized and deployed by an organized social plurality" (Wolf 1982:74) and the environment. The mode of production, then, is a "specific, historically occurring set of social relations through which labor is deployed to wrest energy from nature by means of tools, skills, organization, and knowledge" (Wolf 1982:75). It includes both a technological element--a tool kit and a built environment germane to production activities--and a sociocultural element--knowledge, skills, and organization.

Aspects of the mode of production are visible archaeologically. Obviously, tools (a hoe, for instance, or a digging stick) and features (corrals, bread ovens, *acequias*, etc.) express the technological element. The organizational element includes a number of sub-elements, including work group size and composition, and scheduling, that are not directly visible archaeologically, but that may be encoded in the settlement pattern of a region or in the layout of a site.

Reconstructing historic modes of production

I used ethnographic and historic accounts of Zuni food production (Bloom 1936; Bohrer 1960; Bunzel 1932; Cushing 1974; Ferguson 1988; Ferguson and Hart 1985; Green 1981; Holmes and Fowler 1980; Sitgreaves 1854; Stevenson 1904; Whipple 1855) to reconstruct the modes of production associated with the important historic domesticates.

Although hunted and collected foods, as well as other crops, remained a part of Zuni subsistence through the nineteenth century, maize, sheep, wheat, and peaches were the central elements in subsistence production (Cushing 1974; Green 1981; Stevenson 1904).

Table 6.1 lists the environmental requirements of these major elements of Zuni food production, while table 6.2 lists the tools and facilities associated with historic herding and cultivation. Table 6.3 presents a summary of the organization of labor associated with various subsistence tasks; since scheduling required the concentration of labor at certain times, the yearly round is included in this table. As noted above, the information contained in these tables has been amassed from historic and ethnographic accounts. In some cases, the information is probably incomplete or there is no information available, which is indicated in the tables.

Table 6.1. Environmental Requirements of Historic Zuni Domesticates.

Domesticate	Soils/ vegetation	Water sources	Locations
maize	loam/ sandy loam	runoff, rivers	floodplain; slopes, uplands
peaches	sandy soil	runoff	north facing slopes
wheat	loam	spring-fed acequias	floodplain
sheep	grass or scrub forage	springs, seeps, stock ponds	floodplain; slopes; uplands

Note: Information is from Bohrer 1960; Ferguson 1988; Holmes and Fowler 1980.

Table 6.2. Tools and Facilities Associated with Historic Zuni Domesticates.

Domesticate	Facilities	Tools
maize	field boundary markers; waffle gardens; water control features; roasting pits; field houses; mealing bins; storage rooms	seed bags; digging stick; axe; hoe; staff; grinding stones; baking stones; ovens; basketry sieves, trays and bread plaques; storage vessels
peaches	water control facilities; field houses; roofs for drying	no information
wheat	*acequias* and log aqueducts; waffle gardens; field houses; threshing floors; storage bins; beehive ovens	hand plow; knives/ sickles; winnowing baskets; dough bowls; storage bags
sheep	stock ponds and dams; sheep camps consisting of field house, sheds, corrals, pens, outhouse; wool racks	shears/ knives

Note: Information is from Bloom 1936; Cushing 1974; Green 1979; Holmes and Fowler 1980.

Table 6.3. The Organization of Production.

Domesticate	Task	Scheduling	Work group
maize	preparing field	April	small household group
	planting	May-June	small household group
	thinning	June	small household group
	3 stavings (weeding)	June-August	large group/ clan relatives
	hilling	August	large group/ related women
	1st harvest/roasting	September	large group
	harvest	October	large group
	husking, braiding	November	large group/ related women
peaches	pruning	spring	small family group
	picking	September	small family group
	drying	October	small group/ women
wheat	plowing	February- March	small household group
	planting	February- March	small household group
	ditch cleaning	spring	large group/ village
	hoeing	Mar-September	small family group
	watering	Mar-September	small household group
	ditch maintenance	Mar-September	large group/ village
	harvest	September	large group/ clan brothers
	threshing	September-October	large group
sheep	lambing	April-May	men
	shearing	spring	men
	summer range	June-October	small group/ 3-5 related men
	harvested fields	November	small group/ related men
	winter camp	November-March	small group/ related men

Note: Information is from Bohrer 1960: Cushing 1974; Ferguson 1988; Holmes and Fowler 1980; Stevenson 1904.

Soil, terrain, and water requirements for some of the introduced domesticates were sufficiently different from those for maize to warrant expansion outside the floodplain of the Zuni River. These places were part of the Zuni use area, but they apparently had not supported a built environment since the Spanish Conquest. Orchards required a relatively small labor input and minimal built infrastructure; growing peaches would not have entailed significant change in the built environment or in the settlement landscape. The periodic presence of small family groups tending orchards could be accommodated by the construction of fieldhouses, and, in fact, the documentary record describes just such fieldhouses near the peach orchards on the north-facing slopes of Dowa Yallane (Mollhausen 1858:90; Sitgreaves 1853:5; Foreman 1941:144).

Pastoralism played a major role in the initial expansion into satellite villages. Although sheep could be grazed on virtually any part of the traditional Zuni use area, including the floodplain, the Zuni preferred, understandably, to keep animals out of fields during the growing season. Thus, pastoralism required mobility, which was considerable at times (Ferguson 1988:22). In the fall, sheep grazed on the stubble of harvested fields near Zuni Pueblo, and they were kept in the protected environs of the pueblo and the farming villages during the winter. "Summer range" included sheep camps that were located one to two days travel from the winter bases and more distant range as far away as seventy miles from Zuni Pueblo (Ferguson and Hart 1985:41). Ethnographically, then, the extent of Zuni transhumance was well beyond daily commuting range.

Land in the Zuni River valley near the pueblo was devoted to maize agriculture and gardening (Lesley 1929:227-8; Sitgreaves 1853:5). Non-conflicting use of the various kinds of land was apparently a feature of Zuni land use during the Historic Period: as long as land was unrestricted, this would not have presented problems for the Zuni.

The organization of pastoralism and *acequia* irrigation for wheat required changes in the relations of production. Herding was organized patrilineally in small groups of men. By the beginning of the twentieth century, the typical sheep camp was tenanted by a group of three to five men--typically a grandfather, a father, and his sons, although work groups were probably larger before 1870 when herds needed to be protected from raiding. Herds, and probably use rights to range and sheep camps, were inherited through the male line (Holmes and Fowler 1980:252; Smith and Roberts 1954), in continuation of a pattern borrowed from the Spanish patrilineal tradition. As Ferguson (1988:22) points out, the small group organization of Zuni pastoralism allowed families to pool herds and labor, so that some men could farm while others were at sheep camps.

Agricultural work groups were generally organized along lineage and clan lines. For instance, clan brothers assisted with weeding and hilling maize and hoeing wheat, and groups of related women husked and braided maize or prepared peaches for drying (Bohrer 1960; Cushing 1974; Holmes and Fowler 1980). An exception to this practice was the digging and maintaining of *acequia* systems at the farming villages. This labor, which required relatively large groups, was organized along village or community lines rather than by kinship. Because the river valley farming villages were not founded or occupied by members of one kin group or clan, it was more efficient for the personnel of large labor groups to crosscut kin lines.

Settlement configurations and new modes of production

New modes of production associated with pastoralism and *acequia* agriculture had implications for the institution of seasonal circulation and the built environment of the satellite settlements. Since the heaviest labor requirements occurred between March and November, it is not surprising that production-related satellite settlements were seasonal, occupied during periods of high labor demand. Aspects of the organization of production, such as work group size and the kinds of activities that occurred in these predominantly economic settlements, should be directly related to the use of space in the villages. Differences in the organization of production, therefore, should explain at least some, if not most, of the differences in settlement configuration.

In evaluating the relationship between the organization of production and village configuration, I looked at settlement and room block sizes and the kinds of features present in the different villages. The organization of wheat agriculture required the presence of a large labor force through much of the growing season; thus settlements associated with this mode of production should be larger than sheep camps. The inclusion of diverse types of land in the site catchments of the river valley farming villages suggest that these villages supported a wider range of activities than the earlier ones; this also would contribute to a larger site size. Assuming that people who worked together tended to live in closer proximity, room block size (the number of rooms per room block) might be considered a measure of the size of cooperating work groups. If this is the case, then, not only should sites be larger during the American Period, but room blocks should be larger as well. As noted above in table 6.2, sheep camps and wheat-growing villages were associated with specific features; thus there

Table 6.4. Attributes of the Built Environment of Several Zuni Satellite Villages.

Site	Period	Features[1]	No. of Room blocks	No. of rooms	Range of room block sizes[2]	Mean no. of rooms per room block	Mean distance between room blocks[3]
Kyaki:ma RS	Spanish/Mexican	C,O	5	9	1-3	1.8	Not applicable
Shundekya	Spanish/Mexican	C	1	2	2	2	Not applicable
H. Luwal'a	Spanish/Mexican	C,O	8	49	1-13	6.1	33.6
Wimaya:wa	Spanish/Mexican	C,O	5	17	1-8	3.4	17.4
Ojo Caliente	American	C,T,A,Ov	31	94	1-28	3.0	10.3
Lower Pescado	American	C,O,T,A,Ov	8	113	1-34	14.1	5.9
Upper Nutria	American	C,T,A,Ov	11	74	1-18	7.1	9.6
Upper Pescado	American	C,T,A,Ov	12	25	1-5	2.1	21
Lower Nutria	American	C,T,A,Ov	15	44	1-7	2.9	10.8
Tekapo	American	C,T,A,Ov	11	28	1-5	2.5	12.1

Notes: Data are from Ferguson 1993; Mills et al. 1982; Rothschild and Dublin 1995.
[1]Feature abbreviations are as follows:
C= corrals; A = *acequias*; Ov = beehive ovens; T = threshing floors; O = peach orchard.
[2] Room block size is measured in numbers of rooms per room block.
[3]All measurements are in meters.

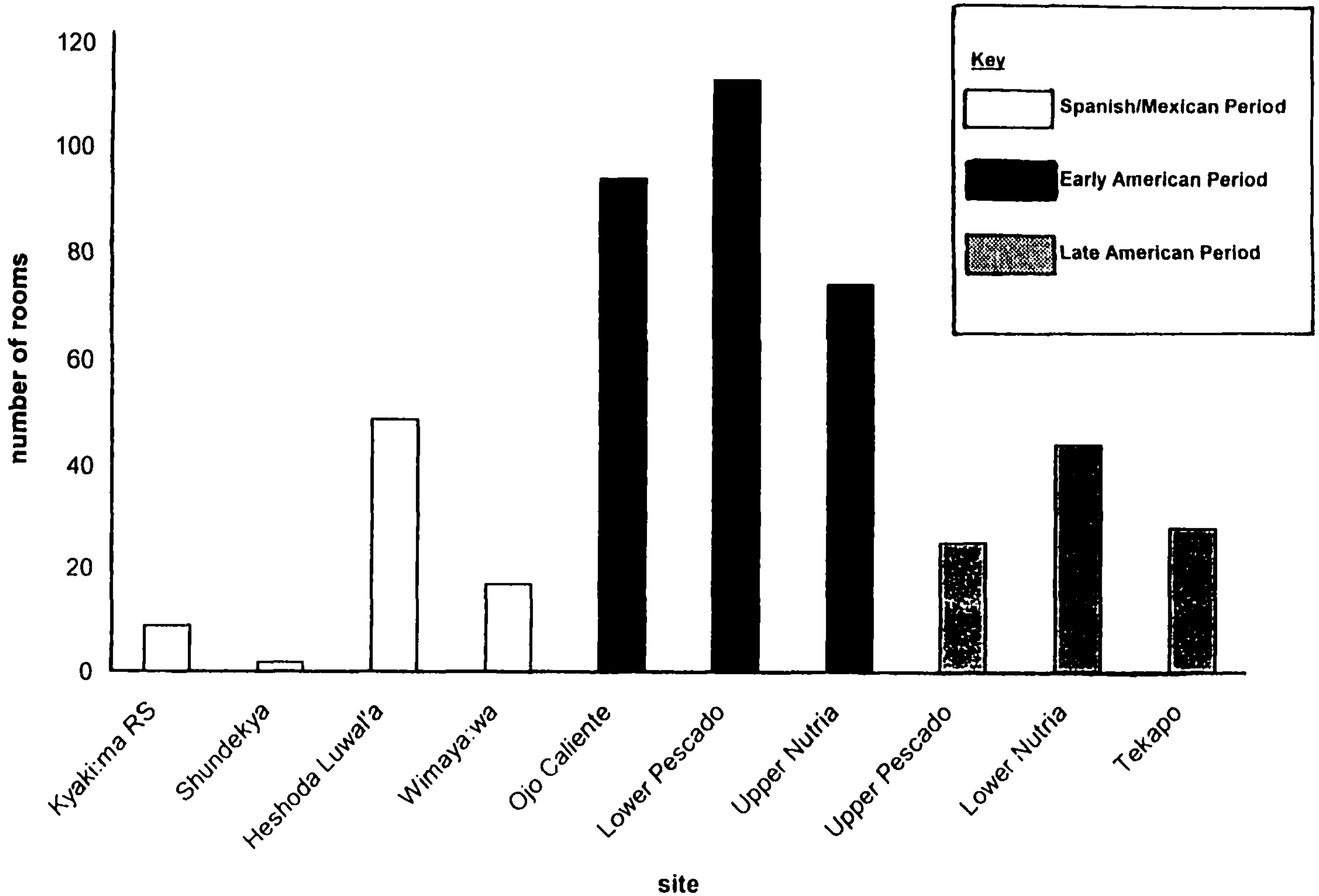


Figure 6.1. Sizes of Zuni satellite settlements during the Spanish and American Periods.

should be a difference in the kinds of features present in each type of settlement.

If differences in the organization of production are important determinants of the settlement configuration, then settlements with distinctive economic orientations should look different. Table 6.4 presents information on site and room block size and the kinds of features present at several of the better-documented satellite villages (Ferguson 1993; Mills et al. 1982; Rothschild and Dublin 1995). The bar chart, figure 6.1, illustrates differences in site sizes among the villages.

The Spanish/ Mexican Period settlements can be grouped into specialized site types, based on differences in size and the built environment (Ferguson 1993:89-90). These sites were generally small, and several closely resemble Zuni sheep camps described in the ethnographic record (Holmes and Fowler 1980:259-64). Room blocks, each associated with a corral or a complex of corrals, generally contained fewer than five rooms (Ferguson 1993:142-7). Wimaya:wa (figure 6.2, page 185) is a good example of this type of satellite site; another is the "refuge site" at Hawikku, which contained a corral and one room block that was built during the Protohistoric occupation of Hawikku and reoccupied after the Pueblo Revolt (Smith et al. 1966:119).

Other eighteenth-century satellite sites were used for farming outlying fields. The irrigated field complex described by Dominguez in 1776 (Adams and Chavez 1956:201) was probably the farming hamlet of Ranchos de Piedras Negras, which housed 28 people in 1790 (Ferguson 1993:90-1). The archaeological remains at this locality have not been surveyed, but it would appear from the 1790 census that the settlement was small. Early tree-ring dates on structural timbers from Ojo Caliente, Upper Nutria, and Lower Pescado indicate that these also served as small satellite sites, probably associated with spring-irrigated field complexes.

Early satellite settlements were used as sheep camps, farming districts, or sites of peach orchards, economic orientations that did not require a large labor force. The sites were occupied seasonally during the spring and summer months (Adams 1953:296; Ferguson 1993:88). The establishment of these small settlements, often no more than single room blocks, inaugurated a pattern of seasonal transhumance related to economic activities. This pattern allowed the newly consolidated population to use outlying farm and range land, while maintaining a political center at Zuni Pueblo. This differed from the kind of temporary site represented by Dowa Yallane, which served as a refuge from political or military reprisals and was occupied, not seasonally but apparently at sporadic intervals by the entire population, not segments of the population.

The nineteenth-century summer villages at Ojo Caliente, Upper Nutria, and Lower Pescado built on the experience of previous seasonal circulation, but they looked quite different from the earlier sites. These relatively large villages ranged in size from 74 to 113 rooms with seasonal populations in 1880 of 440, 473, and 580 residents, respectively (Holmes 1983). Room blocks were generally larger than in the earlier settlements; at Lower Pescado Village, for example, the mean room block size was 14.1 rooms. Because people in these villages lived closer together than in the earlier villages, communication among the residents was easier (Ferguson 1993:279-81), presumably facilitating cooperation in ditch maintenance and water allocation under an *acequia* system.

Interestingly, the three late villages at Tekapo, Lower Nutria, and Upper Pescado tended to be closer in size to the eighteenth-century settlements than to their parent villages. Since these villages were also used for *acequia* agriculture, they should have been larger if the organization of production was the only factor structuring settlement size during the 1890s and the early twentieth century, when these villages were founded.

The kinds of economic features present at the nineteenth- and twentieth-century satellite villages differed from those at the eighteenth-century sites. although corrals continued to be important. Peach orchards were present in the vicinity of Lower Pescado and presumably were tended by residents of that village. The features associated with wheat agriculture included *acequias*. threshing floors. and beehive ovens. The greater variety of features present in the later villages reflect the number of different economic activities that occurred there. As the site catchment analysis also suggests. these villages were more diverse than the earlier. specialized satellite settlements.

The distribution of corrals. room blocks. and the organization of production:

The spatial distribution of corrals and room blocks at the eighteenth- and nineteenth-century sites further indicates how the role of satellite settlements changed over time. The maps. figures 6.2 and 6.3. depict the eighteenth-century satellite site at Wimaya:wa. surveyed by Ferguson (1993:148), and the nineteenth-century farming village of Lower Pescado, surveyed by the Mindeleffs in the 1880s (Mindeleff 1989:Plate LXIX).

At Wimaya:wa, each corral/ enclosure complex is associated with an adjacent room block, so that the site is made up of five discrete architectural groupings, each consisting of a room block and a contiguous corral complex. At Lower Pescado Village, four well-preserved

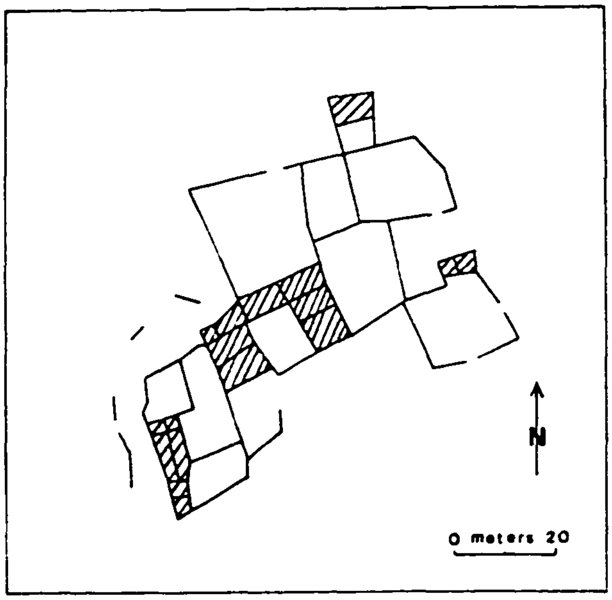


Figure 6.2. Plan view of the eighteenth-century satellite site of Wimaya:wa (after Ferguson 1993:148). The hatched enclosures are identified as rooms, while the others are corrals or unroofed open areas. Note the association of corrals with small room blocks.

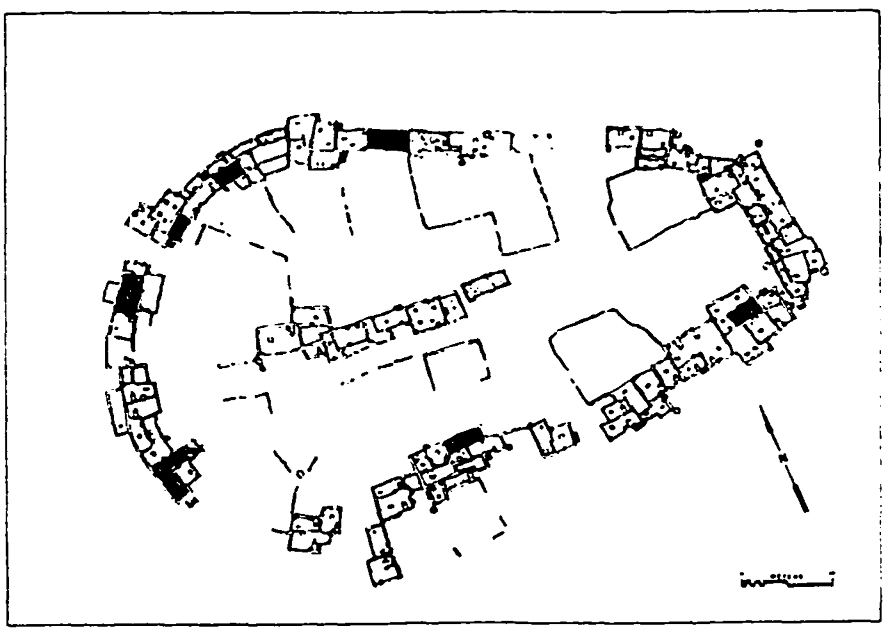


Figure 6.3. The Mindeleff Map of Lower Pescado Village, 1885 (after Mindeleff 1989:Plate LXIX). Note the large room blocks and the location of the corrals in the center of the oval.

and three fragmentary corrals were clustered in the center of the village, and the unambiguous room block-to-corral association that existed at the early satellite settlements was no longer apparent. This suggests that the spatial organization of pastoralism had become more community-based; whether this change was related to defensive concerns or to the use of the later villages as winter bases for livestock is not clear.

The Organization of Production, Settlement Patterns, and Some Unanswered Questions

Clearly, there was a relationship between the organization of production associated with the incorporation of new domesticates and spatial differences in the early and later satellite villages. However, several questions remain. It is suggested in the archaeological record (although the evidence is not abundant) that the additive incorporation of introduced species occurred over a lengthy period of time. Economic decisions regarding these appear to have been based on the weighing of production requirements and the perceived advantages of certain domesticates.

Sheep pastoralism allowed the Zuni to convert the extensive grasslands of their use area into a mobile and useful resource base that could be stored on the hoof and later used for meat, wool, and hides (Ferguson 1993:83). Livestock were apparently incorporated into Zuni subsistence regimes by the end of the Pueblo Revolt; evidence from the Hopi pueblo of Awatovi suggests that, before 1680, domestic animals were kept only at the missions (Olsen 1978). It may be that, at Zuni as well as at Hopi, the Franciscans controlled these means of production; in any case, as soon as the missionaries were driven out, the Zuni appear to have embraced pastoralism.

Wheat agriculture also required significant changes in the relations of production, including higher labor demands, new technologies, and a different pattern of land use than maize. Essentially, wheat is redundant at Zuni, where a staple grain, maize, had been cultivated successfully for centuries. What factors encouraged the nineteenth-century addition of irrigated wheat farming to the Zuni agricultural repertoire?

The regular use of land outside the daily catchment area of Zuni Pueblo required the establishment of facilities in outlying areas. That these were seasonal rather than year-round settlements is, I suggest, related to the social and political exigencies of a colonial frontier system where there are significant centrifugal pressures as well as external encroachment along a contested frontier. The development of seasonal villages in a satellite relationship to Zuni Pueblo allowed the Zuni to exploit outlying areas and to maintain a visible presence along the frontier while also maintaining a political and symbolic focal point at a central pueblo. In the following sections, I will explore aspects of the historic social landscape in the context of settlement change at Zuni.

Factionalism and the Development of Satellite Sites

The historic Zuni settlement system emphasized unity in the presence of a strong central pueblo which was the site of integrative ceremonial activity, while the satellite villages represented seasonal expansion into economically attractive areas. Preucel (1988:19) considered mobility an "adaptive response which may be more or less successful in mitigating social or environmental stress." It has been suggested that seasonal dispersion in the historic Southwest was useful in alleviating social stresses related to crowded conditions, factionalism, or unrest after the Pueblo Revolt (Preucel 1988:76-8; White 1942:79).

Fissioning, which weakens political fabric and cultural identity alike, is a possible response to centrifigal stresses associated with colonialism. Existing tensions might also be exacerbated under colonial conditions (Ferguson and Whitehead 1992; also see chapter 2 above) and might find expression in factionalism, perhaps in the form of "traditional" and "progressive" parties. Internal conflict might arise from a number of situations, including demographic factors (population loss from epidemic disease, crowding caused by infilling and dislocations of neighboring peoples); economic pressures; stress on the subsistence system related to the loss of labor or to tribute demands (Spielmann 1989); or political conflict related to restructuring or shifting alliances.

In this section, I will discuss the evidence for factionalism at Zuni during the eighteenth and nineteenth centuries, expectations for the settlement pattern, and the fit between these two variables.

Evidence for factionalism

At Zuni, the settlement system composed of central pueblo and dispersed satellite villages might be considered an effective compromise between centrifugal and centripetal forces operating during the eighteenth and nineteenth centuries. Centripetal forces that were expressed spatially in the maintenance of a central pueblo might have flowed from the necessity to maintain unity in the face of outside threats and assimilative pressures, while centrifugal tendencies might have crystallized around the complex and often changing relations with the colonial powers of Spain and the United States and the "trading and raiding" relationship with the neighboring Navajo and Apache. Factionalism, exacerbated by American meddling at the pueblo, was reported by researchers on late nineteenth- and early twentieth-century Zuni history (Eggan and Pandey 1979:477; Pandey 1967; Roscoe 1991; Simmons 1980:106-26). Considering the common occurrence of factionalism in colonial settings, it would not be surprising that factions were present at Zuni through the Historic Period.

The evidence for factionalism cited here is anecdotal and relies on the interpretation of Spanish, Mexican, and American military and administrative reports. This has resulted in an emphasis on the relationship between internal stresses at Zuni and attitudes toward Athapaskans. Pueblo-Athapaskan relations were of considerable strategic importance to the various New Mexican governments, who were almost continuously engaged in warfare with the Navajos and Apaches during the eighteenth and nineteenth centuries. Unfortunately there are very few native accounts of political relationships during this time period.

The historic record suggests that factionalism was expressed through Zuni conduct during military campaigns and through diplomacy. Incidents associated with two campaigns against the Navajo provide insights on the nature of conflicts within the pueblo. These were the Perez campaigns in 1836 (Brugge 1969:196; McNitt 1972:76-7) and the Carson campaign and its aftermath in the 1860s (FWLB 1861-1869). During the eighteenth and nineteenth centuries, the Zuni participated in several campaigns against members of Athapaskan bands, who in turn raided the pueblo and other Zuni settlements for grain and domestic animals (Hendricks and Wilson editors 1995:4). Military reports of Zuni responses during this period are often contradictory, describing both friendly and antagonistic relationships; it is likely that these are describing the activities of separate factions within the pueblo.

During the second Perez campaign, Mexican forces marched against Zuni Pueblo, having heard that the Zuni had allied with the Navajo. They turned back after the Zuni had turned over several Navajo prisoners, convincing Perez of their friendship toward the Mexicans (McNitt 1972:76-7). Another account of this same incident reports that Mexican forces had surrounded the pueblo before the two Navajo prisoners were surrendered (Brugge 1969:196). These reports are suggestive of an internal debate existing at Zuni over policies toward Athapaskans and Mexicans. An incident that occurred around the same time offers further support for this hypothesis. In May 1836, a Zuni war party attacked seven Navajos near Zuni Pueblo, capturing sheep and goats and killing three of the Navajo party. While they were in pursuit of the remaining four, a pro-Navajo group led by two Zunis ran off the captured stock, killing a horse in the process (Brugge 1969:196). The outcome of this fracas was not recorded, but the presence of pro- and anti-Navajo factions is evident.

These incidents are echoed in reports written during 1864 and 1865, at the height of American efforts to remove the Navajo to the Bosque Redondo. During the summer of 1864, it was reported that individual Zuni were warning Navajos not to surrender to the Army, telling them that they would be enslaved; it was also reported that Navajo fugitives were being hidden at Zuni Pueblo (FWLB 1864). That this was not an expression of a unified pro-Navajo stance was apparent in an incident related by a Navajo informant, Peshlakai Etsedi. Etsedi, who was on his way to the Bosque Redondo, was warned by a Zuni who spoke Navajo that he should not stay at the pueblo since there was a plot to kill adults and capture children and young girls (Brugge 1969). The command at Fort Wingate expressed concern that the Zuni were supplying information to the Apache. who were also at war with the United States; in July 1864, a Zuni was arrested for "illegal traffic with and giving information to the Apaches" (FWLB 1864). This individual was later released to the Zuni governor Pedro Pino, after he had promised continued Zuni allegiance to the United States.

There were many reasons for pro-Navajo sentiments among some segments of the Zuni population. beginning with the fact that many Navajo bands had allied with Pueblo peoples during the Pueblo Revolt. During the seventeenth century, it was not uncommon for dissatisfied Puebloans to run off to live with Athapaskan bands. whose lives, they fancied, were freer of the yoke of Spanish domination, according to a document written in 1638 (Brugge 1969). Additional factors might have included kinship ties; during the early nineteenth century Father de la Prada, the missionary at Zuni Pueblo, complained that many Navajos were staying at the pueblo and marrying Zuni women (Brugge 1969:194). By the mid-nineteenth century, trade relations were also a factor. In 1849, a thriving arms trade among Mexicans, Angloamericans, and Athapaskans operated out of Zuni Pueblo, no doubt with Zuni approval, if not participation; this trade was still in place in 1871 (Abel 1915:53; Dorr 1871; United States Congress 1871:806). The Navajo and Apache trade also included sheep and other foodstuffs, textiles, hides, and craft items (FWLB 1864). A Navajo by the name of Tom Billy reported that his maternal uncle traded meat and salt with a Zuni for cornmeal and bread. They would meet outside Zuni, "in the woods," where the Zuni would go, ostensibly to collect firewood (Brugge 1969). This account, which is not dated, indicates that trade with the Navajo was frowned upon.

Although some at Zuni openly supported the Athapaskans, the Zunis' official stance was one of friendship and alliance with the United States government. The following incidents are reported in the Fort Wingate Letter Books. In 1865, the ability of the Zuni governor to persuade the commandant at Fort Wingate of the pueblo's loyalty resulted in the cancellation of plans to station an Army detachment at the pueblo. During the 1860s, the Zuni provided information to the military on Navajo movements and participated in campaigns against several Navajo headmen. At various times, they refused to allow Navajo refugees to stay at the pueblo, although, at other times, as noted above, they were accused of harboring Navajos. In August 1864, they turned over a party of Apaches to the commandant at Fort Wingate. Zuni involvement in the complicated politics of the time also included diplomatic intercession with Fort Wingate on behalf of both Navajos and Apaches.

During this period of endemic warfare and constantly shifting alliances, it was in Zuni's best interests to remain on amicable terms with all parties, not least because of their strategic location between Navajo and Apache territory. The inconsistent United States support for Zuni may also have exacerbated factionalism at the pueblo. This inconsistency was documented in the account of a visit by Pedro Pino, the Zuni governor, to James Calhoun, the territorial governor and Indian Agent in Santa Fe in 1850. Noting that troops had been withdrawn from the garrison at Cebolleta and that the United States had refused to supply Zuni with arms to defend itself, Pino spoke of the Zunis' "disappointments" with the Americans. "Why, at the moment the Navajo are going to war against Zuni, are American troops withdrawn from Cebolleta?" The governor said, "I suppose to give the Navajos <u>a fair chance</u> against us - <u>who were promised</u> protection." [emphasis in original] (Abel 1915:250; AGO 1850).

I think that the documentary record supports a hypothesis of the presence of factionalism related to Zuni diplomacy and military affairs. It also illustrates Zuni efforts, which appear to have been generally successful, to manipulate situations and major players during the volatile and fractious years of the eighteenth and nineteenth centuries. A useful strategy in colonial frontier settings, Zuni activities were analogous to those of the Iroquois in relation to the French, English, and Algonkians in the colonial Northeast (Bradley 1987; Richter 1992; Rothschild personal communication 1997). Factionalism remained an element of Zuni political life into the twentieth century (Pandey 1967; Roscoe 1991; Simmons 1980), although the focus of debate shifted from military and diplomatic relations to resistance to the influx of American culture that arrived with the railroad and settlers.

Factionalism, dispersion, and the founding of satellite villages:

Since the late eighteenth century, the Santa Ana Pueblo satellite villages at Ranchitos have occupied five parcels of irrigable farmland along the Rio Grande River. In the 1940s, Ranchitos consisted of two villages and an outlying group of houses. Elements of the settlement patterns and architecture of these villages are thought to express a tendency toward individuality, independence, and separatism, qualities that were considered useful in alleviating social stress related to overcrowding at the pueblo (White 1942:79). The houses at Ranchitos are free-standing, and rooms are not aggregated into clustered room blocks. In contrast, Santa Ana Pueblo is "very compact, [with the result that] the 'social distance' between individual egos was quite small, and in social psychology, as in mechanics, the shorter the distance between moving parts, the greater the friction" (White 1942:41).

There are several expectations that emerge from this case study. Increased social distance could be achieved by decreasing clustering; in a less clustered settlement, room blocks should be small and freestanding with open space between them. Open space might include use areas or features associated with subsistence or household activities, but it should form a boundary of sorts between structures. The maintenance of social distance might be further facilitated by restricting movement within a settlement; that is, by making it difficult to get from one part of the village to another. As villages become more crowded, daughter communities might be founded at a distance from the parent village, but infilling should not occur in the parent village if maintaining social distance remains important.

These conditions were not present at Zuni Pueblo, which was characterized by massive and clustered room blocks, a layout that would encourage unity and social concourse. The satellite villages were structured differently, although by the mid-nineteenth century changes toward increased clustering had occurred. The eighteenth-century villages were small, containing fewer rooms and fewer room blocks than the later villages (see table 6.4, page 180). To test the null hypothesis that there was no difference in site size between the earlier Spanish/Mexican Period group of sites and the later American Period group, the Mann-Whitney Test was employed. This non-parametric test, based on relative ranks of the variables in both samples, measures differences in the dispersion and form of each sample (Blalock 1972:255). The distribution of the resulting statistic (U) is keyed to a probability table (Blalock 1972:561); for the purposes of this test, a probability of .05 or lower was considered sufficient to reject the null hypothesis. Site size was measured in number of rooms. The value of U on differences in the distribution of site sizes was 3, and the associated probability was .03; therefore the null hypothesis of no difference was rejected.

In addition, although there were small room blocks (containing fewer than five rooms) at all the villages, only the nineteenth- century villages contained large, clustered room blocks. The mean number of rooms per room block is generally smaller in the earlier villages than in the later and there is more distance between room blocks. The early villages conform better to the expectations of the model connecting spatial distance to social distance.

In his analysis of the spatial syntax of historic Zuni sites, Ferguson (1993:142-56) surveyed four early satellite villages (Shundekya, Kyaki:ma Refuge Sites, Wimaya:wa, and Heshoda Luwal'a) and four late ones (Lower Pescado, Ojo Caliente, and Lower and Upper Nutria). Units in the early villages were strongly bounded, making it difficult to move from one unit to another within a community (Ferguson 1993:274). The structure of the open space within these communities would have constrained the number of chance encounters among community members; these villages were "hard to get to" and "hard to get inside." (Ferguson 1993:266). The later villages do not demonstrate this degree of social segregation.

The American Period villages do not conform well to White's model, even though factionalism continued into this period. Labor demands of *acequia* agriculture and a concern with defense were probably more important in driving settlement patterns during this period. By 1850, 150 years after consolidation, the Zuni had developed effective social mechanisms for dealing with the centrifugal stresses that engendered factionalism. Some researchers have suggested that the Bow Priesthood gained in importance during the Historic Period (Eggan 1950), and it may be that the centralization of ritual activities at Zuni Pueblo also helped deflect tendencies toward fissioning.

The farming village at Ojo Caliente was an exception to the observation that the nineteenth-century villages are more clustered than the earlier ones. One reason for this may be that houses from different time periods are pooled. Tree-ring dates indicate that there was an eighteenth-century occupation at this village (Mills et al. 1982), and Mindeleff (1989:Plate LXXIII) observed that early room blocks were built on top of the mesa fronting the Ojo Caliente road. These room blocks are smaller and more scattered, while the later room blocks fronting the road contain more rooms, like those at Lower Pescado and Upper Nutria. These two villages were laid out in ovals that conformed to the configurations of earlier, fourteenth-century pueblos. They appeared clustered, with relatively large room blocks that created a demarcation, or boundary, between "inside" and "outside" spaces. The demarcation, however, was not between room blocks, as in the earlier villages, but between the villages and the outside, a defensive configuration.

At Upper Nutria, later room blocks built outside the circle suggest that the tendency to "spread out" was replacing clustering (Mindeleff 1989:94); by the 1890s, daughter villages were founded at Upper Pescado and Lower Nutria. About 1912, Tekapo was founded by members of a single clan that had left Ojo Caliente because of internal disagreements (Mills et al. 1982). These incidents of fissioning occurred after the need for defense had waned and during a period when factionalism at Zuni was reported to be very high (Pandey 1967; Roscoe 1991). It may be that these expansion villages are related to processes that encouraged social distancing; the layouts of Tekapo and Upper Pescado are generally closer to the initial situation of small scattered residences, although Lower Nutria contains some agglomerated room blocks.

Internal stress, expressed as factionalism, may have been a predictor of settlement configuration in the eighteenth century, but not in the early years of the American Period. At this time, other factors, including defense, the need to protect valuable resources, and labor demand associated with agricultural change seem to have gained in importance, selecting for more clustered and enclosed settlement configurations at Lower Pescado and Upper Nutria Villages. By the late nineteenth century, this pattern seems to have reversed, and the process of social distancing may again have become a factor in the configurations of the satellite villages.

Warfare, Defense, and Zuni Satellite Villages

Defensive requirements are considered important in the development of the historic built environment (Cushing 1974; Dublin 1989; Ferguson 1993; Green 1990; Mindeleff 1891). The massive multistory room blocks and enclosed plazas of Zuni Pueblo, the impregnable or hidden locations of the early satellite settlements and the enclosed configurations of the later ones are offered as evidence for the defensive nature of Zuni settlement patterns and architecture. In this section, I will examine historic accounts of warfare in the Zuni area and the relationship between defensive concerns and changes in the architecture and settings of the Zuni satellite villages.

Documentary evidence for conflict in colonial New Mexico

Conflict was endemic in western New Mexico from the onset of Spanish control in the early seventeenth century through the Navajo and Apache wars during the late nineteenth century. I used administrative and military reports (United States National Archives 1849-1900), as well as Zuni accounts of historic incidents of violence (Ferguson and Hart 1985; Green 1979, 1990; United States Claims Court 1987) to reconstruct patterns of conflict.

The nature of conflict changed during the early years of the eighteenth century. In the seventeenth century, incidents of conflict in the Zuni area had centered on the Spanish and particularly on the missions. The first decade of the eighteenth century was a period of shifting alliances, probably marked by internal political unrest and factionalism after the consolidation of the population. A Spanish garrison was stationed at Zuni Pueblo in 1699 and again between 1700 and 1703, in part to protect the Zuni against Athapaskan raids and in part to protect Spanish civilians living at the pueblo. Three Spanish civilians who had offended the Zuni by their aggressive behavior were killed at Zuni Pueblo in 1703 and four others were killed in 1705 (Jones 1966). Zuni was occasionally used as a staging area and provisioning center for Spanish military activities along the western edges of the territory. In 1703, for instance, Zuni warriors joined Spanish troops in a raid at Hopi and skirmishes with that pueblo continued as late as 1719 (Ferguson and Hart 1985; Jones 1966). Athapaskan raids on Zuni were reported in 1705 and 1708; in turn, the Zuni participated in Spanish-led expeditions against the Navajos and Apaches as early as 1705 (Ferguson and Hart 1985; Hendricks and Wilson 1996).

These sketchy reports identify several axes of conflict after the Pueblo Revolt-- with the Spanish, with other pueblos, and with Athapaskans, who soon became the major focus of warfare. Athapaskan raids had become common, not only at Zuni but throughout the area, by the mid-eighteenth century. The severity and frequency of raids at Zuni are not known, but it is likely that many incidents were unreported; from the perspective of administrators in Santa Fe, Zuni was a frontier village, far from the center of Spanish activity in the Rio Grande valley. It is impossible to identify periods of intensified or diminished raiding, but the fact that the Zuni participated in Spanish military actions against the Athapaskans in 1747, 1754, and 1786, indicates that raiding continued to present a problem through the eighteenth century. Raiding continued into the American Period as the most common form of warfare in the area. The historic accounts, although incomplete, allow generalizations about the objectives of raiding, places where raids and retaliatory attacks occurred, and the size of raiding parties. These are all factors which would enter into Zuni decisions about defensive measures.

During the nineteenth century, reported raids in the Zuni area were conducted by Navajo, Apache, and Ute bands. The major objectives were livestock (horses, sheep, mules, and occasionally cattle), grain, and prisoners. Amounts taken could be substantial; in October 1850, a Navajo raiding party attacked Zuni Pueblo, stealing most of that year's maize crop (AGO 1850). In two raids in 1849 and 1850, the Navajo took Zuni women as prisoners. The Zuni also took prisoners; in a battle in the Datil Mountains in October 1863, the Zuni and their allies took 54 Navajo women and children (FWLB 1863). These Navajo prisoners were probably turned over to the United States Army and sent to Bosque Redondo, but prisoners taken earlier and prisoners taken by the Navajo often entered the New Mexican slave trade. In 1804-5, during the height of the slave trade, Spanish and Zuni allies under Lieutenant Narbona took 33 prisoners, 30 of whom were women and children (McNitt 1972); the disposition of these prisoners is not known.

Although most of the reported raids occurred at Zuni Pueblo, raids took place at all three of the American Period farming villages and at Zuni foraging camps in the Zuni Mountains. Of 31 raids reported in the United States military records during the 1850s and 1860s, 18 occurred at Zuni Pueblo, 4 at Pescado, 4 in the Zuni Mountains, 2 each at Nutria and Ojo Caliente, and 1 in the hills north of Zuni Pueblo. The higher frequency of raids at the pueblo and the farming villages (rather than at outlying campsites) is not surprising, since these were places where quantities of resources were stored. Navajo campsites in the vicinity of Ojo de Oso, north of Upper Nutria, were used periodically from the late eighteenth through the late nineteenth century (Bloom 1936:108; (Correll 1979; Green 1990:247; Miera de Pacheco 1778; Reeve 1971; USCC 1987:32, 36). If Ojo de Oso was used as a staging area for Navajo raids, this would explain the more frequent occurrence of raids in the Zuni Mountains and at Nutria and Pescado rather than south of Zuni Pueblo.

Raids occurred during all seasons; the element of surprise was probably important for a successful outcome. Although it is hard to estimate an average size for raiding parties, the number of casualties, often reported in military accounts, can be used as a rough guide, since they presumably represented a percentage of the total raiding party. Using these figures, I estimated that, although raiding parties were occasionally small, generally more than ten persons participated in raids on localities in the Zuni area. In July 1865, for instance, the Zuni reported that fifty Utes had participated in a raid at Nutria, destroying three wheat fields and stealing horses (FWLB 1865). A simultaneous attack on Zuni Pueblo and on Pescado in 1846 required a large and well organized Navajo force (Ferguson and Hart 1985:60; Whipple 1855). Most accounts note that members of raiding parties were mounted. Cushing recounted a raid that took place at a fieldhouse in the Zuni valley southwest of the pueblo, probably in the 1830s (Green 1981:272ff). This account, which describes the raiding from a Zuni point of view, is similar to the military reports in general content. The raiding party, which struck suddenly, was mounted and consisted of more than five Navajos. They took foodstuffs and one prisoner, a woman.

To summarize, raiding was the predominant form of conflict during the eighteenth and nineteenth centuries. There was no seasonal or spatial pattern, although resources and prisoners were the usual objectives, which meant that any settlement or farmstead with storage facilities and corrals would be a suitable target. The river valley farming villages were in place at the height of raiding during the early part of the American Period, and defensive measures would be expected at these villages.

Defensive features of Zuni satellite settlements

Location and architecture contributed to the defensive capabilities of Zuni sites. Impregnable or hidden locations, on promontories, mesa or ridge tops, in caves or rock shelters, are defensible because they are difficult to access, because they have long sight lines so that approaching enemies can be seen at a distance, or because they are not visible to outsiders. Defensive architecture mimics these topographic features. Aspects of the built environment such as enclosing walls and clustered buildings limit access to the interior of settlements, while watchtowers and multi-story rooftops provide long sight lines. In a situation where raiding for resources is common, defensive sites might exhibit structural features that enclose and protect storage areas.

The seventeenth-century Zuni refuge village atop the mesa of Dowa Yallane was the ideal defensive site. Ferguson (1991; 1993:128-41) provides an invaluable description of the architecture, while the account of Diego de Vargas (1914:304) describes the setting on top of a steep sided mesa almost 300 meters above the surrounding floodplain. Views from Dowa Yallane extend 360 degrees across the Zuni River valley and the surrounding countryside. Access is limited by the steepness of the cliff and the narrowness of the ascending path; de Vargas, ascending in 1692 during the *Reconquista*, was required to climb alone and on foot (see above, page 60).

Many of the eighteenth-century satellite sites are situated in inaccessible or hidden places. Shundekya, a sheep camp built on a mesa bench in the upper Galestina Canyon, had a wide view of the lower canyon. Access was via a steep narrow path, which was walled in wider places along the route, probably to prevent livestock from falling off the cliff (Ferguson 1993:146), but the wall also restricted passage. At Shundekya, setting and architecture contributed to the defensive character of the site. Heshoda Luwal'a, built on two promontories overlooking a deep canyon, is accessible by a rugged trail that snakes through broken mesa country north of Zuni Pueblo. The village is not on any major trails out of the pueblo and its presence may well have been unremarked even during its heyday. The Miera y Pacheco map, compiled in 1779 and reproduced here as figure 6.4, does not show this village, although it does illustrate several abandoned Protohistoric pueblos in the Zuni valley. Although Miera, a member of the Escalante expedition, passed within a few miles of the village (Bolton 1950:3; Warner 1995:139-40), the countryside is so broken that he would not have seen the village. No contemporary Spanish observers mentioned this village, although

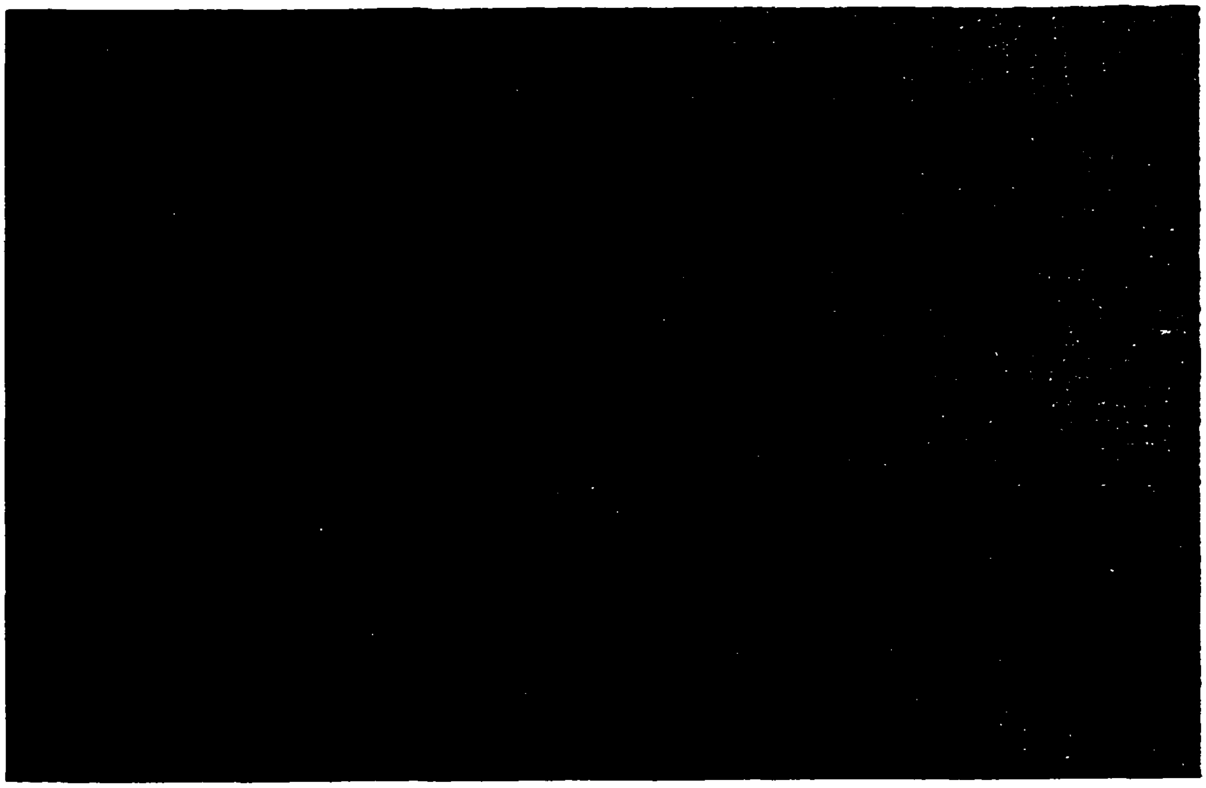


Figure 6.4. A segment of the Miera y Pacheco Map of 1778, showing the Zuni area. Note the presence of Navajo encampments (marked by hogans) at Ojo de Oso and in the Chuska ("Chusca") Mountains. The Protohistoric sites of Kyaki:ma ("Caquima") and Hawikku ("Jaquiqui") are seen to the south of Zuni, indicated by the mission in the lower center of the figure.

farming localities along the *Calle del Obispo* were duly noted in accounts of *visitas*. At Heshoda Luwal'a, the defensive effectiveness of the village lay in its inaccessible location and rugged topography, but also in its hiddenness.

Nineteenth-century satellite settlements were situated in relatively open river valley settings that were suitable for *acequia* agriculture, but that were not, in themselves, defensible. Upper Nutria and Lower Pescado villages, located within a short distance of Navajo encampments in the Zuni Mountains, were targets of raids during the mid-nineteenth century. Both villages were built on top of fourteenth-century pueblos that were semi-enclosed by perimeter walls. Upper Nutria Village (figure 6.5) backs on a line of ridges that form the western edge of the Zuni Mountains. In 1885, the room blocks that constituted the village formed a semicircle with its closed end facing the mountains to the north and east and its open western end facing the Nutria valley and Zuni field complexes. The semicircle was partially closed by a room block along the west side. Mindeleff (1989:94) thought that the four small room blocks between the main semicircle and Mexican Hill had been constructed after the cessation of hostilities. If this is so, the enclosed layout of the village presented an unbroken front along the north and east sides, restricting access to the room blocks and central plaza and providing protection for resources stored in or near the buildings. Navajo

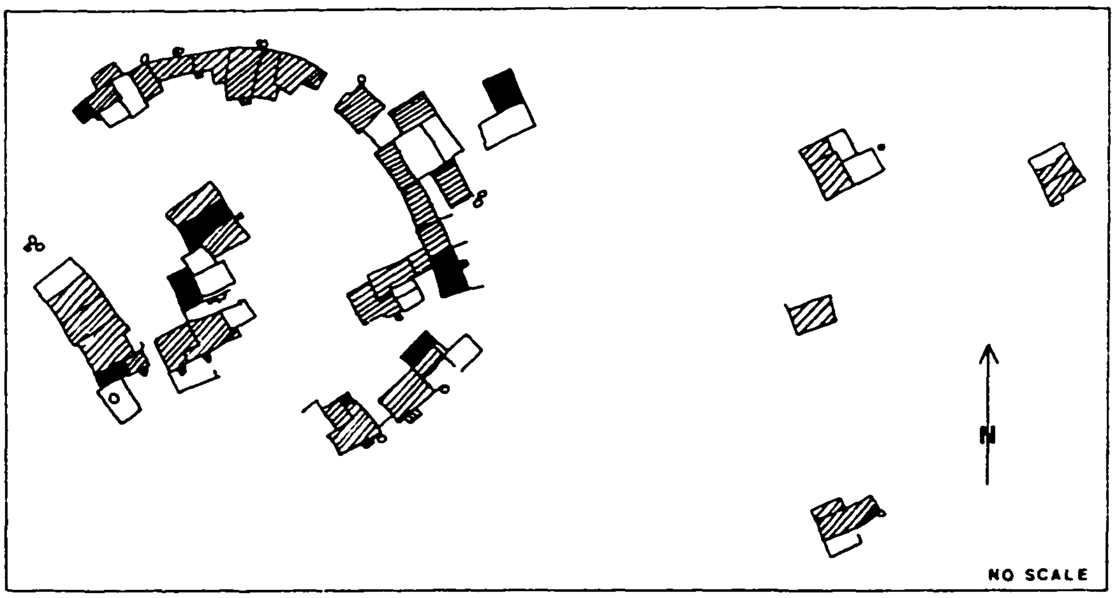


Figure 6.5. The Mindeleff Map of Upper Nutria Village in 1885 (after Mindeleff 1989:Plate LXVII).

and Ute raiders would most likely approach the village from the north and east; the Navajo had campsites in the Zuni Mountains, and were often observed in the vicinity of Nutria Springs, north of the farming village (Bloom 1936:108; Green 1990:247).

At Lower Pescado Village, defensive elements were also apparent in the architecture and layout. This village on the *Calle de Obispo*, the most open of the nineteenth-century villages topographically, is also the most enclosed architecturally; the village is shown on the Mindeleff map, figure 6.3. Located in the relatively broad Pescado valley, Lower Pescado Village was built on a knoll that stands two meters above the surrounding floodplain. Sight lines extend across the valley and eastward and westward for a distance along the river. The large room blocks were laid out in a rough teardrop shape, echoing the configuration of the underlying fourteenth-century pueblo, and facing the interior plaza, which contained one room block and several stone and wood corrals. Access to the interior was limited to four entryways, with no access from the east or upriver end of the site. In 1885, the mean width of these entryways was 9.5 meters, adequate for the passage of flocks of sheep. The village was encircled by a mortared masonry wall sixty-five centimeters wide; a segment of this perimeter wall was excavated by the Barnard/Columbia Field School in 1991 (Rothschild and Dublin 1995:59-76). The stonework identified the feature as a fourteenth-century construction, but the condition of the mortar and artifacts and features found in association with the wall indicated that it had been refurbished in the nineteenth century. The outer row of nineteenth-century rooms were built against the wall, so that it served as a back wall of the room blocks as well as a perimeter. Clearly what was being protected at this place were resources stored in the interior, sheep and grain. In his analysis of the spatial syntax at

Pescado, Ferguson (1993:225-6) suggested that the open space structure at this village functioned to connect the interior (or corral area) to the exterior (or range); the constricted access points allowed controlled entry. The configuration served the purpose of "moving livestock in and out in a controlled fashion that otherwise facilitated protective enclosure of the settlement" (Ferguson 1993:226).

Lower Pescado and Upper Nutria Villages appear to represent a compromise between economic and defensive requirements. The economics of wheat agriculture required expansion into the river valleys adjacent to large permanent springs, while the prevalence of raiding required that resources be protected. This was accomplished by the reuse of enclosed fourteenth-century pueblos with protected resource storage areas at the center. Once the threat of raiding was gone, the architecture of the villages opened up.

Production for Market and the Nineteenth-Century Farming Villages

Although the rapidly changing social landscape of the mid-nineteenth century was characterized by endemic conflict, it also expanded opportunities for trade with Athapaskan groups and with the United States military who were stationed at garrisons and forts in the area. Much of this trade was in grain.

The development of relatively large villages at the permanent springs of Ojo Caliente, Nutria, and Pescado expanded Zuni settlement and cultivation into areas that were suitable for wheat. According to the historic record, wheat was a major crop at these villages. In 1857, Edward Beale wrote that "[h]ere [at Pescado] the fine wheat of the Zunians is principally raised." (Lesley 1929:227-8). During the 1880s, all wheat was grown at the farming villages (Green 1979:293; Stevenson 1904). This also may have been the case in the 1850s since wheat required *acequia* irrigation which was feasible only at the major springs.

As noted above, the available evidence indicates that the Zuni were not growing wheat in quantity before the mid-nineteenth century. Presumably, wheat was one of the crops grown for the mission at irrigated plots near Black Rock in 1776 (Adams and Chavez 1956:96). Once the mission was abandoned, however, there was no reason to continue growing wheat, which was harder to cultivate and produced lower yields than maize (Lopinot 1986). Certainly wheat was not needed for subsistence. By farming floodwater fields near the pueblo and along the slopes at the edges of the river valley and in the various farming districts, the Zuni could grow sufficient maize to feed themselves and to maintain a surplus against dry years (Bohrer 1960; Stevenson 1904). The population did not grow appreciably during this period, which would have placed stress on the resource base, and rainfall was relatively good (Rose et al. 1982). Grain was not needed for forage, since herds were grazed on the open range. Even if expanding grain production were necessary for subsistence, I expect that the Zuni would have concentrated on maize rather than wheat, which required higher labor input for lower yields. So the question remains; why wheat?

Several researchers have tied expanding wheat production at Zuni to a developing Angloamerican market for grain (Ferguson 1993; Hart 1980; Holmes and Fowler 1980; Mills et al. 1982). This is, for the purposes of this dissertation, an intriguing suggestion since entry into a market economy is a well-documented effect of colonial penetration. That a grain trade existed at Zuni during the early years of the American occupation is documented. Major Henry L. Kendrick, the commandant at Fort Defiance, reported in 1856 that the Zuni sold $4000 worth of grain annually to the fort. He went on to write that the Zuni "slowly enlarge the area of their planting grounds under the stimulus afforded them by our market" (Kendrick 1950:332), explicitly tying the expansion of the river valley farming villages to the grain trade. In the following paragraphs, I will examine the documentation of Zuni grain trade in an effort to understand its duration, extent, and organization, as well as its connection to the river valley farming villages.

Historic accounts of the grain trade

A major market for Zuni grain, according to nineteenth-century reports, was the United States military and the various American expeditions that passed through the pueblo. There are also anecdotal accounts of an active grain trade with the Navajo (Brugge 1969:198; Green 1979:297-300; Kendrick 1950:332). Clearly, grain was a major trade item at Zuni. Zuni provisioning of military expeditions was reported as early as 1705 (McNitt 1972; Hendricks and Wilson 1996). Whether this provisioning was conducted as trade, the commandeering of goods, or as an element of Zuni hospitality is not known, but the tradition continued into the American Period. In 1847, when the Walker campaign against the Navajo ran out of food, a detachment was sent to Zuni for provisions, "which the Zunis offered generously" (McNitt:1972:12).

Zuni hospitality included feasting, which entailed the distribution of foodstuffs. In 1849, when the Washington expedition stopped at Zuni Pueblo; Colonel Washington and his staff were served a meal which included "breads, tortillas with chili, melons, and peaches" (United States Senate 1849:60). The provision of food, including meats, breads and fruit "in profusion," was also a component of trade with Apaches at Zuni Pueblo in the 1870s (Dorr 1871:359). Cushing reported a trading encounter between the Zuni governor, Palowatiwa, and a Navajo trading partner at which a large meal ("enough ... provender for ten men") was served (Green 1979:298).

In 1850, there was an American garrison at Cebolleta, followed by the establishment of Fort Defiance, Fort Fauntleroy, and Fort Wingate. The forts were accessible via the *Calle del Obispo*, which led eastward from Zuni through the El Morro valley to Ojo de Gallo (the location of Fort Wingate). A wagon trail through the Zuni Mountains led to Ojo de Oso, the site of Fort Fauntleroy and, later, the rebuilt Fort Wingate, and another wagon trail connected Zuni Pueblo and Fort Defiance. These access routes are depicted on the Whipple survey of 1853, reproduced here as figure 6.6. Transport would have been difficult, but not impossible in dry weather. The river valley farming village of Lower Pescado was located on the *Calle de Obispo*, while Zuni Pueblo was situated at the juncture of roads leading north to Fort Defiance and east to Ojo de Gallo, where Fort Wingate was to be built. By the 1850s, then, there was a potential market for Zuni grain, and a rudimentary transportation infrastructure.

The organization, extent, and timing of the Zuni grain trade can be partially reconstructed from historic accounts. The Zuni were provisioning the garrison at Cebolleta in 1850, when its commandant, Colonel Monroe, sent fifty muskets to assist them in protecting their crops from Navajo raids. Monroe reported that protecting Zuni crops was important since the troops at Cebolleta relied on Zuni produce for "a portion of their supplies" (DNM 1850). In 1851, James Calhoun, the territorial governor and Indian Agent, authorized the continued purchase of corn at Zuni, formalizing a trade that was previously

Figure 6.6. A segment of the 1853 Whipple map, showing the location of Fort Defiance, north of Zuni Pueblo, and the access routes into the Zuni area.

sporadic or opportunistic (Abel 1915). At this point, at least some grain was being purchased rather than bartered.

From the existing accounts, it appears that both corn and wheat were being sold to Americans. In 1851, Henry Dodge reported that he had purchased one thousand bags of corn for Fort Defiance (DNM 1851): corn, probably for forage, was purchased for Fort Defiance in the late 1850s (Kendrick 1947, 1950). Although these accounts specify that the grain trade was in "corn," not wheat, the terms were interchangeable in the nineteenth century; the use of the term "corn" probably referred to both maize and wheat. The purchase of grain for military forces stationed in New Mexico included processed and unprocessed wheat, corn meal, and hominy (Frazer 1972:213; QMG 1849-1861).

The purchase of grain and forage was a major military expenditure in the New Mexico territory. Between 1849 and 1861, reported purchases from large contractors totalled eleven million pounds, while an additional 250,000 pounds of grain were reported but not contracted for (Frazer 1972:227). At an average of $.08 per pound (Frazer 1972:229), these reported expenditures totalled about $900,000, or about $75,000 per year for the district of New Mexico. Purchases from Zuni do not appear in the records of the Quartermaster General's Office, nor do purchases made by individual expedition leaders. It is therefore necessary to rely on anecdotal accounts in attempts to ascertain the extent of the Zuni trade with the Americans. Most military purchases, even for the remote western forts at Defiance and Fauntleroy, were made from large contractors who milled the grain (Frazer 1972). The Zuni trade most likely supplied only a small percentage of the grain sold to the military, as well as some grain supplied to expeditions that passed through the pueblo.

It is difficult to reconcile accounts of Zuni grain sales, which were usually recorded by volume in bushels, with the records of the Quartermaster General's Office, which recorded sales by weight in pounds. In 1854, the reported rate paid for grain at Fort Defiance was $1.35 a bushel (MISC 1854), which allows some estimation of the comparative value of the grain trade to Zuni. In 1853, Lieutenant Whipple, leading an Army surveying party, purchased 800 bushels of corn at Zuni (Foreman 1941:140), a purchase that would have amounted to almost $1100. In 1857, Edward Beale purchased 28.5 tons of corn, about 2300 bushels, more than $3000 (Lesley 1929:227-8). In the same year, Lieutenant Kendrick reported that the Zuni were supplying the garrison at Fort Defiance with $4000 per year in corn (about 3000 bushels). Clearly, during some years, the proceeds from the grain trade were considerable, if these accounts are accurate, but there is no indication of an influx of wealth entering the pueblo. Observers during the early years of the American occupation described the Zuni as "hardy, well-fed, and well-clothed" (Abel 1915:300), but not wealthy. Since the land supplied a good living, it is not surprising that the Zuni people appeared comfortable.

It is not clear how the grain trade was organized or how the proceeds were used. Possibly, it was conducted by trading partners in much the same way that the Navajo and Apache trade was handled (Brugge 1969:198; Dorr 1871:341-5; Green 1979:296-301). In this case, monies may have been spread out among various people and therefore were not evident on the level of the general pueblo. The Athapaskan trade was accompanied by elaborate feasting and gifting; Zuni trade goods included crafts made from purchased materials as well as grain and salt, which were local products. Some proceeds from the

American grain trade may have been used to purchase trade goods and silver and other imported raw materials for craft production, although silversmithing does not appear to have become important until after 1870 (Walker 1974), by which time the American grain trade had ended.

Following ancient tradition, Zuni Pueblo was a major trading center for the entire area, and Americans and Mexicans, as well as Athapaskans, met there to exchange various items (McNitt 1962). These included firearms and liquor (Abel 1915:53; FWLB 1864; Kendrick 1947:179; US Congress 1871:806), items that may also have been purchased from grain proceeds during the 1850s and 1860s. However, the Zuni may not have been major players in this trade in contraband, since most reports indicate the presence of "Mexican" or "American" liquor and arms traders illegally operating out of the pueblo.

The Zuni grain trade apparently peaked during the 1850s and ended by the 1860s. Grain purchases are not mentioned in military records or travellers' accounts after that latter year (Domenech 1860:213). By 1860, many of the exploratory expeditions that travelled through Zuni had also ended, so that market disappeared as well. Production for market was dependent on growing conditions, which also deteriorated as precipitation became more variable during the 1860s (Rose et al. 1982). In 1865, Major Shaw, the commandant at Fort Wingate, issued rations to the Zuni, noting that they "were in a starving condition" (FWLB 1865); at this point, the Zuni were not growing sufficient grain to produce a surplus for trade.

Agricultural expansion may have been necessary to produce surplus maize at Zuni, and it was certainly necessary for wheat. The existence of a market for Zuni grain would have contributed to the development of farming areas, and the river valley farming villages where wheat was produced would have grown in response to the labor demands associated with *acequia* agriculture and the defensive requirements associated with the development of settlements in relatively exposed locations. However, I do not think that the availability of the nascent Zuni grain trade is adequate to explain the continued development of the villages even after the market had disappeared. While the grain trade was apparently lucrative, it was relatively short-lived because of the vicissitudes of demand and because of the unpredictable growing conditions in the area. The decision to expand production may have been associated with a major settlement change, but it was a very short-term situation. The Zuni remained in their farming villages at the springs after the grain market collapsed and through the mid-1860s, a period of heavy raiding, with grain a target. So while the opening of markets for Zuni grain might explain the initial expansion to some extent, it does not explain the continued importance of the river valley farming villages.

Marking Use Rights on a Contested Landscape

The restructuring of Zuni settlement patterns during the mid-nineteenth century involved a shift in economic strategies (Roger Anyon, personal communication 1993; Ferguson 1993, 1995; Holmes and Fowler 1982; Mills et al. 1982) and an increased commitment to satellite villages on the edges of the core settlement area. I suggest in this section that political and ideological factors emphasizing boundary maintenance and the symbolic associations of ancestral Zuni land played a role in the growth of these villages.

Incidents of site reuse and the construction of field houses at the edges of settlement systems to mark use-rights to land have been noted at other locations in the American

Southwest (Garcia-Mason 1979:450; Head and Snead 1992; Kohler 1992). Kohler (1992:625) has suggested that, in these cases, expansion is related to increased aggregation and competition over valuable resources. The alluvial land and large, permanent springs at the river valley farming villages certainly constituted key resources, a fact recognized by the Zuni Bow Priest Naiiutchi, who stated in 1883 at the height of the Nutria land controversy:

> [I]f there be but one thing upon which we depend for our lives, and our cattle, and our corn, it is the four springs [Nutria, Pescado, Ojo Caliente, Blackrock]. Take these away and you take away the life of the Zuni. The land of the Zuni is dry and sandy, and those springs are all we have. We want the water to make food. We do not want to keep others away, but we want the water from the springs in order that we may live. (Green 1990:124)

The development of large farming villages in the valleys of the Nutria, Pescado, and Zuni Rivers effectively expanded the core area of Zuni settlement. While the early satellite villages were located at distances of eight to twenty-four kilometers from Zuni Pueblo, the later villages were much further, from twenty-four to forty kilometers. Moreover, the territory within their circumference encompassed large segments of the most important drainages in the region, as well as valuable permanent springs. Expansion, which was marked by architectural development, occurred at a time of increased encroachment on the part of non-Zuni peoples. The farming villages at Lower Pescado, Upper Nutria, and Ojo Caliente were the largest and most visible of the Zuni satellite settlements. In this section, I will outline the historical documentation of encroachment on Zuni land. I will then discuss examples of the use of the built environment to signal use rights to land and the features of the river valley farming villages that might be considered useful in this respect.

The historical documentation of encroachment during the late nineteenth century

Although most instances of land seizure at Zuni occurred after 1860, it is not necessary to document actual alienation of land to demonstrate the presence of a perceived threat to the Zuni core area. In a frontier setting, many different groups may use land within the same area (Forbes 1968); in some cases, this might entail land seizures, in others, not. In any case, increased stress tends to generate conflict among the various players. The development of "contested landscape," or, if you will, a more complex social landscape, might be marked by increased territoriality that is explicitly expressed in strategies of boundary maintenance.

At the beginning of the American Period, the "boundaries" of the Zuni use area were not only ambiguous, but were a matter of concern to the government in Santa Fe. As Calhoun wrote in 1850:

> In relation to the extent of territory belonging to each pueblo [Isleta, Socorro, and Zuni], nothing is definitely known. ... The lands are held under Spanish and Mexican Grants and the boundaries of the original grants have been, from time to time, enlarged to meet the wants of these Christian Indians ... the general opinion is, not one of these Pueblos have a square of less than eight miles and a half on each side." (Abel 1915:172)

The grant boundaries that Calhoun specified were probably those of the fraudulent Cruzate grant, which defined an area that was much smaller than the traditional Zuni use area.

In 1851, the Zuni, along with representatives of the other Pueblos, complained to the government in Santa Fe of encroachments on their territories (DNM 1851). In 1854, the Zuni again complained, this time that Mexican herders were grazing sheep on Zuni range west of the pueblo (USCC 1987:55). No action was taken by the government, since New Mexico territory was not an "officially defined Indian country" (MISC 1854).

During the same period that these encroachments were occurring, the United States government was drawing up treaties with the Navajo that established "boundaries" for Navajo territory. Treaties enacted in 1855 and 1858 included land near Pescado and Nutria as well as other parts of the Zuni use area in Navajo territory; in fact, the Treaty of Laguna Negra (1855) set the north bank of the Zuni River as the southern border of Navajo land, a line that would have included both Pescado and Nutria within Navajo territory (DNM 1855). These treaties merely confirmed aspects of land use that pre-dated the American occupation; Navajo bands were using campsites near the springs at Ojo de Oso and at Nutria and in the El Morro and Ramah valleys east of Pescado well before these treaties were enacted. The "official" recognition of this fact, however, may have served to lessen military action on the part of the United Sates government to safeguard Zuni use areas. Although treaties with the Navajo specifically excluded lands "owned" by the Pueblo of Zuni, Major Kendrick at Fort Defiance expressed concern that, under the Treaty of Laguna Negra, the Navajo might take possession of Zuni farm land near Pescado and Nutria (Kendrick 1947:179).

From these examples, it is clear that Navajos and Mexicans were expanding westward early in the American Period and that areas near the springs at Pescado and Nutria were pressure points. Encroachment increased after the subjugation of the Navajo in the 1860s had brought relative peace to the area. By the 1870s, American farmers and ranchers had begun to settle in the Zuni Mountains and in the valley of the Little Colorado River southwest of Ojo Caliente (Ferguson and Hart 1985:93; Hart 1980; Teller 1954; USCC 1987:68ff.). In 1879, Taylor Ealy, a Presbyterian missionary at Zuni Pueblo, "served papers" on Mormon settlers to prevent their encroaching on Zuni land (Bender 1984:107). The lands referred to, which were not specified in Ealy's journal, may have been in the vicinity of Lower Pescado Village, since Mormon settlements had been established in the Ramah valley east of the farming village by 1876.

Navajos returning from the Bosque Redondo established farms in the Zuni Mountains near Nutria and Pescado (FWLB 1869). In 1879, Ealy wrote there was continual "bickering" between Zunis and Navajos at Nutria over land use (Bender 1984:119). The use of the springs was a source of contention at Nutria and probably at Pescado and Ojo Caliente as well. In 1881, Galen Eastman, the Navajo Agent, wrote Cushing that while he had removed about thirty Navajos and their families from "that old 'Homestead' of theirs at Nutria Springs," he condoned continued Navajo use of the spring itself. "[S]pring water coming to the surface and accessible is counted by many on this frontier as free for the necessities of man and beast as the air we breathe" (Green 1990:247). The notion that springs were free to all was apparently not universally held, especially as American ranchers occupied more land in the area. In 1883, General Bradley at Fort Wingate thanked Cushing for advising the Zuni not to use rangeland north and east of Nutria and east of Pescado Springs, since these "lands

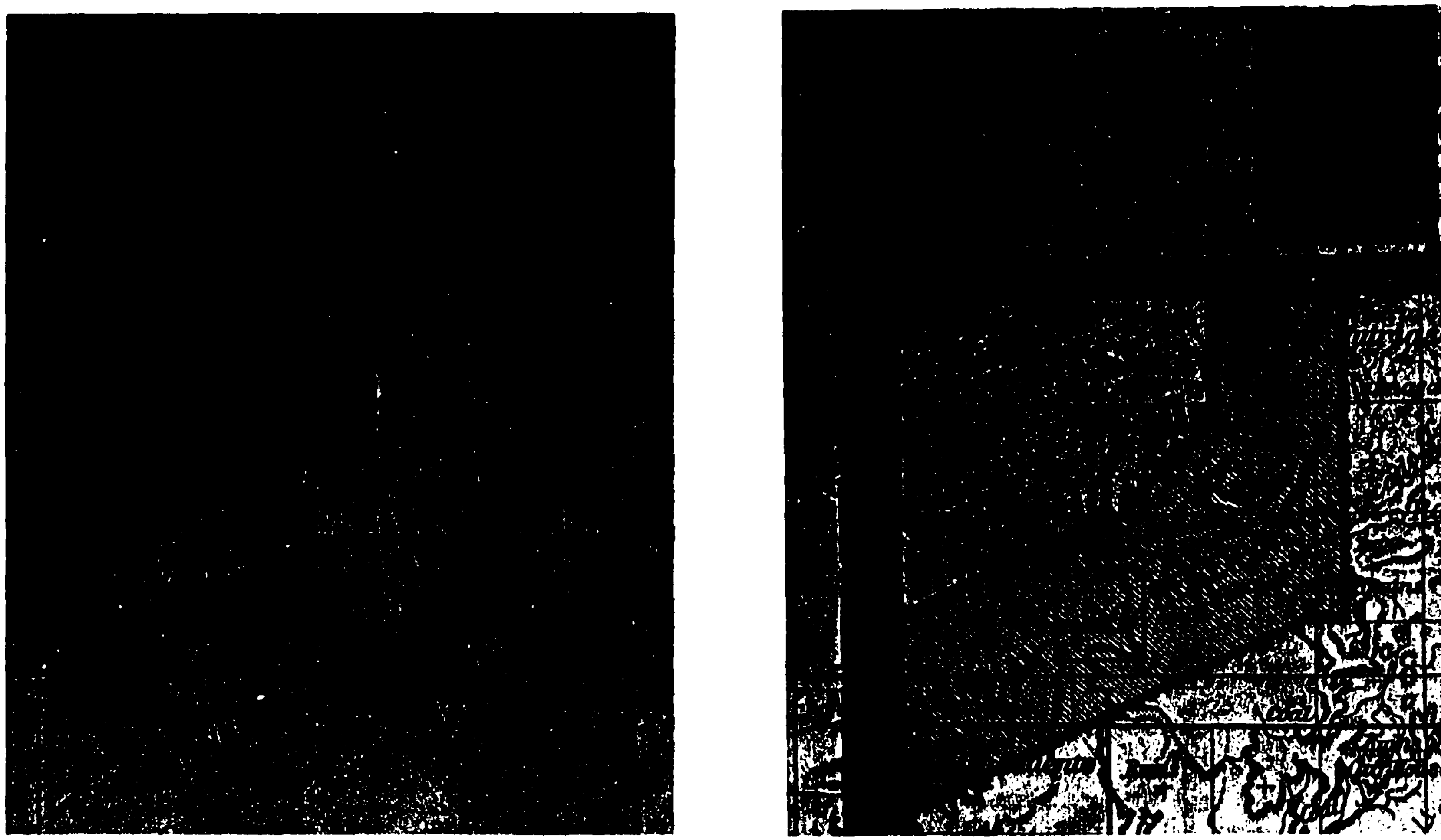


Figure 6.7. The General Land Office maps of 1879 (left) and 1882 (right), showing the omission of the farming village of Upper Nutria from the newly created Zuni reservation and the later correction. Note the proximity of Fort Wingate; the trail (dotted line) connecting Zuni Pueblo and the fort passed through the farming village.

... are now private property, at least the lands having water on them, and the Indians must keep off, whether they like or no" (Green 1990:280).

In 1883, Senator John Logan and the Cibola Cattle Company attempted to annex the Zuni farming village at Upper Nutria, claiming that the reservation boundaries that had been set in 1877 did not include the farming village (Curtis 1883; Green 1990). This incident highlighted the problem of encroachment along the edges of the Zuni settlement area, as well as the efficacy of the built environment in protecting use rights. As the Pueblo Agent, Benjamin Thomas, pointed out, the intent in setting the reservation limits was "to secure to the Zunis three principal farming districts where they raise the means of subsistence, viz: Nutrias, Pescado, and Ojo Caliente" (cited in Green 1990:279). The General Land Office surveys of 1879 and 1881, reproduced here as figure 6.7, show the correction of the reservation boundaries to include Upper Nutria Village.

The use of the built environment to mark rights to land

The construction of architectural and other improvements to land to mark use rights is reported ethnographically at Zuni. During the nineteenth century, Zuni farmers constructed low earthen walls, or "sand strings" around potential fields and placed stones in each of the four corners, thereby signifying future rights (Cushing 1974). After the reservation was fenced in the early twentieth century, stockmen "began to develop permanent ranch facilities to lay claim to [restricted] rangeland." (Ferguson 1993:104). These facilities consisted of masonry buildings, sheds, corrals, and other improvements; in this way, the built environment was used to support or demonstrate use rights within the Zuni community.

Even today, architecture marks rights to areas at the farming villages; if three courses of masonry remain standing, a structure is not considered "abandoned" and may not be used by others (Barbara J. Mills, personal communication; Rothschild et al. 1993:125).

This use of the built environment to signal use rights to valuable land was not unique to Zuni. At Acoma during the early eighteenth century, permanent residential structures began to be built at farming camps along the San Jose River. It has been suggested that this was done in "reaction to the encroachment of early Spanish colonizers upon the village of ?a'k'u [Acoma]" (Garcia-Mason 1979:450).

The river valley farming villages and boundary maintenance activities

The river valley farming villages marked the edges of the Zuni core settlement area along pressure points to the north, east, and southwest of the pueblo. Incorporated within this area were the three major drainages as well as three clusters of economically and ideologically important springs. The use of the farming villages as boundary markers might explain why they had become relatively large settlements by the 1880s, at a time when encroachment into the Zuni use area had reached a peak.

Conditions which would be useful for boundary maintenance, notably the relatively large size and visibility of the river valley farming villages, were not met by isolated fieldhouses, camps or by the early satellite villages, many of which were situated in hidden canyon and mesa locales. Upper Nutria and Lower Pescado Villages were located at pressure points where encroachment occurred, adjacent to concentrations of important land and water resources. The villages were situated along main routes into Zuni Pueblo; travellers coming westward along the *Calle del Obispo* from the Rio Grande valley passed by Lower Pescado Village, while those travelling south from Fort Wingate passed through Upper Nutria. Features of the built environment, including the topography and the settlement configuration, also improved the visibility of the villages, both of which were built on mounds that stood about six meters or so above the river valley. This elevation improved defensibility by lengthening sight lines, but it also made the villages more visible to passersby. The villages, which were built on top of Pueblo IV sites, exhibited a clustered, archaic site configuration which mirrored the shapes of the underlying prehistoric pueblos (Kintigh 1985:46, 53). Clustering of architectural elements would also have increased the visibility of these villages.

At Lower Pescado and Upper Nutria Villages, the Zuni reoccupied areas that had been "abandoned" (in the sense of lacking settlements) before the Pueblo Revolt. The reoccupation of ancestral villages would reassert a linkage to Zuni history encoded in ancient places at a time when the land base was threatened or perceived as threatened.

The locational relationship between ancestral Zuni sites and nineteenth century farming villages is pronounced. As the map (figure 6.8) indicates, the fourteenth- and fifteenth-century sites can be grouped in clusters or "districts" based on proximity and occupation dates (after Kintigh 1985). The three early American Period farming villages are located in districts that have a high density of prehistoric sites. Not all the districts that supported fourteenth- and fifteenth-century sites were reoccupied in the mid-nineteenth century, only those that met the environmental and geopolitical conditions. These were places that were situated on alluvial land adjacent to major springs that supported *acequia* agriculture and that were also pressure points where non-Zuni encroachment on valuable

Zuni use areas was occurring. The only three areas that fit this description are Nutria, Pescado, and Ojo Caliente.

The Zuni are cognizant of the many archeological sites on and near their reservation and identify these places, as well as modern towns, by Zuni place names. Zuni place names for the nineteenth-century farming villages convey their economic importance or the association with an ancient site. Lower Pescado Village is identified by the Zuni place name Heshoda T'sina or "painted house," which is a general name used to refer to the several ruins near Pescado spring. That it is also used to refer to the farming village indicates an awareness of the ancestral associations of this place. The economic function of the river valley farming villages is conveyed by the Zuni name for Nutria, which is Taiya or "planting ground," and the importance of the springs is seen in the Zuni place name for Ojo Caliente, K'yapkwayina'a, or "the place from whence flow the hot waters." Ojo Caliente was not built on the site of an ancient pueblo, but is located in the midst of what might be considered an "archaeological district." Three protohistoric pueblos are located within five kilometers of the farming village; these pueblos, Hawikku, Kechiba:wa, and Chalo:wa, are named in traditional Zuni histories and are considered sacred places because of their connection with the Zuni past. In a sense, the occupation of Ojo Caliente protected not only the springs but these ancestral places located nearby.

Site reuse at the farming villages apparently included the rebuilding on top of the mounds themselves, as well as the reuse of certain features and activity areas. The details of site reuse are best understood from the farming village at Lower Pescado, where archaeological testing was conducted. Examples of the nineteenth-century reuse of

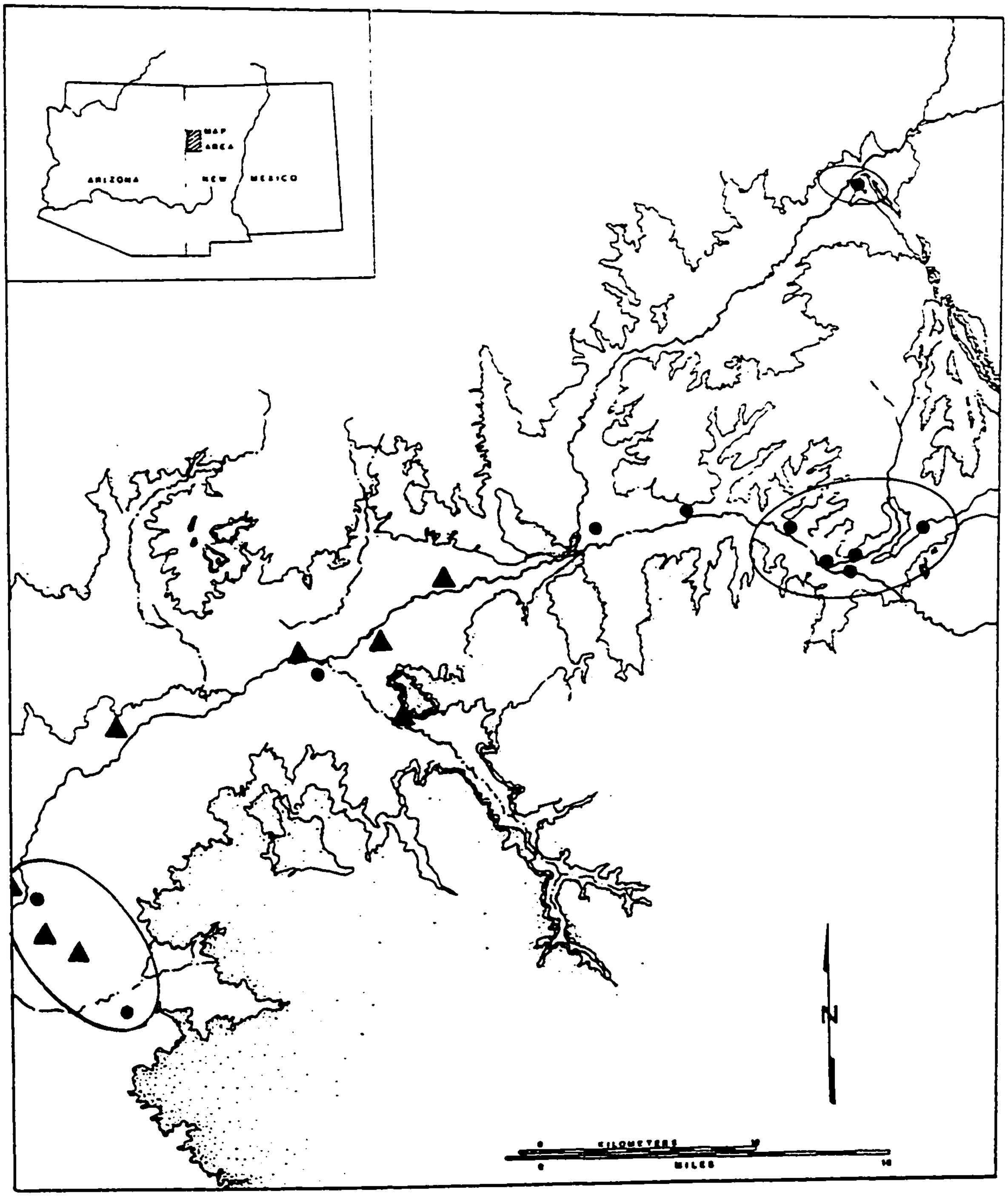


Figure 6.8. Map depicting the locational relationship between ancestral Zuni sites and the nineteenth-century Zuni farming villages.

fourteenth-century site areas and features will be discussed in chapter 7, on the architecture of Lower Pescado Village.

At Zuni, settlement expansion during the nineteenth century is related to political and ideological factors as well as to economic conditions. The continuance of a core area of Zuni settlement from the Protohistoric Period through the present appears to be the direct result of a strategy that emphasized continuity and boundary maintenance in the face of outside pressures. Spicer (1962:577) asserts that Pueblo identity is tied to the retention of at least parts of an ancestral land base: "[a] basic circumstance affecting group identity in the Southwest was the maintenance of residence by the Indians within their traditional territorial ranges. This condition promoted the continuance of a tribal identification which had strong sacred sanctions."

Chapter Summary and Conclusions

In this chapter, I used historic documents, ethnographic accounts, and settlement pattern data to understand the restructuring of the Zuni settlement landscape after the Pueblo Revolt. This restructuring, and the concomitant establishment of seasonal satellite settlements can be linked to the social and political conditions of colonialism under the Spanish and later under the United States.

A gradual reorganization of production followed the phased incorporation of introduced domesticates. This was related to initial transhumance and later changes in the size and location of satellite sites, but it does not provide an explanation of the phased acceptance of introductions, particularly wheat, nor does it explain the development of a settlement system characterized by a strong central pueblo and seasonal villages. It should be apparent from the previous pages that social and political forces operating during the Historic Period, including factionalism, defensive requirements, trade relations and boundary maintenance, were instrumental in shaping these patterns, which can be considered eminently adaptive in a colonial setting. The maintenance of a central pueblo with strong symbolic associations concentrated integrative ceremonial functions during periods of social stress, expected in colonial settings, while the establishment of satellite villages allowed expansion into economically desirable and politically strategic localities. In the volatile social landscape of eighteenth- and nineteenth-century New Mexico, the Zuni remained active players; changing conditions created a dynamic landscape and a multiplicity of functions for the various historic Zuni places. In the following chapters, I will discuss the use of one such place, the Zuni farming village at Lower Pescado.

CHAPTER 7

THE BUILT ENVIRONMENT OF LOWER PESCADO VILLAGE

Introduction

The previous chapters presented the nineteenth-century Zuni farming villages within a regional setting that included the natural environment, modes of production, geopolitics, and political ideologies of settlement. The next three chapters focus more specifically on Lower Pescado Village, which was the subject of architectural survey and archaeological testing. The research at Lower Pescado Village, described in the first section of this chapter, provides information on three broad theoretical, culture historical, and methodological issues. The comparative analyses of the architecture, site structure, and material culture at the two components explore differences in the use of the same locale during two very different periods. The historical archaeology of Lower Pescado Village is a contribution to the developing literature on the archaeology of residential mobility in the American Southwest (Graham 1994; Kelley 1986; Powell 1983; Preucel 1988; Rocek 1995), while changes in the site and material culture during its use as a farming village reflect areas of change and persistence at Zuni during the nineteenth and early twentieth centuries.

In the second section of this chapter, I will examine aspects of the built environment at Lower Pescado Village using survey and excavation data and documentary sources, particularly the Mindeleff map of 1885 (Mindeleff 1891). Residential and non-residential features will be described and discussed in relation to the organization of labor and production, the nineteenth-century economy, and defense. A discussion of how elements of the underlying fourteenth-century pueblo were used in the construction of the nineteenth-century farming village will conclude the analysis of the built environment at the satellite village.

Research at Lower Pescado Village

Research at Lower Pescado Village was conducted by the Barnard/Columbia Field School under the direction of Nan A. Rothschild and Susan A. Dublin over three field seasons during 1989, 1990, and 1991; the site report (Rothschild and Dublin 1995) is on file at the offices of Zuni Cultural Resources Enterprises. The work included several components --architectural survey, collecting oral histories, surface collecting, mapping and excavation.

Architectural survey and interviews

Architectural survey was part of an ongoing program of research on the Zuni farming villages begun by the Zuni Archaeology Program in 1979 (Mills et al. 1982) and continued in 1989 by the Barnard/Columbia Field School at Lower and Upper Pescado and Upper Nutria villages (Rothschild and Dublin 1995). The survey produced two sets of information about Lower Pescado Village. Plan views and elevations were drawn of the two standing structures and several foundations dating to the historic occupation as well as two outlying farmhouses currently occupied on a daily or frequent basis. Features and artifacts within a 25 meter radius of each structure were recorded.

This research provided an ethnoarchaeological baseline for evaluating the use of space at Zuni farmsteads and at Lower Pescado Village during its use as an historic farming village. The findings of the survey are reported in Rothschild and Dublin (1995); the data sheets and drawings are on file at Zuni Cultural Resources Enterprises. Additional analyses using this material have been published by Rothschild and others (Rothschild 1991; Rothschild et al. 1993). Survey data were supplemented by interviews with residents of the farming villages, who provided information on daily activities at the farming villages and on the decline and "abandonment" of the villages. The transcripts are on file with Zuni Cultural Resources Enterprises.

Archaeology

Archaeological research at Lower Pescado Village included surface collection, survey and mapping, and test excavations. The surface collection yielded 1,373 artifacts, many associated with the use of the site after its "abandonment," and more relevant to abandonment processes at the village than to its occupation. The mapping, using alidade and plane table, of visible structural remains and features and the locations of excavation units was begun in 1990 and completed in 1991. The site map was then overlaid on the Borchers map, produced for the earlier farming village study in 1979, and Mindeleff map of 1885 to identify changes that had occurred in the village over time. Since a number of structures could be identified on both the 1885 map and the site map, the overlay also allowed us to differentiate between "early" features that appeared on the Mindeleff Map, and "late" features built after 1885.

Archaeological testing at Lower Pescado Village was conducted over two field seasons during June and July 1990 and July and August 1991. By agreement with the Zuni Tribal Council, excavation was limited to endangered areas of the site; these included the south and east edges of the mound on the arroyo bank, and road cuts A and C. Because we were interested in comparing site use during the two occupations and because surface visibility was good, we used a judgmental sampling strategy that allowed us to maximize variability in the functional and temporal contexts sampled. Excavation units were located in areas where surface remains indicated that there was a feature or a high density of artifacts. Other criteria for the location of excavation units were the likelihood of finding both prehistoric and historic deposits, and the probability of encountering undisturbed stratigraphic sequences. Stratigraphy was most visible in the arroyo cuts where deep deposits were exposed in a number of places. Ten units were excavated over the two field seasons. Units 1 through 3 were excavated in 1990, and units 4 through 10 in 1991. The site map, figure 7.1, shows the distribution of excavation units along the arroyos and road beds.

Units 1, 3, 4, and 6 were placed along currently used roads, where grading was a continuing source of disturbance to archaeological deposits. Units 2, 5, 7, 8, 9, and 10 were placed in or along the eroding south or east edges of the site, on the arroyo above the stream bed. Unit 1 was opened in an area that was distinguished by the presence of standing historic walls with an adjacent section of prehistoric midden that had been cut through by the historic construction; excavation revealed extensive midden deposits overlying prehistoric room fill and masonry architecture. In Unit 2, on the south bank of the arroyo, advanced erosion had exposed a prehistoric foundation with historic room walls overlying the eroding prehistoric ones. Unit 3 was placed along the same road cut as Unit 1, where grading of the road continued to disturb archaeological deposits and features.

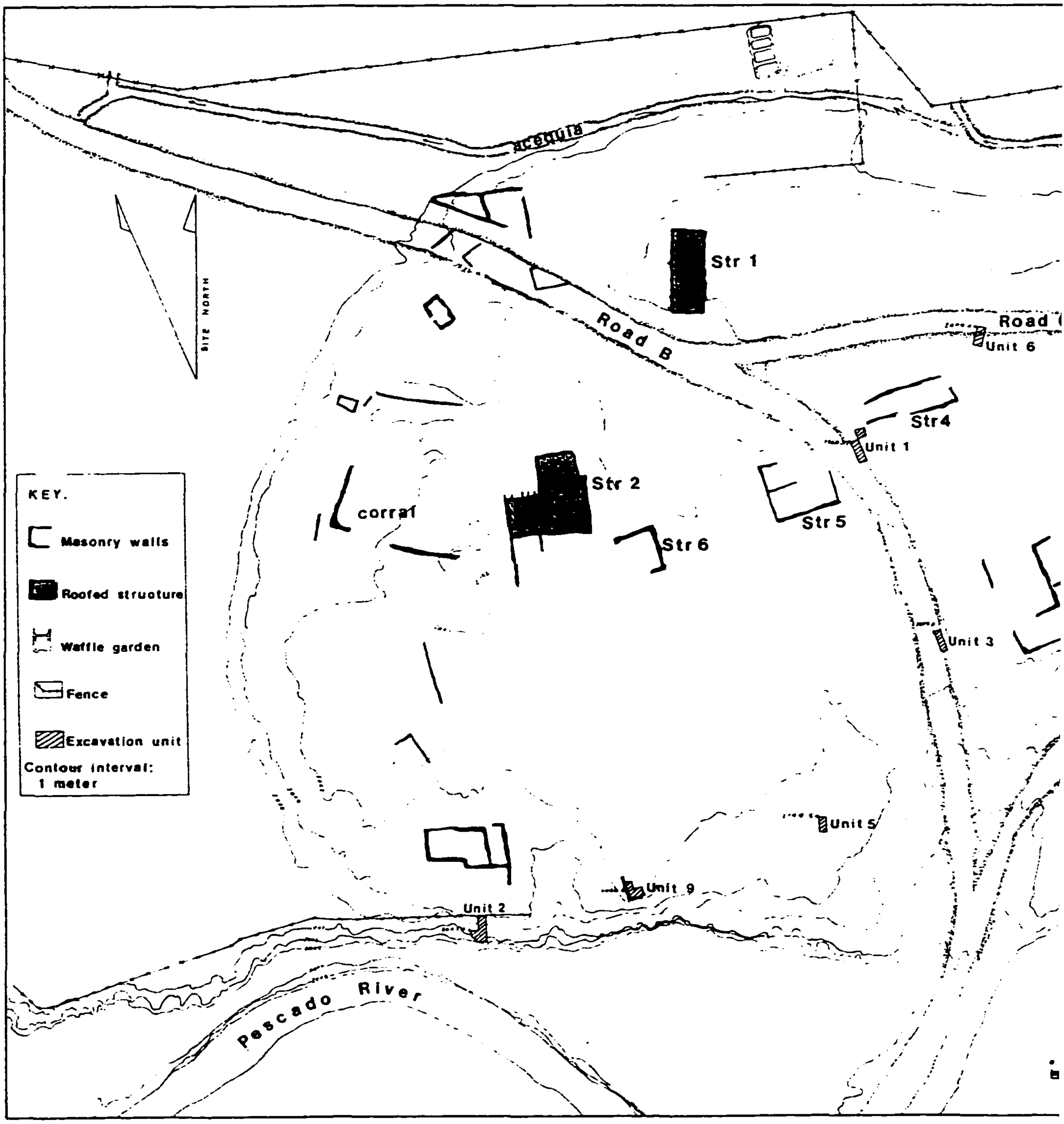
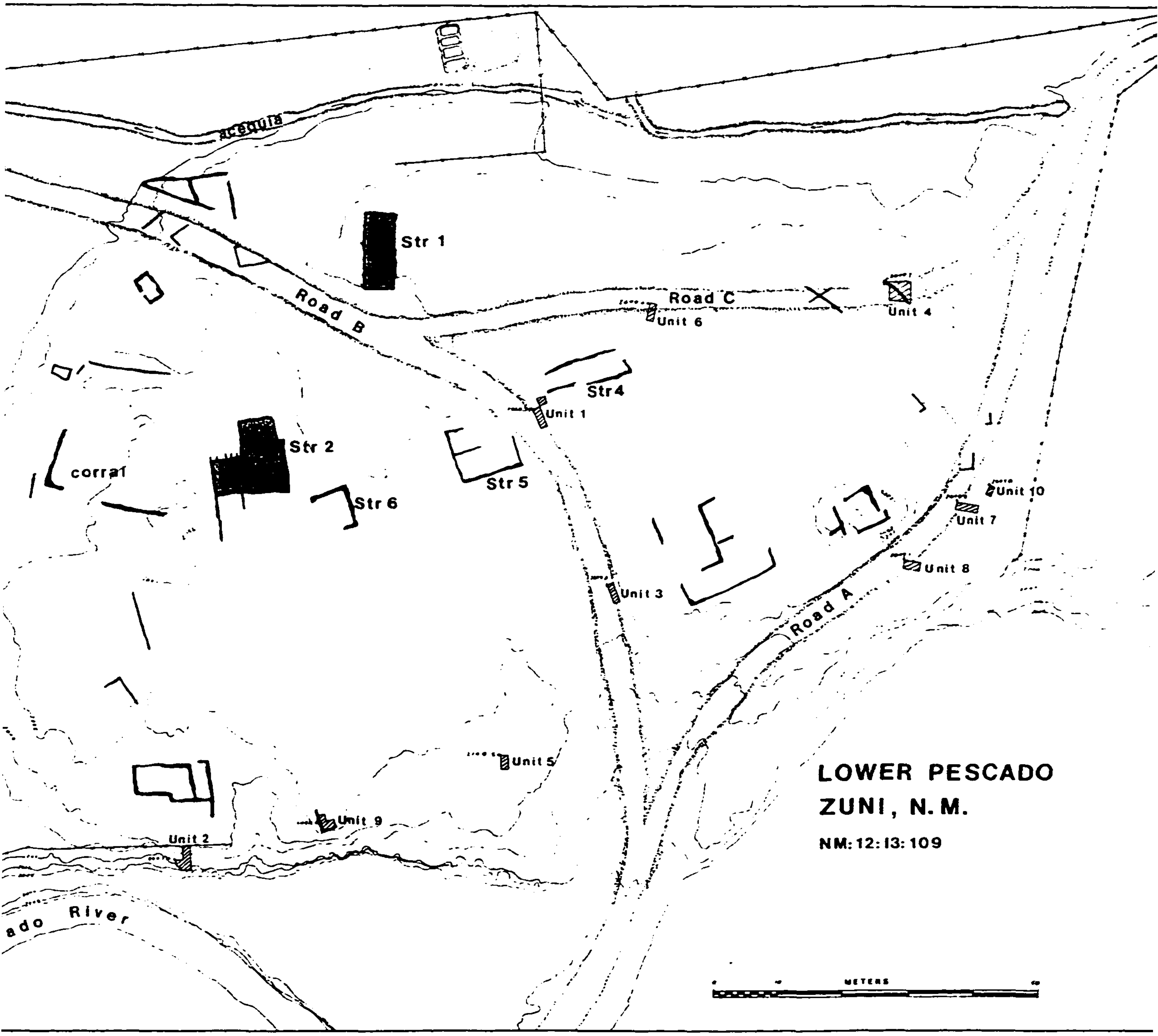


Figure 7.1. Lower Pescado Village, 1990, showing standing structures and the locations of excavation units.



illage, 1990, showing standing structures and the locations of

The visible feature in this unit appeared to be a historic beehive oven, a type of feature introduced by the Spaniards; it was underlain by a prehistoric wall segment that acted as a platform for the oven.

Unit 4, placed in the bed of Road C, straddled the perimeter wall of the historic (and prehistoric) pueblo. Excavation on both sides of the wall revealed prehistoric and historic deposits as well as several buried masonry walls that abutted the interior and exterior faces of the perimeter wall. Unit 5, on a knoll above the eroding south arroyo bank, yielded prehistoric materials below about 50 cm of historic overburden. The materials were recovered from what appeared to represent a series of ground surfaces interleaved with natural river-deposited sandy soils and charcoal lenses, cut by many rodent burrows.

Unit 6, along Road C, was bounded by the north wall of a masonry feature that was lined with clay and contained mixed fill. The feature was determined to be a historic well (Councilman Owen R. Bobelu, personal communication 1991). Units 7 and 8, along the eroding east bank of the river outside the perimeter wall, consisted of historic midden deposits visible on the surface of the site. Unit 7, adjacent to a dump which is still in use, was unique in its high density of historic materials, especially faunal remains, which overlay prehistoric deposits. Unit 8, further to the south along the same band of midden, was less dense, and consisted of mixed historic and prehistoric materials. Unit 9, along the eroding southern embankment, was excavated adjacent to an historic wall remaining on the surface, in the corner of a room; deposits consisted of fill and material associated with the use of the room during the historic occupation. Unit 10, along the east bank of the arroyoin an area of severe erosion, was a partial burial that was excavated after consultation with the Zuni Tribal

Table 7.1. Types of Contexts Excavated at Lower Pescado Village.

Context type	Time period	Examples (Unit/stratum)
buried surface	prehistoric	4M,N; 5H,I,L/M,O,S; 7K
buried surface	historic	1B; 3E; 4B,D,K; 5D,F; 7B
room floor	prehistoric	1I; 2K; 4(fea.6)
room floor	historic	2C; 9D,E
room fill	prehistoric	1H; 2G-I; 4H
room fill	historic	2B,D; 4F,G; 9B/C,H
midden	prehistoric	1D-G
midden, trash scatter	historic	5B-C; 7C-I; 8B-H
builders' trench	historic	1C; 2F
fill/ pit feature	prehistoric	5features2,3,4
fill/ pit feature	historic	5feature1
fill/ well	historic	6B-F
fill/ beehive oven	historic	3C,D
fill/ hearth	prehistoric	1J; 2J
fill/ hearth	historic	9F,G

Council and reburied. Material from Unit 10 is not included in these analyses.

The units were excavated using shovels, trowels, brushes and dental picks; sediments were dry-screened through quarter-inch mesh. Flotation, pollen and radiocarbon samples were taken from a number of strata. We followed the Zuni Archaeology Program method for recording information and used their data forms and collection procedures. The units were excavated in arbitrary 10 cm levels, following the locus/level system used at the Zuni Archaeology Program. When soil changes were visible to the excavators, new levels were defined, even if the 10 cm interval had not been reached. Profiles were done immediately prior to closing out the units. What this meant (particularly in the case of the middens where there was extensive, poorly defined lensing) is that stratigraphic levels presented on the profiles do not always correspond with excavated arbitrary levels. In most cases, there is more than one excavated 10 cm level in a stratigraphic unit. Stratigraphic units and features were given letter designations. Appendix C presents a summary of the stratigraphy of the test units.

The total excavated area at Lower Pescado Village consisted of 31.1m^2, less than 1% of the site area delimited by the mound. The total volume of excavated material was 31.1m^3; 28,575 artifacts and faunal and botanical remains were recovered from the excavation units. Stratigraphic analysis revealed nine functional types of excavated contexts, which are listed in table 7.1. For most of these, examples from both components were excavated.

Timing of the Occupations at Lower Pescado Village

The Early Occupations

The earlier occupations of Lower Pescado Village can be dated by ceramics, using the time periods established by Kintigh (Kintigh 1985:15-19; also see Carlson 1970; Marquardt 1974; Smith et al. 1966; Stone 1992). Although small numbers of twelfth-century ceramics (Puerco Black-on-white and Reserve Black-on-white) attest to the use of the site during this period, the major Puebloan occupation was during the fourteenth century. The prevalence of Heshota utla and Kwakina redwares place the onset of this occupation during Kintigh's Transitional Complex DE (AD1300-1325), while the presence of Protohistoric ceramics,

Table 7.2. References for the Historic Chronology of Lower Pescado Village.

Type of data	Dates	References
Tree rings	1807-1931	W.J. Robinson personal communication 1990; Rothschild and Dublin 1995:App.C
Zuni ceramics	1700-1930	Batkin 1987; Ferguson and Mills 1982:295-300; Frank and Harlow 1974; Hardin 1983; Harlow 1990; Mera 1939; Rothschild and Dublin 1995
Euroamerican artifacts	late 19th c.	Rothschild and Dublin 1995
Documentary sources	1850-1900	Baxter 1882:77-9; Bloom 1936; Cushing 1974; Foreman 1941:135-7; Green 1979, 1990; Holmes and Fowler 1980; McNitt 1964:123; Mills et al. 1982; Mindeleff 1989; Mollhausen 1858:83-5; Kendrick 1950:331; Whipple 1855
Oral history	1920-1950	Mills et al. 1982; Rothschild and Dublin 1995:App.B

including small numbers of Matsaki Brown-on-buff, indicates that the site was occupied into the fifteenth century (Kintigh 1985:19; Rothschild and Dublin 1995:123-125).

The Nineteenth Century

Table 7.2 lists the information used to define the occupation span of the Historic Period farming village. These data indicate that, although the area may have supported scattered field houses prior to the beginning of the American Period, the major historic occupation occurred during the late nineteenth and early twentieth centuries.

Dendrochronology

Because of the scarcity of structural wood at the site, only eight tree ring samples were taken. These were analyzed by the Laboratory of Tree Ring Research at the University of Arizona; the report is reproduced here as part of Appendix B. Samples were taken from Structures 2, 5, and 6, all of which were located in the central complex of rooms designated on the Mindeleff map, figure 7.2, as Room Blocks VII and VIII. The dates range from 1807 to 1931; since none of these were cutting dates, the sampled beams may actually have been younger than the dates would indicate.

Because of the small sample and the lack of cutting dates, the tree ring data are difficult to interpret. The two earliest dates (1807 and 1839) and the two latest (1929 and 1931) were from beams in Structure 2, a maintained multi-room field house. Even assuming that the dates are close to cutting dates, the early beams may be from reused wood; the presence of old wood in the area may indicate use during the late Spanish Period. The late dates probably represent remodelling during the 1930s or even later, since this structure continued in use (albeit sporadic) into the 1990s. The remaining four dates range from 1891 to 1894; these may represent initial construction or remodelling of existing structures. Structure 5, which produced tree ring dates of 1893 and 1895, was in use as a residence in the 1940s (Rothschild and Dublin 1995:Appendix B).

The large corpus of tree ring dates from the better maintained villages at Ojo Caliente and Upper Nutria support the scenario suggested by the limited data from Lower Pescado

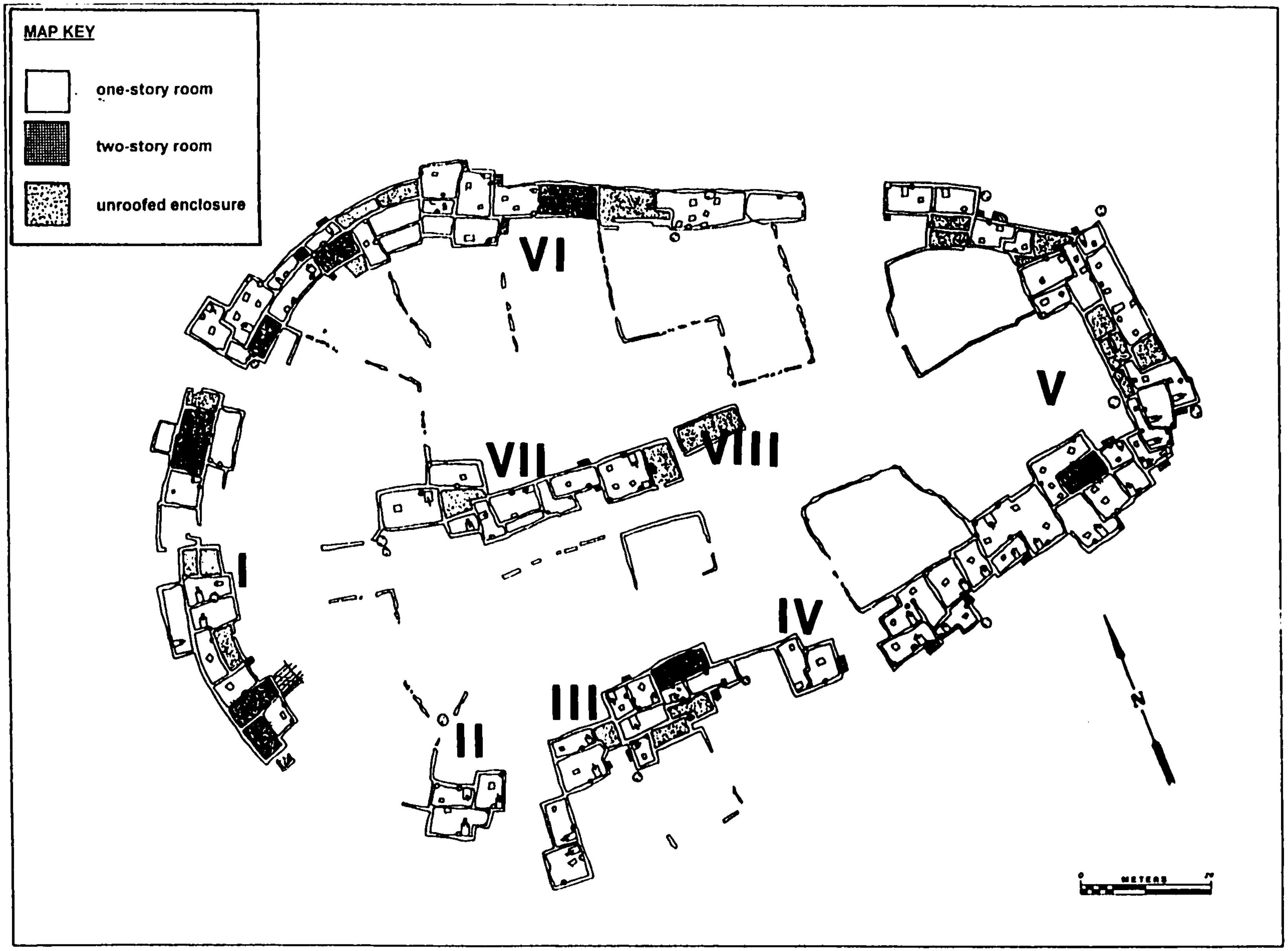


Figure 7.2. The Mindeleff map of Lower Pescado Village, 1885 (after Mindeleff 1989:Plate LXIX).

Village (Ferguson 1996:63-72; Mills et al. 1982). That is, the areas around the farming villages saw some limited use during the Spanish and Mexican Periods, but construction increased during the 1850s and peaked in the 1880s and 1890s, a period that some consider the "heyday" of the river valley farming villages (Holmes and Fowler 1981; Mills et al. 1982). A drop off in construction activity, indicated by fewer beam dates, had occurred by end of the 1940s.

Ceramics and Euroamerican artifacts

Historic pottery and Euroamerican artifacts recovered during the excavations at Lower Pescado Village support a mid- to late-nineteenth-century date for the beginning of the major historic occupation of this site. Eighteenth- and nineteenth-century decorated ceramics at Zuni are classified in three major types; Ashiwi Polychrome manufactured between 1700 and 1750; Kiapkwa Polychrome manufactured between 1750 and 1850; and Zuni Polychrome manufactured after 1850 (Batkin 1987; Frank and Harlow 1974; Harlow 1990; Mera 1939). Although some researchers have suggested that there are insufficient differences between Kiapkwa and Zuni Polychromes to warrant the designation of two separate ceramic categories (Ferguson 1993:145; Hardin cited in Ferguson and Mills 1982:296), an attribute analysis of both types revealed significant differences between the two in a number of attributes (Ferguson and Mills 1982:330-1). The distinction was retained in identifying the sherds from the excavations at Lower Pescado Village.

Zuni Polychrome sherds constituted 27.3% of the historic decorated pottery found at Lower Pescado Village. With the exception of two sherds of Ashiwi Polychrome, other historic decorated pottery consisted of types that are undated although a number of these are represented in the late nineteenth-century Stevenson collection (Stevenson 1883) and described in the Zuni Pueblo waterline monitoring report (Ferguson and Mills 1982). These types include Historic Plain Polished Buffware, Zuni Brown-on-buff, Zuni Black-on-red, and Zuni Brown-on-White; their inclusion in the Stevenson collection may indicate that they were late types. The two Ashiwi Polychrome sherds were apparently from the same vessel and were recovered from a ground surface underlying the late nineteenth-century midden deposits in Excavation Unit 7. Although these may be indicative of a small early historic use of the site that is also suggested by the presence of early tree ring dates, the bulk of the pottery supports a late nineteenth-century date for the beginning of the major occupation.

Relatively few Euroamerican artifacts were recovered from the excavations at Lower Pescado Village, most from upper stratigraphic levels. Although these are more fully discussed in chapter 9, some brief comments are in order here. Aside from three fragments of dark green glass and one possible pearlware sherd, manufacturing dates for all the Euroamerican artifacts post-dated 1880. The incursion of Euroamerican material culture (small though it is) was probably associated with the railroad, which had been built through to present-day Gallup in 1881. Dark green glass has manufacturing dates between 1815 and 1885 (McKearin and McKearin 1941; Riley 1948); it was recovered from midden deposits in Unit 7. Pearlware is a late eighteenth- to early nineteenth-century earthenware; the sherd from Lower Pescado Village was found in an area of sheet scatter in Excavation Unit 5 along the south arroyo bank; it is quite small and the identification is not secure.

While the chronological information that can be gleaned from the artifacts recovered at Lower Pescado Village is not decisive, it does support the chronology suggested by the tree-ring data--a small occupation prior to the beginning of the American Period with major development occurring after 1850. Documentary evidence and oral history further support this chronology.

Documentary sources and oral history

Since historical accounts of the Zuni farming villages were discussed in chapter 3, I will only summarize those that relate directly to the chronology of Lower Pescado Village. A number of accounts from the early years of the American occupation contain descriptions of settlements in the Pescado valley, but some are quite difficult to interpret. The earliest detailed account of the Pescado valley was written by Lieutenant James Simpson, who travelled through Zuni in September 1849 as a member of the Washington expedition. Simpson's rather enigmatic description of an encampment and cultivated fields in the vicinity of Pescado Springs has been variously interpreted by researchers.

Simpson described the "ruins of ... an old pueblo" situated on the Pescado River about twelve miles from Zuni Pueblo. The site, which measured about 90 meters by 120 meters, contained the ruins of two-story houses; corrals and a rectangular semisubterranean structure ("kiva") were in the central plaza (McNitt 1964:123-5). Kintigh (1985:55-6) identified the site as Heshota utla, while McNitt, who edited Simpson's diaries, thought that it was an unnamed ruin in the south bank of the river (McNitt 1964:121-2). Is this the earliest description of Lower Pescado Village? I do not think so. While the size of the site would be congruent with either Heshota utla (107 m by 128 m) or Lower Pescado Village (107 m by

158 m), the distance from Zuni Pueblo places it closer to Heshota utla. In general, Simpson's measurements of distances tend to be accurate; thus, this encampment was probably not at Lower Pescado Village, but rather closer to Heshota utla, although it may not have been the latter site either, since the features described by Simpson were not present at Heshota utla (Kintigh 1985:55).

Simpson went on to describe the springs at Ojos de Pescado and the adjacent archaeological sites now known as Pescado West, Upper and Lower Pescado Ruins (Kintigh 1985:49, 54-5). The latter should not be confused with Lower Pescado Village, which refers only to the farming village and the underlying fourteenth-century site. Two miles west of Ojos de Pescado was a farming district that Simpson referred to as "Pescado Springs." This, I believe, was what was to become Lower Pescado Village, which is 1.9 miles west of the springs. As I interpret the historical evidence, the farming district in 1849 consisted of recently harvested fields but not a village, although I think that it is reasonable to expect that there were one or more field houses associated with the field complexes, since the 16 mile distance from Zuni Pueblo was too far for daily commuting.

In November 1853, Lieutenant Amiens Whipple and his travelling companion Baron Mollhausen described a village of "perhaps a hundred houses" that was "occasionally occupied in summer by Zuni Indians while cultivating the well-watered valley" (Foreman 1941:136).

> [The] village was compactly built, ...the houses were of ruder construction than any before seen, being composed of loose stones piled up singly without mortar. Some were yet entire ... The plaza

> was converted into numerous corrals for sheep and goats. The entrance to the dwellings was by a ladder, or rather post, cut into steps and inclined to rest upon the roof. From thence, through a hole, a similar stair led down to the interior. Some of the contiguous buildings contained a second story, having a door to connect with the neighboring *azotea* [flat roof], and a fireplace above, the room below being for the stores of grain. The walls were thin, the vigas small, and the pueblo ... showed nothing of the labor and skill displayed in the construction of the ancient strongholds at the [Pescado] springs and at the Moro (sic)" (Foreman 1941:137).

There is no doubt that this was Lower Pescado Village. Four years after Simpson's description of the Pescado Springs farming district, a "village" was in place at that locality. The built environment consisted of fragmentary or poorly constructed masonry room blocks around a plaza with corrals. The presence of fireplaces on the upper floors of two-story rooms indicates that these were used for habitation, while ground floor rooms in two-story complexes were used for storage (Bloom 1936:111). Entry through roof hatchways was probably a defensive convention, although the construction techniques and the ease by which Whipple and Mollhausen entered the village does not suggest that it was strongly fortified.

What does the discrepancy between the Simpson description and the later Whipple and Mollhausen descriptions tell us about the founding of the village at Lower Pescado? It is not likely that the village was built during the four years between Simpson's visit in 1849 and Whipple's and Mollhausen's in 1853. In 1849, there were cultivated fields near the springs and probably field houses, considering the dendrochronological evidence and the logistics of residential mobility. The haphazard construction techniques and the dilapidated condition of some structures might be indicative of a gradual reconstruction of older remains, elements of which were cannibalized to build the farming village (but see Holmes and Fowler 1981:168 for an alternative interpretation). In other words, Whipple and Mollhausen were seeing the farming village at a time when it was developing from a small cluster of field houses into the large, rather formal village that was mapped by Victor and Cosmos Mindeleff thirty years later.

During the 1850s, visitors to Zuni wrote of the importance of the Pescado valley as a grain-producing area and the slow growth of the Zuni farming districts in response to demands for grain during the early years of the American occupation (Domenech 1860:209; Kendrick 1950:331; Lesley 1929:227-8; US National Archives RG393 1851-8). In 1874, one observer noted that people stayed in the farming villages for most of the year, returning to Zuni Pueblo late in the fall for the winter ceremonials (Klett cited in Mills et al. 1982). By the 1870s, then, the farming villages were being used for longer periods during the year and probably had become more "permanent" features of the settlement landscape. By the 1880s, Lower Pescado Village had developed into a settlement of 113 rooms that housed 580 persons during the farming season (Holmes 1983).

According to oral accounts of the villages, including Lower Pescado, the settlements gradually became abandoned for seasonal residential use during the first half of the twentieth century. Some structures at Lower Pescado and the other farming villages continue to be used on a daily or sporadic basis as sheep camps, storage facilities, sources of raw materials for construction, and for a number of other purposes. Thus they cannot be considered "abandoned," in the sense of "no longer used;" rather the way the villages are used has changed (Rothschild et al. 1993:125). Fewer people are using the farming villages, they are not being used on a daily basis, and fewer structures are standing or are maintained (roofed) than in 1885.

The chronology of this diminishing use is not entirely clear, although it is clear that it occurred gradually. Interviews conducted by Mills, Holmes, and Ferguson for the initial farming village study indicate that all the Zuni farming villages lost significant population during the 1930s. This is attributed to environmental degradation which adversely affected the hydrology of the farming districts and to efforts on the part of the Bureau of Indian Affairs to concentrate the farming population on irrigation units near Zuni Pueblo (Mills et al. 1982). Remnant populations remained in residence at Lower Pescado Village through the 1940s and into the 1960s (Rothschild and Dublin 1995:Appendix B). During the early 1950s, there were three families staying at the village. Today, two houses (Structures 1 and 2) are maintained; these are used for storage and occasional overnight stays by herders. A nearby farmer uses the mound for grazing his sheep, and another cultivates a waffle garden behind Structure 1.

To summarize, the available evidence places the "founding" of Lower Pescado Village (and probably Upper Nutria and Ojo Caliente as well) in the early years of the American Period. The villages developed in an area that had supported scattered field houses used for farming and perhaps herding during the earlier Spanish and Mexican Periods. They burgeoned during the late nineteenth and early twentieth centuries, but had begun to decline by the 1930s.

Geographic Setting of Lower Pescado Village

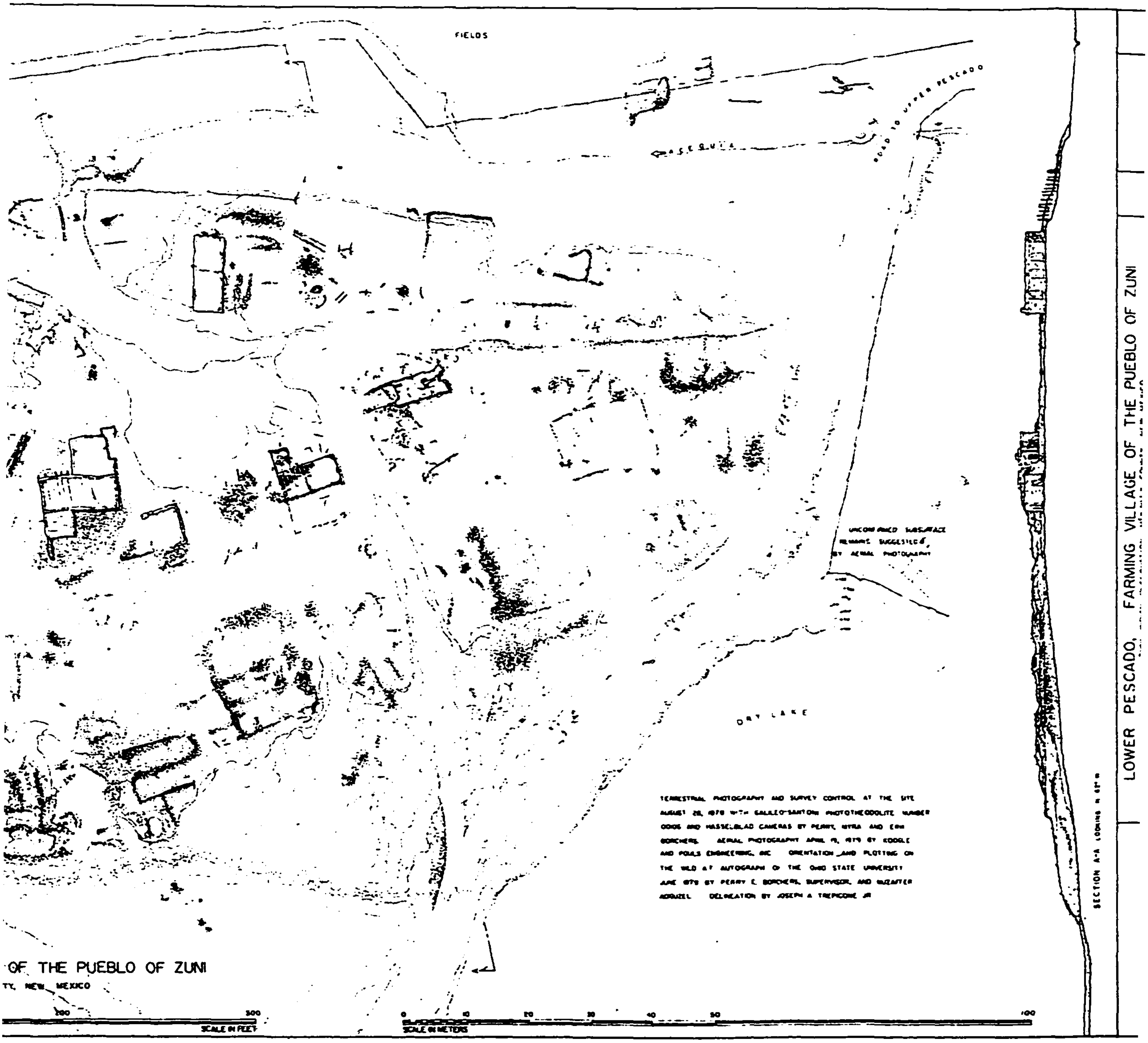
Lower Pescado Village stands on a knoll or mound situated on the north bank of the Pescado River. The mound stands about 4 meters above the floodplain of the river: at least 2 meters of this consist of cultural deposits. Because of its height above the floodplain, Lower Pescado Village commands a view of the Pescado valley and New Mexico Route 53, once called the *Calle del Obispo*, which served as a main east to west route in the seventeenth century and probably before the Spanish Conquest as well.

The floodplain is currently used for irrigated farming and grazing. Approximately 1,200 hectares in the vicinity of the farming village can be farmed, but not all this land was used historically. According to records of the Bureau of Land Management, only 206 ha were farmed in 1911 (Ferguson 1988). Using an estimate of .4 irrigated hectares per person (Kintigh 1985:105), the area under cultivation in 1911 would have been sufficient to feed a population of 516 persons. During the late nineteenth and early twentieth centuries, the agricultural potential of the Pescado valley was greater than it is today after the timbering and dam construction altered the hydrology of the area. At this time, Lower Pescado Village was economically self-sufficient, a situation that had changed by the 1930s.

Ojos de Pescado, two kilometers upstream from the village, provides irrigation water for the area, although its flow has decreased since the turn of the twentieth century. Today the arroyo of the Pescado River is incised to a depth of about 9 meters below the surface of the mound that constitutes the village. Historic descriptions and photographs illustrate that the river was entrenched by the late nineteenth century, as discussed above in chapter 5, but a comparison of the Mindeleff map and the map compiled by Perry Borchers in 1979 (Mills et al. 1982, reproduced here as figure 7.3) demonstrates that the river had cut a much deeper and wider arroyo between 1885 and 1979. Although the Mindeleff map does not show the river or its bank, it is obvious from the depiction of room blocks that there were more rooms along the south side of the village in 1885 than there are today. The abundance of cultural remains in the arroyo cut attest to the continued downcutting in this area of the site. Since the 1880s, the arroyo has been cut back about 5.7 m, or an average of 50 cm per decade; a comparison of the position of the cut bank between 1979, when the Borchers map was compiled, and 1989, when we began our field work, indicates that erosion along the south edge of the site has been about 45 cm.

Vegetation communities reflect elevational gradients. Mesa tops support ponderosa pine, while the slopes are characterized by pinyon-juniper scrub grading into sagebrush on the lower slopes. The valley supports plains grassland and riverine plant communities. Table 7.3 is a list of plants observed in the vicinity during 1979; the list was compiled by Carol Brandt, paleoethnobotanist for the Zuni Archaeology Program. A number of these species are indicators of environmental degradation or of past use. Wolfberry, for instance, is commonly found in disturbed contexts and its presence is used by some archaeologists to identify the presence of buried sites. Sagebrush has been associated with overgrazed areas, while goosefoot and amaranth are often found near irrigated fields (Bohrer 1960:199).

Figure 7.3. The Borchers map of Lower Pescado Village, 1979.



ɔ Village, 1979.

Table 7.3. Plant Species Observed in the Vicinity of Lowe·· Pescado Village.

Common name	Species name	Biotic zone
wolfberry[1]	*Lycium torreyi*	floodplain
goosefoot[1]	*Chenopodium* sp	floodplain
amaranth[1]	*Amaranthus* sp.	floodplain
Indian tea	*Thelesperma megapotamicum*	floodplain
milkweed	*Asclepias* sp.	floodplain
beeweed[1]	*Cleome* sp.	floodplain
yarrow	*Achillea millefolium*	floodplain
fourwing saltbush[1]	*Atriplex canescens*	floodplain
globe mallow[1]	*Sphaeralcea* sp.	floodplain
sunflower[1]	*Helioanthus* sp.	floodplain
buckwheat	*Erigonum* sp.	floodplain
cattail	*Typha latifolia*	river bank
reed grass	*Phragmites communis*	river bank
tule	*Scirpus acutus*	river bank
willow[1]	*Salix* sp.	river bank
sage[1]	*Artemisia tridentata*	slope
pinon pine[1]	*Pinus edulis*	slope
juniper[1]	*Juniperus* sp	slope
ponderosa pine[1]	*Pinus ponderosa*	mesa tops

Note: Information is from Carol Brandt (personal communication 1991).

[1]These species that were also identified in pollen or flotation samples from the site.

During the Historic period, the major environmental change in the Lower Pescado area was hydrological, resulting in a lowered water table, reduced river flow, and arroyo cutting. The vegetation communities reflect the use of the floodplain and mesa slopes for irrigated farming and grazing, and a comparison between historic and contemporary species suggests the persistence of biotic communities. An informant who lived at Pescado as a child in the 1940s and early 1950s; described it as a good place to live because there was good water, good hunting and good farming (Rothschild and Dublin 1995).

The Mindeleff Map

The Mindeleff map (figure 7.2), compiled in 1885, was the primary document used in examining the nineteenth-century built environment of Lower Pescado Village. To facilitate discussion of this important map, I numbered the room blocks using Roman numerals. Historic accounts and photographs, the architectural survey conducted for the Zuni Farming Village Study, and the archaeological testing provided additional information on the architecture and settlement structure of the village and changes in these over time (Mills et al. 1980; Rothschild 1991; Rothschild and Dublin 1995; Rothschild et al. 1993). Ferguson has already situated Lower Pescado Village within a framework of Zuni architectural traditions and innovations during the Historic Period (Ferguson 1993; 1996). I will not reiterate his findings but rather will touch on aspects of the architecture of Lower Pescado village that I consider related to the productive, social, and political forces that shaped the nineteenth century in this area.

To understand the relationship of the Mindeleff map with features recorded during survey and excavation, the site map compiled in 1990 was overlaid on the 1885 map; the overlay is reproduced as figure 7.4. The reconciliation of the two maps, produced over a century apart, is not exact, but might be considered a "best fit." There were a number of congruities, or places where walls or features on the earlier map also appeared on the later, that were used as reference points for constructing the overlay. These included wall segments in room blocks I, II, III, V, and VII and two areas where the perimeter wall was visible on the 1990 surface of the site. Discrepancies between the two maps are due to the extensive renovation of room blocks that characterizes the architecture of the Zuni farming villages and Zuni architecture in general (Mills et al. 1982: Nabokov 1989:xxxi); to abandonment processes and the resulting degradation of the architecture; and to mismeasurements in compiling the Mindeleff map (Borchers cited in Mills et al. 1982).

A comparison of the 1885 Mindeleff map, the 1979 Borchers map, and the 1990 site map reveals the extensive changes that have taken place in the village over the past century. There are no visible remains of room block VI which defined the north wall of the site, while the outlines of parts of room blocks I through V are visible on the surface as wall segments or mounds: examples are shown in the photographs, figure 7.5. Structure 2, a maintained room block in 1990, is barely recognizable in the photograph, figure 7.6, as the heavily renovated remnant of the central room block (VII) shown on the Mindeleff map. Structure 1, also standing in 1990, was built or refurbished in 1945, according to a date carved on a wall stone; if this date is accurate, this building was probably the last structure built at Lower Pescado Village. The stone and brush corrals which dominated the central area of the 1885 village are largely gone, although the remains of one are visible behind Structure 2 (figures 7.7, 7.8).

The map of Lower Pescado Village was one of a number of maps of Zuni and Hopi settlements drawn by Victor and Cosmos Mindeleff for the Bureau of American Ethnology

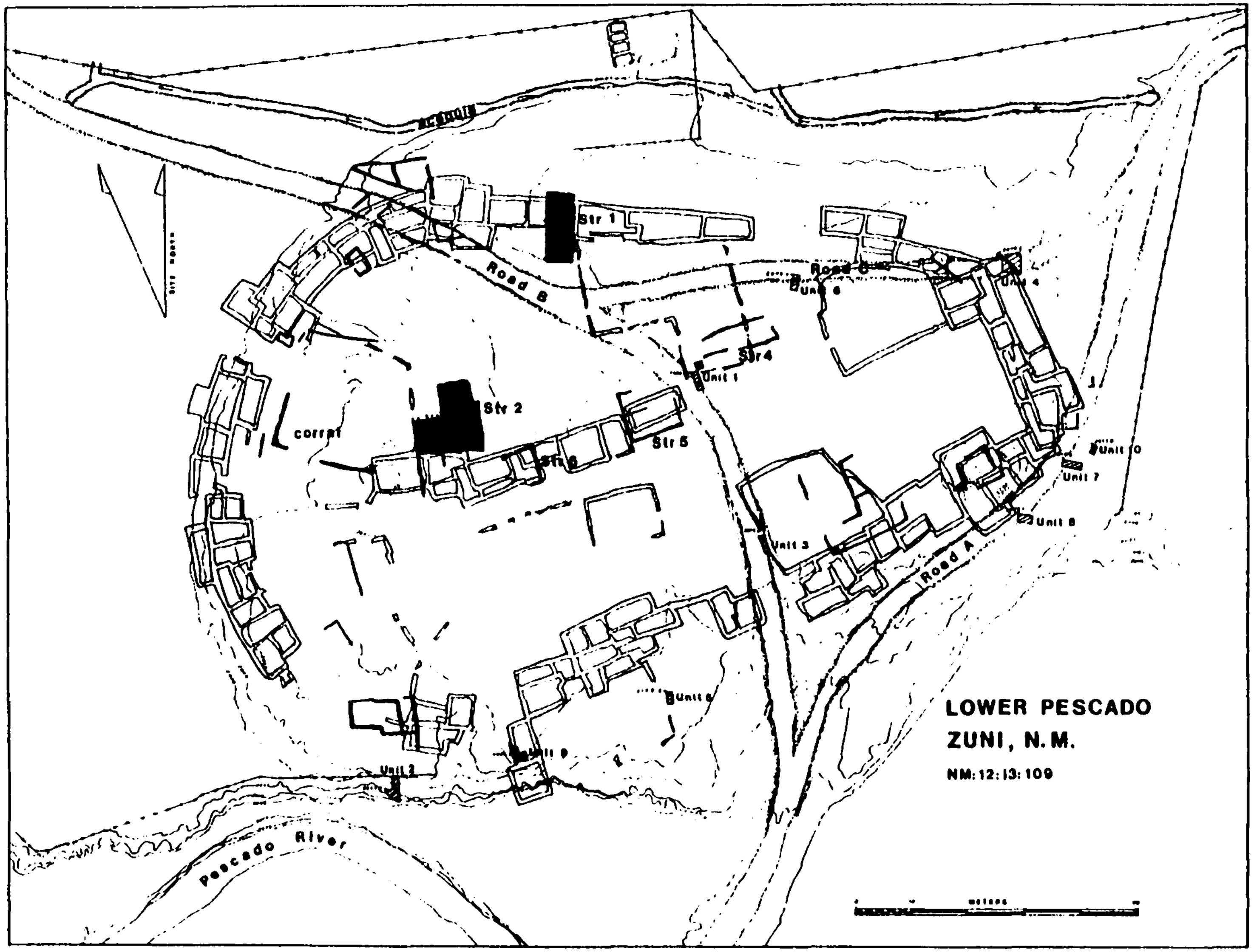


Figure 7.4. The 1885 Mindeleff map of Lower Pescado Village (in red) overlaid on the 1990 site map. Note the correspondence between the dimensions of the mound in 1990 and the outline of the nineteenth-century room blocks.

during the 1880s (Mindeleff 1989). Victor Mindeleff described the process by which the maps were compiled (Mindeleff 1989:44). Exterior lines of room blocks were first measured using a compass and tape; irregularities in the wall lines were then refined by remeasuring, and architectural details such as roof hatchways were plotted. Each room block was drawn separately, and later placed on the village plan based on taped measurements of the distances of each room block from its neighbors and the orientations of each based on compass sightings. This type of "segmental survey" (Borchers cited in Mills et al. 1982) where distances and orientations are based on internal measurements rather than the relationship to an established datum point is potentially misleading because a small mismeasurement in one of the segments can distort additional measurements that involve that segment. Perry Borchers, using historic photographs, uncovered a distortion in spatial relationships in the southwestern quadrant of the site (Borchers cited in Mills et al. 1989). The gap between room blocks I and II was probably much narrower than it was depicted on the Mindeleff map, more in keeping with the distance shown on the Borchers map. Nonetheless, the Mindeleff map of Lower Pescado Village is generally accurate, and an invaluable resource.

The Mindeleff map was not published with a scale; by comparing measurements on the published map with measurements noted in the Mindeleffs' field notes, Ferguson reconstructed a scale for each of the maps (Ferguson 1993:158). Working independently and comparing measurements of extant walls to measurements on an enlargement of the published map, I calculated a scale of 1 inch to 7.6 meters for the published map, within 10 centimeters of Ferguson's calculations. Although the two reconstructed scales are almost identical, my scale is used in this study.

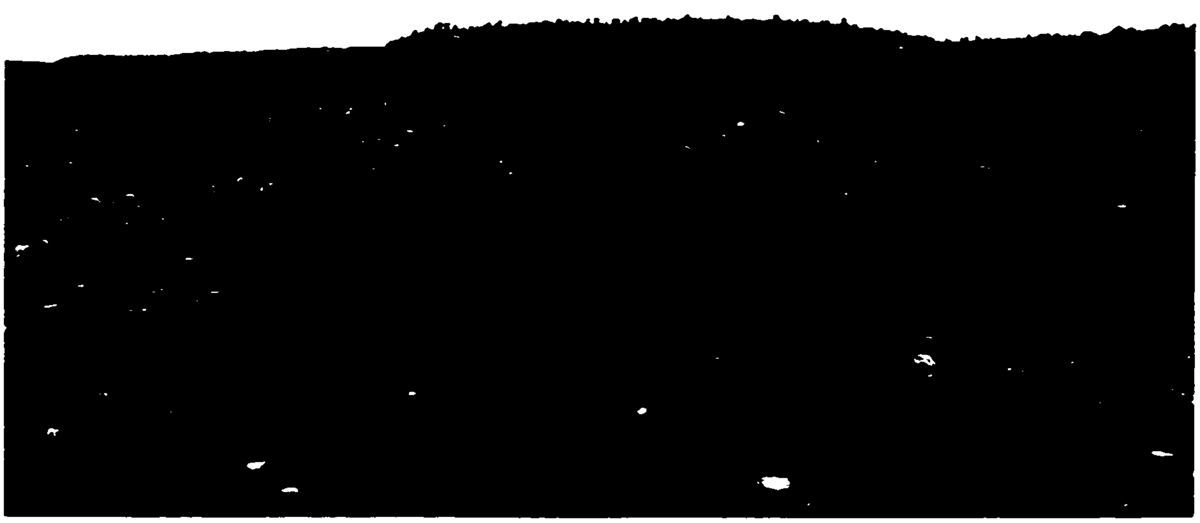


Figure 7.5. Nineteenth-century room block foundations visible as rock alignments or discolorations in the vegetation at Lower Pescado Village, 1990. Structure 2 is in the background of the bottom photograph.

Figure 7.6. The east wall of Structure 2 at Lower Pescado Village, 1990.

Figure 7.7. The remains of a stone corral west of Structure 2 at Lower Pescado Village, 1990.

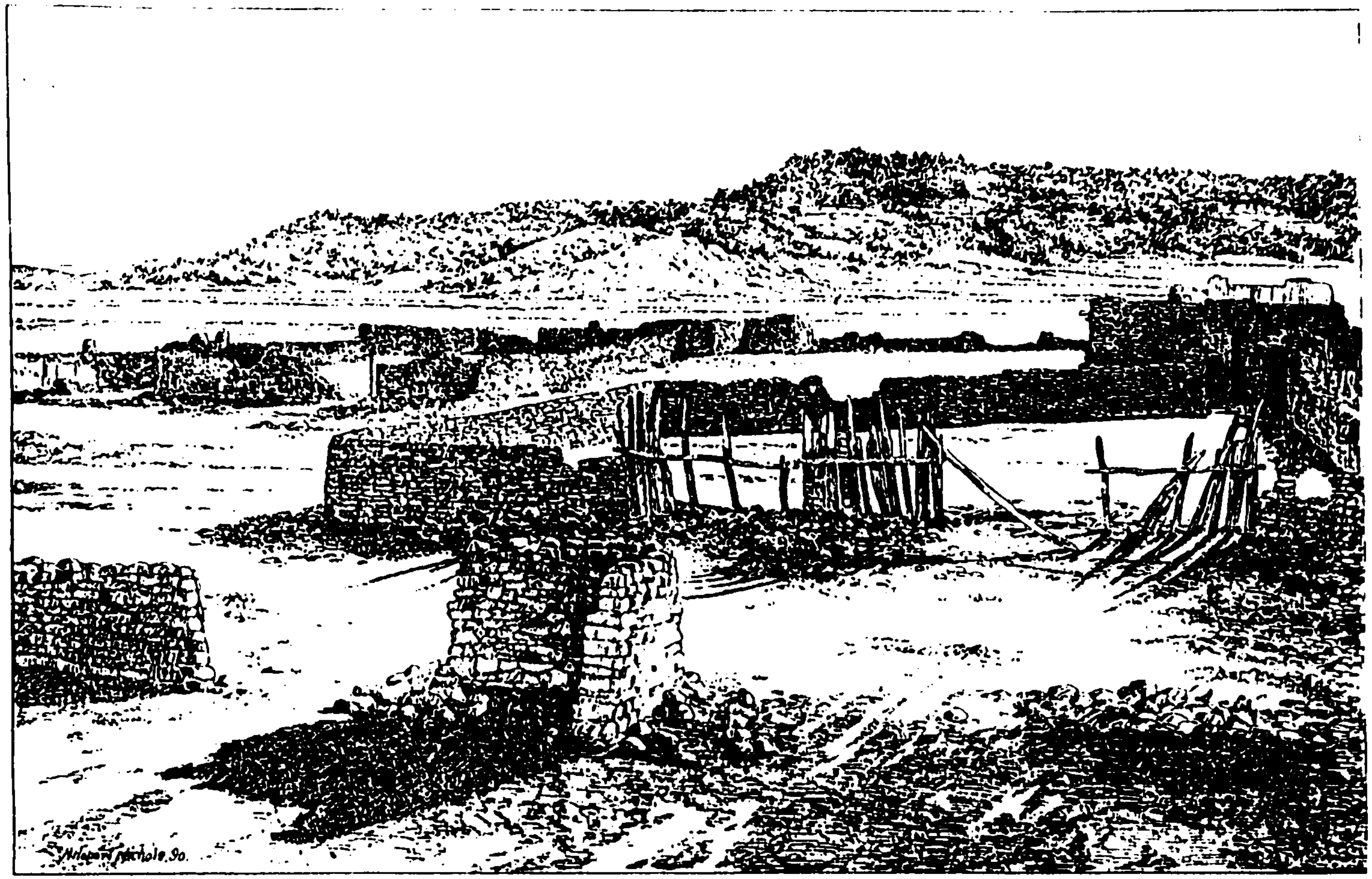


Figure 7.8. Mindeleff's illustration of corrals in the central plaza at Lower Pescado Village. Based on the configuration of the mesa in the background, it appears that this view is similar to the one in the 1990 photograph, figure 7.7.

The Late Nineteenth-Century Built Environment of Lower Pescado Village

Elements that constitute the built environment of Lower Pescado Village can be described as "constructed" and "accumulated." At Lower Pescado Village, constructed features included the residential architecture, or room blocks, and various built features--corrals, animal pens, bread ovens, external stone staircases, exterior fireplaces, a *ramada*, and a walk-in well. Accumulated features included stockpiled building materials and firewood, trash dumps, and the large midden along the east arroyo bank outside the room block area. Agricultural features--fields and *acequias*--were also located outside the village.

The village formed an elongated oval, with four entry points along its south, north, southwest and northwest sides. This configuration was achieved by the arrangement of the residential architecture, which in 1885 consisted of 113 roofed and unroofed enclosures grouped in eight room blocks. The exterior dimensions of the village were 158 m by 107 m; its long axis was parallel to the Pescado River. The central plaza, which contained two room blocks and six or seven corrals, measured 137 m by 75 m. The village was entered via the relatively narrow passages between room blocks. On the west side, both entries led into corrals; these entries were probably used for moving stock into and out of the village (Ferguson 1993:226). Along the south, the entryway between room blocks IV and V, where the modern road enters the village, was probably how Whipple and Mollhausen entered Pescado in 1853 after crossing the river on stepping stones.

The layout of Lower Pescado Village can be characterized as "closed." There is a well defined, bounded "inside" and "outside," and access is controlled by restricted entry points. Three architectural elements contribute to this: 1) the relatively large size of the room blocks; 2) the relatively narrow passageways between the room blocks; and 3) the reuse of the fourteenth-century perimeter wall to create an unbroken exterior facade along the west, north, and east sides of the site. These features contribute also to a rather "formal" aspect of the village configuration that would have presented a contrast to the generally poor quality of the masonry (Foreman 1941:137; Mindeleff 1989:96; Mollhausen 1858:83). In the Zuni area, such formal geometric shapes were typical of the Nucleation Period sites (Kintigh 1985; Stone 1992). Thus, the configuration of Lower Pescado Village was conservative and "archaic," reminiscent of the earlier settlements and most likely mirroring the shape of the underlying fourteenth-century pueblo.

The site configuration is both functional and symbolic. Restricted access and the protection of resources (livestock) inside the central plaza area was clearly defensive (Ferguson 1993:280; Mindeleff 1989:227), while the archaic, formal configuration was a visual link to the Zuni past. It is difficult to establish that this linkage was intentional, but the connection is echoed in the Zuni place name for the farming district at Pescado, Heshoda t'sina, or "Pictured house," referring to petroglyphs found at a nearby fourteenth-century site (Kintigh 1985:53).

Residential architecture

This section contains a discussion of the residential architecture--room blocks and rooms--at Lower Pescado Village, and construction techniques. These are compared with the residential architecture at Upper Nutria and Ojo Caliente, the other two farming villages mapped by the Mindeleffs, and with Zuni Pueblo. The findings corroborate those of

Ferguson's more detailed and formal analysis that highlighted differences among the various types of Historic Period settlements at Zuni (Ferguson 1993).

The room blocks

A room block is a suite of rooms that share common walls. Room blocks depicted on the Mindeleff map of Lower Pescado Village included roofed and unroofed masonry enclosures. It is assumed that unroofed enclosures were "abandoned," in the sense that they were no longer being used for habitation, although they might have been used as work spaces, for trash disposal, or for stockpiling materials for later use.

In 1885, the eight room blocks at Lower Pescado Village ranged in size from one to thirty-four "rooms." The Mindeleff map shows roofs rather than rooms; since it is possible that a roof covered more than one room, the number of rooms at the site may be underestimated (Mills et al. 1982). Table 7.4 lists the summary statistics that describe room blocks at Lower Pescado Village, Ojo Caliente and Upper Nutria, the three farming villages in use in 1885. The histograms, figure 7.9a-c, show the distribution of room block sizes.

Room block size at Lower Pescado Village was quite variable, more so than at the other two villages. Two very large room blocks, RB V with 34 rooms and RB VI with 27 rooms, created the north and east sides of the village, while the smallest room blocks (less than three rooms) were situated on the river bank and in the central plaza area. The largest room blocks, which presented an expanse of wall to the exterior, were located in areas that were more vulnerable, looking northward toward the Zuni Mountains where there were known Navajo encampments and eastward down the *Calle del Obispo*, the main route

Table 7.4. Attributes of Room Blocks at the 1885 Farming Villages.

Attributes	Lower Pescado	Ojo Caliente	Upper Nutria
Number of room blocks	8	31	11
Number of rooms	113	94	74
Range of room block sizes	1 - 34	1 - 28	1 - 18
Mean room block size	14.1	3.0	7.1
Median room block size	13	1	6.5
Standard deviation of sizes	12.2	5.2	5.2
Roofed rooms (no.; %)	90 (79.6%)	67 (71.3%)	53 (71.6%)
Unroofed rooms (no.; %)	23 (20.4%)	27 (28.7%)	21 (28.4%)

Note: Data are from Mindeleff (1989).

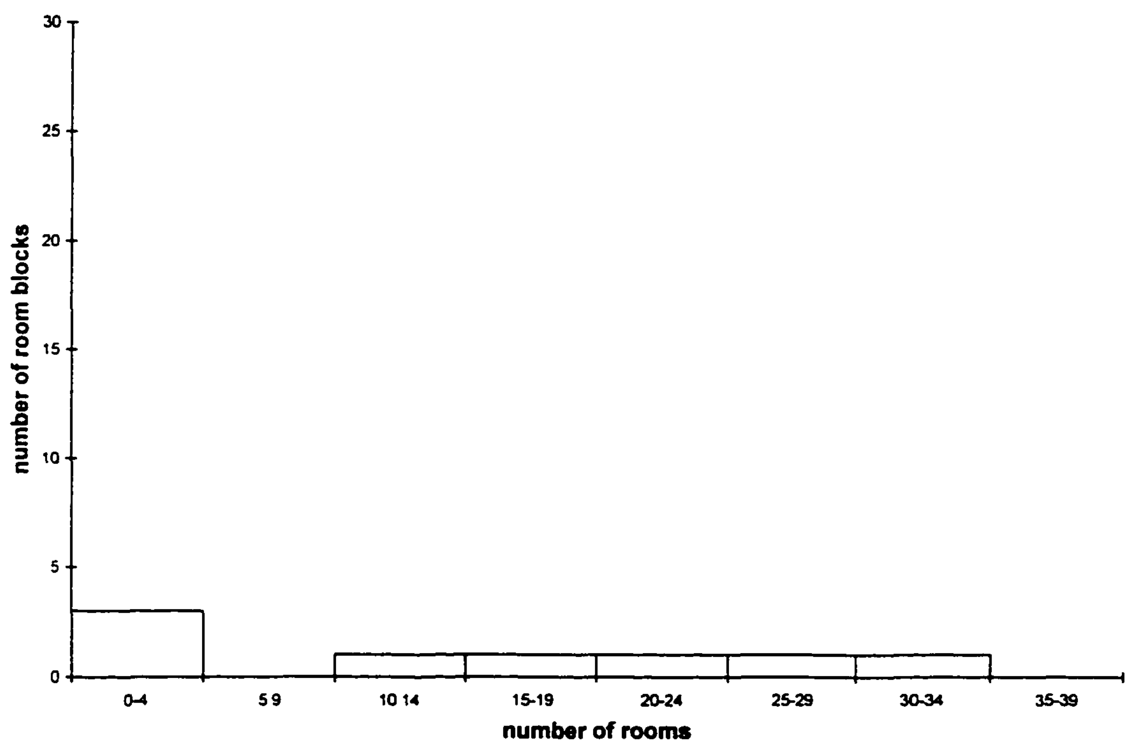


Figure 7.9a. Room block sizes at Lower Pescado, 1885.

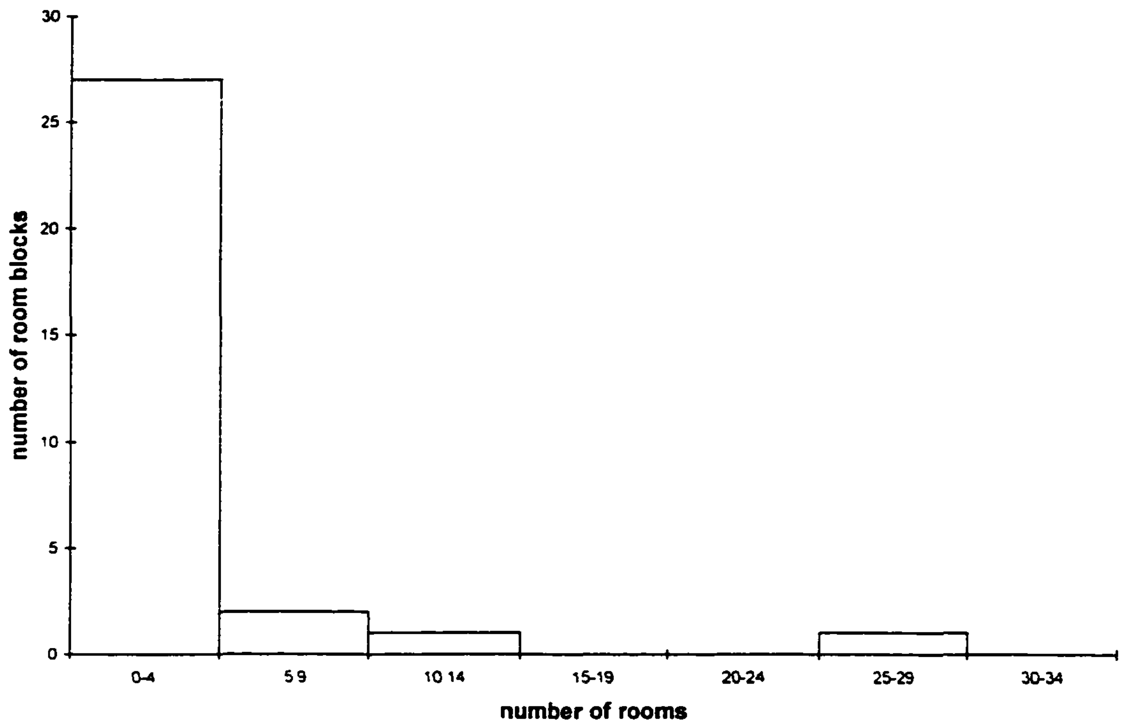


Figure 7.9b. Room block sizes at Ojo Caliente, 1885.

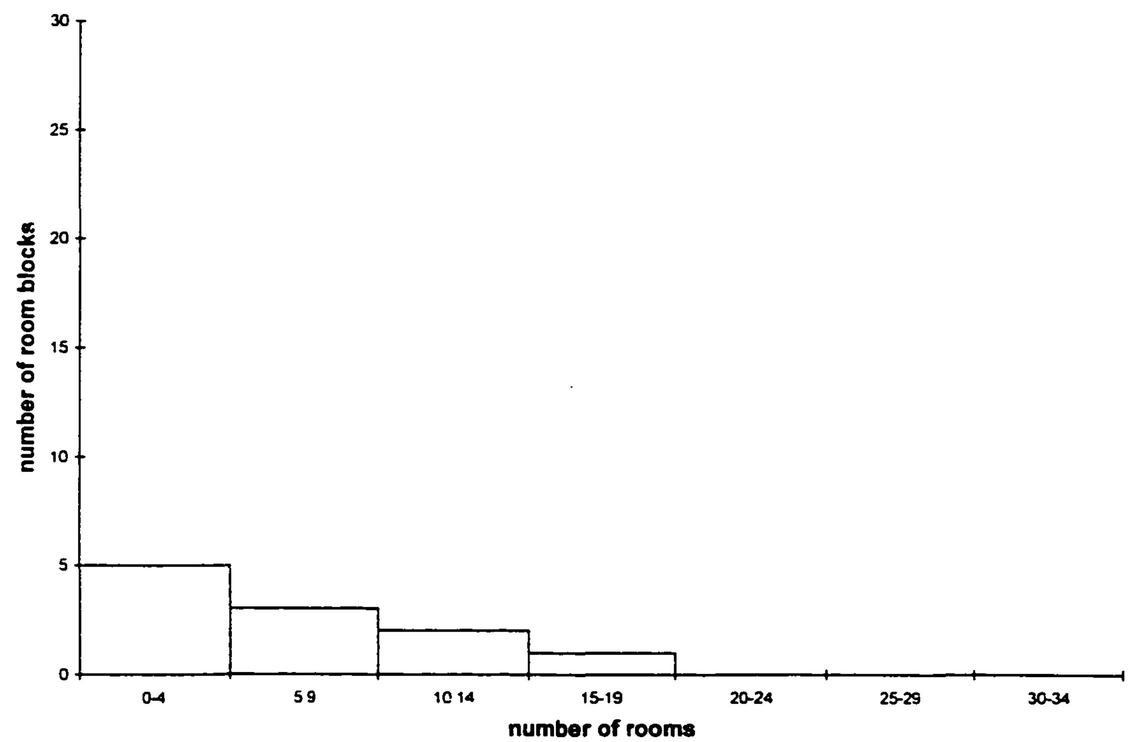


Figure 7.9c. Room block sizes at Upper Nutria, 1885.

through the area. Smaller room blocks were placed in what might be considered more protected, or less easily accessible, areas of the site, along the river where visitors would have to wade across to enter, or in the center of the oval of room blocks. This suggests that the relative clustering and positioning of rooms was related to defense

Room block size in all three farming villages was variable, which might indicate an opportunistic rather than a planned construction strategy, with rooms being added as needs changed. This is in keeping with the observation that it is difficult to correlate specific structures on the Mindeleff map and the later Borchers maps, because of the extensive renovation to individual field houses or room blocks (Mills et al.1982). Similarly, the relatively high percentage of unroofed enclosures paints a picture of settlements in flux, with rooms consistently being "abandoned," renovated, or their uses changing. Some unroofed enclosures may not have been rooms, but rather animal pens (see below).

Lower Pescado Village was the largest of the three farming villages, and apparently the most clustered, if room block size (measured by the number of rooms per room block) can be considered indicative of clustering. Ojo Caliente was more dispersed than the other two farming villages. At that village, there were many one-room field houses and small room blocks (less than four rooms); only four room blocks were larger than five rooms. The small room blocks at Upper Nutria, outside the main circle of structures, are thought to be late, built after Navajo raiding had abated (Mindeleff 1989:94). Upper Nutria and Lower Pescado, at the edge of the Zuni Mountains, were in areas that were associated with Navajo encampments at Ojo del Oso and in the Ramah valley, thus it is not surprising to see a clustered layout, which would be beneficial for defense against raiding. Ojo Caliente, on the other hand, was farther away from the main thrust of raiding and encroachment; therefore, visibility and a clustered site configuration may not have been as important at that village as at the other two. At Ojo Caliente, defensive needs were met by building field houses on the mesa top overlooking the road (Mindeleff 1989:96). In terms of the locations of the field houses on mesa tops and the dispersed settlement configuration, Ojo Caliente looks more like the earlier eighteenth-century "refuge sites" than the nineteenth-century river valley farming villages, although its location near a spring and its size place it in the latter category. At Lower Pescado and Upper Nutria, building on the footprint of the fourteenth-century pueblos may also have influenced the historic layout of these two villages; this is discussed below.

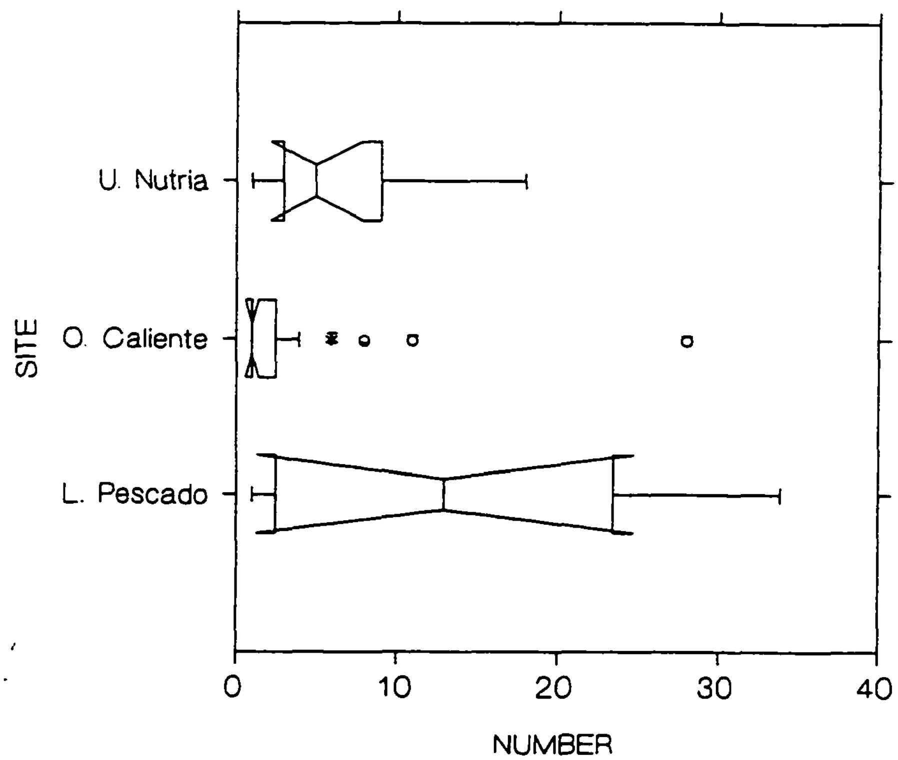


Figure 7.10. Notched box plots of room block sizes at the farming villages of Lower Pescado, Ojo Caliente, and Upper Nutria.

Although there are many more small room blocks at Ojo Caliente than at the other two villages, median room block sizes at the villages are not very different, as indicated in the notched box plots, figure 7.10. Median values were used because the data are not normally distributed; also, the median values mitigate the influence of outliers. The vertical line in the center of each box represents the median value of rooms per room block and the "hinges" at each side represent upper and lower quartiles; the values within the hinges represent the midspread of the data (Drennan 1996:39-44). The "whiskers" extending beyond the boxes identify values that fall within 1.5 midspreads of the median, while asterisks represent outlying values and circles far outliers. The notch identifies 95% confidence intervals around the median. The values for Lower Pescado and Upper Nutria overlap considerably. Although there is some overlap in the values for Lower Pescado Village and Ojo Caliente, the lesser similarity between those two sites reflects the more dispersed settlement configuration at the latter village. Important differences in nineteenth-century settlement configurations, however, exist between the farming villages and Zuni Pueblo, discussed in the next section and by Ferguson (1993;1996).

Rooms

As noted above, the term "room" refers to both roofed areas and unroofed enclosures. Room size was measured on the Mindeleff map using a scale of 7.6 m to the inch (see above). On exterior walls, measurements were taken to the edge of the roof line; on party walls, measurements extended to the center of the party wall. Two-story rooms were counted twice. Appendix D lists the areas of individual rooms or masonry enclosures at Lower

Table 7.5. Descriptive Statistics on Enclosure Sizes at Lower Pescado Village in 1885.

	Total	Range	Mean	Median	Standard Deviation
All enclosures	3401	3.1 - 92.1	30.1	28.5	15
Roofed enclosures	2880	5.3 - 92.1	32	30.9	14.5
Unroofed enclosures	522	3.1 - 69.4	21.1	17.6	14

Notes: Data are from Mindeleff 1989. All areas are in square meters.

Pescado Village in 1885, while table 7.5 provides summary statistics on these data.

The total amount of residential space at the village was 3401 m^2. Using the 1880 Cushing census figure of 580 residents, the distribution of residential space per person was 5.9 m^2. If only roofed areas are included, assuming that only roofed ares were in use as residential space, the allocation of residential space drops to 5 m^2 per person.

Presumably not all rooms at Lower Pescado Village were allocated for residential use; at Upper Nutria in the 1880s, John Bourke observed that certain rooms were set aside for storage. It has been suggested in the literature on Puebloan architecture that room size may be correlated with room function; at Walpi, for instance, there was a slight tendency for storage rooms to be smaller than habitation rooms (Adams 1983). In their survey of the twentieth-century architecture at the farming villages of Tekapo, Ojo Caliente, and Upper Nutria, Mills and her colleagues found that habitation rooms were often converted to storage rooms, thus room size might not necessarily correspond to room function at the Zuni farming villages (Mills et al. 1982). If room size were related to function, a bimodal distribution of sizes would be expected. The histogram, figure 7.11, showing the frequency distribution of room sizes at Lower Pescado Village, indicates that the distribution of room sizes in 1885

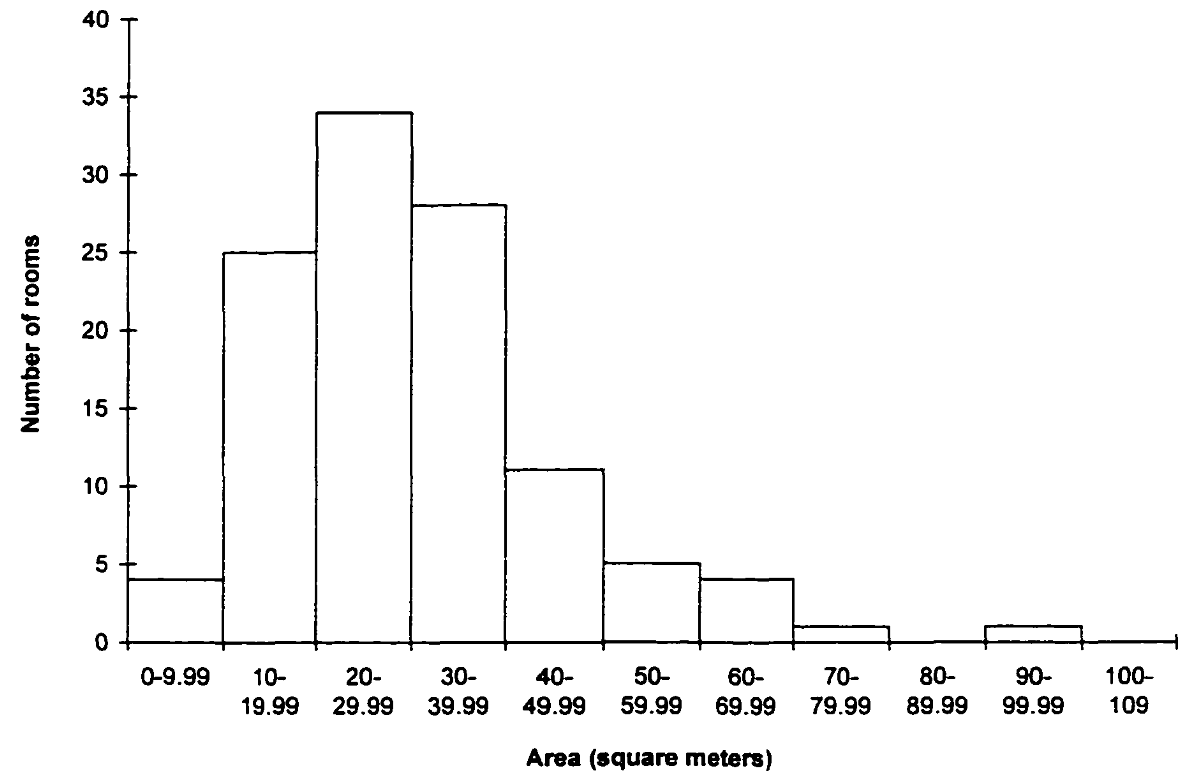


Figure 7.11. Room sizes at Lower Pescado Village, 1885.

was not bimodal, but rather was skewed toward the left, or smaller, end of the distribution. This suggests that room size was conditioned by factors other than room function.

At Lower Pescado Village, room size may have increased over time, in agreement with a similar observation made during the initial Zuni Farming Village Study. Based on size differences between "abandoned" (i.e. roofless), and "maintained" (i.e. roofed) rooms at Ojo Caliente, Tekapo, and Upper Nutria (Mills et al. 1982:Table 7.2), Mills and her colleagues suggested that room size at the farming villages had increased during the twentieth century. Using a similar criteria of "maintained" versus "abandoned" rooms at Lower Pescado Village

Table 7.6. Statistics on Room Size at Three Nineteenth-Century Farming Villages.

	Range	Median	Mean	Std Deviation
Lower Pescado Village	3.1 - 92.1	28.5	30.1	15
Ojo Caliente	5.6 - 111.5	26.6	32.1	20.7
Upper Nutria	3.4 - 65.6	25.9	27.1	13.5

Notes: Data on Ojo Caliente and Lower Nutria are from Mills et al. (1982:Table 7.1). All areas are in square meters.

in 1885, it is evident that the median size of roofed enclosures, 30.9 m^2, was considerably larger than the median size of unroofed enclosures, 17.6 m^2. Given the wide range of variability in room size, the median is a more appropriate measure of central tendency than the mean. The trend toward larger rooms that was noted in the initial Zuni Farming Village Study may have begun quite early in the history of the river valley farming villages, shortly after the end of the Navajo Wars and the abatement of raiding and coincident with the increased use of the farming villages. It may have signalled the beginning of a shift toward full-time use of the villages, a shift that occurred in other pueblos but never reached fruition at Zuni.

Table 7.6 presents comparative statistics on room sizes at the three farming villages mapped by the Mindeleffs in 1885. In all three cases, there was a wide range of variability but a similar range of room sizes and a similar median room size. The similarity in room size probably reflects the presence of a similar residence-group size at each of the villages as well as the expression of a "spatial template" (Rothschild 1991) that conditioned what was an appropriate size for habitation rooms.

Non-residential features at Lower Pescado Village

Table 7.7 lists the kinds and locations of non-residential features at Lower Pescado Village. These include built features such as corrals or ovens, cleared areas, and accumulated features which consist of materials compiled over a period of time. The central plaza, corrals, a *ramada*, and a number of unroofed enclosures, exterior stairs, and beehive ovens appeared on the Mindeleff map. The presence and locations of other features, notably fields and *acequias*, were noted in historic documents. The remaining features were identified during survey and excavation at Lower Pescado Village. These included a catchment basin for storing water and waffle gardens, both situated north of structure 1; barbed wire and wood fences; stone retaining walls; outhouses and sheds; burned areas; concentrations of wood chips, the remnants of chopping firewood; small piles and metal barrels containing refuse and swept trash; and stockpiled reusable items such as building stone and wood. Since it is not clear that all or even many of these types of features were present during the late nineteenth century, the only features that are included in the table are those that were mentioned in historic accounts or were associated with excavated strata that could be assigned to the late nineteenth and early twentieth centuries.

The locations and functions of the features at Lower Pescado Village are crucial to an understanding of the structure of site space at the farming village and the kinds of activities that took place there. Feature locations are characterized in two ways; whether they were inside or outside the oval of residential architecture and in terms of their proximity to a specific room block or group of rooms. Most features were located inside the oval, where there would have been some protection against raiding. Significant exceptions to this pattern

Table 7.7. Features at Lower Pescado Village.

Feature	Construction Type	Construction Material	Location
plaza	cleared	earth	center
corrals	built	masonry, wood, brush	in plaza (center)
beehive ovens	built	masonry	within 10 m of room blocks
exterior stairs	built	masonry	adjacent to room blocks; at south entry to village
unroofed enclosures	built	masonry	within room blocks
ramada	built	wood and brush	room block I
exterior hearths	built	masonry	within 10 m of room blocks
walk-in well	built	masonry, clay	northeast corner of plaza
threshing floor	cleared	stone, packed earth	unknown
acequias	built		outside village
fields	cleared		outside village
midden	accumulated		outside village
sheet scatter	accumulated		outside village
stockpiled material	accumulated	building stone; wood	within 10 m of room blocks

Note: Data are from Baxter (1882), Mills et al. (1982), Mindeleff (1989), Rothschild and Dublin (1995), and United States Congress (1853, 1854).

included agricultural fields and *acequias*, the locations of which were conditioned by constraints on space and by logistics. Obviously, fields would not have fit inside the plaza and therefore needed to be on the outskirts of the village, preferably close enough that they could be watched or guarded, especially during harvest when they would have been most vulnerable to predation. There were watchtowers near fields in the Zuni valley, but there is no mention of such towers in the Pescado valley. Constraints on the placement of *acequias* were related to aspects of hydrology, drainage, and topography. Pescado Springs was the source of irrigation water for the village; irrigation ditches extended from the springs downhill to fields near the village.

The midden was outside the village, between room block V and the river. Since the prevailing winds are from the west, this location would have minimized noxious odors. Large trash dumps at Zuni Pueblo also tended to be on the south and east sides of the settlement (Spier 1917:263), although at both sites trash was also used to fill abandoned rooms (Ferguson and Mills 1982:245; see chapter 8, below). Factors that influenced the placement of features outside the village included spatial limitations and concerns with sanitation.

Animals were corralled or penned inside the oval, clearly a protected location. Seven partial or complete corrals are shown on the Mindeleff map; each room block opens onto at least one corral. The only corral that is located outside the room blocks is on the river bank, south of room block III. This is a location, which, while not inside the oval, would have afforded some protection; the corral also may have been a later addition, built after raiding had diminished. As noted in chapter 6, the spatial relationship of corrals and room blocks suggests that residents pooled labor and corral space.

Many features that allowed access into rooms or room blocks were located inside the oval, protecting inhabitants and restricting access to the village. In the 1850s, the village was entered via stone steps leading into the plaza (Foreman 1941:137; Mollhausen 1858:83); both the steps and the narrow entrances would have been easy to close off to intruders. By the 1880s, it was possible to enter some room blocks from outside the oval; exterior stone steps leading to roofs of a number of the room blocks are shown on the Mindeleff map. Undoubtedly, access to the village was made easier only after the raiding had abated.

Not surprisingly, features associated with domestic activities, such as beehive ovens, were generally placed near groups of rooms. The Mindeleffs recorded twelve ovens at Lower Pescado Village; most were situated adjacent to rooms, although one was on the roof of room block I. Presumably, ovens were shared by the occupants of the adjacent rooms, since these features were more or less evenly distributed. Excavation Unit 3, a collapsed oven at the side of Road A, was not present at the time of the Mindeleff survey; the map shows a corral in that area.

The walk-in well (figure 5.2; page 127) was located at the northeast corner of the plaza in what probably was a public area. This feature did not appear on the Mindeleff map, but was found during the excavation of Unit 6. It was initially thought to be part of a room block but was identified as a well by a Zuni informant who had remembered a similar feature at Nutria where he had lived as a child (Owen Bobelu personal communication 1991). The well was probably used by all the residents of the village, thus its location in a public area. Feature locations were apparently related to several factors, including defensive concerns,

Table 7.8. Activity Classes and Features at Lower Pescado Village.

Activity class	Feature(s)
subsistence	corrals, animal pens, fields, *acequias*, threshing floor
domestic routine	oven, hearth, walk-in well, *ramada*, midden, sheet scatter
maintenance	stockpiled materials
access	exterior stairs

spatial requirements and limitations, how a specific feature was used, and who used it.

Features that were related to access and to resources were more likely to be situated in protected areas inside the oval, while features associated with everyday domestic activities were generally close to living areas. Features that were used by more than one residence group (such as the walk-in well) were not associated with any one room block, but rather were in public or general use areas of the site. The closed character of the built environment is heightened by the locations of resource-related features.

Non-residential features at Lower Pescado Village were generally related to subsistence activities or to domestic routine. Functional classes of features and related activities are summarized in table 7.8. Activities represented by these features were utilitarian, related to the conduct of everyday life and subsistence; at Lower Pescado Village, there was no structured or formal place for social or ceremonial activities. Use of the plaza, which traditionally filled that role in Puebloan communities, was restricted by the presence of the corrals and a room block.

Lower Pescado Village and Zuni Pueblo: a brief comparison

Ferguson (1993, 1996) used the techniques of spatial syntax to evaluate historic Zuni settlement configurations, finding important distinctions between the farming villages and the central settlement at Zuni Pueblo. I will not reiterate his findings but will briefly discuss some differences between Lower Pescado Village and Zuni Pueblo; my more informal analysis corroborates Ferguson's findings.

Zuni Pueblo was surveyed by Victor and Cosmos Mindeleff in 1881 (Mindeleff 1989:Plate LXXVI). The main pueblo was considerably larger than the satellite villages; the Mindeleffs mapped 406 roofed spaces. Based on the analysis of the 1881 map, Ferguson estimated that approximately 50% of these roofed areas had two stories and 25% had three stories, which produced a minimum count of 701 rooms (Ferguson 1996:74). The larger size is, of course, in keeping with the larger population of the central pueblo and the fact that all Zunis maintained a residence there, even though they might have lived at the farming villages during the growing season.

The difference in population between Zuni Pueblo and the farming villages does not account for the entire difference in settlement size. If population size were the only factor influencing settlement size, one would expect a similar ratio of people to rooms at all four sites, but this is not the case. Table 7.9 presents figures on population, number of rooms, and the ratio of people to rooms at the four sites mapped by the Mindeleffs. Population figures are based on the 1880 Cushing census (Holmes 1983); room counts were compiled from the Mindeleff maps (Ferguson 1993; Mindeleff 1989). As noted above, it is sometimes difficult to estimate the number of rooms from the Mindeleff maps because of the indistinguishable

Table 7.9. Number of People per Room at Nineteenth-Century Zuni Settlements.

Site	Zuni Pueblo	Lower Pescado	Ojo Caliente	Upper Nutria
Population	1613	580	440	473
No. of rooms	701	113	94	74
People/room	2.3	5.1	4.7	6.4

Note: Data are from Ferguson (1993), Holmes (1983), and Mindeleff (1989).

variations in the shading convention used to designate multi-story rooms and because the Mindeleffs mapped roofed areas rather than rooms. I used Ferguson's room counts for Zuni Pueblo, Upper Nutria, and Ojo Caliente. His estimates of the number of rooms at Lower Pescado Village and mine differ slightly because of differences in counting several roofed areas with partial walls in room blocks V and VI. My estimate of 113 rooms is used here.

The number of people per room was considerably higher at the farming villages than at Zuni Pueblo. Did this mean that the farming villages were more crowded? Probably they were, to some extent, although crowding at the farming villages would have been somewhat alleviated by the fact that much of residents' time was spent outdoors; in fields, on the range, and in outdoor activity areas denoted by features such as hearths and beehive ovens (Rothschild 1991). The lower ratio of persons to rooms at Zuni Pueblo may reflect less crowded conditions, but I suspect that it also reflects the presence of special-purpose rooms at the main pueblo that were not present at the farming villages. Notable among these were ceremonial rooms, as Adams recorded for Hopi pueblos (Adams 1983); there were no ceremonial rooms at the farming villages. There were probably more storage rooms at Zuni Pueblo, associated with the larger population and greater range of activities, including ceremonial activities which required quantities of foodstuffs and accouterments (Stevenson 1904)

The differences between the number of people per room at Zuni Pueblo and at the farming villages reflects the different uses of the two types of settlements and differences in the amount and kind of public space. Another kind of public space that is important in Puebloan communities is the plaza. The four plazas at Zuni Pueblo were characterized by hard-packed earthen floors and the absence of any other features, and were used for ceremonial purposes. At Lower Pescado Village, the central plaza, which presumably overlay a similar fourteenth-century feature, was not cleared or packed down in the manner of the plazas at Zuni Pueblo (Mindeleff 1989:Plates LXX and LXXI). The plaza at the farming village was occupied by a residential room block and by corrals. The utilitarian role of the plaza at Lower Pescado Village contrasts strongly with the ceremonial role of the plazas at Zuni Pueblo, again indicative of the difference in the way the two sites were used and, presumably, of the perceptions or meanings of these two types of places in Zuni cultural geography.

There are no reliable figures for nineteenth-century room size at Zuni Pueblo (Ferguson 1996:73); therefore it is not possible to compare the main pueblo with the farming villages in this respect. It is possible, however to discuss appointments; rooms were finished and furnished more elaborately at Zuni Pueblo than at the farming villages. According to the historic accounts, more labor and more costly materials (including Euroamerican imports) went into room construction at Zuni Pueblo than at the farming villages (Baxter 1882; Bloom 1936; Cushing 1974; Green 1974, 1990; Mindeleff 1989). Table 7.10 contrasts several

Table 7.10. Comparison of Rooms at Zuni Pueblo and the Farming Villages.

Zuni Pueblo	Farming Villages
stone-paved floors	earthen floors
plastered and painted walls	plain plastered walls
many, special-use fireplaces	single corner or center fireplace
glass windows	selenite windows
wooden doors with nails	some ceiling hatchways
banquettes, wood block seats	blankets, sheepskins for seating and sleeping
wall niches, poles for hanging clothing	wall niches with pottery and domestic items;
and blankets; olla racks	poles for hanging clothing and blankets
bins and boxes with ceremonial items	

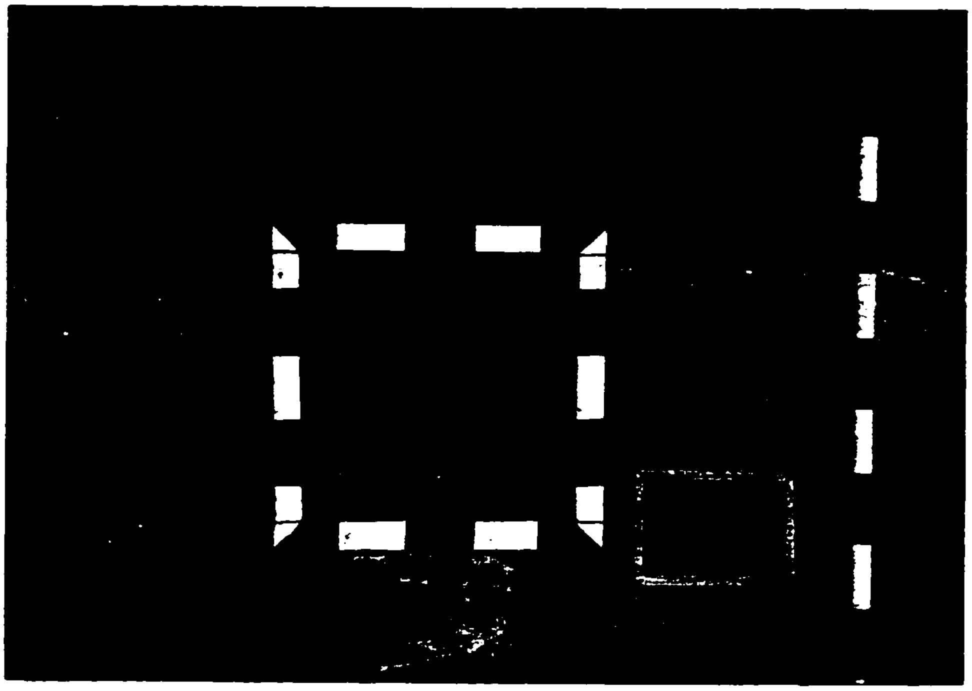
Note: Information is based on historic accounts in Baxter (1882), Bloom (1936), Cushing (1974), Green (1974, 1990), and Mindeleff (1989).

descriptions of rooms from accounts written in the 1880s. At Zuni Pueblo, room floors were paved with stone, walls were carefully plastered and some were painted with realistic or geometric designs. Rooms were furnished with banquettes and wood block seats, and there were many fireplaces. Descriptions of room interiors at the farming villages noted features such as the packed dirt floor and corner hearth that were seen in excavated examples of historic rooms in units 2 and 9. The use of glass in some windows and nails suggest that Euroamerican construction materials were becoming more common at Zuni Pueblo by this period. These innovations appear to have been more prevalent at Zuni Pueblo than at the farming villages. It may be that the farming villages were slower to shift from traditional building materials and architectural conventions; for instance, ceiling hatchways were still in use at Lower Pescado Village in 1881, when the journalist Sylvester Baxter entered Patricio Pino's house in this manner (Baxter 1882:79).

Construction techniques at the farming villages were poor, according to some historic observers (Mindeleff 1989; Mollhausen 1858; Whipple 1855). Some authors write that the masonry walls were constructed of local sandstone and basalt in a "crude" manner (Mindeleff 1989; Whipple 1855). The adjective refers to the use of building stones of non-uniform sizes, a prolific use of chinking stones, and uneven mortar, as illustrated in the photographs, figure 7.12, which were taken at the farming villages of Lower Pescado and Lower Nutria during architectural survey in 1989.

Zuni Pueblo was more agglomerated than the satellite villages. The degree of agglomeration can be assessed by the size of the room blocks (the number of rooms per room block) and by the number of stories. Sites with large room blocks and many multi-storied structures would be considered more agglomerated, or clustered, tha those with small room blocks and few, or no, multi-storied rooms. The four room blocks at Zuni Pueblo in 1885 had a mean size of 101.5 rooms per room block (Ferguson 1993:187), considerably larger than the sizes of room blocks at the farming villages. Approximately 75% of these rooms were multi-storied, compared to 7% (8 rooms) of the rooms at Lower Pescado Village and 11% (8 rooms) at Upper Nutria; there were no two-storied rooms at Ojo Caliente. The size of the room blocks and the number of multi-storied structures at Zuni Pueblo are indicative of a complex architecture with more public use space and more variation in room types, including ritual rooms.

There were only three unroofed enclosures at Zuni Pueblo, while five more rooms



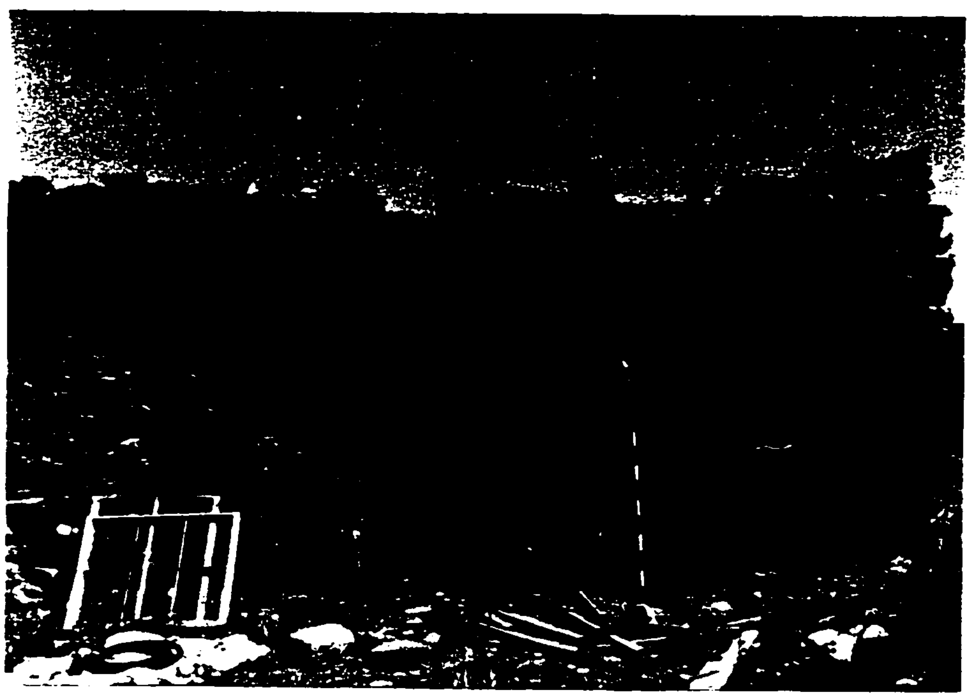


Figure 7.12. Details of masonry on field houses at Lower Pescado Village (top) and Upper Nutria (bottom). Note the use of stones of different sizes, abundant chinking, and uneven coursing in the example from Lower Nutria. The smaller stones in the Lower Pescado example were scavenged from remnants of fourteenth-century walls, as manifested by the pecked surfaces and the patina on several stones; chinking stones are used to even out the courses. Photographs taken for the Zuni Farming Village Study (Rothschild and Dublin 1995).

were partially unroofed. In contrast, at the satellite villages, there were many unroofed enclosures; 23 at Lower Pescado Village (20% of the total number of rooms), 21 at Upper Nutria (28% of the total room count), and 27 at Ojo Caliente (29% of the total number of rooms). This suggests that the farming villages were in a greater state of flux, and architecturally more unstable, than Zuni Pueblo. More renovation may have been occurring at the farming villages, whereas at Zuni Pueblo, tradition may have dictated that certain aspects of the settlement configuration remain stable (Ferguson 1993:186-7). Although the renovation of room blocks between 1885 and 1915 was so extensive that Kroeber was unable to use the Mindeleff map as a base map for his plan of the pueblo in 1916 (Ferguson 1993), these changes occurred relatively late in the history of the ancient pueblo. The point that is important here is that, during the late nineteenth century, strictures on renovation may have been more pronounced at the older pueblo than at the recent (and symbolically not as important) farming villages.

In summary, the main pueblo exhibited a greater variety in room types and probably activities. Room blocks were larger and more clustered, and displayed more complex and costly architecture and embellishments. On the other hand, construction techniques at Lower Pescado Village were rather "casual," and the interiors of rooms showed a lack of embellishment and a simplicity in furnishings and features. These lent a utilitarian and informal character to the village, despite its formal oval configuration.

The Use of the Past in Nineteenth-Century Construction at Lower Pescado Village

Lower Pescado Village was located in an economically attractive area that was also associated with the Zuni past, in the form of a fourteenth-century pueblo that underlay the farming village. I have suggested above and elsewhere that the reuse of this ancestral place can be seen as a symbolic statement of land rights made during a period of non-Zuni expansion into the area (Dublin 1994). This section explores the ways in which the remains of the ancient pueblo were reused in the nineteenth century. The term "pueblo" is used here to refer to the fourteenth-century site, while the term "farming village" refers to the nineteenth-century site.

The fourteenth-century site

To understand how the past was reused in the built environment of the nineteenth century, it is first necessary to examine what is known of the architecture and layout of the fourteenth-century site. This is difficult because our excavations were limited and because the older site is obscured by the remains of the farming village. However, some aspects of the built environment of the fourteenth-century pueblo can be inferred from previous research on pueblos of that period and from the excavation data.

Because of the configuration of the mound and the location of "ancient" walls identified by the Mindeleffs, Kintigh (1985:53) reasoned that the general layout of the farming village echoed that of the earlier pueblo. To some extent, our excavation refuted this. The presence of fourteenth-century walls outside the perimeter wall in Excavation Unit 4 and the remains of what appeared to be fourteenth-century pecked masonry foundations in Road A indicate that some prehistoric construction had taken place outside the line of the perimeter wall. Since the perimeter wall formed the northern and eastern boundaries of the farming village, it can be stated that, in this area of the site, the layout of the farming village did not exactly echo that of the fourteenth-century pueblo. However, based on our excavations in Units 1 and 2 and on the site topography, there is no other indication of incongruities between the layouts of the two components. Therefore, it is reasonably safe to infer that the pueblo was roughly oval with a central plaza, which is a configuration typical of a number of fourteenth-century sites in the Zuni area (Kintigh 1985:80-1). Other researchers have emphasized the defensibility of this type of settlement configuration (Watson et al. 1980).

Our research at Lower Pescado Village revealed fourteenth-century structural remains underlying nineteenth-century foundations along the south, east, and north sides of the village. As the profile of the north and east walls of Excavation Unit 2 (figure 7.13) illustrates, a nineteenth-century builders' trench (stratum F) and a masonry foundation wall (feature 2) cut through roomfill deposits (strata G and H) associated with a fourteenth-century room, part of which had collapsed into the arroyo. The walls were differentiated by masonry style as well as by the associated deposits; stone elements that constitued the earlier wall were uniformly pecked, while the nineteenth-century wall was composed of both pecked and chiselled stones. The base of the nineteenth-century foundation wall, feature 2, was 28 cm higher than the top of the older wall (feature 3), but the orientation of the two rooms, parallel to the river, would have been similar. This orientation was probably mandated by topographic considerations and the location of the site along the bank of the river. Apparently both the fourteenth- and nineteenth-century rooms of which these walls were a part had been part of a tier of room blocks along the river.

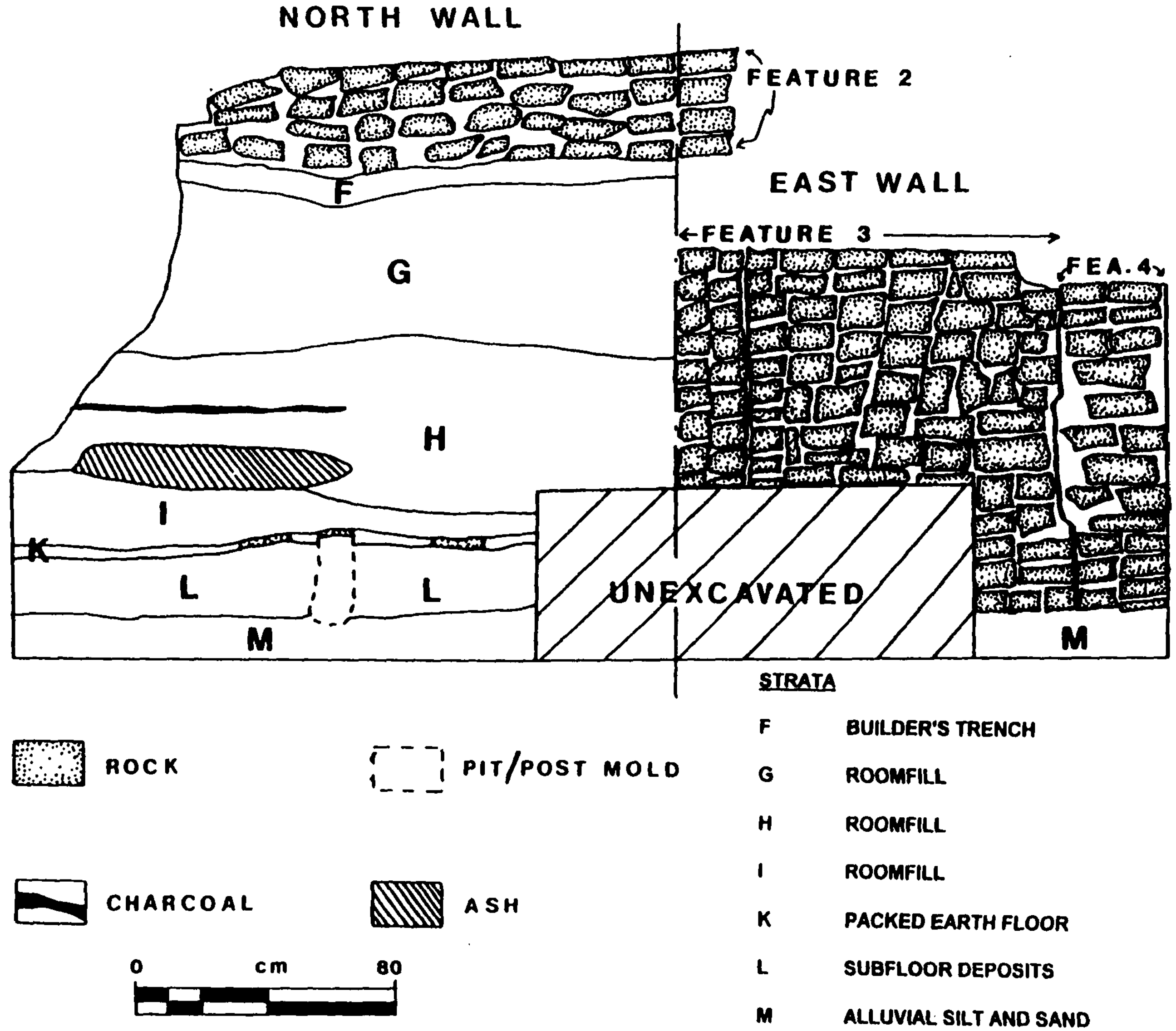


Figure 7.13. Profile of the north and east walls of Excavation Unit 2 at Lower Pescado Village.

In Excavation Unit 1, the foundation of structure 4, built during the historic occupation, cut through fourteenth-century midden deposits; these in turn overlay a segment of an older masonry foundation. The plan view of Excavation Unit 1, figure 7.14, shows the relationship of these wall segments, which are offset and not directly superimposed; the base of the Structure 4 wall (feature 1) was 74 cm above the top of the older wall (feature 2). The location of Excavation Unit, almost 20 m south of the northern tier of room blocks, suggests that the older wall may have been part of a central room block.

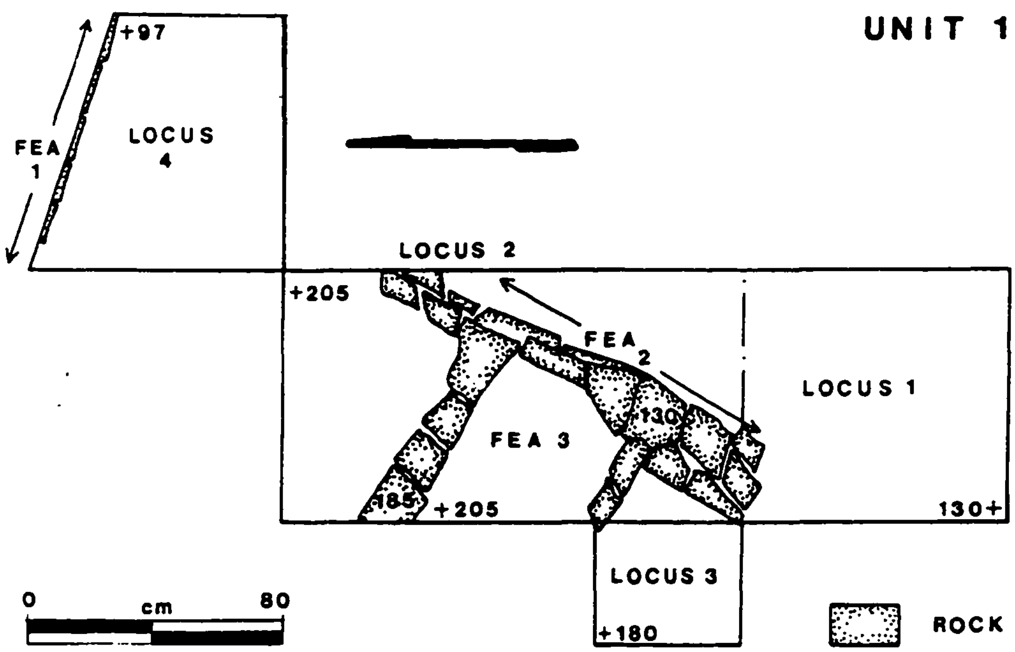


Figure 7.14. Plan view of Excavation Unit 1 at Lower Pescado Village. Feature 1 is the wall of historic structure 4, while feature 2 is an underlying prehistoric wall.

Part of a fourteenth-century perimeter wall, discussed below, was visible along the north side of the farming village and probably formed the curved rear walls of room blocks I, V, and VI as seen on the Mindeleff map. Fourteenth-century foundations outside the perimeter wall and in the road bed along the east side of the mound may define the eastern extent of the site, as noted above. The excavation of Units 5, 7, and 8, outside the nineteenth-century oval of room blocks, did not reveal structural remains from either occupation period, although there were activity areas in these locations.

The excavation data, limited though it is, supports Kintigh's inference that the fourteenth-century site consisted of an oval configuration of room blocks surrounding a central plaza. The evidence from Excavation Unit 1 suggests that there was also a central room block, a feature that was not uncommon in fourteenth-century pueblos in this area. Figure 7.15 shows a plan of Pescado West Ruin, a fourteenth-century pueblo characterized by

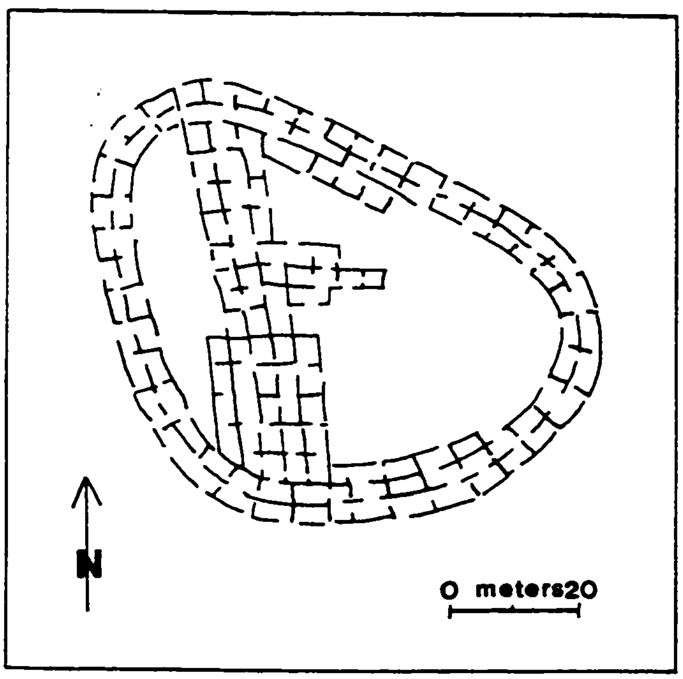


Figure 7.15. Plan of Pescado West Ruin, a fourteenth-century nucleated site with a central room block (after Kintigh 1985:54).

a roughly circular layout and a room block that cut across the central plaza (Kintigh 1985:54). During both occupation periods, there were activity areas situated outside the oval, which are discussed in chapter 8.

The Mound

Residents of Lower Pescado Village were aware of the presence of the older site. Its ruins would have been visible to nineteenth-century residents of the farming village in at least two ways--as an artificial mound created by the cultural debris of the earlier occupation, and by the presence of artifacts exposed on the surface of the site. In Unit 2, excavated to culturally sterile alluvial soil, archaeological deposits extended 230 cm below the surface of the mound (Rothschild and Dublin 1995:48). In other areas of the site, fourteenth-century deposits were excavated to depths ranging from 1.5 to 1.8 m. The height of the artificial mound created by the remains of the fourteenth-century village, then, was at least 2 m. Sheet erosion and road grading exposed artifacts and building stone on the surface of the site; these remains, exemplified by the wall segments shown in the photograph, figure 7.16, are visible today and were also noted by historic observers (Foreman 1941:137).

Stratigraphic relationships between new and old masonry suggest that some, but not all, early foundations were visible during the nineteenth century. The perimeter wall, which was rebuilt during the later occupation, was an example. In areas where we excavated, the extent of soil deposition between the fourteenth- and nineteenth-century levels was not great, considering the four hundred years' occupational hiatus; this was probably due to erosion. Although older foundations are visible today in the cut banks of the river, these may not have

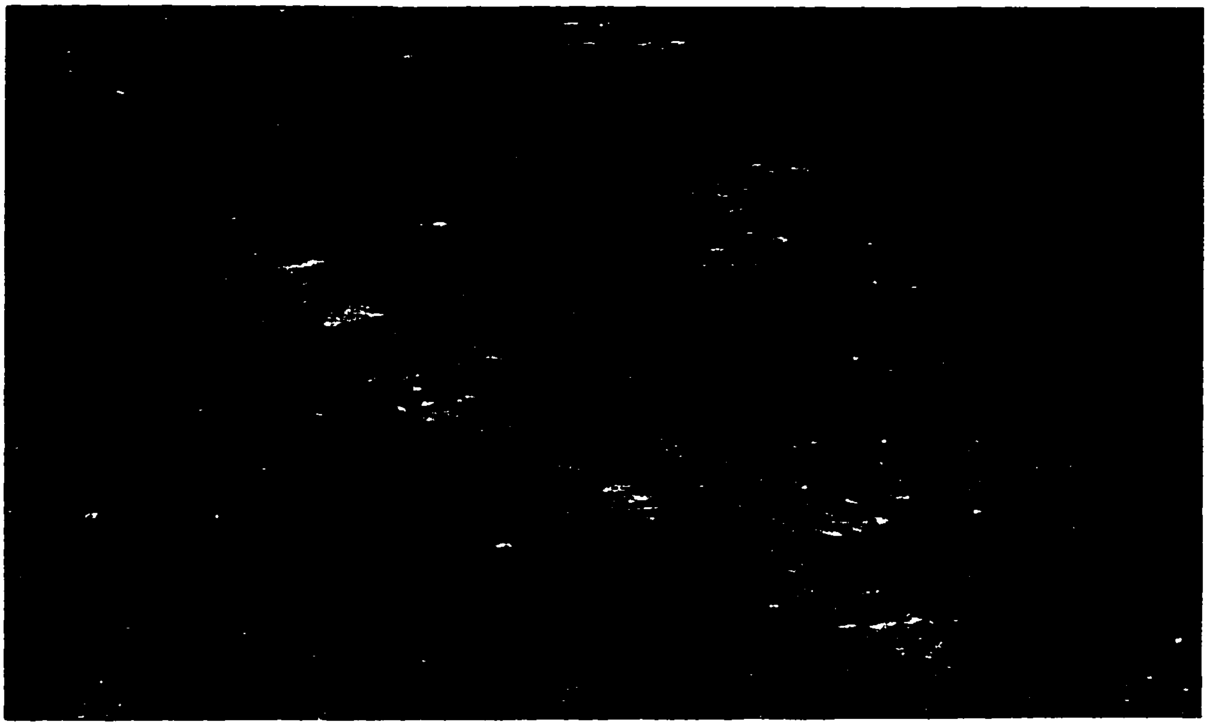


Figure 7.16. Segments of a fourteenth-century foundation wall that was exposed in the bed of Road B at Lower Pescado Village, 1990.

been exposed before the onset of severe arroyo cutting.

Nineteenth-century Reuse of Architectural Elements

Elements of the past were used in several ways at the farming village of Lower Pescado. These included the use of the mound itself; the reuse of structural elements, including masonry and wall segments; and the rebuilding of the perimeter wall. In addition to providing a symbolic statement of ownership, this reuse filled pragmatic needs.

Essentially, the remains of the past were used as a building platform in the sense that the mound provided an eminence on which the farming village stood. The added elevation meant that the farming village was easily seen from the *Calle del Obispo*, the major route through the area. Visibility, as noted in chapter 6, is an important aspect of boundary maintenance. Not only could the village be seen from a distance, residents could also see a greater distance than than they could have had the village been built right on the floodplain. In other words, sight lines were increased because of the higher elevation above the plain. Today, from the farming village, one can see south to the road and across the plain to the southern mesa, eastward across agricultural fields to Ojos de Pescado, and northward to the northern mesa at the foot of the Zuni Mountains. These long sight lines extended toward areas where there were Navajo encampments and toward the routes that would most likely be used by raiding parties. Building on the mound improved the defensibility of the village.

As seen in the photograph, figure 7.12, fourteenth-century building stones were reused in nineteenth- and twentieth-century construction, but our excavations indicate that the residents of the farming village did not necessarily use the ancient foundations as the bases for new room block construction. This is evident in the orientation of the nineteenth- and fourteenth-century walls that were excavated in Units 1 and 2, shown in figures 7.13 and 7.14. However, in at least one case, the residents of the farming village reused a masonry wall segment in a new way, as a platform for a beehive oven, a feature type that was introduced by the Spaniards along with wheat. The oven, excavated as part of Unit 3, is shown in the photograph, figure 7.17a; figure 7.17b shows intact ovens from Zuni Pueblo to illustrate the position of the masonry platform under the oven bases. The partial wall that can be seen on the right side of the archaeological oven was dated to the fourteenth-century;

Figure 7.17a. The remains of a beehive oven, excavated in Unit 3 at Lower Pescado Village.

Figure 7.17b. Beehive ovens at Zuni Pueblo, 1990.

dating was based on the stratigraphic position of the wall, on the pecked finish of the masonry elements and on associated artifacts (Rothschild and Dublin 1995:55-9).

The Perimeter Wall

Although fourteenth-century foundations were not reused (at least in the excavated cases), the configuration of the old pueblo was retained. This was achieved by refurbishing and reusing the fourteenth-century perimeter wall. As noted above, this wall probably formed the rear walls of room blocks I, V, and VI. The perimeter wall was apparently not rebuilt along the south side of the mound, judging from the irregular exterior outlines of Room Blocks II, III, and IV; perhaps the presence of the river provided protection for the residents and their livestock.

The Mindeleffs observed two areas of "ancient masonry" on the north side of the village (Mindeleff 1989:95). These wall segments, apparently parts of the perimeter wall, can be identified as part of the north wall of room block VI and the unroofed enclosure that forms the northeast corner of Room Block V. In 1990, two segments of the perimeter wall were visible in Roads B and C; the segment in Road C was excavated in 1991 as part of Unit 4. The Mindeleffs distinguished the "ancient masonry" from the nineteenth-century stonework by its quality (see figure 7.12, above).

The plan view of Excavation Unit 4, figure 7.18, shows the perimeter wall, feature 1, and three associated fourteenth-century walls (features 2, 3, and 6) that abutted the perimeterwall, indicating that they had been built later. There were no associated nineteenth- or twentieth-century walls in the excavation area of the perimeter wall and very few historic

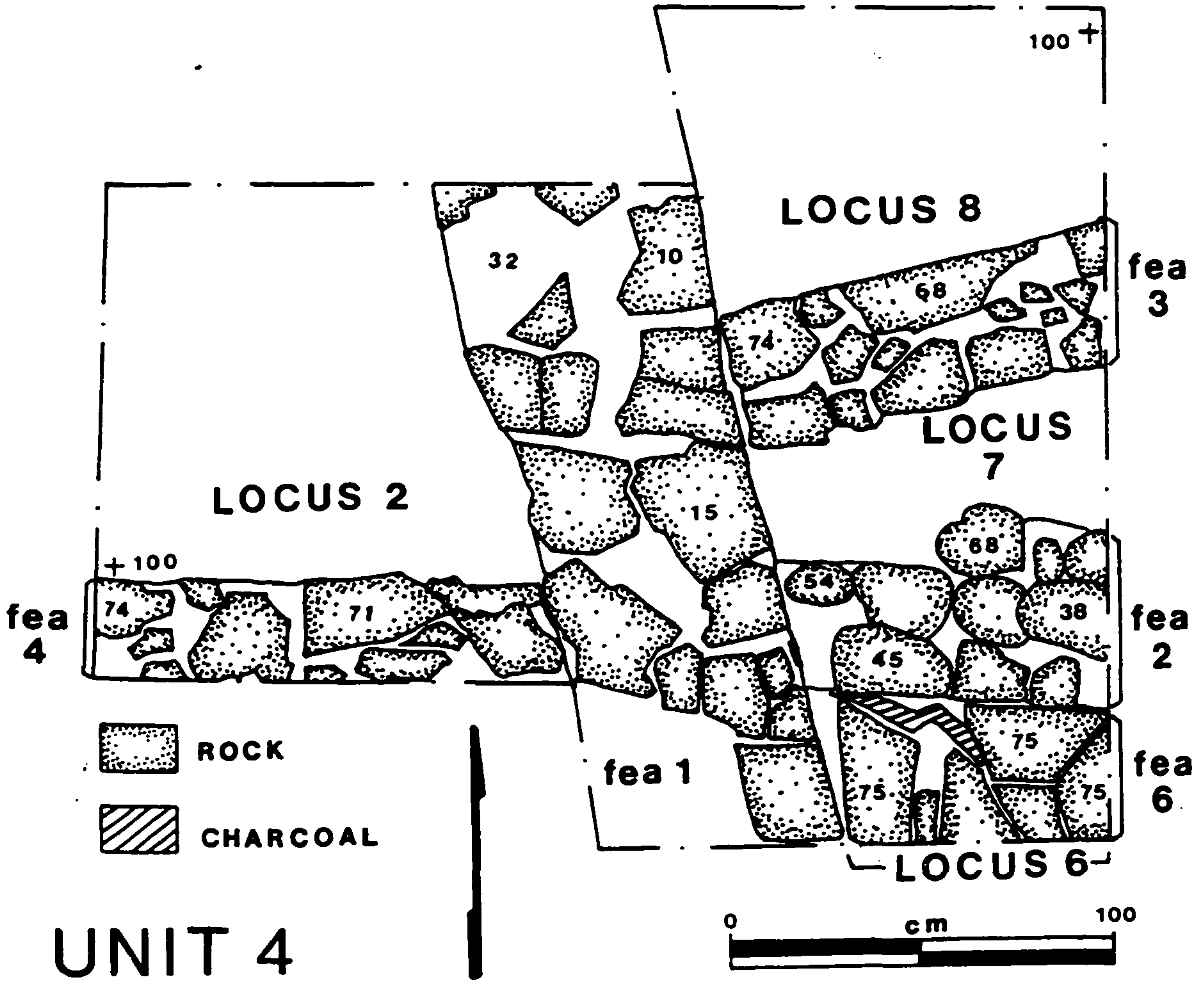


Figure 7.18. Plan view of Excavation Unit 4 at Lower Pescado Village. Feature 1 is the perimeter wall, while features 2, 3, and 4 are fourteenth-century walls that were built after the perimeter wall. Feature 6 is a stone pavement, also dating to the fourteenth century.

artifacts; as noted above, the Mindeleffs show only an unroofed enclosure here. Relationships among the various strata and features in Unit 4 are complicated, reflecting the intensive use of this area of the site during the fourteenth century. In contrast, both the area outside the wall and the area adjacent to the wall on the interior showed light use during the nineteenth century. The structural and artifactual evidence indicates that the area was used differently during the two occupations. In the fourteenth century, areas on both sides of the wall were used, apparently for room blocks and domestic activity, whereas, during the nineteenth century, the wall served to bound the village, defining a very clear "inside" and "outside."

Table 7.11 summarizes the differences in features and stratigraphy between the areas inside and outside the perimeter wall. The site report (Rothschild and Dublin 1995) and Appendix C provide more detailed descriptions of this unit. The roads postdated 1885, since they do not appear on the Mindeleff map, and they were probably built much later. As late as the 1940s, according to one informant, the path through the village entered between Room Blocks IV and V and exited between Room Blocks V and VI (Rothschild and Dublin 1995:Appendix B). Apparently, the only nineteenth-century activity that occurred in the immediate vicinity of the wall was the dumping of burned construction debris; whether this material was from a structure that burned *in situ* or whether it was moved to this location is not known. In contrast, for at least some periods during the fourteenth century, the perimeter wall was not the boundary of the settlement. Activities conducted in this area are discussed in chapter 8.

Figure 7.19 shows the perimeter wall as it appeared during our excavations in 1991.

Table 7.11. Features and Activity Areas Next to the Perimeter Wall in Unit 4.

"Inside"	"Outside"
1. historic overburden and road surface	1. historic overburden and road surface
2. 19th-century silts and sands with ash, charcoal, burned wood, and wall fall probably the remains of dumping	2. 14th-century foundation walls; three ground surfaces; possible "ritual" feature; domestic activities
3. 14th-century wall and room fill	3. 14th-century stone floor and hearth; 14th-century room fill

Note: Position in the same section indicates similar depth below unit datum.

In the excavation of Unit 4, ten courses of masonry were exposed to a depth of 140cm along the western face of the wall, without reaching the bottom of this wall. The perimeter wall is two courses wide, constructed of shaped blocks of gray and tan sandstone. The faces of the stones were pecked, and the walls had been mortared with adobe, which was in good condition, suggesting that the wall was well maintained and that it had probably been refurbished, since the mortar was in much better condition than mortar in other excavated fourteenth-century walls.

Documentary evidence also attests that the perimeter wall was reused during the historic occupation. The Mindeleff map shows parts of the wall in place, although it had fallen into disrepair, perhaps because there was no longer a need for protection after the defeat of the Navajo in the 1860's. By the time Road C was laid out, the perimeter wall was no longer in use and the upper courses had been dismantled, since the road overlies the wall.

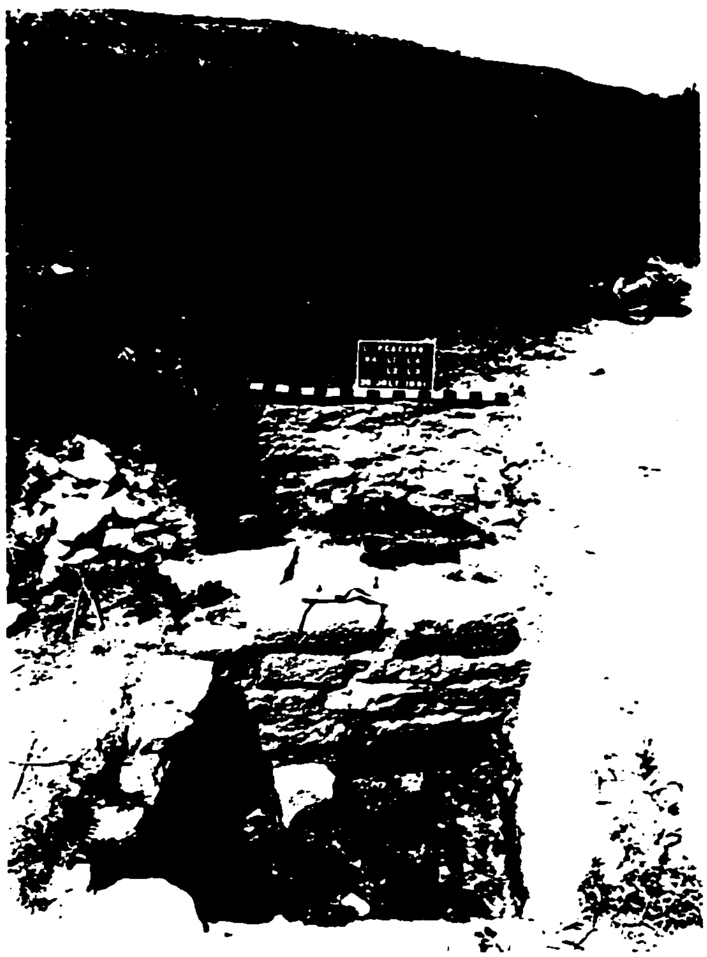


Figure 7.19. A segment of the perimeter wall in Excavation Unit 4 at Lower Pescado Village. The outer, or eastern, face of the wall is at the center of the the photograph. The fourteenth-century walls, features 2 and 3 are visible at the bottom, abutting the perimeter wall.

Summary of reuse

The reuse of fourteenth-century structural elements at Lower Pescado Village was selective. Although building stones and wall segments were reused, entire foundations were not, with one exception. In the case of the perimeter wall, a fourteenth-century structure was reused in the nineteenth century in a similar context, although site areas adjacent to the wall were used quite differently during the two occupations. During the nineteenth century, the refurbished wall served to define the limits of the village and conveyed a defensive advantage by enclosing and limiting access to the room blocks and economically important features situated within the oval, a site configuration which was also reminiscent of the Zuni past.

In the central plaza of the farming village, the use of fourteenth-century features in a new context continued. Most of the excavated or better preserved fourteenth-century sites in the Ramah and Pescado valleys have yielded evidence of the presence of semi-subterranean rooms (kivas) in the plaza, and it is likely that the fourteenth-century pueblo at Lower Pescado contained a similar structure or structures. During the nineteenth century occupation, the plaza contained corrals, providing a protected area for livestock, and a room block in the plaza consisting of habitation and storage rooms. This illustrates a change (and perhaps a reduction) in the range of activities that differentiated the fourteenth-century pueblo from the farming village This is discussed further in chapter 8.

Chapter Summary and Conclusions

The chapter, the first of three based on the research at Lower Pescado Village, explores the built environment of the nineteenth-century site. Similarities are present in the built environment as well as in the geographic setting and socioeconomic contexts of all three mid-nineteenth-century Zuni farming villages, Lower Pescado, Upper Nutria, and Ojo Caliente. Although the villages employ the masonry room block architecture of Zuni Pueblo, they differ from that settlement in size, complexity, and the elaboration of architectural forms and embellishments. The smaller size and simpler architecture of the farming villages is thought to reflect the reduced repertoire of activities conducted at these seasonal localities. In this respect, the built environment provides a material cultural analogue to the elements of the structural model for satellite settlements presented in chapter 4.

The formal, archaic layout of Lower Pescado Village was retained by reconstructing the fourteenth-century perimeter wall. The reuse of this ancestral site can be seen as a statement of use rights to a newly contested frontier area, but it also served a pragmatic purpose by restricting access to the center of the site and protecting important resources. Features of the earlier pueblo were reused selectively in several ways, some of which express differences in how the site was used during the two occupation periods, delimiting and segmented settlement space and structuring the distribution of activities within defined "inside" and "outside" spaces.

CHAPTER 8

THE SITE STRUCTURE OF LOWER PESCADO VILLAGE

Introduction

In this chapter, the use of space at Lower Pescado Village during the prehistoric and historic occupations is examined through the analysis of the site structure. While the previous chapter looked at the architecture and features of the historic farming village, this one looks at the distribution of artifacts and the characteristics of the assemblage from each component in an effort to elucidate and understand similarities and differences in the use of space during the two widely separated occupations. How are these related to differences in activities and site function during the two occupation periods?

Site structural analysis, developed by Martha Graham in her ethnoarchaeological research on residential mobility among the Raramuri, provides a way of revealing how structures, landforms, and activities segment and define space at a site. The variables considered in this type of analysis are: 1) archaeological features and contexts; 2) time period and location of features; 3) artifact activity categories; and 4) artifact densities and distributions.

Analyzing Site Structure

Site structure is defined as "the arrangement and use of space at a place" (Graham 1993; 1994). In her ethnoarchaeological research on Raramuri settlement patterns in northwestern Mexico, Graham examined the distribution of structures, features, and activity areas to understand the use of space at temporarily occupied farmsteads. She found that many variables affected how space was defined and segmented at the farm sites, among them climate, topography, regional settlement pattern, the mode and relations of production, the intensity of occupation (that is, the population size and the duration of stay), and the distribution of human activities and maintenance behaviors. At archaeological sites, post-depositional processes act to distort these patterns laid down during the use life of a site.

Site Structure at Raramuri Farmsteads

Graham found that site space was organized in a similar way at the various places she studied. Figure 8.1 is a generalized illustration of the organizational pattern that she observed. This pattern, roughly concentric and quadripartite, was typical of both year-round

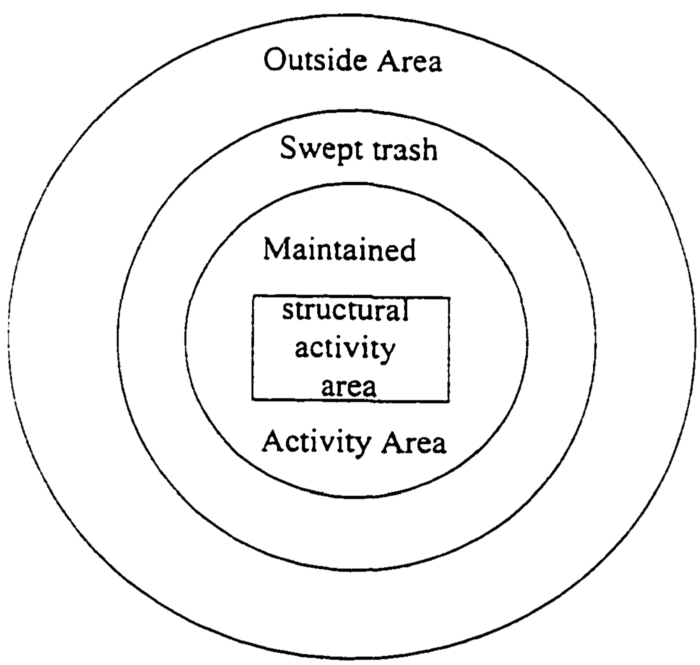


Figure 8.1. A schematic diagram of the site structure of Raramuri field house locations (after Graham 1993).

and seasonal sites, although there were differences in the way the various defined spaces were used; topography and climate also altered the arrangement at some of the sites. The structural activity area consisted of the residence and adjacent outbuildings or attached features like *portales* or *ramadas*. The use of space in the structural activity area was defined and delimited by the architecture. A maintained activity area close to the main structure was swept frequently, leaving a border of swept trash, or small debris, at its outer edge. Areas outside this border were used for discarding large items, for middens, and for activities requiring space that also needed to be at a distance from residences for other reasons, perhaps because of noxious odors or unsightly byproducts. These "outside" areas were where most subsistence activities--animal husbandry and farming--were conducted; outhouses were generally placed in these "outside" localities as well.

Use of Space at Contemporary Zuni Field Houses

Rothschild's ethnoarchaeological study of house lots in the Zuni farming villages identified a pattern of spatial organization that was similar to that identified by Graham for the Raramuri (Rothschild 1991; Rothschild et al. 1993). The data used to define this pattern was collected during the architectural surveys of the Zuni farming villages and included observations about the distribution of features and artifacts associated with standing structures at the farming villages of Upper and Lower Pescado and Lower Nutria. One farmhouse was occupied year round, while others were used daily or on weekends, and yet others were used for storage or sporadically occupied by sheep herders. The permanent residence was more elaborate than the temporarily occupied ones, with a number of outbuildings including a garage and a barn, electricity, and indoor plumbing. As researchers have noted, the presence of relatively large and costly facilities are often indicative of year-round, as opposed to temporary, residences (Graham 1993: Kelley 1986; Kent 1992).

Figure 8.2, a schematic drawing illustrating the demarcation of living space and activity areas at contemporary Zuni field houses, underscores the similarity between spatial patterns or templates identified by Graham and by Rothschild. A swept area along the front wall of a field house at Lower Nutria Village (shown in the photograph, figure 8.3) is analogous to the maintained activity area at the Raramuri field houses; at Lower Nutria, this space was also used by the resident as social space for greeting visitors (and inquiring anthropologists). In accord with this finding at an occupied field house, survey around unoccupied or sporadically used field houses at the Zuni farming villages yielded a low density of cultural material within a five meter radius of structures (Rothschild 1991; Rothschild et al. 1993; Rothschild and Dublin 1995). Between five and ten meters from structures, however, surveyors found concentrations of small refuse (food remains, ceramic sherds and glass fragments, construction materials) typical of the ring of swept trash at the edges of Graham's maintained activity areas. At the Zuni sites, this area was also used for trash barrels, stockpiled construction materials and firewood, and outdoor cooking facilities such as beehive ovens and hearths. The photograph, figure 8.4, taken outside an unoccupied house at Upper Nutria Village, shows an example of this area which was associated with cooking, cutting firewood, and general household maintenance.

Fields, waffle gardens, and threshing floors, features that required space, tended to be

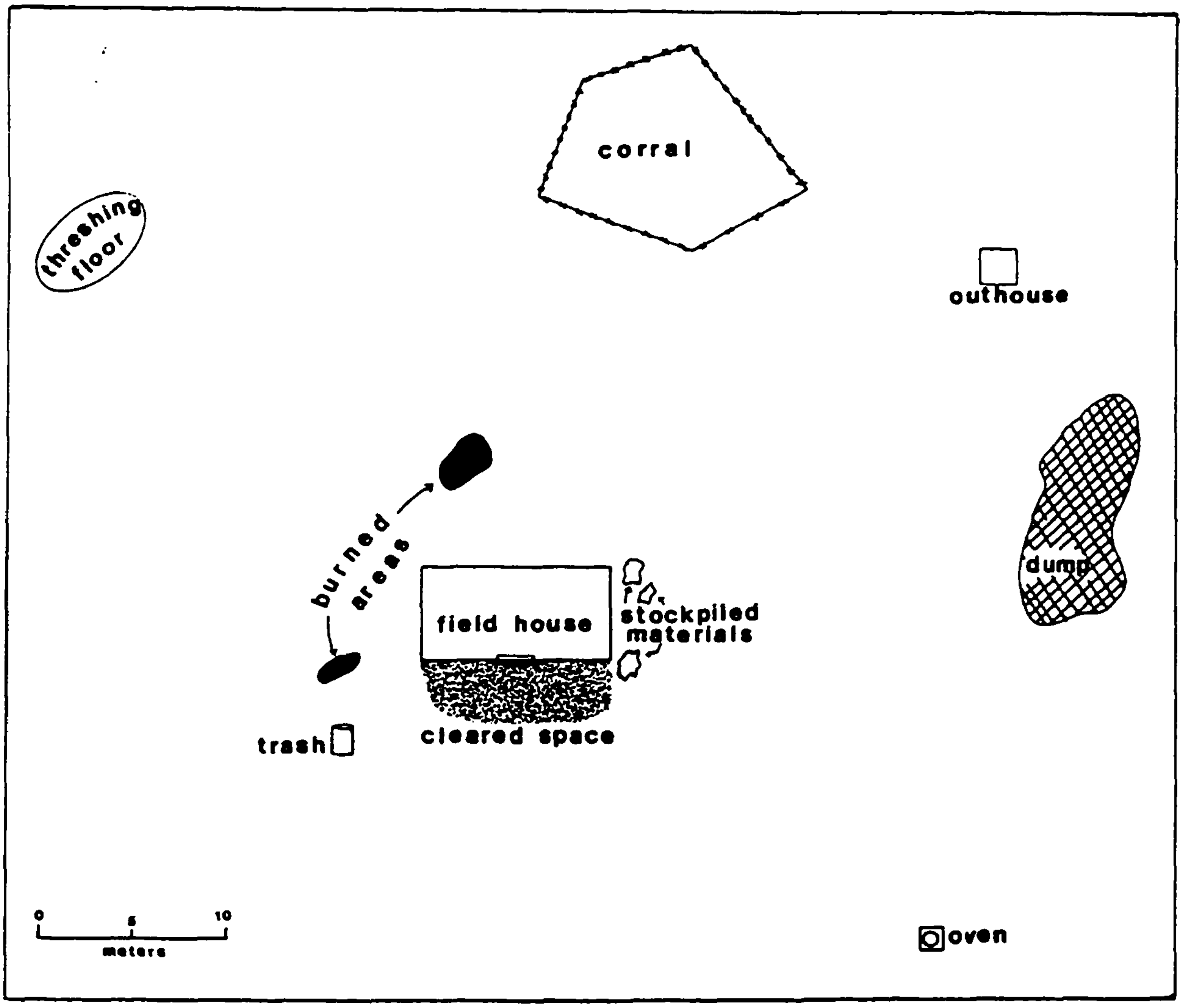


Figure 8.2. Schematic illustration of the site structure at a Zuni field house (after Rothschild 1991).

Figure 8.3. The maintained activity area in front of an occupied Zuni field house at Lower Nutria Village, 1989. Photograph taken for the Zuni Farming Village Study, co-directed by Nan Rothschild and Susan Dublin.

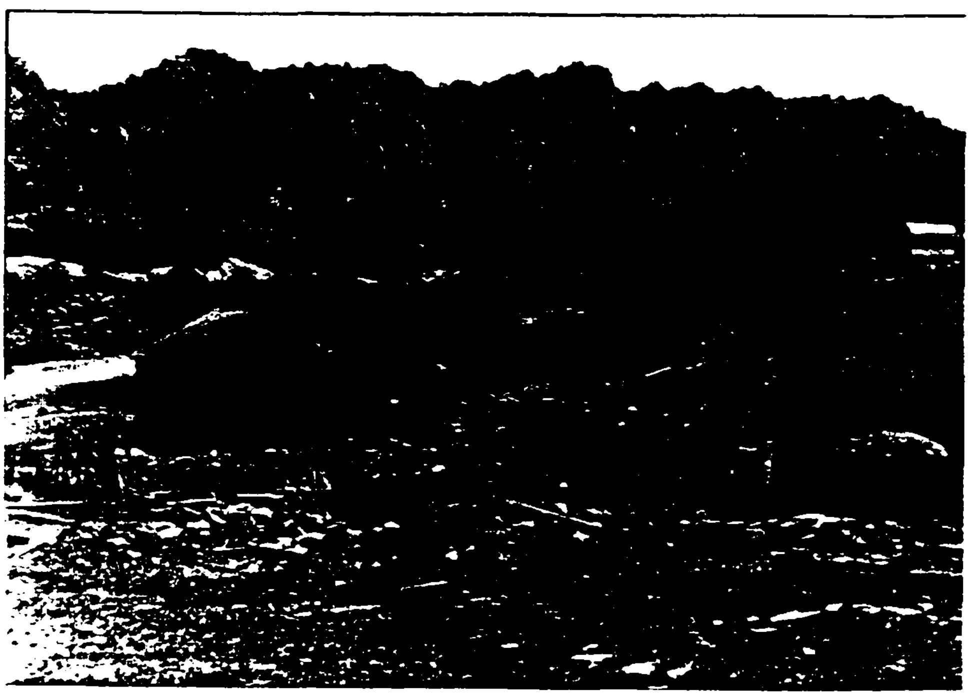


Figure 8.4. The area of swept trash outside an unoccupied field house at Upper Nutria Village, 1989. Note the fence marking the edge of the maintained activity area and the beehive oven in the lower right hand corner. Photograph taken for the Zuni Farming Village Study, co-directed by Nan Rothschild and Susan Dublin.

at least 10 m from field houses, although in one case at Lower Nutria, a resident had cultivated a waffle garden alongside the house. Animal pens, corrals, and outhouses were situated at a distance of 15 m or more from field houses; the photograph, figure 8.5 shows the location of corrals in relation to the residential architecture at Lower Nutria Village. Zuni field houses generally had no formal midden. Small debris was swept away from the immediate vicinity of houses, resulting in the above-mentioned scatter of small items at the edge of the maintained activity area (Rothschild et al. 1993), while larger items and concentrated refuse were placed in small dumps and barrels farther away from the house. The lack of a formal midden was typical of temporarily occupied Rarimuri farmsteads and contemporary Zuni field houses, but not of the nineteenth- and early twentieth-century farming village, as seen below.

Figure 8.5. The location of corrals (lower right) in relation to field houses (center) at Lower Nutria Village, 1989. Photograph taken for the Zuni Farming Village Study, co-directed by Nan Rothschild and Susan Dublin.

Site Structure and Residential Mobility

Comparing site structures at temporary and year-round sites, Graham found that mobile agriculturalists use space differently than do wholly sedentary agriculturalists. These differences are summarized in table 8.1.

Table 8.1. Summary of Site Structures of Raramuri Farmsteads.

Year-round Sites	Temporary Sites
large and costly production facilities	few permanent production facilities
numerous items of site furniture	few items of site furniture left on site
stockpiling materials for future use	no stockpiling
formal midden	small informal trash dumps
separate indoor kitchen or cooking area	no separate cooking area
separate hearths for cooking and heating	center hearth used for cooking and heating
formal storage facilities or rooms	storage on room floors and in corners
bounded, specialized activity areas	overlapping activity areas
room floors kept cleaner than activity areas	activity areas cleaner than room floors

Note: Summary is based on Graham (1994).

The spatial organization at Rarimuri year-round sites was more structured and formal with a greater investment in facilities and costly site furniture than at temporarily occupied sites. This latter feature, of course, would be altered by the circumstances of abandonment; people would remove expensive items on abandoning a facility, unless abandonment were unexpected or the items were excessively cumbersome. Stockpiling materials for future use also seems to be more typical of permanent sites than of temporary ones. A formal structure was expressed in the presence of activity-specific areas that were delimited by architecture, fences, or other boundary techniques. Formal midden areas were more common at permanent than at temporary sites.

The site structure at Raramuri temporary residences, on the other hand, was informal. Activity areas were not specialized and there were few permanent or expensive facilities. While domestic tasks occurred in separate rooms or structures at permanent residences, food preparation at Raramuri temporary residences took place in areas that were used for other activities at other times. Hearths in temporary residences were used for heating as well as cooking, and therefore tended to be placed in the center of a room where heat could more readily disperse than in a corner. Graham found that overlapping activity areas at temporary sites were generally cleaned more often than were the activity-specific areas at the year-round sites; the logic of this empirical finding is that people are more likely to clear an area of debris and facilities related to one task before embarking on a second. The less well maintained activity-specific areas may provide some information on the kinds of activities occurring in various parts of a site, since it is possible that some residue of these activities remained. Raramuri temporary sites did not have specialized storage structures or rooms, nor in most cases, shelves, niches, or specialized storage space inside rooms; items were generally stored on floors or in corners of rooms. What this means is that, while swept exterior activity areas tended to produce relatively low numbers of artifacts, interiors often contained many or large items of site furniture which had been stored or cached during an owner's absence.

These aspects of site structure change along a continuum of mobility to sedentism, I

Table 8.2. Features at Lower Pescado Village That Do Not Correspond to Graham's Model for Temporary Sites.

Feature	Reference
formal storage rooms or niches	Baxter 1882; Bloom 1936
formal boundary or perimeter wall	Mindeleff 1891; Rothschild and Dublin 1995
formal midden	Rothschild and Dublin 1995
bounded "yards" or activity areas	Mindeleff 1891
stockpiles	Mills et al. 1982; Rothschild and Dublin 1995
permanent production facilities (threshing floors; corrals, animal pens)	Mills et al. 1982; Mindeleff 1891; Rothschild and Dublin 1995

think, and an understanding of how space is used at a site provides insights on relative mobility and on how a cultural landscape is perceived and used. For instance, how space is structured appears to be sensitive to perceptions as to whether people will return to a place year after year or to length of occupation (Kent 1992). At Shirdasht, a seasonal pastoral site in Iran, the presence of permanent and expensive site furniture reflected the annual use of campsites, even if only for a short period each year (Watson cited in Graham 1994). At Lower Pescado Village, a relatively large nineteenth-century seasonal settlement where residents returned each year, there were some formal features that might generally be associated with year-round sites.

Some aspects of the distribution of historic structures and features at Lower Pescado

Village that were noted in the preceding chapter are not consistent with the site structural model for temporary settlements presented in the Raramuri case study, probably because the Zuni farming village was reoccupied annually. These features are listed in table 8.2. Historic observers remarked on the presence of specialized storage rooms and wall niches where small items were displayed as well as the location of storage space along walls and in corners of habitation rooms (Baxter 1882:78; Bloom 1936:111). The Mindeleff map clearly illustrated the delimiting or bounding of interior and exterior space by the use of the perimeter wall, and our excavations indicate that the wall formed a boundary during the Historic Period. Other bounded areas were defined by the multiroom block architecture and by the unroofed walled areas depicted on the Mindeleff map (see chapter 7). Lower Pescado Village also had a formal midden area, along the east arroyo bank. Like Shirdasht, Lower Pescado Village wasreused annually for at least six months of every year; therefore the presence of some formal or relatively costly features of site structure might be expected.

An Archaeological Application of the Site Structural Approach

It is possible to convert Graham's ethnoarchaeological observations into expectations which can be applied to an analysis of the distributions of artifacts and features at an archaeological site. This relies on the notion that the distribution of cultural material at a site reflects the residue of activities and maintenance behaviors that occurred during the use life of that site as well as the post-depositional processes that have operated on these residues. In the following paragraphs, I will briefly discuss the archaeological signatures of the various uses of space at a site and differences in artifact distributions that might be attributed to temporary or year-round occupation. The site structure of the fourteenth-century pueblo, presumably a year-round site, should differ from that of the nineteenth-century seasonal farming village.

The structural activity area

The structural activity area includes room floors and features inside residences, such as hearths. The lack of formal built or single-purpose features at temporary Raramuri sites generated differences in artifact distributions between room floors and hearths resulting from storage and maintenance activities. The informal use of space for storage and curation at temporary sites implies that house floors at these types of sites would be cluttered with stored items and site furniture, large items that are difficult to transport and inexpensive items that residents are willing to store for periods of time. Because floors and corners of rooms were used for storage, artifact densities in structural activity areas at temporary sites should be higher than artifact densities in areas that were swept more frequently. Hearths at temporary residences were generally used for both cooking and heating. Because of this, Graham found that they collected more ash than single-purpose hearths and therefore were swept out more often than those at permanent facilities, resulting in lower artifact densities.

The maintained activity area

Maintained activity areas included surfaces adjacent to or near residences that were used for various purposes. Graham found that a maintained activity area was more likely to be used for a number of different tasks at a temporary site than at a year-round site, where areas tended to be activity-specific and to contain site furniture associated with a particular activity. For instance, she found that permanent kiln installations and the associated residue of ceramics production were more common at permanent than at temporary sites At temporary sites. the overlapping uses of an activity area resulted in frequent sweeping of that surface and therefore low artifact densities, small artifact sizes, and diminished evidence of the kinds of activities that were conducted there. Rothschild's research indicated that at Zuni field houses. maintained activity areas extended out about five meters from a residence.

"Outside" areas

At Lower Pescado Village, "outside" areas might include two types of spaces--those beyond 5 m from a room block but still inside the perimeter wall, and areas outside the perimeter wall. At temporary sites, outside spaces, used for land-extensive activities and dumping, would not be subjected to the same kind of maintenance as the maintained activity area and therefore should yield higher densities of artifacts and different kinds of cultural material and features. At contemporary Zuni and Rarimuri field houses. areas beyond five meters from a residence are used for informal dumping, for animal pens and corrals, and for outhouses, whereas at permanent sites, outside areas are the loci of formal middens with characteristic organic deposits and high artifact densities. At year-round sites, following Graham's observations, differences in artifact densities between the maintained activity area and outside areas may not be as pronounced as at temporary sites.

Activities, activity areas, and artifact densities

Many researchers have noted that maintenance behaviors, abandonment and post-depositional processes act to remove evidence of activities and activity areas; because of this, assemblages from primary and secondary refuse deposits are expected to be more illustrative of activities at a site than are activity areas (Graham 1993; Joyce and Johannesen 1993:15; Kent 1992). One advantage of a site structural approach is that maintenance behaviors are taken into account in identifying activity areas, although the nature of those activities may not be readily identifiable.

The ethnoarchaeological literature suggests that maintenance behaviors will differ based on distance from a residence, whether an area is activity-specific, and whether a site is occupied throughout the year or only during a part of the year. Graham suggests that the patterning of activities--whether an area is activity-specific or is used for overlapping activities--will have an effect on maintenance behaviors; an area that is used for more than one activity will be kept cleaner than a special-purpose area. At temporary sites, areas close to a residence tend to be kept cleaner than more distant areas, while at permanent sites, the presence of specialized activity areas adjacent to a residence means that these close-in areas contain site furniture or facilities associated with activities. We therefore might expect different maintenance behaviors associated with different uses of areas at the historic farming village of Pescado and subsequently, distinctive patterning of assemblages in different areas of the site. There should also be discernible differences in maintenance behavior and artifact patterning between the two components.

The Comparative Analysis of Site Structures at Lower Pescado Village

Site structural analysis posits a relationship between artifact distributions, behavior, and activities at a site whereby artifacts are considered a residue of human behavior. This is not a direct relationship, however, because of post-depositional processes. Since site structural analysis relies heavily on contextual data--location, distribution, frequency/density of artifacts and features--an understanding of post-depositional processes is vital.

Post-Depositional Processes

Natural and cultural factors have contributed to the deterioration of archaeological deposits and features at Lower Pescado Village. A major factor that continues to affect the south and east edges of the site is arroyo downcutting; in places, to a depth of about six meters below the surface of the mound. The southern arroyo cut exposed fourteenth-century room blocks, dislodging segments of masonry and redepositing artifacts in the streambed and along its banks. On the eastern edge of the site, two meters of stratified historic midden are exposed in the arroyo face; at least two recent dumping episodes, one marked by a concentration of tin cans and other small metal debris and the other by quantities of disposable diapers, have obscured and dislodged archaeological deposits.

Three graded dirt roads intersect the site; roads A and B are graded several times per year by a truck fitted with a front blade. The roads are presently cut to a depth of approximately one meter below grade, exposing cultural material in the cuts. Grader debris is piled in berms along both sides, displacing material from older deposits in the roadbed and mixing it with surface material from the roadsides. During our field seasons, three or four cars per day passed over roads A and B enroute to outlying farms and field houses. This activity has a persistent damaging effect on materials in the roadbeds, increasing their susceptibility to erosion.

Other processes have had an adverse impact on archaeological deposits at Lower Pescado Village. Sheet erosion from spring runoff and heavy summer rains has moved material downslope toward the river, mixing cultural material from the various occupation periods; twelfth-, thirteenth- and fourteenth-century ceramics are found on the surface alongside historic Zuni Polychromes and Blackwares. Other factors that have been instrumental in the mixing of deposits are burrowing by small mammals and ant activity, evidenced by the large ant hills scattered across the site. Deposits from burrows were excavated separately. Historic Period sweeping, filling, and other such activities cut into prehistoric deposits and displaced small artifacts, while reuse of materials, especially building stone, often made it difficult to assess the age of features from surface remains. Zuni potters use ground sherds for temper (Cushing 1974; Bunzel 1929:6; Stevenson 1904): in a number of places at the site, we found small piles of sherds from various time periods, perhaps set aside for this purpose. Because of these problems of redeposition, mixing, and reuse, it was difficult to assign most lithics to periods unless the deposit was sealed; we also defined an additional ceramic category, "redeposited sherds." Reuse appears to be an important component of the behavioral repertoire at this site, as it is at other sites, although it is not always remarked upon or recognized (but see Head and Snead 1992).

Current land use practices at Lower Pescado Village have affected the integrity of past cultural remains to some extent. Although the farming village is "abandoned," in the sense that the standing structures are not being used as residences, the land continues to be used in a variety of ways (Rothschild et al. 1993). A waffle garden behind Structure 1 is cultivated sporadically. *Acequias* along the north edge of the mound water pasture and fields adjacent to the site; presumably, these are periodically cleaned out or redug. Sheep are grazed on the western half of the mound on a regular basis. The remains of recent campfires and debris attest to the use of the site for picnics. These modern uses contribute to the accumulation of debris and the mixing of cultural materials from the various occupation periods.

While there has been significant disturbance and the site is endangered, our knowledge of post-depositional processes is good and severely disturbed areas are easily identifiable. In some parts of the site, historic use sealed and preserved earlier deposits.

Definitions of Contexts

Five broad context types were defined for this analysis; these are midden, fill, room floors, ground surfaces, and thermal features. Trash disposal areas are identified by mottled deposits, with a very high frequency of ash and charcoal lenses, as well as used-up or disposable cultural material (e.g., redeposited sherds, food remains). Two types of trash disposal were identified in the excavations--midden and trash pits. Fill was identified by the presence of mottled deposits enclosed within structure or feature walls and a lower density of debris, especially ash and charcoal, than in middens. Two types of fill were identified in the excavations, room fill and feature fill; historic features that appear to have been intentionally filled included two builders' trenches and a historic well. At Zuni Pueblo, fill was used to level areas for the construction of plazas or room floors (Ferguson and Mills 1982:245). In

Excavation Units 2 and 9 at Lower Pescado Village, thick fill deposits consisting of secondary refuse and wall fall underlay the most recent room floors. Prehistoric room fill, consisting of trash deposited in apparently abandoned rooms, did not support later overlying construction.

Room floors were identified by the presence of compacted soils, enclosure within masonry walls, and the presence of floor features such as hearths or ash pits. Historic room floors at the farming villages were constructed of packed earth or adobe (Baxter 1882; Bloom 1936; Frisbie and Denny 1991). Ground surfaces were recognized by compact or hardpacked soils and small, flat-lying artifacts, and sometimes by the presence of pit features or lenses. Although the matrices often looked like those of room floors, ground surfaces were easily differentiated because they were not associated with masonry walls. For this analysis, ground surfaces were characterized as "close-in," within five meters of a structure or feature; or "outside," beyond five meters of a structure or feature or outside the perimeter wall. The ethnoarchaeological research presented above strongly indicates that there should be differences in artifact densities and the constituents of assemblages recovered from these two categories of surfaces. Room floors were considered part of the structural activity area, and close-in surfaces part of the maintained activity area. Thermal features--hearths, ash pits, and ovens--are easily identified by their unique structural elements and by the high occurrence of ash and charcoal.

Forty-one archaeological deposits from Lower Pescado Village, including examples of each contextual category from each component, were examined for the site structural analysis. Criteria for selection included: 1) the ability to identify a context based on the soil matrix and the characteristics described above; 2) the ability to assign a given context to a time period; and 3) the ability to identify and control for post-depositional disturbance. Thus the upper levels of the prehistoric midden in Excavation Unit 1 were not included because intrusive materials recovered from animal burrows could not be separated from the midden deposits. In Excavation Units 5 and 8, both of which were heavily burrowed into, the more recent material from the burrows was excavated separately from the main matrix; deposits from these two excavation units are included in the analysis, although material from the burrows is not. Excavated contexts included in the site structural analysis are listed in table 8.3; they are identified by unit, stratum designation and time period. Because the model predicts that there is a relationship between proximity to a residence and use of an area, the table also notes the locations of the various contexts adjacent to a structure or feature, inside or outside the perimeter wall.

I did not distinguish between early and late prehistoric contexts since that is not relevant to the research which seeks to understand site structural differences between the fourteenth- and nineteenth-century occupations, but I did distinguish between early and late historic when possible. Because of the lack of structural wood from excavated contexts, tree ring dates were not available. Assignment of specific contexts to a time period is based on stratigraphic relationships, artifacts, informant interviews, and documentary evidence. Structures shown on the Mindeleff map and identified on the ground are considered to date to the Early Historic Period, roughly analogous to the "period of conquest and exploration" (1846-1870) and the early years of the "period of settlement and development" (1871-1902). Areas that are stratigraphically earlier than these are also assigned to the Early Historic

Table 8.3. Excavated Contexts That Are Used in the Site Structure Analysis.

Unit/ stratum	Period[1]	Context	Location[2]	Site structural area
1B	LH	ground surface	adjacent to structure 4	maintained activity area
1C	LH	builder's trench	adjacent to structure 4	maintained activity area
1D-G	P	midden	above room fill (1H)	trash deposit
1H	P	room fill	above room floor (1I)	trash deposit
1I	P	room floor	inside structure	structural activity area
1J	P	ash pit	inside structure	structural activity area
2B	LH	room fill	above room floor (2C)	trash deposit
2C	H	room floor	inside structure	structural activity area
2D	EH	room fill	below room floor (2C)	trash deposit
2G-I	P	room fill	above room floor (2K)	trash deposit
2J	P	hearth	inside structure	structural activity area
2K	P	room floor	inside structure	structural activity area
3C-D	LH	beehive oven	road A	maintained activity area
3E	LH	ground surface	adjacent to oven (3C-D)	maintained activity area
4B	LH	ground surface	outside perimeter wall	outside area
4D	EH	ground surface	inside perimeter wall	maintained activity area
4F-G	EH?	room fill	above room floor	trash deposit
4H	P	room fill	above room floor	trash deposit
4 fea6	P	room floor	outside perimeter wall	structural activity area
4K	LH	ground surface	outside perimeter wall	outside area
4M	P	ground surface	outside perimeter wall	maintained activity area
4N fea5	P	ground surface	outside perimeter wall	maintained activity area
5B-C	LH	ground surface	outside perimeter wall	outside area
5D	H	ground surface	outside perimeter wall	outside area
5F	EH	ground surface	outside perimeter wall	outside area
5I fea2	P	ground surface	outside perimeter wall	outside area
5L-M	P	ground surface	outside perimeter wall	outside area

Table 8.3, continued

Unit/ stratum	Period[1]	Context	Location[2]	Site structural area
5O fea3	P	ground surface	outside perimeter wall	outside area
5S fea4	P	ground surface	outside perimeter wall	outside area
5 fea1	H	pit	outside perimeter wall	outside area
5 fea2	P	pit	outside perimeter wall	outside area
5 fea3	P	pit	outside perimeter wall	outside area
5 fea4	P	pit	outside perimeter wall	outside area
7C-I	H	midden	outside perimeter wall	trash deposit
7K	P	ground surface	outside perimeter wall	outside area
8B-H	H	midden	outside perimeter wall	trash deposit
9B-C	LH	room fill	above room floor (9D)	trash deposit
9D	LH	room floor	inside structure	structural activity area
9E	EH	room floor	inside structure	structural activity area
9F-G	EH	hearth	inside structure	structural activity area
9H	EH	room fill	below room floor (9E)	trash deposit

[1]Period abbreviations are as follows: P=prehistoric; H=historic; EH=early historic (before 1885); LH=late historic (after 1885).

[2]Associated strata are listed in parentheses after the location.

period. Structures and features that are not depicted on the Mindeleff map or that are stratigraphically later than Early Historic deposits or features are assigned to the Late Historic Period, after 1890. One context, a road surface (stratum 4K), post-dated the 1930s, according to informants' accounts (Rothschild and Dublin 1995).

Because excavation areas varied in size, artifact frequencies for each context are not comparable; that is, smaller excavated areas may yield fewer artifacts, not because of differences in the intensity of human activities but rather because the excavated area was smaller. To compare assemblages across contexts, I used artifact densities, the number of artifacts per cubic meter, rather than artifact frequencies. Although this assumes that artifacts are equally distributed across a context, it is preferable to comparing frequencies of material recovered from excavation areas of different sizes. Density figures were calculated by dividing the number of artifacts recovered from a context by the excavated volume of that context.

Artifacts recovered from each context were separated into functional categories, which in some cases allowed me to identify activities conducted in various areas of the site, or, in the case of the middens, to identify activities on a site level. Although maintenance behaviors during the use life of the site, and abandonment and other post-depositional processes have affected the positions of artifacts, I believe that displacement does not cross site boundaries, i.e., that the artifacts recovered from Lower Pescado were used at that site although they may have been displaced from areas where they were initially used or discarded. Material recovered from the middens probably provides the best gauge of activities conducted at the site.

Nine artifact categories, based on similar breakdowns by Ward et al. (1977) and South (1977), were identified.

1. The category of food remains includes only faunal remains, since botanical remains from flotation and pollen samples were not quantified.
2. Artifacts associated with food preparation include cooking pots, processing implements, ground stone (*manos*, *metates*, etc), and chipped stone (scrapers).
3. Artifacts associated with food serving and storage include ceramic bowls and jars.

4. The category of general utility tools includes multi-purpose tools--hammerstones, for instance, and utilized flakes, which are the most numerous artifact type in this group.
5. Subsistence-related artifacts production include agricultural tools such as hoes, hunting implements (e.g., projectile points), and items associated with pastoralism. The most common artifacts in this last subcategory were fragments of barbed wire.
6. The category of household manufacturing consists of tools used in the manufacture of tools and the residue from manufacturing activities. An example of the former would be an abrader, while the most common example of the latter was debitage. This category also includes tools and the raw materials of craft manufacture; examples are needles and awls, but also cloth, leather, unshaped stone, and bead blanks.
7. The categories of personal and ceremonial items were combined because of the small number of artifacts in each and because, according to the ethnographic evidence, ceremonial artifacts are often "owned" by a household or an individual. The category includes beads and other jewelry, clothing, fetishes, paint sticks, and minerals.
8. Construction-related artifacts include items used in building construction and maintenance--masonry elements, chunks of adobe and plaster, tar and asphalt roofing tiles, milled lumber, nails, window glass.
9. Redeposited sherds, present in all historic deposits, were the residue of maintenance behavior at the farming village. In some cases, a higher than average number of redeposited sherds was indicative of certain types of post-depositional disturbance such as erosion and slope wash. These cases, discussed below, were easily identified by examining topography, soil conditions, and other physical evidence.

Results of the analysis

Archaeological contexts and density classes

Contextual data on artifact densities are presented in table 8.4; figure 8.6 graphs the frequency distribution; breaks in the distribution formed a basis for designating artifact density classes A through D. These are, in ascending order, density class A (0-899 artifacts per cubic meter), density class B (900-2399 artifacts per cubic meter), density class C (2400-3299 artifacts per cubic meter), and density class D (more than 3300 artifacts per cubic meter). Low artifact densities were considered evidence for sweeping or other sorts of cleaning; sweeping is easier to identify since it will leave behind small fragments, many of which will be trampled into ground surfaces or room floors.

Assemblages from several deposits included in this analysis were subjected to a high degree of post-depositional disturbance, which was easily recognizable by the nature of the soil matrix, mixing of the assemblage, and by the location of the deposit. The deposits were included in the sample, however, because it was relatively simple to correct for inflated artifact densities that were the result of the inclusion of material deposited after the area was abandoned. Historic Period surfaces in Excavation Unit 5 yielded very high percentages of prehistoric sherds that had been redeposited by sheet erosion along the edge of the south arroyo bank. A similar situation inflated artifact densities in the uppermost level of the prehistoric room fill from Excavation Unit 2 and in the overburden overlying the upper room floor in Excavation Unit 9. In Unit 1, located at the edge of Road A, the excavation of a historic surface associated with structure 4 yielded high frequencies of redeposited sherds that had been dislocated by road grading from the underlying prehistoric midden. In each case,

Table 8.4. Artifact Densities from Sampled Contexts at Lower Pescado Village.

Unit/ stratum	Period[1]	Context	Site structural area	Density[2]	Density Class
1B	LH	ground surface	maintained activity area	223.3[3]	A
1C	LH	builder's trench	maintained activity area	692.3	A
1D-G	P	midden	trash deposit	2833.1	C
1H	P	room fill	trash deposit	370.9	A
1I	P	room floor	structural activity area	330.7	A
1J	P	ash pit	structural activity area	1666.7	B
2B	LH	room fill	trash deposit	546.9	A
2C	H	room floor	structural activity area	540.3	A
2D	EH	room fill	trash deposit	1915.5	B
2H-I	P	room fill	trash deposit	692.5	A
2J	P	hearth	structural activity area	817.0	A
2K	P	room floor	structural activity area	1172.6	B
3C-D	LH	beehive oven	maintained activity area	543.9	A
3E	LH	ground surface	maintained activity area	290.4	A
4B	LH	ground surface	outside area	515.8	A
4D	EH	ground surface	maintained activity area	384.6	A
4F-G	EH?	room fill	trash deposit	895.0	A
4H	P	room fill	trash deposit	230.7	A
4, f6	P	room floor	structural activity area	500.0	A
4K	LH	ground surface	outside perimeter wall	1883.2	B
4M	P	ground surface	maintained activity area	1815.8	B
4N, f5	P	ground surface	maintained activity area	1210.5	B
5B-C	LH	ground surface	outside perimeter wall	664.8[3]	A
5D	H	ground surface	outside perimeter wall	484.6[3]	A
5F	EH	ground surface	outside perimeter wall	396.2[3]	A
5I, f2	P	ground surface	outside perimeter wall	1108.5	B

Table 8.4, continued

Unit/ stratum	Period[1]	Context	Site structural area	Density[2]	Density Class
5L-M	P	ground surface	outside perimeter wall	1201.3	B
5O,f3	P	ground surface	outside perimeter wall	1252.8	B
5S, f4	P	ground surface	outside perimeter wall	848.4	A
5 fea1	H	pit	outside perimeter wall	5958.3	D
5 fea2	P	pit	outside perimeter wall	982.1	B
5 fea3	P	pit	outside perimeter wall	560.5	A
5 fea4	P	pit	outside perimeter wall	299.4	A
7C-I	H	midden	trash deposit	3289.0	C
7K	P	ground surface	outside area	1230.2	B
8B-H	H	midden	trash deposit	1356.9	B
9B-C	LH	room fill	trash deposit	718.7[3]	A
9D	LH	room floor	structural activity area	1613.6	B
9E	EH	room floor	structural activity area	1681.8	B
9F-G	EH	hearth	structural activity area	371.5	A
9H	EH	room fill	trash deposit	2142.9	B

[1]Period abbreviations are as follows: P=prehistoric; H=historic; EH=early historic (before 1885); LH=late historic (after 1885).

[2]Number of artifacts per cubic meter.

[3]Density figures were adjusted to correct for post-depositional factors.

clearly intrusive material was not included in calculating artifact frequencies and densities and the figures listed in the table reflect the adjusted densities.

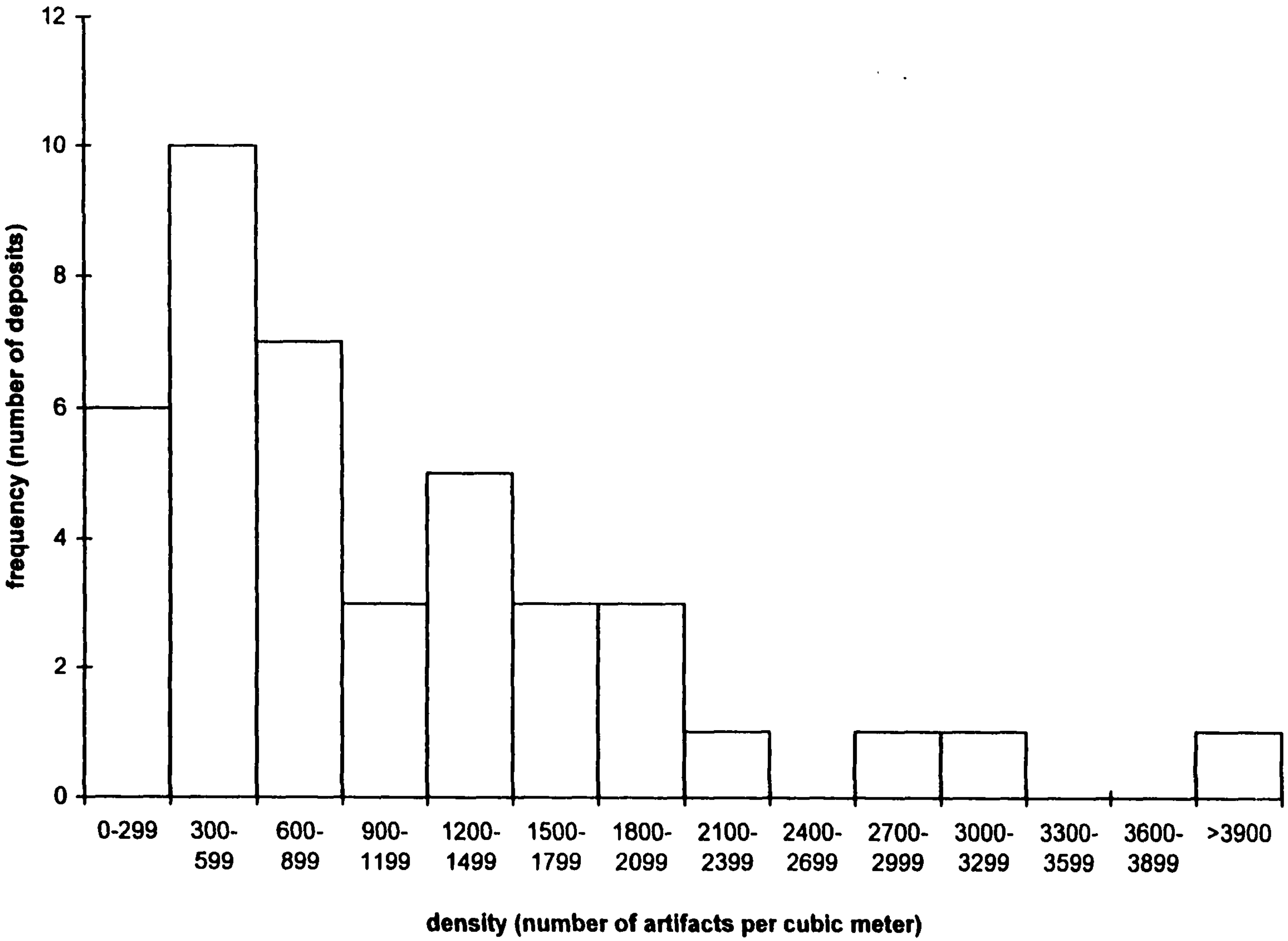


Figure 8.6. Frequency distribution of artifact densities from a sample of excavated deposits at Lower Pescado Village.

Summary data

The results of the site structural analysis provide insights on the use of place that are related to activities and also to maintenance behaviors. Different artifact distributions in various areas of the site within a single component demonstrate synchronic variability in site structure while differences between components illustrate changes in site structure over time. The ethnoarchaeological research cited above provides a template for interpreting synchronic and diachronic variability. As indicated in the box plot, figure 8.7, a similar distribution of artifact densities across both the historic and the prehistoric samples indicate that differential

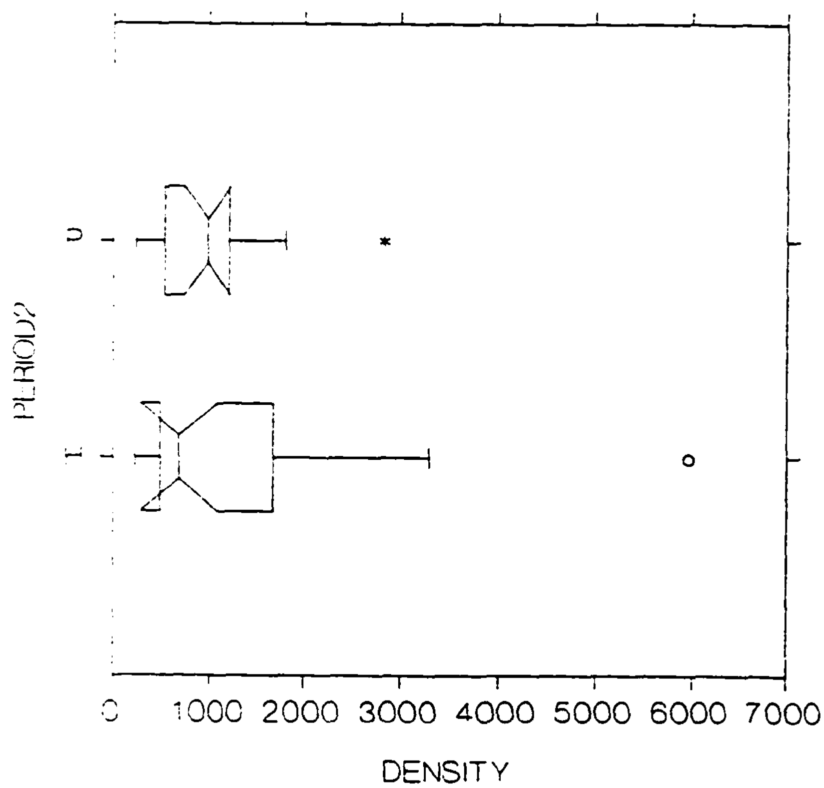


Figure 8.7. Stacked box plots of artifact densities (number of artifacts per cubic meter) from a sample of prehistoric and historic deposits at Lower Pescado Village.

preservation was not a significant problem; if it were, one might expect that prehistoric artifact densities would be significantly lower. While the mean density of cultural material recovered from the prehistoric sample, was 1,006.5 artifacts per cubic meter, slightly lower than the mean density of 1,232.3 artifacts per cubic meter that were recovered from historic deposits, the midspreads of both data sets overlap considerably.

Several observations can be made about the summary data before proceeding to a discussion of the results for each occupation period. Initially, it is surprising that many historic deposits yielded higher artifact densities than did the prehistoric. Since the occupation of the fourteenth-century year-round pueblo was a higher intensity occupation than the seasonal occupation of the farming village, it might be expected to produce a larger material record (Graham 1993). The unexpectedly high density of artifacts from historic deposits is due in part to the fact that the historic village was built on top of an earlier site.

Figure 8.8 shows the distribution of artifacts grouped in functional categories; this information is also listed in table 8.5. Context totals listed in the table do not always match the frequencies because artifacts that could not be classified in a functional category were not listed although they were added into the totals. Two categories dominate the historic sample, redeposited sherds (N=4,146; 31.6%) and food remains (N=7,312; 55.7%). Redeposited sherds, the residue of maintenance activities and post-depositional processes, account for almost one-third of the historic sample.

A comparatively high density of pottery and other artifacts associated with domestic routine--*manos*, *metates*, and cooking slabs--can be considered indicative of a high intensity of occupation. Artifacts associated with food preparation, serving and storage represent 71%

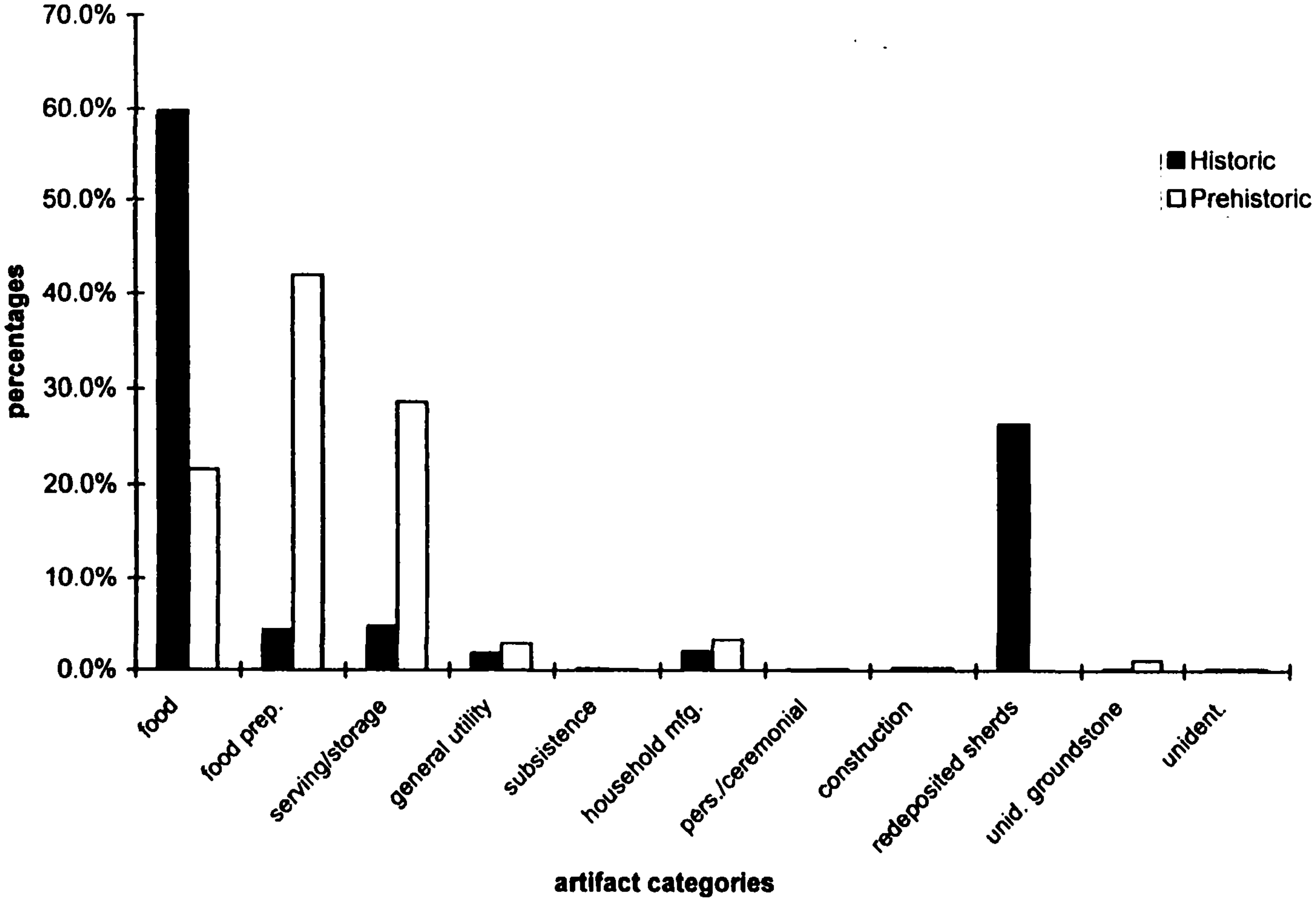


Figure 8.8. Functional categories of artifacts from historic and prehistoric deposits at Lower Pescado Village.

Table 8.5. Functional Categories of Artifacts from Selected Contexts at Lower Pescado Village.

Unit/ stratum	Food	Food Preparation	Serving/ storage	General utility	Subsistence tools	Household manufacturing	Personal/ ceremonial	Construction	Redeposited Sherds	Ground stone	Total
1D-G	1384	2090	1479	153	3	182	15	17	0	53	5380
1H	8	18	19	2	0	3	0	0	0	6	56
1I	1	13	4	0	0	0	0	0	0	0	18
1J	4	6	4	2	0	2	0	0	0	2	20
2H-I	23	164	78	12	0	5	0	0	0	4	286
2J	13	21	7	2	0	0	0	3	0	10	56
2K	26	100	60	15	1	16	0	0	0	2	220
4H	46	0	3	0	0	1	0	0	0	0	50
4fea6	0	1	5	0	0	0	0	0	0	7	13
4M	16	74	43	4	0	1	0	0	0	0	138
4Nfea5	14	111	50	6	0	2	0	0	0	1	184
5Ifea2	22	61	44	0	0	0	0	0	0	0	127
5L-M	13	216	71	5	1	8	1	0	0	1	316
5Ofea3	7	49	33	3	0	10	0	0	0	2	105
5Sfea4	32	40	57	2	0	3	0	0	0	0	134
5fea2	1	8	1	0	0	0	0	0	0	0	10
5fea3	2	13	7	0	0	0	0	0	0	1	23
5fea4	1	4	4	0	0	2	0	0	0	0	11
7K	33	213	213	10	0	11	0	0	0	1	481
1B	43	3	28	14	3	24	2	4	0	0	123
1C	135	8	4	11	1	25	0	3	329	1	517

Table 8.5, continued

Unit/ Stratum	Food	Food Preparation	Serving/ storage	General utility	Subsistence tools	Household manufacturing	Personal/ ceremonial	Construction	Redeposited Sherds	Ground stone	Total
2B	8	1	0	1	0	1	0	1	23	0	35
2C	35	7	3	3	1	3	0	0	98	1	151
2D	275	12	15	7	0	6	0	0	250	2	567
3C-D	19	1	0	0	0	0	0	0	30	0	50
3E	12	0	0	7	2	0	0	0	19	0	40
4B	20	0	3	1	0	0	0	1	23	0	49
4K	22	4	2	2	0	2	0	0	130	0	162
4D	0	2	2	0	0	0	0	0	6	0	10
4F-G	64	26	6	0	0	1	1	0	94	2	194
5B-C	94	1	7	18	3	24	0	0	0	0	147
5D	21	0	3	12	0	27	0	0	0	0	63
5F	35	1	1	12	0	26	1	0	0	0	76
5fea1	9	1	0	5	0	8	0	1	119	0	143
7C-I	5967	366	367	38	9	31	1	18	1122	7	7993
8B-H	263	7	21	57	1	33	0	1	755	6	1144
9B-C	63	69	71	14	7	13	0	2	0	3	258
9D	11	6	9	3	0	3	2	0	36	1	71
9E	27	1	3	4	0	4	0	1	30	4	74
9F-G	1	1	20	1	0	0	0	0	4	0	27
9H	156	15	11	5	0	8	0	1	77	2	275

of the total number of artifacts from the prehistoric sample (N=6,204 or 1,054.2 artifacts per cubic meter), but only 8.4% of the historic artifacts (N=1,104 or 155.7 artifacts per cubic meter). Since groundstone tools are heavy and cumbersome, it might be expected that large groundstone artifacts would be stored at the farming village over the winter, but the relative scarcity of these implements in historic deposits supports the conclusion that this later occupation represented a lighter intensity use than the earlier.

Another noteworthy aspect of the summary data from the two components at the site is the high percentage of animal bone recovered from the historic strata. Faunal remains comprised more than one-half the total cultural material found in historic deposits; much of the animal bone consisted of the remains of sheep and goat, underscoring the importance of pastoralism at the historic farming village and highlighting an important difference in the use of the site during the two occupations. This is further discussed in chapter 9.

The summary data highlight general differences in site structure during the two occupations, notably the higher intensity of occupation during the prehistoric period, and the focus on animal husbandry during the historic occupation. The contextual analysis, discussed below, revealed additional differences.

The Site Structure of the Fourteenth-Century Aggregated Pueblo

During each occupation period, the settlement space at Lower Pescado Village was structured differently, yielding different kinds of assemblages, expressed in the densities (number of artifacts per cubic meter) and functional categories of cultural material in various areas of the site. To facilitate comparisons within and across the two time periods, I used

Table 8.6. Artifact Densities from Site Structural Areas at Lower Pescado Village.

Types of contexts	Prehistoric		Historic	
	Median	**Class**	**Median**	**Class**
Structural activity areas (room floors)	500.0	A	1613.4	B
Structural activity areas (hearths)	1241.9	B	457.7	A
Maintained activity areas	1513.2	B	290.4	A
"Outside" areas	1201.3	B	515.8	A
Room fill	370.9	A	895.0	A
Midden	2833.1	C	2323.0	C

median artifact densities for each site structural area; these are listed in table 8.6. Use of the median rather than the mean compensates for the presence of outliers in several of the sampled contexts. Table 8.7 lists the distribution of artifacts within functional categories for each site structural area of the prehistoric component.

Structural activity areas

The fourteenth-century structural activity areas were represented by three room floors and two hearths, which are listed separately because of the different expectations for each kind of context in the ethnoarchaeological model. In general, room floors yielded fewer artifacts per cubic meter than did hearths, a finding that is related to maintenance activity during the use life of the site and to abandonment processes. Researchers at Grasshopper Pueblo and at Black Mesa found that rooms that were abandoned as part of a planned move were cleaner than rooms that had been abandoned hastily (Gumerman 1984:109; Longacre et

Table 8.7. Functional Artifact Categories Recovered from Prehistoric Site Structural Areas at Lower Pescado Village.

Context	Food	Food Preparation	Serving/ storage	General utility	Subsistence tools	Household manufacturing	Personal/ ceremonial	Construction	Ground stone	Unidentified	Total
Midden	1384	2090	1479	153	3	182	15	17	53	4	5380
Room fill	77	182	100	14	0	9	0	0	10	0	392
Pit fill	4	25	12	0	0	2	0	0	1	0	44
Hearths	17	27	11	4	0	2	0	3	12	0	76
SAA[1]	27	114	69	15	1	16	0	0	2	7	251
MAA[2]	30	185	93	10	0	3	0	0	1	0	322
"Outside"	107	579	418	20	1	32	1	0	3	2	1163

[1]SAA stands for Structural activity area.

[2]MAA stands for Maintained activity area.

al. 1982). In situations where abandonment had occurred hastily without advance planning, residents often left unbroken artifacts, particularly large, hard-to-move items, on room floors. At Lower Pescado Village, no whole artifacts were recovered from room floors, indicating that residents removed useful items before the settlement was abandoned.

The two excavated hearths yielded more artifacts per cubic meter than did the room floors. This is in keeping with Graham's observation that, at year-round settlements, there might be several hearths in a structure, each used for a specific purpose, whereas at temporary settlements, a single hearth might serve for both cooking and heating (Graham 1994:98). Special-purpose facilities were cleaned out less frequently than were multi-purpose ones, and might be expected to produce higher densities of artifacts. According to the journalist Sylvester Baxter, who visited Zuni Pueblo in 1881, rooms at the main pueblo often had three or four fireplaces, "one designated for roasting meat, another for baking bread, another for boiling &c" (Baxter 1882:80). This is a good example of the specialization thought to be characteristic of features in year-round settlements.

As seen in figure 8.9, artifacts recovered from fourteenth-century structural activity areas consisted mostly of items used in domestic routine. Ceramics were the most common artifact type; sherds from cooking pots outnumbered those from serving or storage vessels.

Maintained activity areas

The fourteenth-century maintained activity areas were represented by two superimposed surfaces excavated as part of Unit 4. These were outside the perimeter wall and adjacent to two masonry walls, features 2 and 3 (Rothschild and Dublin 1995:60; see

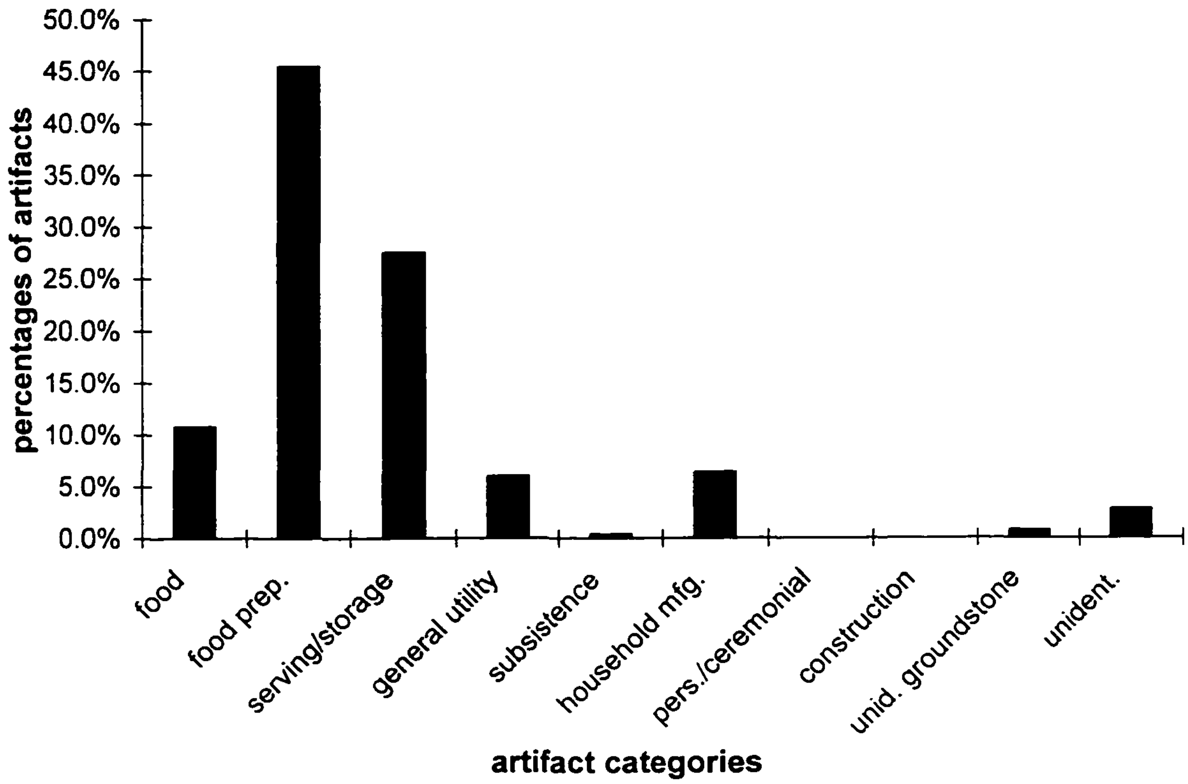


Figure 8.9. The distribution of artifact categories from prehistoric structural activity areas at Lower Pescado Village.

figure 7.16, above); the narrow, irregular shapes of the areas suggest that they were exterior rather than interior surfaces. Stratum 4N was associated with feature 5 (shown in the photograph figure 8.10), a double line of holes punched into the surface, each containing a kernel of maize. Both ground surfaces yielded a quantity of tepary beans (Carol Brandt, personal communication 1991); several sherds of a corrugated cooking pot were lying on the surface of stratum 4M.

Excavation of these surfaces produced artifact densities three times higher than the

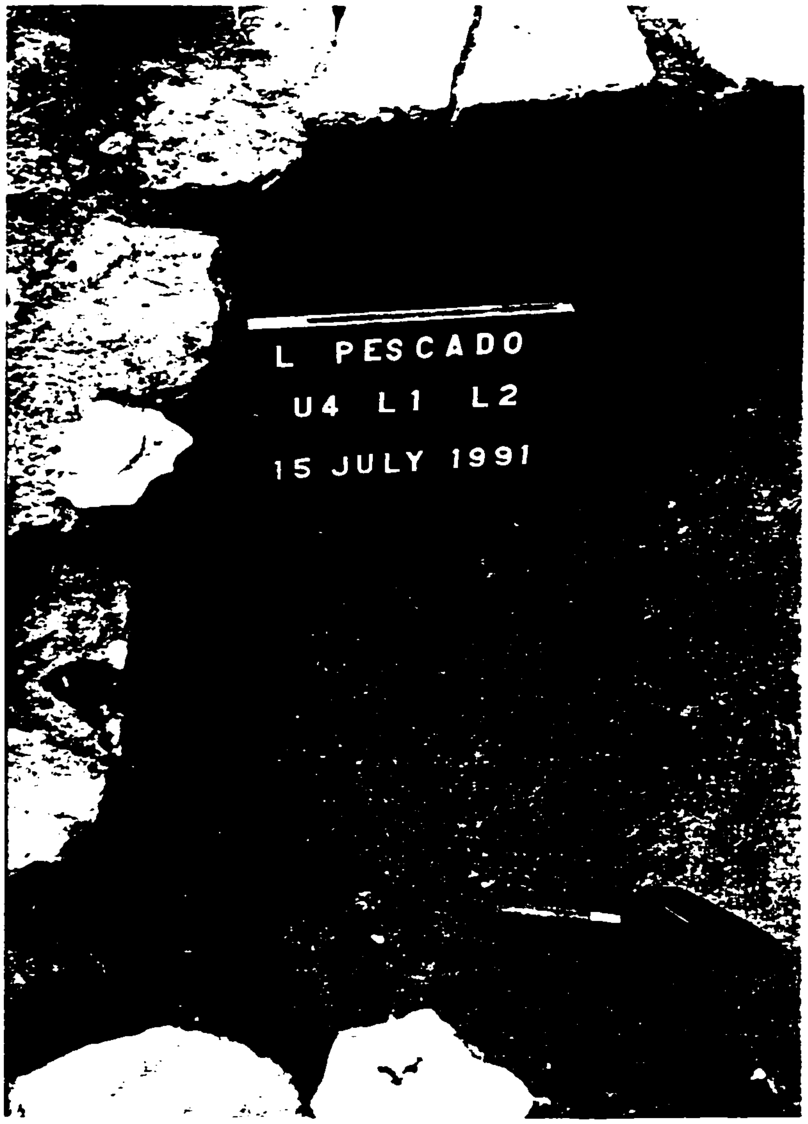


Figure 8.10. Feature 5 in Excavation Unit 9 at Lower Pescado Village, 1991. The feature consisted of a double row of holes (to the left of the trowel) apparently punched into a ground surface. A large sherd of corrugated pottery is lying on the surface at the center of the photograph. The perimeter wall (feature 1) is at the top of the photograph.

median artifact density recorded for fourteenth-century room floors, a finding that is in keeping with Graham's observation that maintained activity areas at year-round sites were specialized, activity-specific areas. Because these spaces were used for only one kind of activity, there was not a need to sweep after each use. Therefore, maintained activity areas in year-round sites were not as assiduously maintained as were room floors and tended to yield more cultural debris, which might provide information about activities conducted there. Both ground surfaces yielded very high percentages of artifacts, mostly pot sherds, associated with food preparation, serving, and storage; the distributions are shown in figure 8.11. We do not know what feature 5 was used for. The high number of sherds from cooking vessels and the botanical remains suggest that this area was used for domestic activities, notably food preparation, while the regular alignment of holes may indicate some sort of domestic ceremonial feature. Maize was used by the Hopi in house blessing ceremonies during the nineteenth century (Mindeleff 1891); perhaps this feature served a similar purpose.

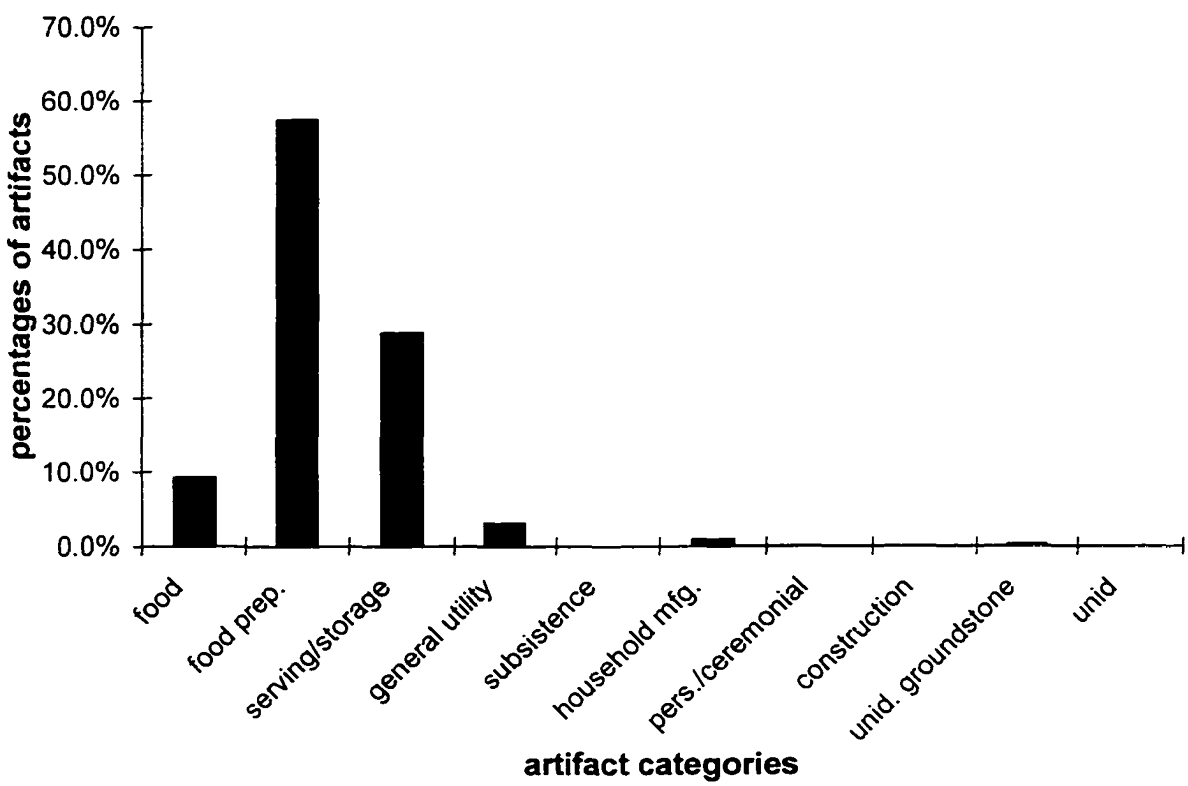


Figure 8.11. The distribution of artifact categories from prehistoric maintained activity areas at Lower Pescado Village.

"Outside" areas

The fourteenth-century sample consisted of four buried ground surfaces located on the south arroyo bank and excavated as part of Unit 5, and a fifth buried surface in Excavation Unit 7 that underlay the historic midden along the eastern arroyo bank. The surfaces in Excavation Unit 5 were separated by deposits of relatively clean alluvial sand, apparently stream-laid, and some were associated with pit features, which are included in the sample. All the surfaces were outside the perimeter wall, and none were associated with masonry features or architecture.

In general, outside areas yielded more artifacts per cubic meter than did the fourteenth century room floors, but fewer than the maintained activity areas. Most of the artifacts recovered from outside areas were pot sherds associated with food preparation, serving, and storage (see figure 8.12). Artifact frequencies in the fill deposits associated with pit features 2, 3, and 4 in Excavation Unit 5 were uniformly low, ranging from 10 to 23 artifacts. The low numbers of artifacts and the very high occurrence of charcoal and ash in pit fills and on the associated surfaces in this area suggest that the pits were used for fires or for the disposal of ash from fires. There is no indication from material on the ground surfaces that these areas along the southern edge of the site were used as middens.

Discard areas

Two types of fourteenth-century trash deposits--room fill and midden--were excavated at Lower Pescado Village. These represented different kinds of discard behavior and yielded qualitatively and quantitatively different kinds of assemblages.

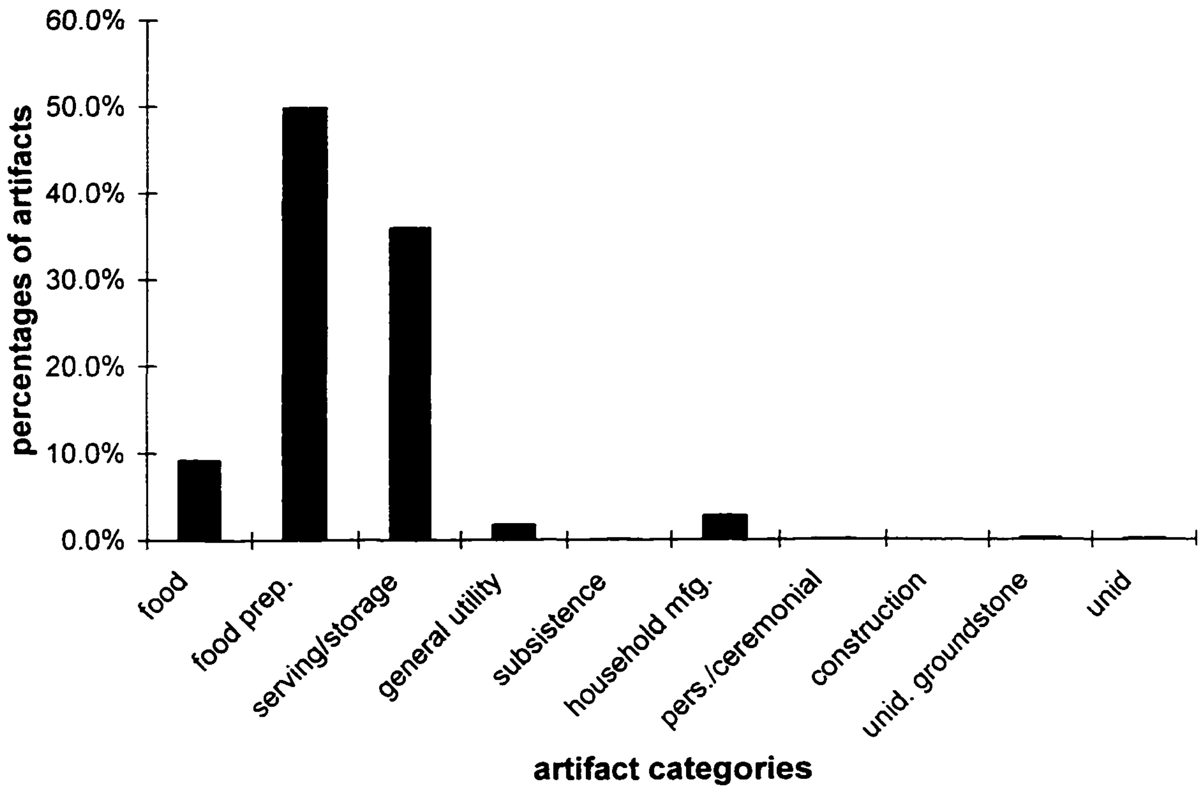


Figure 8.12. The distribution of artifact categories from prehistoric "outside" areas at lower Pescado Village.

Deposits of fourteenth-century room fill were excavated in Units 1, 2, and 4. The density of cultural material recovered from prehistoric room fill was generally low. The distribution of artifacts by categories is shown in the bar chart, figure 8.13. Pot sherds were the most common constituent of fourteenth-century room fills, comprising 71.9% of the assemblage (N=282), while faunal remains accounted for 19.5% (N=77). More interesting, perhaps, than the artifact assembla, are the other materials included in fill deposits, which indicate that fourteenth-century residents filled abandoned rooms in different ways. Masonry

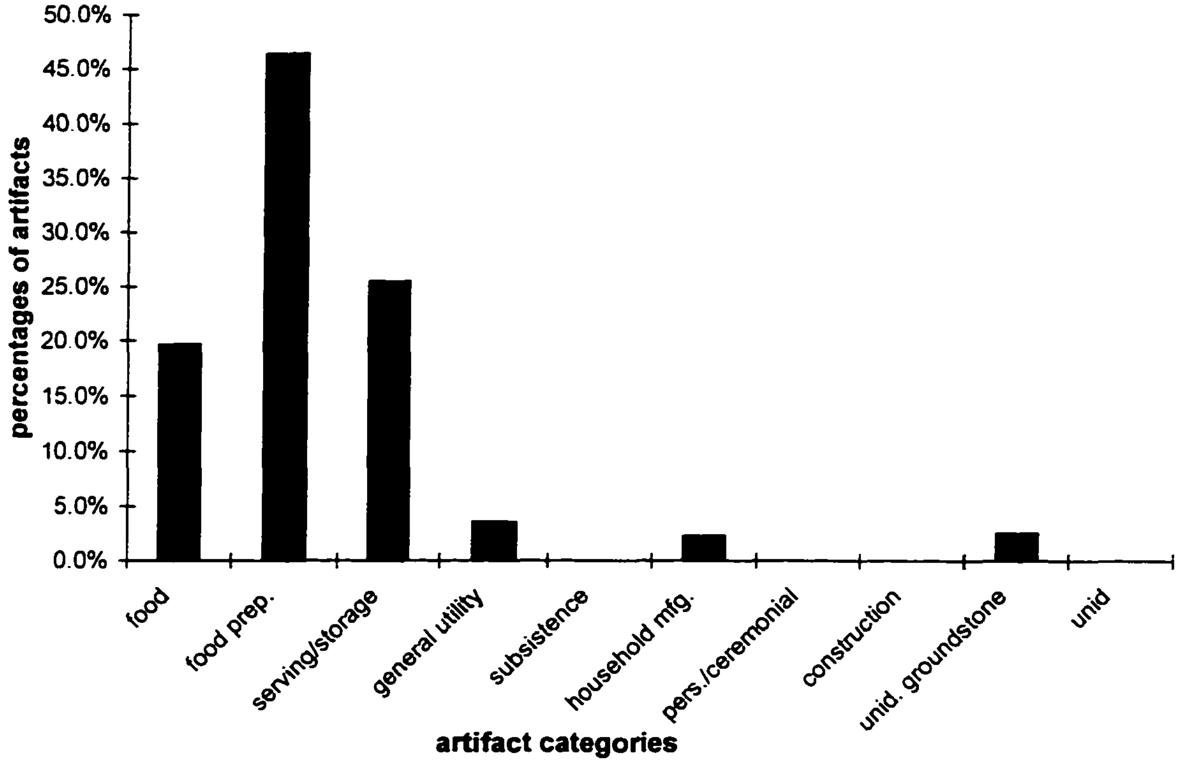


Figure 8.13. The distribution of artifact categories from prehistoric room fill deposits at Lower Pescado Village.

from wall fall was used in the Excavation Unit 4 room fill, but not in the others. In Excavation Unit 2, the fill is stratified indicating several different filling episodes, while in the other two cases, the lack of stratification suggests a single dumping episode.

The midden deposit excavated in Unit 1 overlay an abandoned and filled room at the edge of the historic plaza (probably also used as a plaza during the fourteenth century) and may have been used by a single residence group. As expected, the midden yielded a very

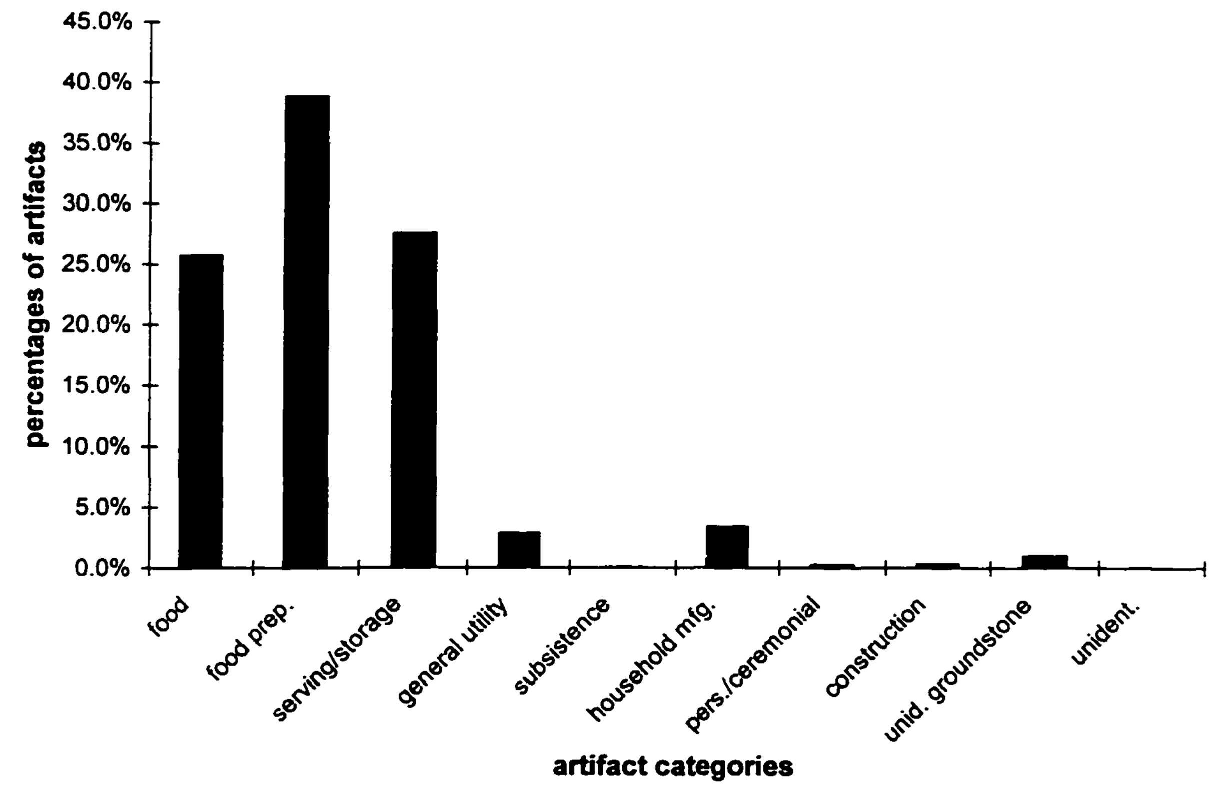


Figure 8.14. The distribution of artifact categories from prehistoric midden deposits at Lower Pescado Village.

high density of artifacts. It also produced a great diversity of cultural material, including artifacts from every functional category; the bar chart, figure 8.14, shows the distribution of artifact categories recovered from midden deposits. Most cultural material from the midden consisted of ceramics associated with food preparation, serving, and storage (66.3%); other categories represented included food remains (25.7%) and general utility tools, mostly utilized flakes, and artifacts associated with household manufacturing, mostly debitage. This latter category accounted for 6.2% of the total assemblage from the midden. Although the category of artifacts associated with personal and ceremonial use represented a very small percentage (0.3%) of the assemblage from the midden, the presence of artifacts that fall into this category is worth noting, since these relatively valuable or safeguarded artifacts would most likely only appear in small frequencies.

Summary of the prehistoric site structure

In general, artifact densities, which might be considered the residue of site structure, maintenance behaviors, and abandonment and post-depositional processes, fit the ethnoarchaeological expectations for year-round sites. Based on the expectations derived from the ethnoarchaeological model, I suggest that the site structure of the fourteenth-century pueblo was relatively formal, with designated, special-purpose areas. The best examples of such areas are the maintained activity areas adjacent to room blocks, which were used for food preparation, judging from the very high percentages of ceramics recovered from these areas. In general, the high numbers of artifacts associated with domestic routine indicate that this component saw a relatively high intensity occupation.

The Site Structure of the Nineteenth Century Farming Village

In this section, I will discuss the results of the site structure analysis of historic deposits from Lower Pescado Village, which reveal differences in site structure between the two components at the site. These differences were seen in the relationship between artifact densities and defined site areas and in the distribution of artifacts that were grouped into functional categories, listed in table 8.8.

Table 8.8. Distribution of Artifact Categories Recovered from Historic Site Structural Areas at Lower Pescado Village.

Context	Food	Food Preparation	Serving/ storage	General utility	Subsistence	Household manufacturing	Personal/ ceremonial	Construction	Redeposited sherds	Unidentified	Total
Midden	6230	373	388	95	10	64	1	19	1937	20	9137
Room fill	566	123	103	27	7	29	1	4	444	25	1329
Pit fill	9	1	0	5	0	8	0	1	119	0	143
Hearths	187	10	24	12	1	25	0	3	393	1	656
SAA[1]	73	14	15	10	1	10	2	1	164	6	296
MAA[2]	55	5	30	21	5	24	2	4	25	2	173
"Outside"	192	6	16	45	3	79	1	1	153	1	497

[1]SAA stands for Structural activity area.

[2]MAA stands for Maintained activity area.

Structural activity areas

Three room floors in Excavation Units 2 and 9, a hearth in Excavation Unit 9, and a beehive oven, Excavation Unit 3, constituted the historic sample in this contextual category. In general, historic room floors yielded relatively high artifact densities, unlike the historic maintained activity areas discussed below or the prehistoric room floors discussed above. This finding is consistent with the ethnoarchaeological expectation that room floors in temporary settlements tended to be more cluttered than room floors in year-round settlements because they served as storage facilities (Graham 1994:92), but the nature of the cultural material recovered from historic room floors at Lower Pescado Village was more reminiscent of trash--small swept items--than stored site furniture. The bar chart, figure 8.15 shows the distribution of artifacts recovered from structural activity areas. Redeposited sherds comprise the highest percentage of material, 55.4% (N=164), while faunal remains constitute 24.7% of the assemblage (N=73). The relative lack of historic artifacts associated with food processing and preparation, eating, sleeping, and storage, the major activities associated with Raramuri temporary dwellings, suggests that these items were not considered site furniture and were removed when rooms were closed for the winter or abandoned.

Maintained activity areas

Maintained activity areas at the historic farming village were represented by three ground surfaces. Stratum 1B was adjacent to the Late Historic Structure 4, while stratum 3E was associated with the beehive oven excavated in Unit 3, and stratum 4D was directly inside the perimeter wall. These areas yielded artifact densities that were among the lowest at the

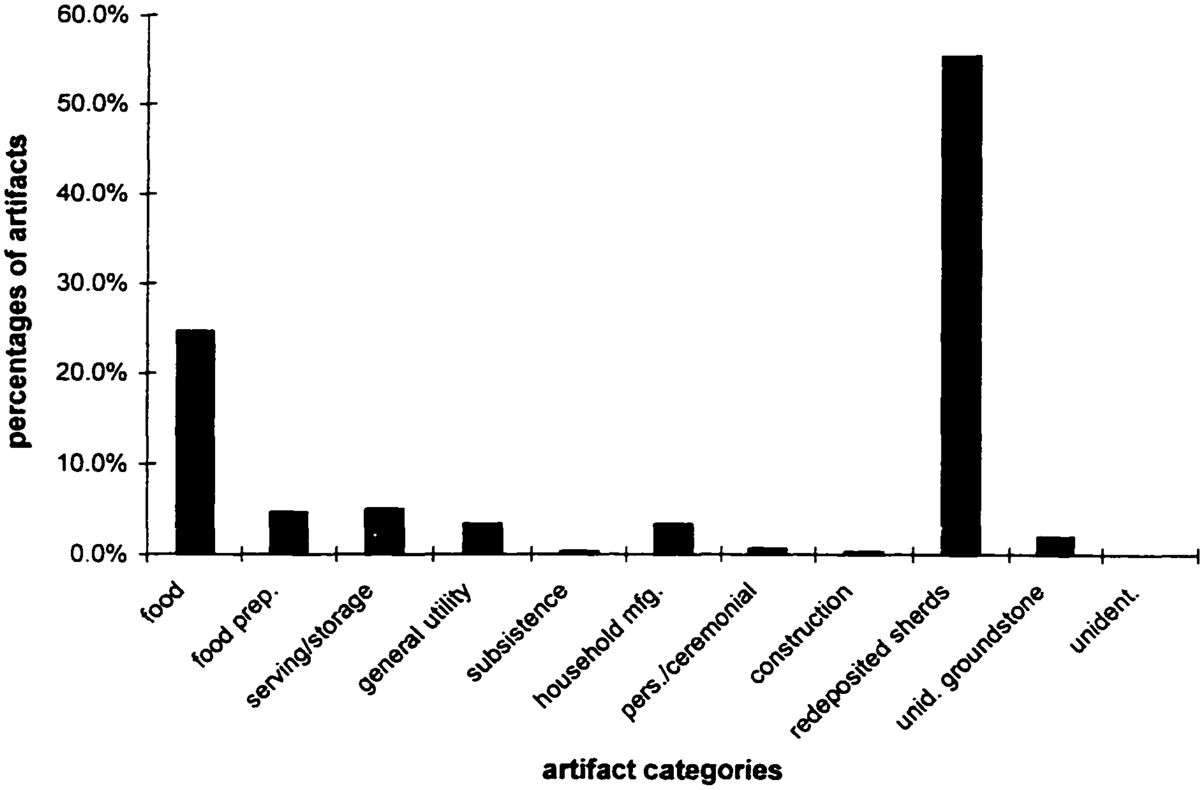


Figure 8.15. The distribution of artifact categories from historic structural activity areas at Lower Pescado Village.

site, a finding that is consistent with Graham's observation that maintained activity areas at temporary sites were informal, unbounded, and multi-functional. Because of conflicting demands on these spaces, they were swept frequently and, therefore, would not be expected to produce large numbers of artifacts or to provide information on the nature of activities associated with the maintained activity areas (Graham 1994).

Most artifacts recovered from historic maintained areas were small in size, typical of material deposited by sweeping. A relatively high percentage of debitage and modified flakes from the surface associated with structure 4 (stratum 1B) probably reflected the inclusion of

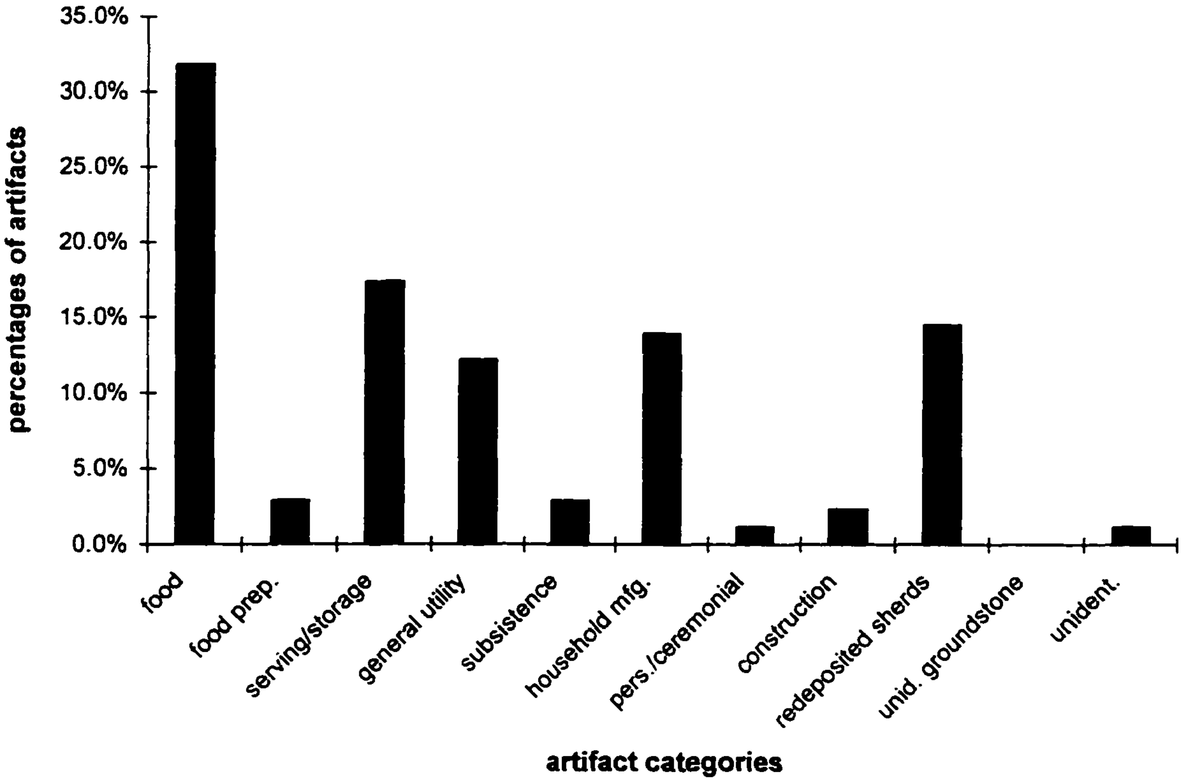


Figure 8.16. The distribution of artifact categories from historic maintained activity areas at Lower Pescado Village.

material that had eroded out of the adjacent prehistoric midden excavated in Unit 1. Figure 8.16 shows the distribution of artifacts from historic maintained activity areas.

"Outside" areas

"Outside" areas at the historic farming villages were represented by five buried ground surfaces, all located outside the perimeter wall. Three superimposed surfaces were excavated as part of Excavation Unit 5, along the south bank of the arroyo, while the other

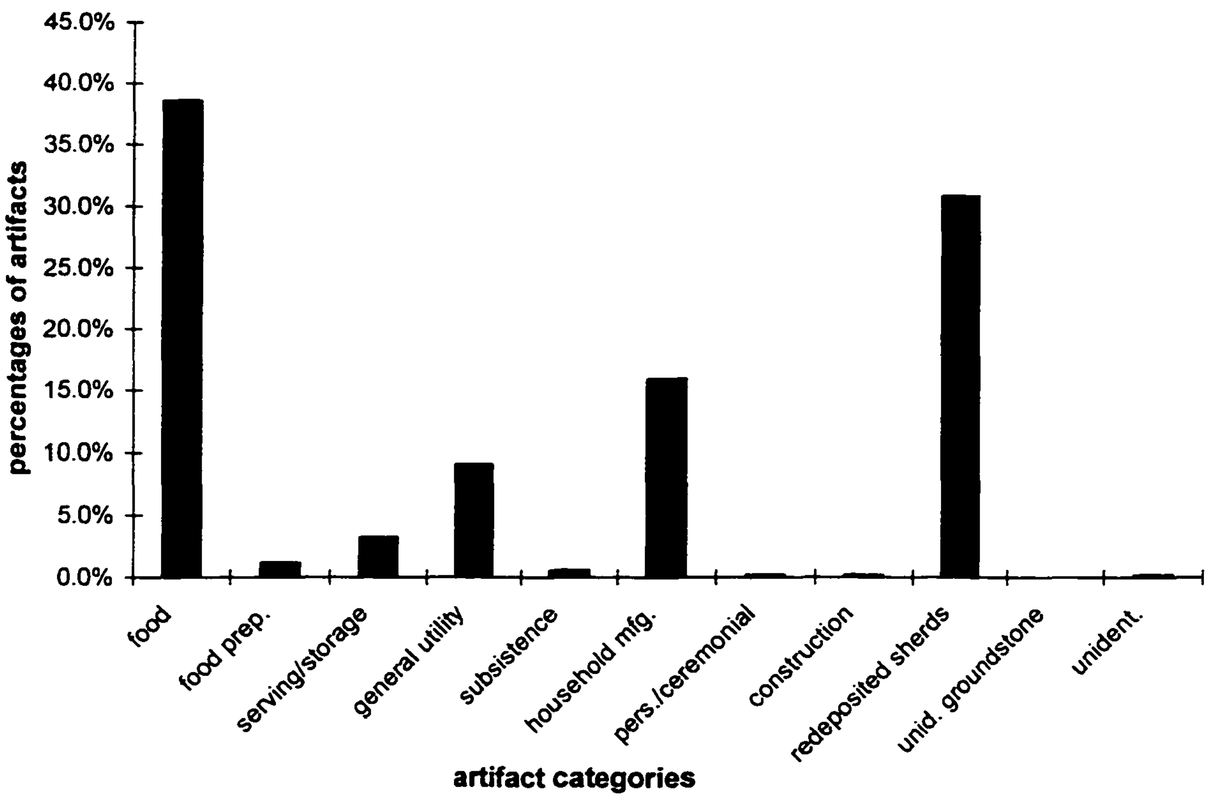


Figure 8.17. The distribution of artifact categories from historic "outside" areas at Lower Pescado Village.

two surfaces, excavated in Unit 4, were located directly outside the perimeter wall in the northeast section of the site. At least one of these latter surfaces, stratum 4B, was used as a road surface after the farming village was abandoned.

In general, artifact densities were light. As evident in figure 8.17, faunal remains and redeposited sherds were the most common artifact categories, perhaps reflecting the use of this area outside the circle of room blocks and corrals for the disposal of primary refuse, or litter. In the historic deposits in Excavation Unit 5, this type of deposition was visible as sheet scatter, consisting of small artifacts mixed with fragments of charcoal and ash

(Rothschild and Dublin 1995:80-81); these differ significantly from the dense, organic deposits that characterize the midden area in Excavation Unit 7 along the eastern arroyo bank. Feature 1 in Unit 5, a pit associated with a historic surface, stratum 5D, yielded a very high density of redeposited sherds, indicating the use of this feature as a repository for swept trash. More than three-quarters of the redeposited sherds were small in size (less than 2 cm^2), consistent with this interpretation.

Most of the historic buried surfaces in Excavation Unit 5 yielded relatively high percentages of chipped stone flakes and debitage. One historic surface in particular, stratum 5F, appears to have been used as a lithic production area during the historic period. Relatively high numbers of chipped stone artifacts, including six cores, were recovered from this stratum and the underlying alluvial deposit.

Discard areas

Five room fill deposits and two samples from the broad band of midden along the east arroyo bank are considered in this discussion of historic trash disposal areas. The excavations at the farming village revealed three types of historic discard behaviors associated with different areas of the site. These were the filling of abandoned rooms and features across the site, the use of trash pits along the south arroyo bank (discussed in the previous section), and the use of a formal midden area, outside the perimeter wall along the east bank of the arroyo.

Two early historic room fills and three later deposits are included in the sample. Differences between the two sets of room fills may indicate changes in construction

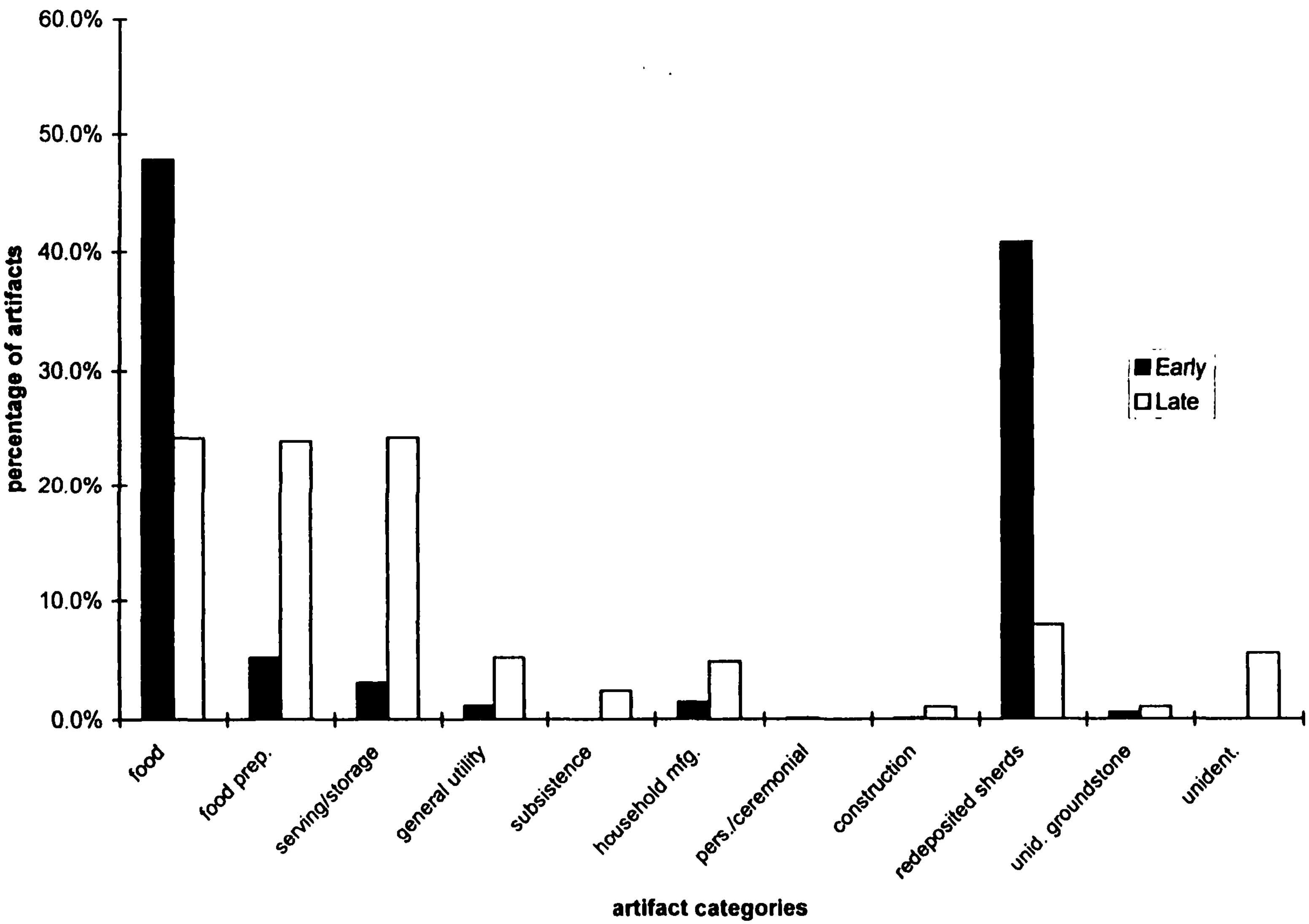
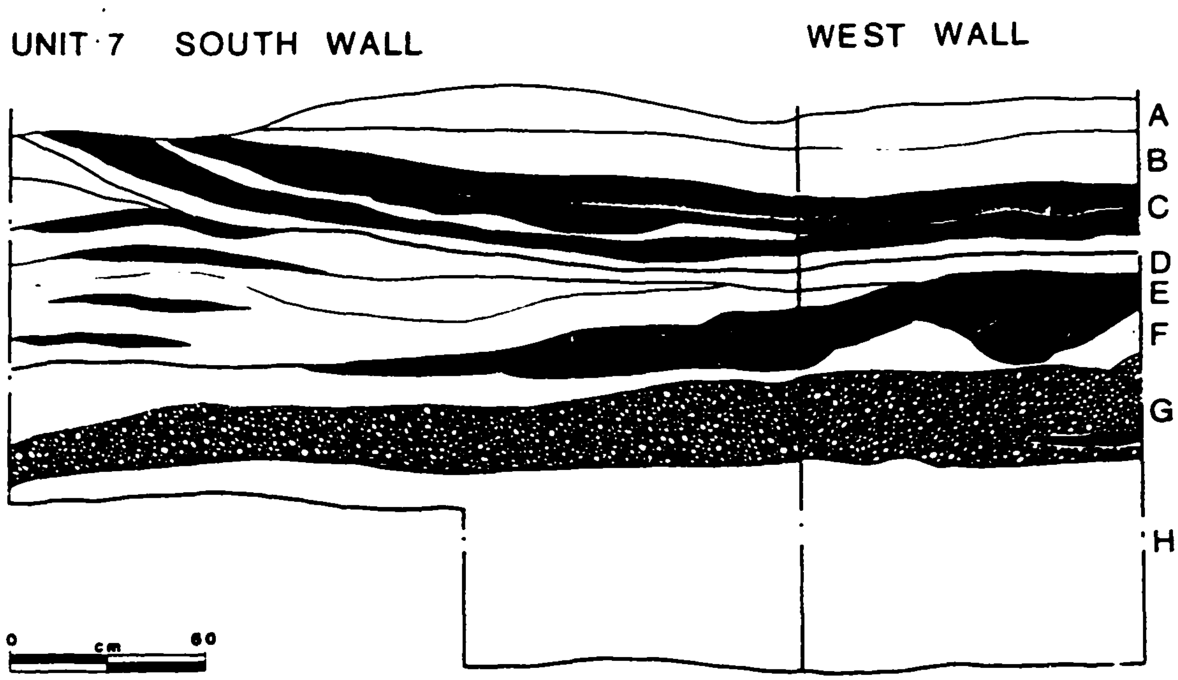


Figure 8.18. Functional categories of artifacts from early and late historic room fill deposits at Lower Pescado Village.

techniques. The two early room fills in Units 2 and 9 produced relatively high densities of cultural material (1915.5 artifacts per m^3 and 2142.9 artifacts per m^3 , respectively), mostly redeposited sherds and faunal remains. Figure 8.18 shows the distribution of artifact categories from early and late room fill deposits. At Zuni Pueblo, secondary trash was often used to fill abandoned rooms, providing a platform for later construction (Ferguson and Mills 1982:260; Kroeber 1917:260); the high artifact densities and the kinds of artifacts found in the early room fills at Lower Pescado Village appear to consist of secondary trash deposits used in the same manner. The late room fills, however, produced generally lower densities of artifacts and less faunal material; none of these fill deposits supported a later floor. The Unit 4 room fill may have been material dumped in this area after a fire, since it contained quantities of burned debris, while the Unit 9 room fill contained numerous fragments of discarded metal, parts of rusted tin cans and barbed wire.

Lower Pescado Village during the historic period differs from the ethnoarchaeologically observed temporary settlements in having a formal midden area, along the east bank of the arroyo. Topographic features may have contributed to the use of this area for trash disposal; at some Raramuri farmsteads, the presence of unique topographic features such as outcrops or slopes led to their use as formal middens (Graham 1994). As seen in the profile drawing of Excavation Unit 7, reproduced here as figure 8.19, the eastern bank of the arroyo possessed some topographic features that might be considered advantageous for the siting of a trash dump. The land sloped down toward the river in this area outside the perimeter wall. Since the prevailing winds in this area are westerlies, the midden was downwind of the residential area of the village, allowing any noxious odors to blow away



STRATA

A SANDY OVERBURDEN
B HARD-PACKED SURFACE
C SILT WITH CHARCOAL AND ASH
D HARD-PACKED SILT WITH CHARCOAL AND ASH
E HEAVILY MOTTLED SILT WITH ASH LENSES
F HARD-PACKED SILT WITH CHARCOAL
G HARD-PACKED SILT WITH ROCKS
H FOURTEENTH-CENTURY DEPOSITS

Figure 8.19. Profile of the south and west walls of Excavation Unit 7 at Lower Pescado Village. Strata C through F are midden deposits, while stratum G was a buried ground surface associated with the nineteenth-century occupation.

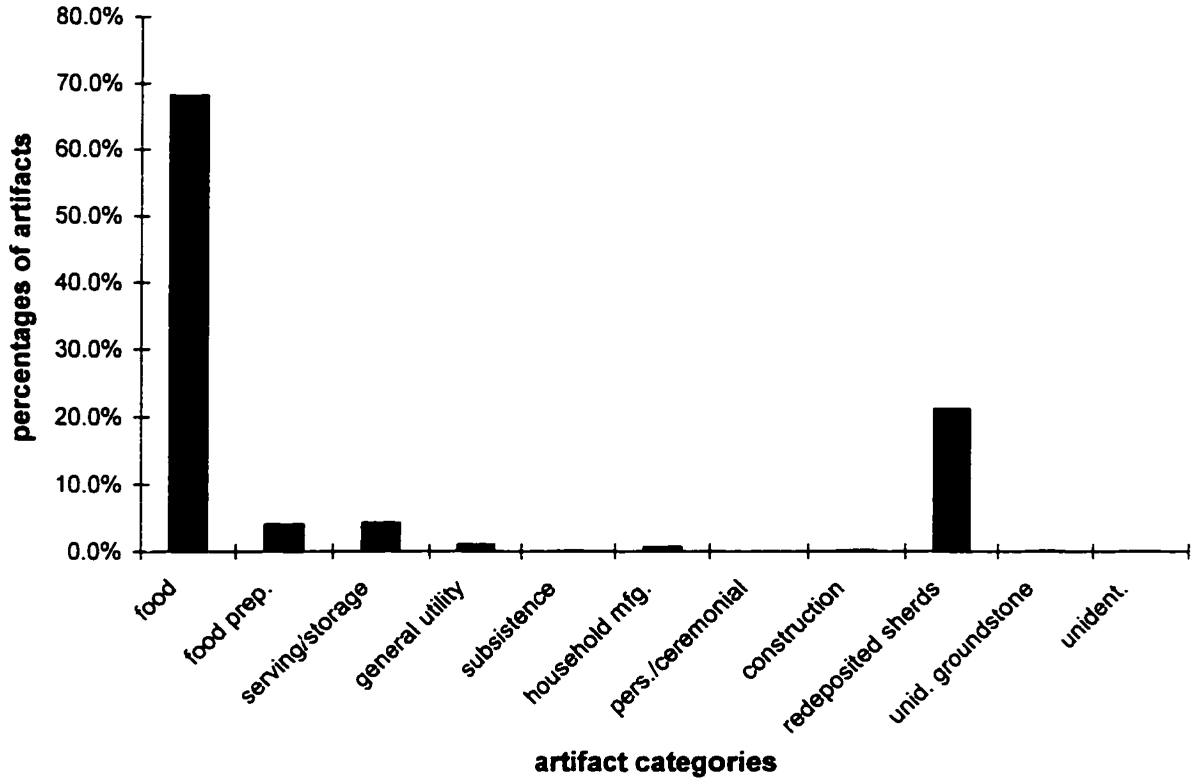


Figure 8.20. The distribution of artifact categories from historic midden deposits at Lower Pescado Village.

from the room blocks.

Unit 7, which yielded an extremely high density of cultural material, was in the center of the midden, while Unit 8 was at the southern edge. The bar chart, figure 8.20, shows the distribution of artifact categories represented in the assemblage from Unit 7. Faunal remains dominate the assemblage, representing almost three-quarters of the cultural material. Redeposited sherds, probably swept trash, constitute another 14.8%. Non-food remains associated with daily life at the farming village represented only a small fraction of the historic assemblage. Ceramic and groundstone artifacts for food preparation, serving and storage were common at the fourteenth-century pueblo, but rare at the nineteenth-century farming village, where they constituted only 9.2% of the midden assemblage. Only one personal artifact, a shell bead, was found in the midden.

Summary of the historic site structure

The expectations of Graham's ethnoarchaeological model of the site structure of temporary sites fit many aspects of the site structure of the historic farming village. The relatively low artifact densities recorded on maintained activity areas suggest that these close-in areas supported overlapping activities. Because of conflicting demands on the use of multi-activity areas, these were swept frequently, leaving little or no residue of past activities.

While room floors were more cluttered than exterior surfaces, the relative scarcity of artifacts associated with domestic activities suggests that pottery and even the larger and heavier groundstone cooking slabs and *metates* were not considered site furniture that was cached at the farming village over the winter. Most of the cultural material recovered from structural activity areas consisted of redeposited sherds and small fragments of bone that appeared to be the residue of sweeping rather than storage. The scarcity of site furniture may also be due to abandonment processes, as useful artifacts were removed from rooms upon the abandonment of a room block. Some large, hard-to-move items may have been stockpiled for future use (Rothschild and Dublin 1995:47; Tomka 1994:11). Material recorded inside structure 2 at Lower Pescado Village, a roofed two-room field house used occasionally by herders, included a stone bench built along one wall, and a broken *he'we* stone or cooking slab. The photograph, figure 8.21, shows the interior of an abandoned, partially roofed room at Upper Nutria. Site furniture included large, hard-to-move items including a stone bench topped by a *metate*, an icebox, wooden shelves, and stockpiled building stone. Pieces of milled lumber found on the historic room floors in Excavation Units 2 and 9 (figure 8.22) may have been cached in those rooms for future use.

"Outside" areas are thought to provide more information on activities since they were not regularly subjected to sweeping. The distribution of artifacts from the midden provides some information on the nature of activities at the farming village, especially the importance of sheep herding. The locations of features are more revealing of the spatial organization of activities. Corrals occupied the central plaza in what might be considered an "outside" locality, more than 5 meters from the room blocks (albeit at the protected center of the village rather than on the outskirts). Fireplaces inside rooms were used for cooking, as noted by historic observers (Baxter 1882:78); the photograph, figure 8.23, shows the corner fireplace excavated in Unit 9. The location of ovens within 5 m of many of the room blocks indicates that cooking also took place in maintained activity areas as well as in structural activity areas.

Artifact distributions from outside surfaces along the south cut bank provided information on the spatial patterning of activities in this area of the farming village. High numbers of redeposited sherds and faunal material recovered from the excavation of superimposed ground surfaces indicate that this area was used for primary deposition of trash at various times. Early in the occupation of the farming village, this area may have been used for lithic manufacture; stratum F, a buried ground surface in Excavation Unit 5, yielded the highest frequency of chipped stone, including 5 cores, from any non-midden deposit.

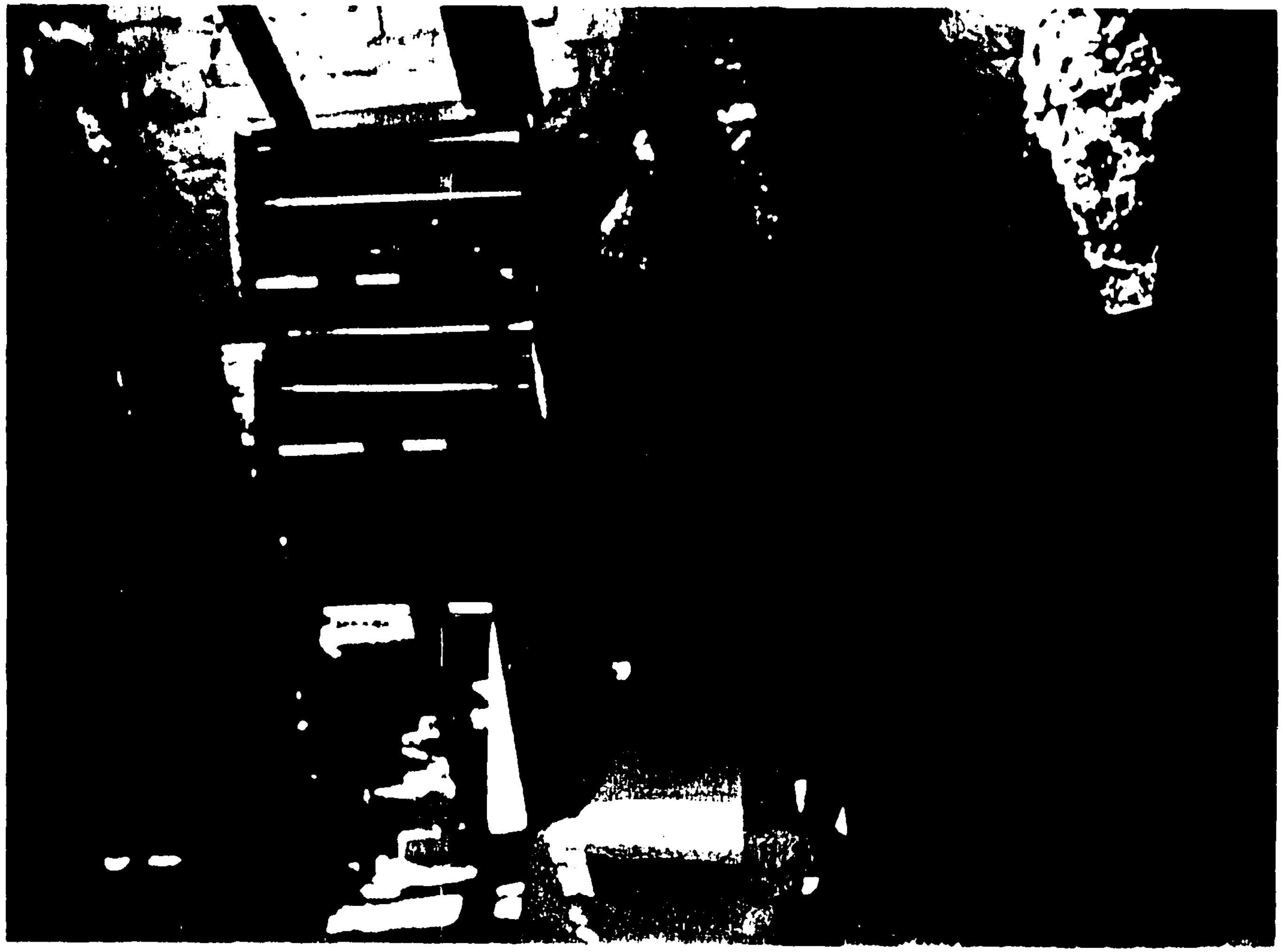


Figure 8.21. The interior of an unoccupied room at Upper Nutria, showing discarded site furniture.

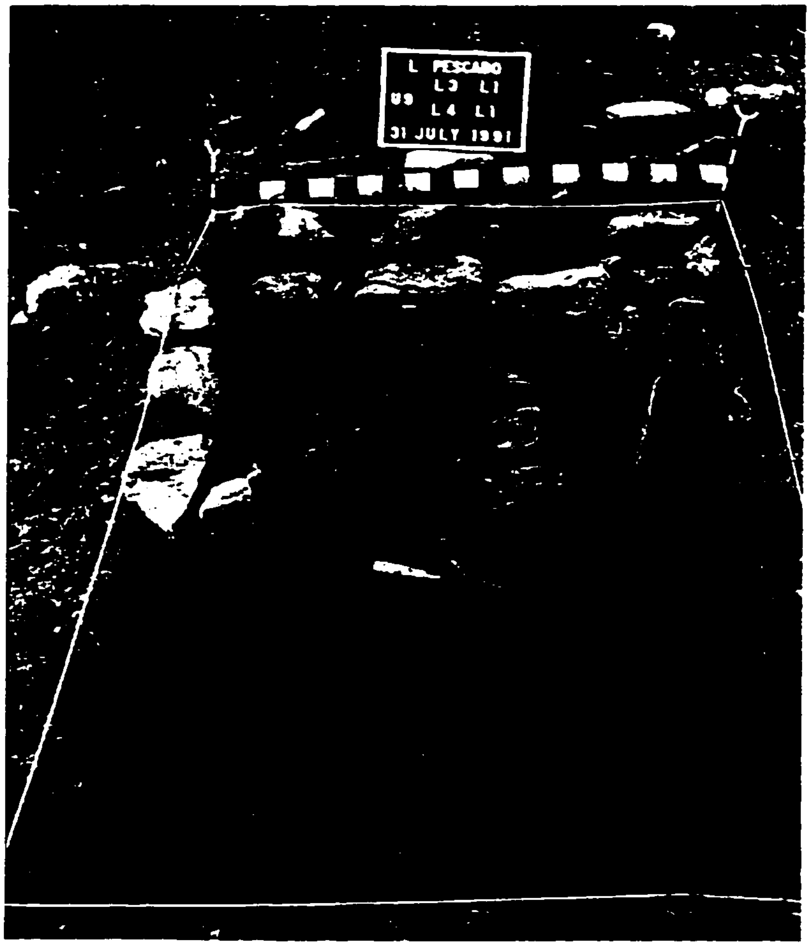


Figure 8.22. Pieces of milled lumber found on an excavated room floor in Excavation Unit 9 at Lower Pescado Village, 1991.

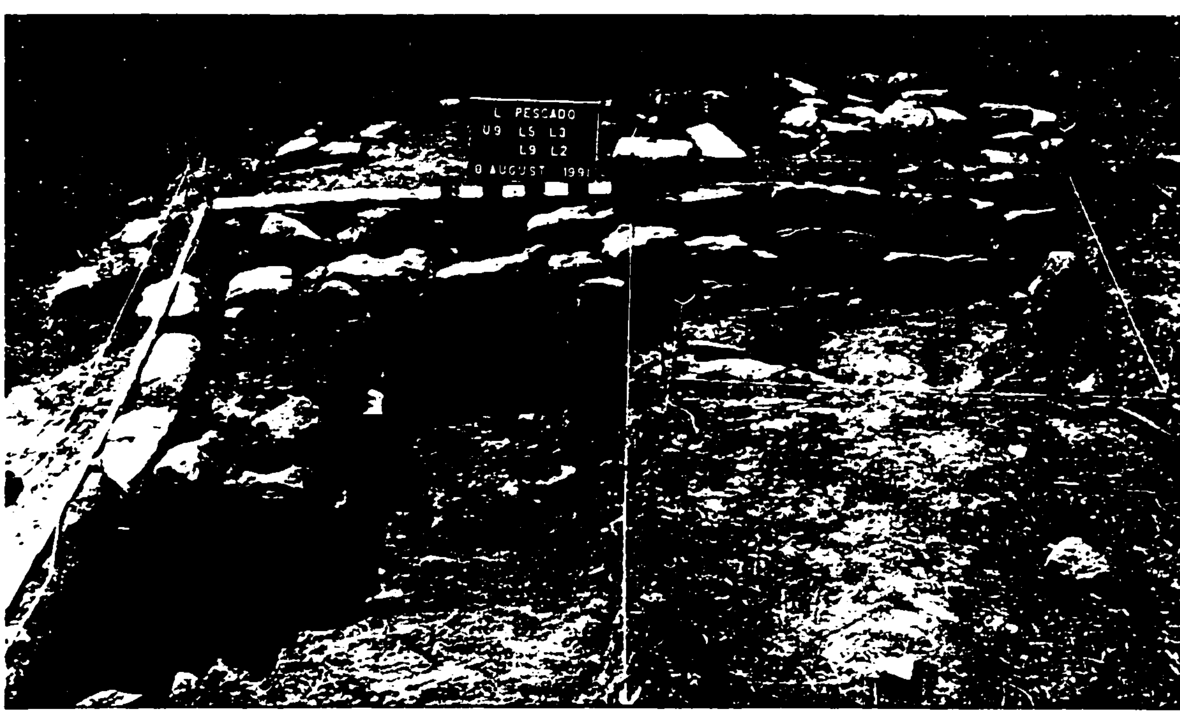


Figure 8.23. The corner hearth in Excavation Unit 9 at Lower Pescado Village, 1991.

Site Structures Compared

The site structure analysis revealed differences in the way that space was arranged and used during the two occupations. To some extent, these are in accord with the expectations of the ethnoarchaeological model that temporary sites, such as the historic farming village, would exhibit a less bounded and more informal use of space than year-round sites, such as the prehistoric pueblo.

As noted above, the comparatively high frequency of prehistoric artifacts that were associated with domestic activities indicates that the earlier occupation was "higher intensity" than the later. Intensity of occupation is directly related to the size of the resident population and duration of stay at a site (Graham 1994); a year-round site can be expected to support a higher intensity occupation than a temporary site of a similar size. The fourteenth-century pueblo, thought to have had 420 rooms (Kintigh 1985:53), was much larger than the historic farming village, with 118 rooms that housed 580 persons in 1880 (Ferguson 1993:100). Although both sites were in use for approximately the same length of time, a little over a century, the historic village was occupied only during the farming season.

Figure 8.24, comparing artifact densities from historic and prehistoric site areas, shows differences in the ways that activity areas were defined and used during each occupation. The graph plots median artifact densities, indicated by the diamond, and the high and low ends of the range of densities for each area, indicated by the vertical lines. Fourteenth- and nineteenth-century areas are juxtaposed so that differences are easily visible.

Based on the density data and the types of artifacts found in each areas, certain statements can be made regarding differences in the use of space duirng the two occupations.

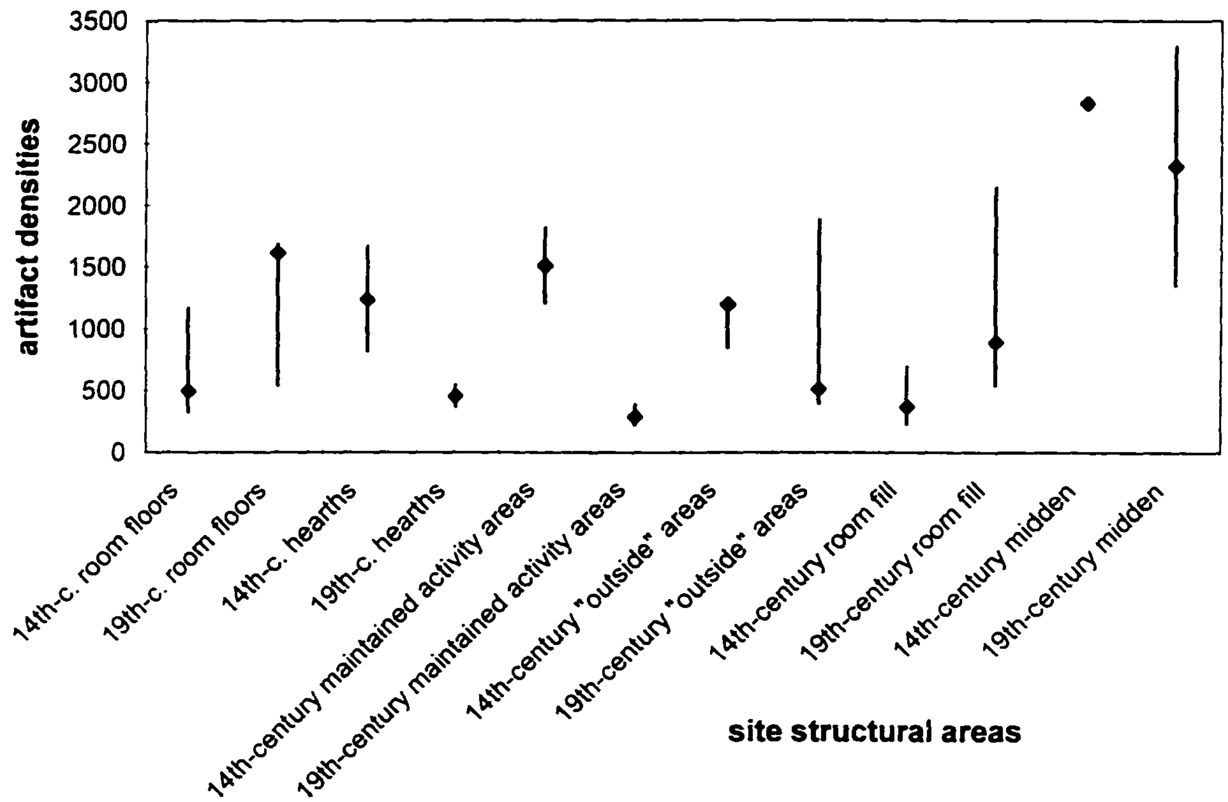


Figure 8.24. A comparison of median artifact densities from site atructural areas.

Specialized, activity-specific areas adjacent to prehistoric rooms were apparently used for food preparation, whereas these same maintained activity areas at the farming village supported overlapping uses. Surfaces along the south arroyo bank were also used differently during each occupation period. The prehistoric pit features in this area were characterized by high concentrations of charcoal and ash, possibly debris from fires used for cooking or heat, while the single historic pit feature was apparently used for swept trash. Late historic surfaces in this area also showed scatters of trash or litter, although an earlier historic surface was apparently used for lithic production.

Discard patterns differed during the two occupations. During the prehistoric and late historic periods, room fill consisted of trash deposited after the abandonment of a room. During the early historic occupation, room fill was used to level areas before laying a new floor. In these early historic room fills, wall fall was a major constituent of the fill. The middens differed in location and material. The fourteenth-century midden, situated inside an abandoned room, may have been used by a single residence group. Prehistoric midden deposits included a number of relatively valuable personal items, including turquoise and shell beads, two clay fetishes, and a large Archaic Period projectile point that may have been part of a medicine bundle. Historic midden deposits included very few personal items and no artifacts that could be associated with ceremonial activities. The historic midden was located along the arroyo bank outside the perimeter wall, and was probably used by the entire village; no other midden areas were visible on the surface of the mound.

The presence of a formal midden at a temporary site was one way in which the historic site structure at Lower Pescado Village deviated from the ethnoarchaeological examples observed by Graham (1994) and Rothschild (1991). The delimiting of the residential area of the village by the perimeter wall is another important deviation from the ethnoarchaeological model. As noted above, the perimeter wall, built during the earlier occupation, was reused for the purpose of restricting access to the residential area and corrals during a period of warfare. At Lower Pescado Village, unique conditions may have operated to reshape the more informal and unbounded site structure observed at other temporary settlements. Activity areas, however, do seem to conform to the model.

Chapter Summary and Conclusions

In this chapter, excavation data from Lower Pescado Village were used to examine the ways in which space was arranged and used in the fourteenth-century pueblo and the nineteenth-century farming village that was built on its footprint. Contrasts between the two occupations are particularly useful in understanding differences in the ways that space is allocated at year-round and temporary sites.

While certain aspects of the architecture and layout of the farming village--notably the oval configuration of room blocks and perimeter wall-- retained the archaic, formal pattern of the older pueblo, the excavation data revealed a more informal, unbounded allocation of activity areas than had been the case at the earlier settlement. The overlapping use of these areas, as well as the scarcity of artifacts associated with domestic routine and the lack of elaborate or expensive site furniture are typical of ethnographically observed field house locations at Zuni and elsewhere. The data from Lower Pescado Village provide an interesting contrast between the reused structural elements and the generally informal use of space. The architecture delimited or bounded the settlement space, as Ferguson (1993; 1995) has pointed out; this was advantageous during the turbulent years of the 1850s and 1860s when there was a need to protect people and livestock. The site structural analysis revealed the underlying, informal pattern of the spatial organization of the farming village, which was not apparent from an architectural analysis alone.

CHAPTER 9

THE MATERIAL CULTURE OF LOWER PESCADO VILLAGE

Introduction

The previous chapters explored the use of place during the American Period by employing techniques of regional and spatial analysis. The regional analysis depicted the relationship of the nineteenth-century farming villages to a larger sphere of the Zuni agro-pastoral economy and the geopolitics of the Angloamerican colonial encounter. The analysis of the built environment and the site structure of Lower Pescado Village elucidated how some aspects of the settlement landscape were rearranged and used to express new relationships. The nineteenth-century structure of Lower Pescado Village was similar in many ways to ethnoarchaeological models describing the structure of seasonal or temporary settlements (Graham 1993; Kent 1992; Rothschild 1991), although there were differences related to the unique historical and organizational situation of nineteenth-century Zuni.

In this chapter I examine characteristics of the artifact assemblages recovered from excavated historic and prehistoric contexts at Lower Pescado Village and address two basic questions. What are the differences in the material culture of each component? How do these differences express differences in activities during the two occupation periods? Historic materials from Lower Pescado Village are also compared to material from historic contexts at Zuni Pueblo (Caywood 1972; Ferguson and Mills 1982), which allowed me to distinguish (to some extent) the differences that are related to temporal change from differences in site function between the central pueblo and the satellite farming village.

A third question refers to the extent and nature of "acculturative change" that is manifested in the material record from Lower Pescado Village. In what temporal and functional contexts do Euroamerican goods appear? Are there concomitant changes in Zuni material culture inventories at the farming village? Are these changes comparable on the level of the central pueblo?

Sources of Data

The data used to evaluate these questions include ceramics, faunal remains, and Euroamerican artifacts from both components at Lower Pescado Village (designated LPVP, or Lower Pescado Village Prehistoric, and LPVH, or Lower Pescado Village Historic) and from historic deposits excavated at Zuni Pueblo (designated ZPH). The excavations at Lower Pescado Village are described in the previous chapter. The faunal assemblage was analyzed by Michael A. Etnier at the University of Washington under the supervision of Professor Donald Grayson (Etnier 1997).

The Zuni Pueblo data derive from two archaeological projects. In 1966, the National Park Service conducted limited excavations in the vicinity of the mission church. Although the primary goal was to identify original construction details in conjunction with the mission restoration, the excavations uncovered deposits extending from the Protohistoric Period through the nineteenth century (Caywood 1972). Between 1977 and 1980, the Zuni Archaeology Program conducted a program of archaeological monitoring associated with the installation of water and sewer lines in the pueblo and the construction of a new bridge over the Zuni river (Ferguson and Mills 1982). Samples of machine-excavated sediments from over three kilometers of trenches in the Pueblo and from areas adjacent to the bridge abutments were examined. Vertical and horizontal proveniences were approximate, since the trenches were not excavated stratigraphically. A total of 21,069 artifacts, many of which were dated by attributes to the late Historic Period, were recovered and analyzed by the staff at the Zuni Archaeology Program (Ferguson and Mills 1982:274-438). Cultural materials from the Zuni Pueblo archaeological monitoring operations were not collected stratigraphically; however, the principal investigators believe that the collection is generally late, dating from about 1875 to the present.

Faunal data provide information on differences in subsistence between the prehistoric and the historic occupation at the village and on post-Contact economic change, while Euroamerican artifacts from Lower Pescado Village and Zuni Pueblo are helpful in understanding the nature and extent of Euroamerican impact on the material culture of Zuni.

Ceramics, Domestic Routine, and the Use of Place

Ceramics were the most common artifact type recovered from the excavations at Lower Pescado Village, representing almost 60% (N=17,121) of the total collection (Rothschild and Dublin 1995:120). At Zuni Pueblo, the 13,644 sherds recovered during the waterline project represented 65% of the collection (Ferguson and Mills 1981:274). Because of their stylistic malleability and their crucial role in domestic routine, ceramics are a good indicator of many aspects of social and economic interaction and change (Blitz 1993:81). The importance of pottery production as a "traditional" craft at Zuni (Nahohai and Phelps 1995) suggests that ceramics might be identified with "Zuni-ness" and thus might be expected to remain stable in the volatile context of frontier colonial interactions.

Classification of Ware Types and Ceramic Distribution at Lower Pescado Village

Twenty-seven ware types were identified in the Lower Pescado ceramic assemblage, including material dating to the twelfth century, the fourteenth and fifteenth centuries, and the nineteenth and twentieth centuries. Identifications were based on published descriptions in Carlson (1970), Smith et al. (1966), and Ferguson and Mills (1982) and on unpublished descriptions of White Mountain Redwares and Cibola Whitewares provided by Tammy Stone (personal communication 1990). Polychrome and Black-on-red variants of St. John's and Heshota'utla redwares were not distinguished for this analysis, since there is no temporal distinction between the variants of each ware, nor, except for the presence of kaolin paint on the exterior of the polychromes, does there appear to be a technological distinction (Carlson 1970:31, 82; Ferguson and Mills 1982:289-91; Smith et al. 1966:304-10). The general categories "Cibola Whiteware" and "White Mountain Redware" were used when a sherd could not be identified to a specific type. If a slipped and painted sherd could not be placed in those categories, it was tabulated as "unidentified" white or red ware. Slipped sherds without decoration but with a polished surface were classified as "Plain Polished" white or red ware. Many of these may simply have been undecorated portions of painted vessels.

The Protohistoric category "Late Glazeware" refers to a white slipped ceramic with glaze paint decoration in black, green, purplish, or streaky brown, as described by Smith et al. (1966:315-324). It includes Pinnawa Glaze-on-white and Kechipawan Polychrome, two types that are extremely difficult to distinguish from one another on small sherds (Smith et al.

1966:318) . Classifications of historic ware types follow Ferguson and Mills (1982:295-300; 302-5); one previously undescribed type, a Plain Polished Red-and-buff ware, was noted (Rothschild and Dublin 1995:122). Appendix E is a catalogue of the sherds recovered from the various excavation units at Lower Pescado Village and a list of the cumulative frequencies of the various ware types.

Most sherds (N = 13,450, 78.6% of the ceramic assemblage from the site) dated to the prehistoric occupations; most of these were corrugated utilitarian wares and fourteenth-century glaze painted types. A total of 1,353 sherds, 7.9% of the total ceramic assemblage. were identified as Zuni historic types; sherds from Zuni Blackware cooking pots constituted slightly more than one-half the historic assemblage (731 sherds, or 54% of the historic assemblage). It should be noted that the shift from corrugated wares to Zuni Blackware occurred during the late fourteenth or early fifteenth century (Kintigh 1985:15), so that some of the Lower Pescado Blackware dates to the earlier rather than to the historic occupation. Blackwares recovered from undisturbed prehistoric levels at the site are counted as prehistoric sherds for the analyses below; Blackware sherds recovered from ambiguous or disturbed contexts were not included in the analyses. The functional category of utility wares, (i. e., corrugated pottery and Blackwares), included 8,774 sherds, 51.2% of the total collection. Although ceramics were found in all the test units, most sherds (8525, or almost 50% of the total ceramic collection) were recovered from midden, or secondary contexts, in Units 1, 7, and 8. While almost one-half the total number of sherds were recovered from historic levels (46.1%), most were redeposited fourteenth-century sherds displaced by erosion or by maintenance activity at the farming village.

This section of chapter 9 documents and discusses similarities and differences among the three archaeological ceramic assemblages (LPVP, LPVH, and ZPH) in three respects: 1) assemblage size; 2) relative proportions of utility wares to decorated wares; and 3) ratios of bowls to jars. Vessel sizes from the LPVH and LPVP assemblages are compared using rim diameters. An ethnographic collection compiled by James Stevenson for the Bureau of American Ethnology between 1879 and 1881 (Stevenson 1883) is also used to study the historic ceramic assemblages. This important collection, which is supplemented by ethnographic information on emic Zuni pottery classes and uses, is representative of the kinds of pottery that were being produced in Zuni at the end of the nineteenth century (Hardin 1983). It provides an invaluable reference against which variability in the ceramics from the farming village can be compared. It is expected that the assemblage from the seasonally occupied farming village will differ significantly from the assemblages from the year-round sites in terms of the types of vessels represented (Kent 1992; Mills 1989).

Size of the Ceramic Assemblages

Table 9.1 lists sherd frequencies from the prehistoric and historic components at Lower Pescado Village and from the waterline monitoring at Zuni Pueblo. The prehistoric assemblage from Lower Pescado Village includes redeposited prehistoric sherds recovered from historic deposits as well as sherds recovered *in situ*, since it is presumed that redeposited sherds were displaced from intact prehistoric deposits at the site rather than brought from another site. Not only were there far fewer historic sherds from Lower Pescado Village than from LPVP or from Zuni Pueblo, but historic sherds represented a very

Table 9.1. Sizes of Ceramic Assemblages from Lower Pescado Village and Zuni Pueblo.

Site name	LPVP	LPVH	ZPH
Number of sherds	13,450	1,353	11,422
Percentage of total artifact assemblage	47.1	4.7	54.2

low percentage of the total artifact assemblage from the farming village.

Since ceramics are a frequently used, highly breakable artifact class, it might be expected that sherds would constitute a high percentage of an archaeological assemblage (see DeBoer and Lathrap 1979; Mills 1989). This is the case at Zuni Pueblo and at LPVP, but not at LPVH. The disparity is characteristic of temporary settlements where ceramics are not considered site furniture cached at the farming villages over the winter (Graham 1994).

The transport of pottery from the farming villages to Zuni Pueblo at the end of the farming season is documented in the historic literature. Visiting Lower Pescado Village in November of 1853, Mollhausen described the dwellings as "... desolate apartments ... all was empty, except that here and there in a corner lay a little straw." (Mollhausen 1858:83). Cushing, describing the journey from a farming village back to Zuni during the 1880s, notes that water jars were carried on the backs of burros (Green 1979:296). The transport of possessions between Zuni Pueblo and the farming villages and the removal of goods on the abandonment of the villages meant that ceramics (and other moveable items) did not enter the archaeological record at the farming villages, resulting in a rather "impoverished" material culture, a situation that may be common to temporarily occupied sites (Kent 1992).

Proportions of Unslipped to Slipped Wares:

In this section and the following one, I will examine functional differences in the ceramic repertoires from the two components at Lower Pescado Village (LPVP and LPVH) and from Zuni Pueblo (ZPH). In Southwestern ceramic traditions, functional differences tend to map onto differences in vessel shape and surface treatment (Plog 1980:88). Therefore, a comparison of the relative proportions of differently shaped or finished vessels should provide an idea of the relative importance of various activities associated with foodways.

Functional Variability in Zuni Ceramics

Prehistoric Southwestern utility wares were characterized by an unslipped, unpainted, corrugated surface treatment. Utilitarian pottery of the Late Prehistoric and Historic Periods, or Zuni Blackware, lacks surface corrugation and is generally characterized by an unslipped, roughly finished exterior ranging in color from buff to black (Bunzel 1972:11; Green 1979:320). The interiors of Blackwares are sometimes polished, smudged, or slipped; it is not known whether this interior treatment is time-sensitive, but some investigators have suggested that smudging and polishing were nineteenth-century innovations (Andrew Fowler personal communication 1989). Slipped interiors appear on a small number of Blackwares from Lower Pescado Village and on a single sherd from the waterline collection at Zuni Pueblo (Ferguson and Mills 1982:304). I would suggest that slipped interiors on Blackwares were a late nineteenth-century innovation, although this warrants further investigation. Figure 9.1 shows utility wares from archaeological deposits at Lower Pescado Village.

Ethnographically known Southwestern decorated wares were used for food

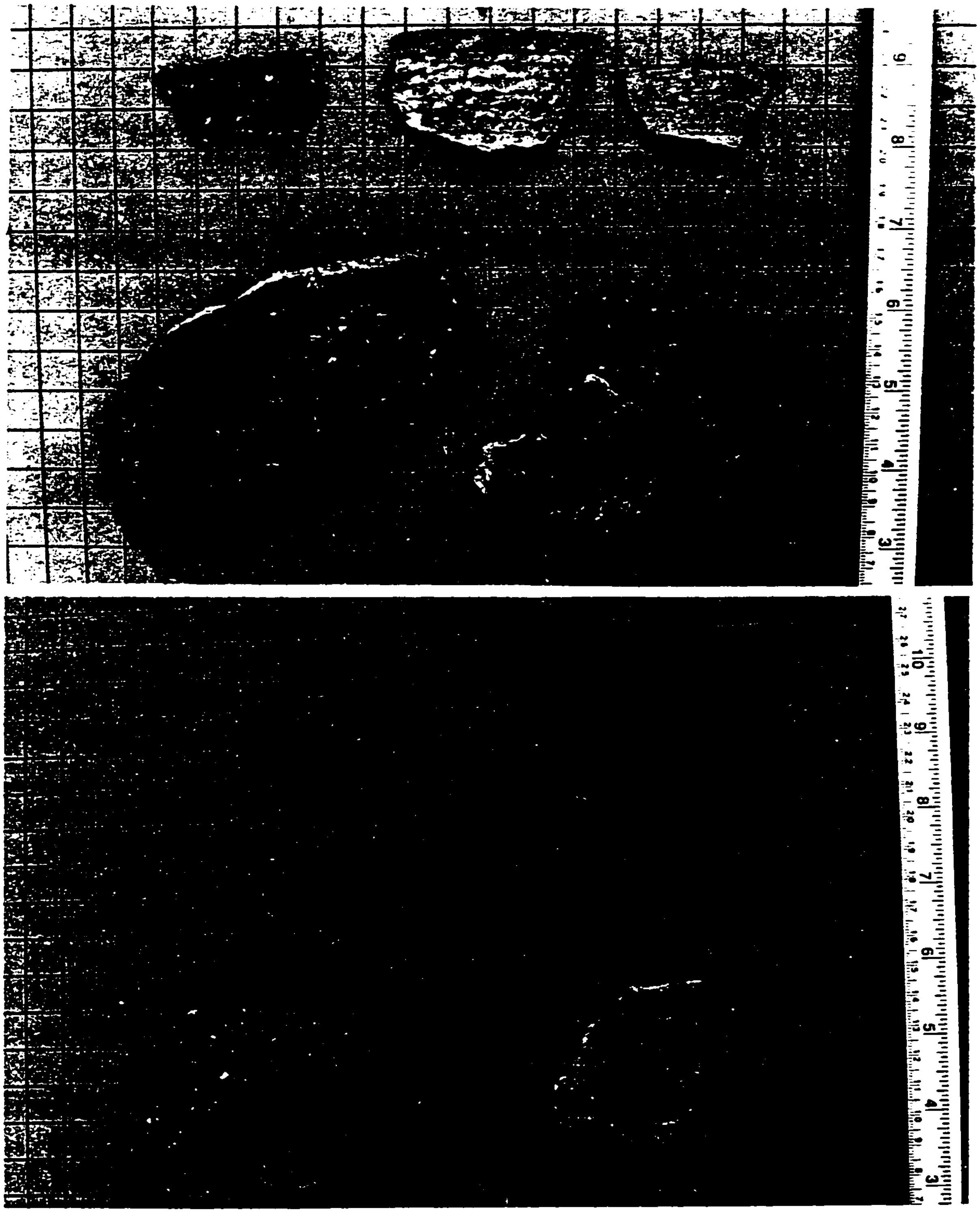


Figure 9.1. Sherds of utility wares from the excavations at Lower Pescado Village. The top photograph shows examples of corrugated wares, while the bottom photograph shows examples of Zuni Blackwares; note the variability in surface color. The Blackware sherd at top left is a fragment of a colander.

preparation, serving, or storage (Plog 1980:84; Stevenson 1884). Functional differences among these were manifested in formal differences in vessel shapes and sizes, and aperture sizes. The important point for this analysis is that slipped wares can be considered functionally distinct from corrugated wares and the (mostly) unslipped Blackwares, which were used for cooking.

Table 9.2. Ratios of Utility Wares to Decorated Wares from Lower Pescado Village and Zuni Pueblo.

	LPVP	LPVH	ZPH
Utility ware	8,043 (59.8%)	639 (53%)	6,822 (68.2%)
Slipped ware	5,407 (40.2%)	567 (47%)	3,178 (31.8%)
Total	13,450 (100%)	1,206 (100%)	10,000 (100%)
Utility ware : slipped ware	1.5 : 1	1.1 : 1	2.1 : 1
Chi square = 277.5	df = 2	significance < .001	

Note: Data are from Ferguson and Mills (1982) and Rothschild and Dublin (1995).

The Data and Findings

Table 9.2 lists the frequencies of utilitarian and decorated sherds from prehistoric contexts at Lower Pescado Village (LPVP), from historic deposits at Lower Pescado Village (LPVH), and from Zuni Pueblo (ZPH). The bar chart, figure 9.2, shows the ratios of sherds from utility wares to sherds from slipped wares in each component. Sherd counts were used rather than minimum number of vessels, because these latter figures were not available for the Zuni Pueblo collection. It should be mentioned that the sherd frequencies from Lower

Pescado Village differ from those in the site report (Rothschild and Dublin 1995:127), although this does not alter the conclusions of the analysis. Some historic sherds were reclassified, based on my increased familiarity with the diagnostics of the historic ware types, altering slipped ware frequencies.

The proportions of utility wares to slipped wares differ among the three samples; the Chi square statistic was employed to evaluate whether these differences were likely to occur

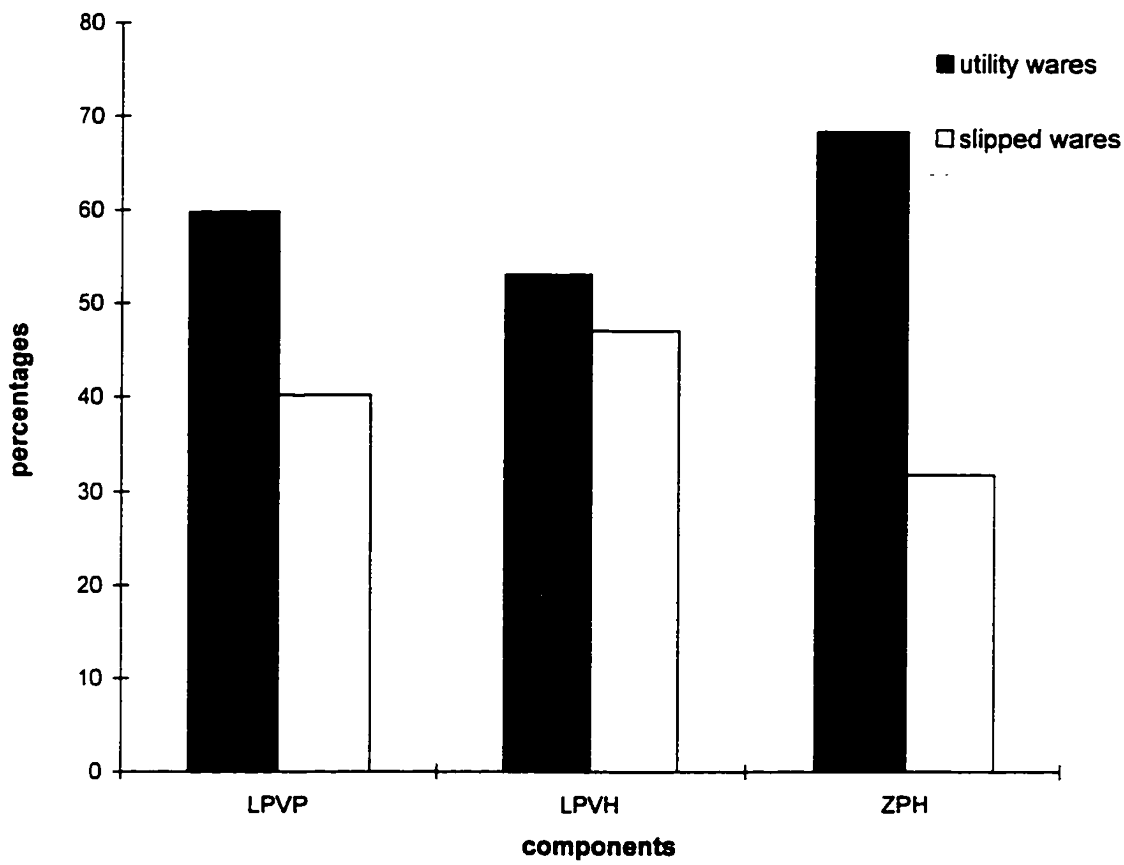


Figure 9.2. Percentages of utility wares and slipped wares from archaeological deposits at Lower Pescado Village and Zuni Pueblo.

randomly. Chi-square is a non-parametric measure of association that can be keyed to a measure of significance (Drennan 1996:197ff); significance values lower than .05 are considered to invalidate the null hypothesis of no difference. In this case, the null hypothesis was invalidated, indicating that there are significant differences in the proportions of utility wares to slipped wares at LPVP, LPVH, and ZPH; the associated probability is less than 0.1%. Although the proportions of utilitarian to slipped wares at the three components differed significantly from one another, the ratios indicate that differences were greatest between the two historic components. Thus it would seem that site functional differences are more important than temporal differences in influencing this aspect of ceramic distributions.

Discussion

The ceramic sample from Zuni Pueblo yielded a relatively high number of sherds from cookwares, while the samples from Lower Pescado Village have lower than expected numbers of cookware sherds. In ethnoarchaeological models of ceramic assemblage formation, ratios of cookwares to serving/storage wares tend to be relatively high, certainly higher than those recorded from LPVH (DeBoer 1985; DeBoer and Lathrap 1979; Mills 1989). The reason generally cited for this is that cooking pots that are regularly subjected to heat broke more often than vessels that were not heated, for example, serving bowls or storage jars. Similarly, Blackware or corrugated cooking pots were less likely to be mended than decorated vessels, since they were less costly to produce. This seems to have been the case at Lower Pescado during both occupations; mend holes only appeared on slipped wares, not on corrugated sherds or Blackwares. All other things being equal, these factors would result in more utility ware than slipped ware sherds entering the archaeological record.

The historic sample from Lower Pescado Village does not conform to models of ceramic assemblage formation. Several factors may be supposed to account for this. As noted above, ceramic vessels, apparently not site furniture at the Zuni farming villages, were carried to Zuni Pueblo when families returned for the winter (Green 1979:296). Some pots used at the farming village may have been broken in transit or at Zuni Pueblo, and unbroken ceramic vessels were removed when the village was abandoned; thus many fragments of vessels that were used at Lower Pescado Village did not enter the archaeological record there. We might also expect that more ceramics were in use at Zuni Pueblo than at the farming villages since the pueblo population was higher. However, these factors (breakage rates, transport, and population) might account for smaller numbers of sherds but not for smaller ratios of Blackwares to slipped wares, since we might expect that the same processes were affecting slipped wares as Blackwares.

I suggest that the difference in the utility to slipped ware ratios at Zuni Pueblo and LPVH is due, at least in part, to the changing role of Zuni Blackwares in the late nineteenth century. The ethnographic literature indicates that these ceramics were used in a ceremonial context at the large winter ceremonials, like Shalako, that were accompanied by feasting. Frank Hamilton Cushing described the evening ceremonials in the specially constructed Shalako houses:

> At about midnight, when fires glare fiercest and
> brightest in every sacred house in Zuni, in each of

> them are stretched out like huge strings of beads
> across the immaculate floors, the rows and rows of
> round bowls, baskets and little black cooking pots
> which make up the service of a great Zuni feast.
> (Green 1979:319-20)

Cushing noted that small Blackware pots were used as serving vessels at Shalako, and presumably at other Zuni ceremonials; another category of large Blackware pots was used for cooking for ceremonials (Hardin 1983). James Stevenson (1883b:347) wrote that these pots, the largest of the Blackwares, had a capacity of about ten gallons. The use of Blackware pots in a ceremonial context would explain some of the disparity between Zuni Pueblo and Lower Pescado Village in the utility to slipped ware ratios. Since, according to the ethnographic information, ceremonials occurred primarily during the winter and only at Zuni Pueblo, we would not expect material culture associated with ceremonial activities to be present at the farming village of Lower Pescado.

It is possible, but not likely, that the high Blackware frequencies in the Zuni Pueblo sample result from mixing time periods, since chronological control of the collection is not good. To control somewhat for temporal variability, I looked at the ratios of Smudged and Polished Blackwares to Zuni Polychromes in the Zuni Pueblo assemblage; as noted above, Smudged and Polished Blackwares are thought to be nineteenth-century innovations. This ratio was even higher, 2.7:1, suggesting that the disparity between the two sites became more pronounced over time. On the other hand, Blackware densities in the historic Unit 7 midden deposits at Lower Pescado Village decrease over time (see table 9.3 and figure 9.3). What appears to be happening is that at Zuni Pueblo, Blackware use was increasing, while at Lower Pescado Village, Blackware use was declining.

The Lower Pescado figures also reflect, I think, an increased reliance on metal pots for cooking (Rothschild and Dublin 1995:128-9). The more durable metal pots would not break as easily as ceramic pots. Because they were more costly, metal pots were more likely to be repaired or recycled when broken, thus entering the archaeological record in lower frequencies than the more breakable Blackwares. While the process of replacement was also occurring at Zuni Pueblo, it is not reflected in lower Blackware counts in archaeological deposits at the pueblo because Blackwares continued to be used in ceremonial contexts. Over time the social context and meaning of Blackwares changed, a change which was visible in the archaeological record at Zuni and at the farming village. This point, which

Table 9.3. Densities of Blackwares from Excavation Unit 7, Lower Pescado Village.

Stratum[1]	Excavated volume[2]	Blackware frequency	Sherd density[3]
C	0.7975	37	46.4
D	0.187	9	48.1
E/F	0.407	161	395.6
G	0.1996	31	155.3
H	0.36475	202	553.8

[1]Strata were given letter designations in the order in which they were encountered during excavation; stratum C in Unit 7 is the latest level and stratum H the earliest.

[2]Volume is measured in cubic meters.

[3]Density refers to the number of sherds per cubic meter.

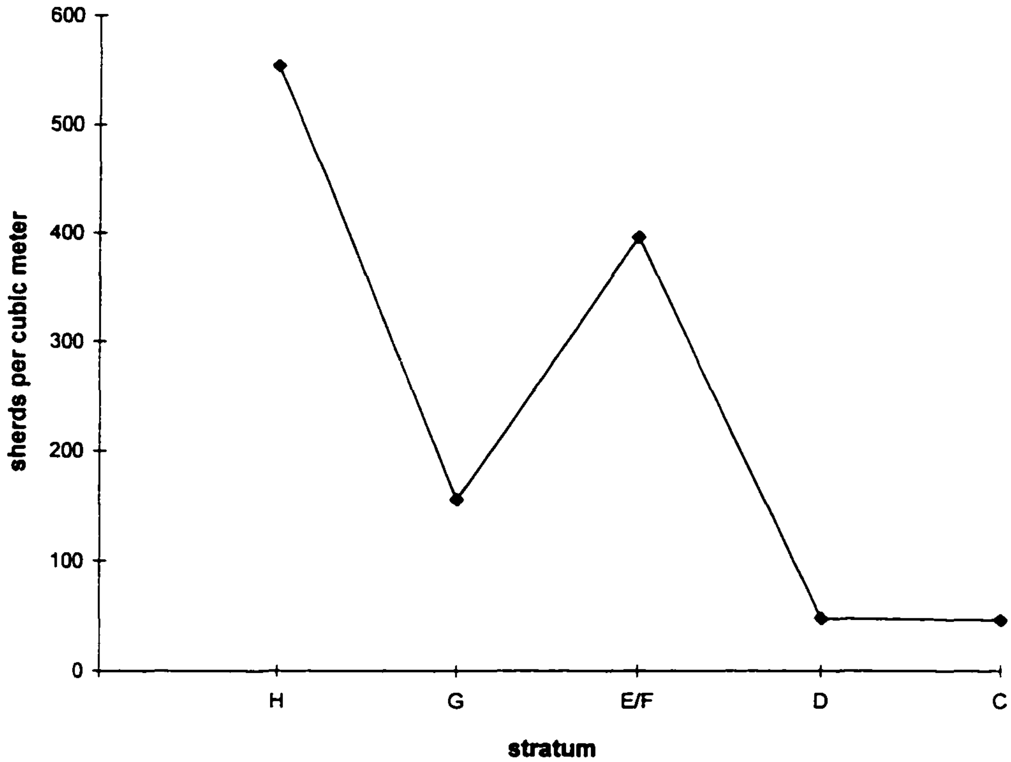


Figure 9.3. Blackware sherd densities from deposits in Excavation Unit 7 at Lower Pescado Village.

underscores an important shift in the perception and use of "traditional" material culture during the early years of Angloamerican market penetration, will be further discussed below.

The Ratios of Bowls to Jars

This section documents variability in the slipped wares recovered from prehistoric and historic deposits at Lower Pescado Village and compares these to a sample of historic slipped ceramics from the waterline monitoring at Zuni Pueblo. Differences in the relative proportions of bowls to jars at the three sites provide insight on variability in foodways and domestic routine. In the late nineteenth century, bowls were used for serving food and for eating, for storing salt and spices, and also in certain tasks of food preparation, for instance, mixing dough for wheat bread (Hardin 1983). Some small bowls were used for non-food purposes; examples include paint bowls and stepped-sided baskets used in ceremonials (Stevenson 1883). Jars were used for storage and for carrying water. Differences among bowls and jars used for various purposes were generally expressed by vessel size or shape. Appendix F lists Zuni vessel classifications collected by James Stevenson in the 1880s.

Essentially, "bowls" are open forms, while "jars" are closed, a reference to aperture size. This was recognized by the Zuni in their designation of two inclusive vessel categories; *sa' le*, or open bowl-shaped forms, and *de' le*, or closed-jar shaped forms (Hardin 1983). For

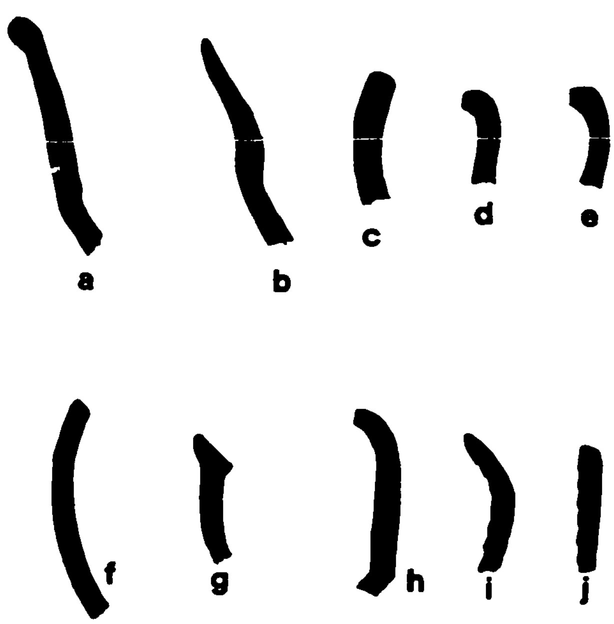


Figure 9.4. Rim profiles on sherds from Lower Pescado Village. A through d are nineteenth-century slipped wares, while e is from a Blackware jar. Note the flaring rims on the historic bowl sherds a and b. Sherds f through e were recovered from fourteenth-century deposits; f and g are from White Mountain Redware bowls, h is from a Cibola whiteware jar, and h and i are from corrugated jars.

this study, which included only sherds, curvature and interior surface treatment were used to distinguish vessel types from body sherds. Bowls are slipped, polished, and generally painted on both exterior and interior surfaces, while jars are unslipped and unpolished on their interior surfaces. The examination of rim sherds allows the differentiation of bowls from jars based on aperture size and rim profile. Jars generally have a smaller aperture than do bowls. On historic jars, rim profiles were incurvate, while rim profiles on bowls were straight or flared, but never incurvate (Ferguson and Mills 1982:320-26). Figure 9.4 illustrates this variability on rim profiles of sherds from both components at Lower Pescado Village.

Data and Findings

Table 9.4 lists the frequencies of bowl and jar sherds in the samples from the three components (LPVP, LPVH, and ZPH), while the bar chart, figure 9.5, shows these data in graphic form. Counts for the sample from Lower Pescado Village are considerably smaller than the frequencies listed above because while most sherds could be sorted into either utility or slipped ware categories, fewer could be identified to vessel form. The sample from Zuni Pueblo consisted of a randomly selected group of 348 historic sherds recovered during the waterline monitoring, including examples of Ashiwi Polychrome, Kiapkwa Polychrome, and Zuni Polychrome. Sherd samples chosen for attribute analysis represented 7% of the total ceramic assemblage; selection was biased toward larger sherds which could provide more information (Ferguson and Mills 1982:319). The analysis was conducted by Barbara Mills and assignments to vessel form were made by her. For this analysis, percentages of the total sample were used to even out sample size differences.

Table 9.4. Ratios of Bowls to Jars from Lower Pescado Village and Zuni Pueblo.

	LPVP		LPVH		ZPH	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
sherds from bowls	2760	79.4	149	67.1	133	38.2
sherds from jars	718	20.6	73	32.9	215	61.8
total	3478	100.0	222	100.0	348	100.0
ratio	3.8:1		2 : 1		0.6 : 1	
chi square = 294.8		df = 2			significance <.001	

Note: Data are from Ferguson and Mills (1982) and Rothschild and Dublin (1995).

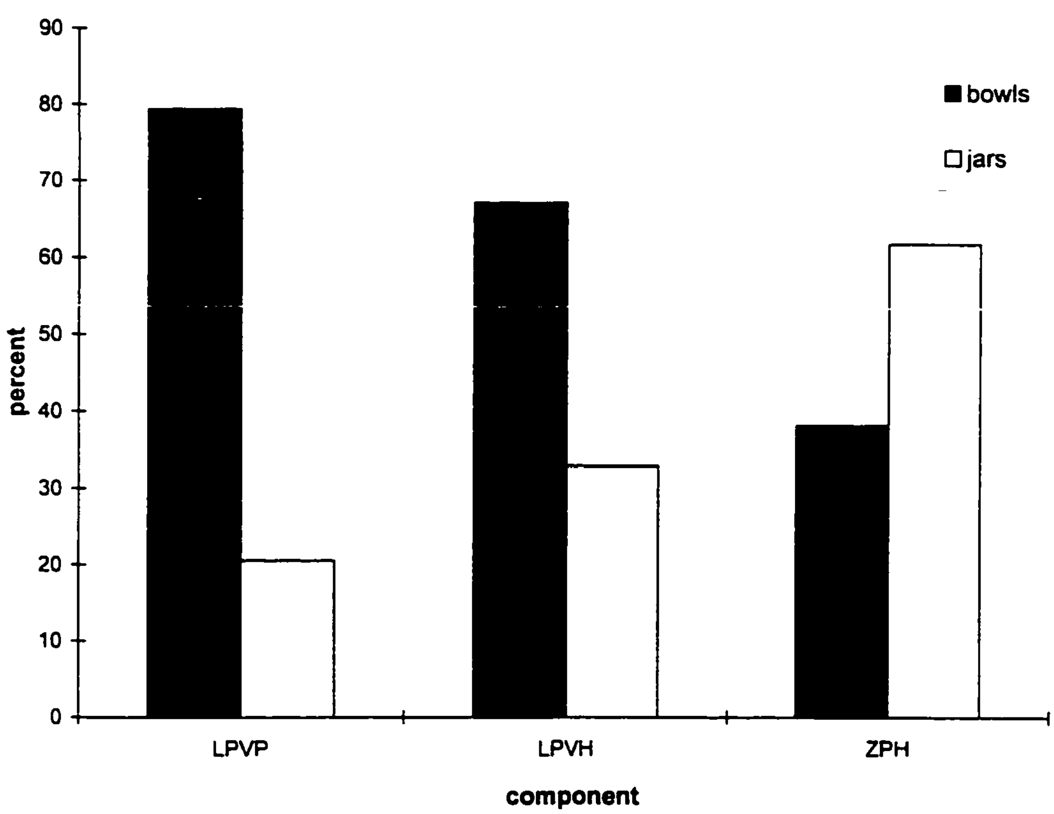


Figure 9.5. Percentages of sherds from bowls and jars at Lower Pescado Village and Zuni Pueblo.

As measured by the chi square statistic, differences in the proportion of bowls to jars were significant among all three samples; that is, the null hypothesis of no difference has been rejected at a probability level less than .001. Again, the sample from Zuni Pueblo was the most distinctive of the three. It was characterized by low frequencies of bowl sherds relative to jar sherds, while in both Lower Pescado samples, bowl sherds were far more numerous than jar sherds.

Discussion

The transport of water jars between the farming villages and the pueblo (Green 1979:296) might have acted to reduce jar frequencies at the satellite sites, but, as noted above, this process might be expected to operate similarly on all ceramic classes, especially since assemblage size data indicate that pots were not considered site furniture at the farming village. The disparity between the Zuni Pueblo and Lower Pescado Village again suggest that ceramics were used differently at each type of historic settlement. In terms of explaining this difference, it may be more profitable to look at the relative abundance of jars at Zuni Pueblo, rather than at the relative scarcity of bowls. That jars, often used for storage, were more common at Zuni Pueblo than at Lower Pescado Village was probably related to the role of Lower Pescado as a satellite village. Surplus foodstuffs may have been stored at the main pueblo, thus the use (and breakage) of more storage vessels at that locality.

Vessel Size Data on Rim Sherds from Lower Pescado Village

An analysis of the proportional representations of vessel forms underscores the difference in the use of ceramics between the historic pueblo and the historic farming village. This is because, rather surprisingly, the two Lower Pescado assemblages were more like each other than either was like the assemblage from Zuni Pueblo. In terms of distinctions among frequencies of cookwares, bowls, and jars, historic site function appeared to be a better predictor of ceramic variability than time. In this section, an analysis of vessel sizes in the Lower Pescado assemblage, emphasis is placed on better understanding the differences in the ceramics from each component at the site. In this way, temporal variability in the domestic routine, an important element in the daily use of the village, is demonstrated.

Methods

Since both prehistoric and historic assemblages consisted entirely of sherds, rim diameter was used as a proxy measure of vessel size (Blitz 1993:85). To test the validity of the assumption that there is a relationship between rim diameter and vessel size, I measured the correlation between vessel heights and rim diameters on a sample of historic Zuni jars from the Stevenson collection. There is a strong positive correlation between rim diameter and vessel height ($R = +.9732$; figure 9.6), indicating that rim diameter can be used as an indicator of vessel size. Rim sherds were measured against a template of concentric arcs that was calibrated in intervals of 1 cm radius. Rim sherds that were less than 3 cm in length were not used in the sample since it was found that the rim curvature was not well enough delineated to produce a reliable measurement.

Mended sherds were counted as one sherd, so that, in effect, the tallies are not of sherds but of minimum numbers of vessels. For both the prehistoric and the historic samples,

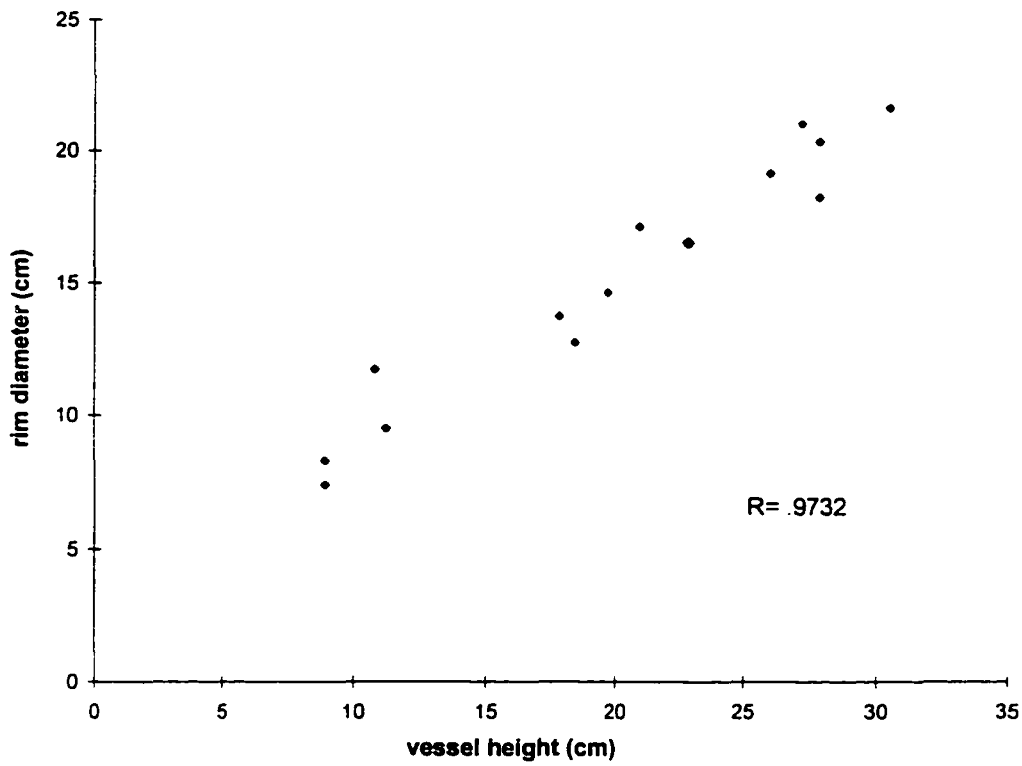


Figure 9.6. Correlation between vessel height and rim diameter on historic Zuni jars (based on Stevenson 1883:324).

utility wares and slipped wares were tallied separately, since it was expected that aspects of vessel size in each ceramic class would vary independently of the other class. Jars, distinguished by rim profile and interior surface treatment, were later separated from bowls, although this resulted in a very small sample of jars. It was, however, appropriate to tally these two vessel forms separately, since they were classified differently in the nineteenth-century Zuni ceramic taxonomies (Hardin 1983; Stevenson 1883).

The variables used in this analysis were the mean rim diameters in each vessel class, the range of sizes and standard deviations, and the presence or absence of well-defined vessel size categories. It was expected that these would provide information on social group sizes, vessel functions, and diversity in ceramic production.

Data

The historic data set consisted of the entire corpus of rim sherds that met the size criterion for inclusion. The sample included 67 sherds (23 Blackware sherds and 44 slipped sherds) from various contexts; 53 sherds, almost 80%, were recovered from the midden deposits in Unit 7. The prehistoric sample of 153 sherds included 45 utility ware sherds and 107 slipped sherds from twenty provenience units. The sample was selected systematically; the only criterion for selection was that the deposit be undisturbed. Contexts for sampling were the midden and room fill deposits in Unit 1, the room fill and floor deposits in Unit 2, and the superimposed ground surfaces in Unit 5. Every other field specimen bag or FS number designation from these contexts were selected, and all rim sherds that met the measurement criterion were included in the analysis. Again, the majority of sherds (102 sherds, 67% of the total number of sherds in the sample) was from midden deposits in Unit 1.

Appendix G lists the provenience information and the rim diameters of the sherds in the sample for analysis. Table 9.5 lists the summary statistics on the prehistoric and historic utility ware and bowl samples; statistics on jar forms were not calculated, since the sample sizes are so small. The findings for each sample will be compared within the vessel classes of utility wares, jars, and bowls.

Table 9.5. Summary Statistics on Rim Diameters from Lower Pescado Village.

	Cookwares		Bowls	
	LPVP	**LPVH**	**LPVP**	**LPVH**
Number of sherds	45	23	97	40
Rim diameters[1]				
Range	4-48	8-39	10-37	14-40
Mean	26.9	24.6	22.5	25.9
Median	28.0	25.0	22.0	24.0
Standard deviation	8.7	8.0	6.7	6.4

[1]All rim measurements are in cemtimeters.

Findings on utility wares

The mean and median rim diameters on corrugated wares were larger than those on Blackwares; also, six corrugated rim diameters were greater than 40 cm, larger than any of the historic Blackware rims. The range of variability in size is greater in the prehistoric sample; this wider range is influenced by the higher end of the distribution. Incidentally, it is interesting to note that the two smallest prehistoric cookware rims are not corrugated wares, but Blackwares, which had begun to be produced toward the end of the prehistoric occupation (Kintigh 1985:15).

One of the more interesting distinctions between the two cookware samples is the presence of very large corrugated pots in the prehistoric sample. Corrugated pots with rim diameters greater than 38 cm constitute the largest of four, possibly five, size categories based on modalities within the sample. There are five peaks in the distribution; at 13-15 cm,

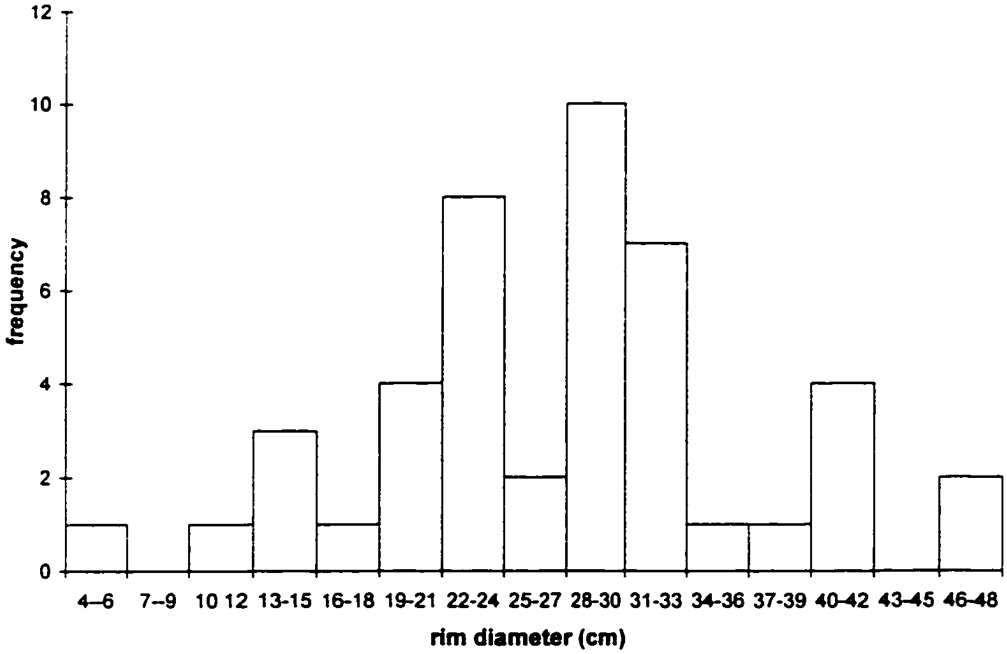


Figure 9.7. Distribution of rim diameters on a sample of prehistoric utility wares from Lower Pescado Village.

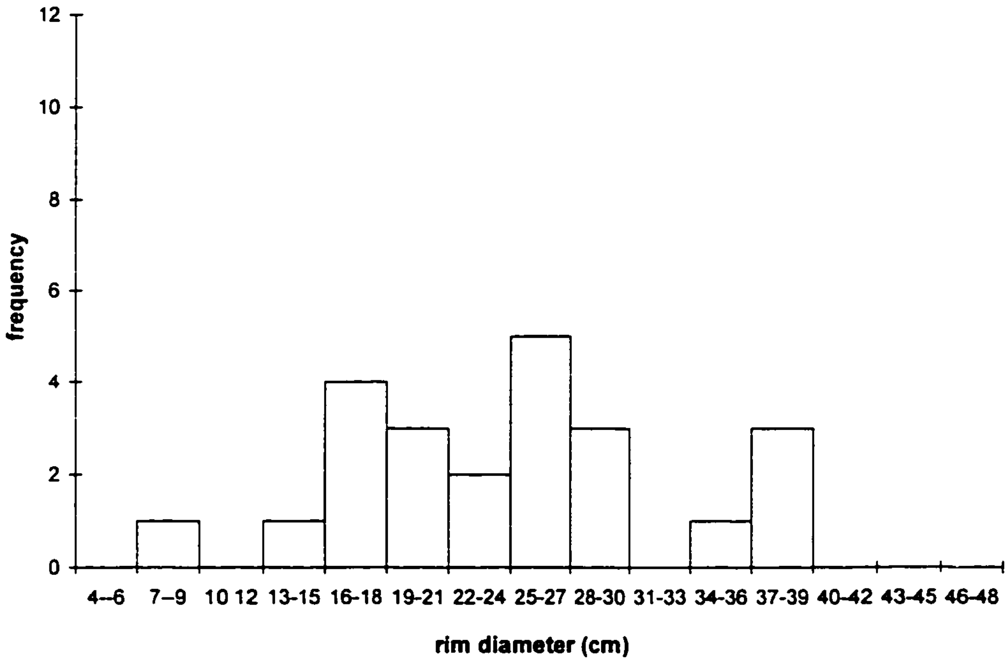


Figure 9.8. Distribution of rim diameters on historic utility wares from Lower Pescado Village.

Table 9.6. Proposed Size Classes of Prehistoric Utility Wares Based on Rim Diameters.

Size class	Range[1]	Number of rims	Percent[2]
I. "small"	4-18	6	13.3%
II. "medium"	19-24	12	26.7
III. "medium"	25-36	20	44.4
IV. "large"	37-42	5	11.1
V. "huge"	43-48	2	4.4
Totals		45	99.9

[1]Measurements are in centimeters.

[2]Percentage of the sample of rims from prehistoric utility wares.

Table 9.7. Proposed Size Classes of Historic Utility Wares Based on Rim Diameters.

Size class	Range[1]	Number of rims	Percent[2]
I. "small"	7-21	9	39.1%
II. "medium"	22-30	10	43.5
III. "large"	31-39	4	17.4
Totals		23	100.0

[1]Measurements are in centimeters.

[2]Percentage of rims from historic utility wares.

at 22-24 cm, at 28-33 cm, at 40-42 cm, and at 46-48 cm. The histogram, figure 9.7, illustrates the distribution of rim diameters on prehistoric utility wares. Table 9.6 lists the sherd frequencies within each proposed size category. Rims from two categories of "medium-sized" pots (19-36 cm) are the most common size classes.

Historic Blackwares have slightly smaller mean and median rim diameters than do prehistoric utility wares; very large rims (more than 43 cm in diameter) are not represented. The historic Blackware rims can possibly be separated into three size categories based on modalities in the frequency distribution, although the breaks are not as clear as they are in the prehistoric sample. The frequency distribution is illustrated in the histogram, figure 9.8. Peaks in the distribution occur at 16-18 cm, 25-27 cm, and 37-39 cm; table 9.7 lists the proposed size classes for historic Blackwares. Again, "medium-sized" rims are the most numerous.

Discussion

While differences between the two groups are in part related to differences in sample size, lower size diversity in the historic utility wares might be expected in view of the difference in the way that the site was used during the two occupations.

Ethnoarchaeological research suggests that different size categories of ceramic vessels are often analogous to different functional categories of vessels used in different contexts (DeBoer and Lathrap 1979; Rice 1987). This is also supported by ethnographic accounts that describe the use of Zuni cookwares during the 1880s. As discussed below, Zuni Blackwares included a range of small and medium-sized cooking pots that were used in everyday cooking for a family. There was also a class of very large pots, with a capacity of ten gallons or more, which was used in cooking for feasts (Hardin 1983; Stevenson 1883:347). According to the rim data, very large Blackware pots were not present in the assemblage from the farming village, although they do appear in the assemblage from the prehistoric component. This suggests that the contexts in which cookwares were used differed between the two components. In both samples, medium-sized rims were the most common class, underscoring the primary role of utility wares in everyday domestic routine. The greater diversity in the corrugated wares may indicate that these wares were more specialized than Blackwares, but it is more likely, that fewer functional types of Blackwares were present at the farming villages than at year round sites.

Findings on slipped wares

The sample of jar rims from each component was very small; as a result, it is difficult to make any statements concerning differences between the characteristics of the assemblages. The stem and leaf plot, table 9.8, shows the distribution of rim diameters on jars from both components. From this, it would appear that rim diameters on historic jars were larger than those on prehistoric jars; there is very little overlap in the distributions from each period.

Table 9.8. Stem-and-Leaf Plot of the Distribution of Rim Diameters on Jars.

Stem	LPVP	LPVH
0	4	
0	6 6 8 8 8 8	
1	0 2	2
1		6 6 8

This finding is in accord with the observation that large storage jars became common at Zuni during the nineteenth century, but that prior to that time, large jars were rare (Batkin

1987:83). The clustering of historic jar rim diameters toward the large end of the size range suggests that these examples from Lower Pescado Village may be representative of the larger category of Late Historic Period storage vessel, and that differences in the jar assemblages are temporal, related to the introduction of new vessel forms. Large storage jars will discussed in more detail below, but for now, it is worth noting that they were rare in historic deposits from the farming village, perhaps because storage of dry foods was more common at the central pueblo, where a substantially larger number of jar sherds were recovered.

In the samples from both components, rim sherds from bowls, representing more than 90% of the total slipped ware, are far more numerous than rim sherds from jars. Table 9.5 (page 380) presents summary statistics for rim sherds from bowls. With a median rim diameter of 24 cm, historic bowls were slightly larger than prehistoric bowls, which had a median rim diameter of 22 cm. In part, this reflects the presence of four very large historic bowls with rim diameters greater than 38 cm.

The histograms, figures 9.9 and 9.10, show the distributions of rim diameters on bowls from each component. Except for the large end of the historic distribution, neither sample shows clear breaks that might indicate the presence of well-defined vessel classes based on size. According to the ethnographic record, late nineteenth-century Zuni bowl assemblages included two classes of small and medium eating and serving bowls (Hardin 1983). It is difficult to discern this kind of distinction in the distribution from either Lower Pescado sample, but the ranges of variability in rim diameters are quite large for both periods.

Four large historic rims recovered from the midden deposits Unit 7 comprise a well-defined size category within bowls. This group, shown in the illustration, figure 9.11,

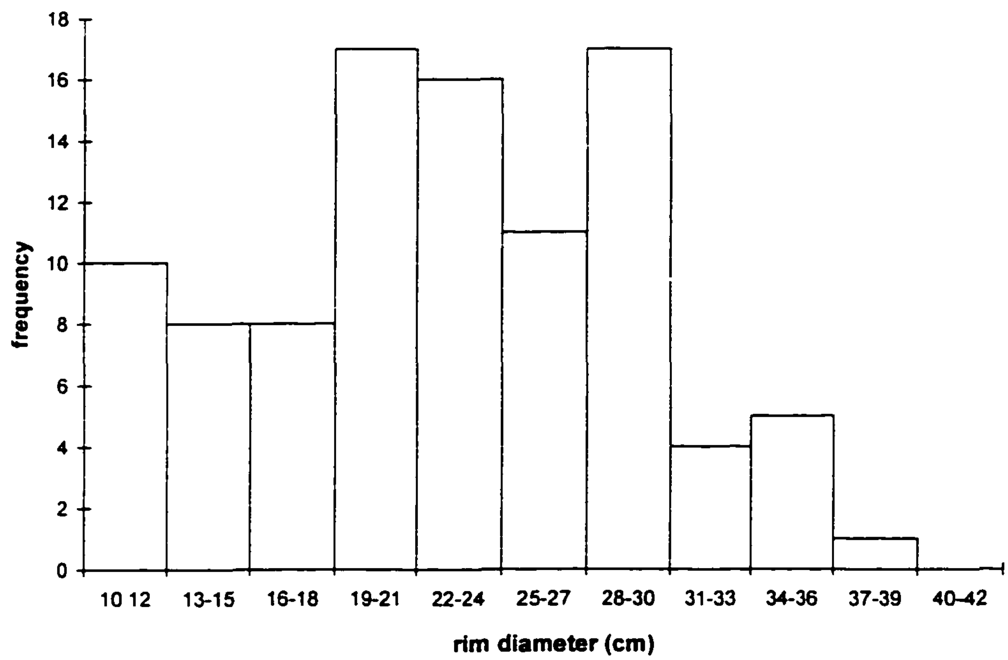


Figure 9.9. Distribution of rim diameters on a sample of prehistoric bowls from Lower Pescado Village.

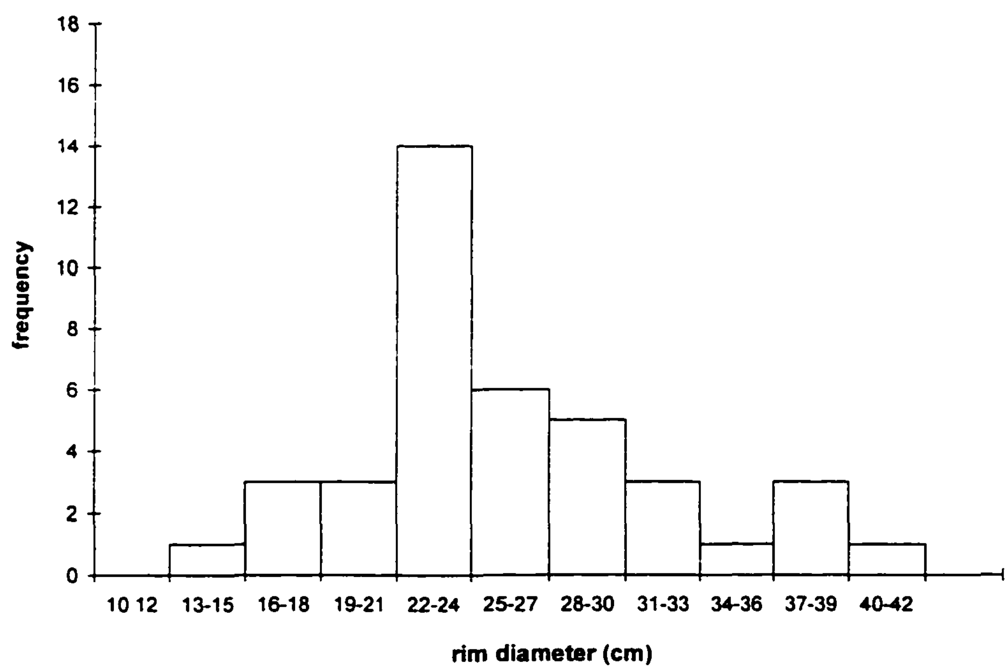


Figure 9.10. Distribution of rim diameters on historic bowls from Lower Pescado Village.

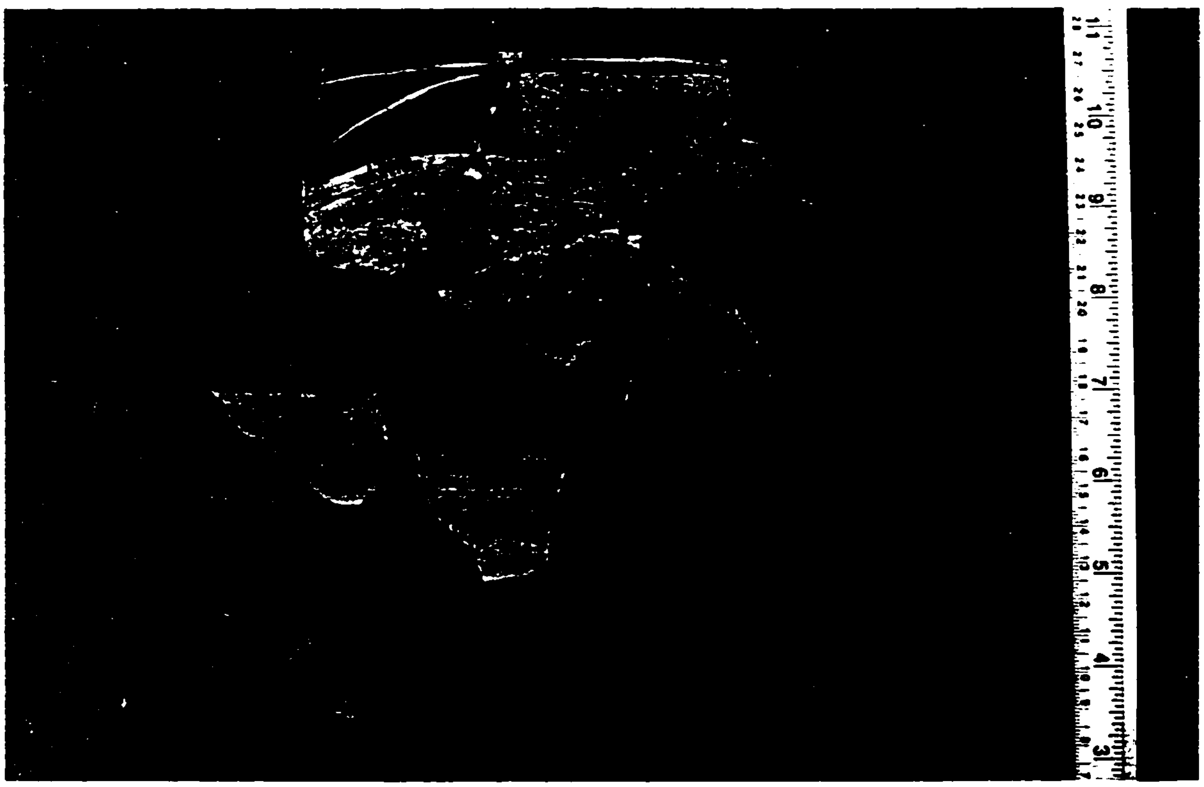


Figure 9.11. Rim sherds of dough bowls from the historic midden deposits at Lower Pescado. Top row, a cross-mended sherd of Historic Brown-on-buff; note the *lapanwe* or hooked feather motif. Middle row, two sherds of Plain Polishedc Buffware. Bottom row, left, Zuni Red-on-buff; and right, Plain Redware.

share the attributes of large size and a flaring rim profile that are characteristic of dough bowls, a vessel form that first appeared at Zuni in the 1830s (Batkin 1987:83). Dough bowls, used in the preparation of wheat bread, are an example of a shift in Zuni ceramic repertoires that was associated with the incorporation of aspects of Euroamerican foodways (see below). Like the example of the storage jars, the difference in the bowl assemblages from the two components is related to the introduction of new vessel forms during the Historic Period.

As expected, the vessel size comparisons between the prehistoric and historic ceramics from Lower Pescado Village revealed some differences within the three broad classes of cookwares, jars, and bowls, although the interpretation of these differences was not always clear. Ceramic change at this site appears to be associated in part with temporal shifts in foodways and storage technology (Batkin 1987:83), but also with differences in site structure, the latter illustrated by differences in the cookware assemblages that, I suggest, are associated with communal or ceremonial activities (also see Blitz 1993).

Zuni Ceramic Categories and the Ceramic Assemblage from Lower Pescado Village

Formal and metric attributes of historic ceramics from Lower Pescado Village differed in some aspects from prehistoric ceramics from that site and from ceramics recovered during the Zuni waterline survey. To what extent are the historic ceramics that were recovered from Lower Pescado Village representative of the kinds of pottery that were being produced at Zuni during the late nineteenth century? How did Zuni potters classify vessels made during that time and how does the historic assemblage from Lower Pescado Village fit in to Zuni ceramic classificatory schemes? These questions are addressed by a comparison of the LVPH ceramics with an ethnographic collection that was assembled during the 1880s, at a time when Lower Pescado Village was a thriving farming community.

The Stevenson Collection

An extensive collection of late nineteenth-century Zuni ceramics was amassed by James Stevenson for the Bureau of American Ethnology during 1879 and 1881. Stevenson also compiled invaluable information on the techniques of pottery production and on Zuni pottery classifications, which was published as an illustrated catalogue that formed part of the Bureau of American Ethnology's annual report in 1883 (Stevenson 1883). A summary of this ethnographic information on vessel sizes, usages, and Zuni terminology is contained in Appendix G. The Stevenson collection, now housed at the Smithsonian Institution, was reanalyzed by Margaret Hardin with a view toward understanding stability and change in late historic Zuni pottery production and use (Hardin 1983). Both Stevenson's descriptions and Hardin's analysis have been used here in developing a profile of ceramic production and usage at Zuni during the late nineteenth century.

The collecting efforts of the Bureau of American Ethnology at Zuni and elsewhere were geared toward amassing a complete record of Native American material culture in the mistaken assumption that indigenous culture would soon disappear (Woodbury and Woodbury 1997). Although the premise that underlay the collecting was in error, the philosophy resulted in collections that could be considered reasonably representative of the range of material culture in a given society. For this reason, the Stevenson collection can be considered a "type collection" against which site-specific differences can be measured.

Zuni Pottery Classifications

The Zuni classified their pottery on the basis of shape and size, attributes that were related to a vessel's use and context (in what kind of setting a vessel was used). The Zuni infix, *sa'le*, as noted above, was used for bowls or vessels with large apertures, while the infix *de'le* was used for jarlike, closed forms and for storage vessels (Hardin 1983). Blackware cooking vessels were classified differently than slipped vessels, and within the broad category of slipped wares, different functional types of vessels were classified within separate functional groups. For example, the broad class of canteens was designated by four different Zuni terms based on vessel shape (barrel shaped, double, duck-shaped, etc.) and size (small or medium). I will discuss only those forms that are relevant to the LPVH ceramic assemblage; that is, cookwares, bowls, and jars.

Stevenson defined five types of Blackware cooking pots, including three closed *olla* forms in small, medium, and large sizes, and two bowl-shaped forms, one with a tripod base. Examples from the collection are shown in figure 9.12. According to Stevenson(1883:358), "[t]hese vessels are generally of medium size, though in some instances the dimensions vary exceedingly." As noted above, the largest vessels, used to cook for feasts, might exceed a capacity of ten gallons, while the smallest, for family use, were often "less than four inches [10.2 cm] in diameter [at the shoulder] and not quite three inches high." The use of small Blackware pots as serving vessels at feasts has been noted above. Scales for the illustrations reproduced as figure 9.12 are shown as fractions of the actual size, and Zuni names were provided in the text. While both bowls and medium-sized jars are illustrated, neither small or large cooking vessels are represented.

Based on the rim profiles of the sherds from Lower Pescado Village, both bowl and jar forms were represented in the archaeological assemblage. However, very large Blackware vessels do not appear to be represented, nor does the LPVH collection include Blackwares with appliqued decoration or with tripod bases, as illustrated in the catalogue. In general, the Blackware sample from the farming village seems to be more limited in terms of vessel types represented and the variety of surface treatments than that collected by Stevenson.

Stevenson depicted two types of jars, which are differentiated by size. Small jars ranged from 12.5 to 17.5 cm in height, with rim diameters between 9 and 13.5 centimeters, while larger jars ranged from 20 to 30 cm in height with rim diameters between 16 and 22 centimeters (Stevenson 1883:343). The smaller jars were used for carrying water while the larger were used to store dry foods, bread, salt or water (Hardin 1983). Historic accounts mention the presence of storage jars, or *ollas*, at the farming villages, at least during the farming season, when people were in residence (Baxter 1882:78; Bloom 1936:111). Clearly they were part of the ceramic repertoire at the villages. Water jars also were, most certainly, used at the villages, but both types of ceramics may have been transported back to Zuni Pueblo at the end of the season.

Jar sherds from the excavations at Lower Pescado Village include one example of the smaller, water-carrying jar, and three examples of the larger storage jar, considered to be a relatively late historic vessel type (Batkin 1987:83). One rim is worth noting, because it is one of the few sherds from Lower Pescado Village that displayed "classic" Zuni design motifs. The cross-mended vessel (FS numbers 5128.27, 38, 39 and 5149. 23, 30; figure 9.13) was recovered from the midden, Unit 7, in deposits thought to date to about 1880. This Zuni

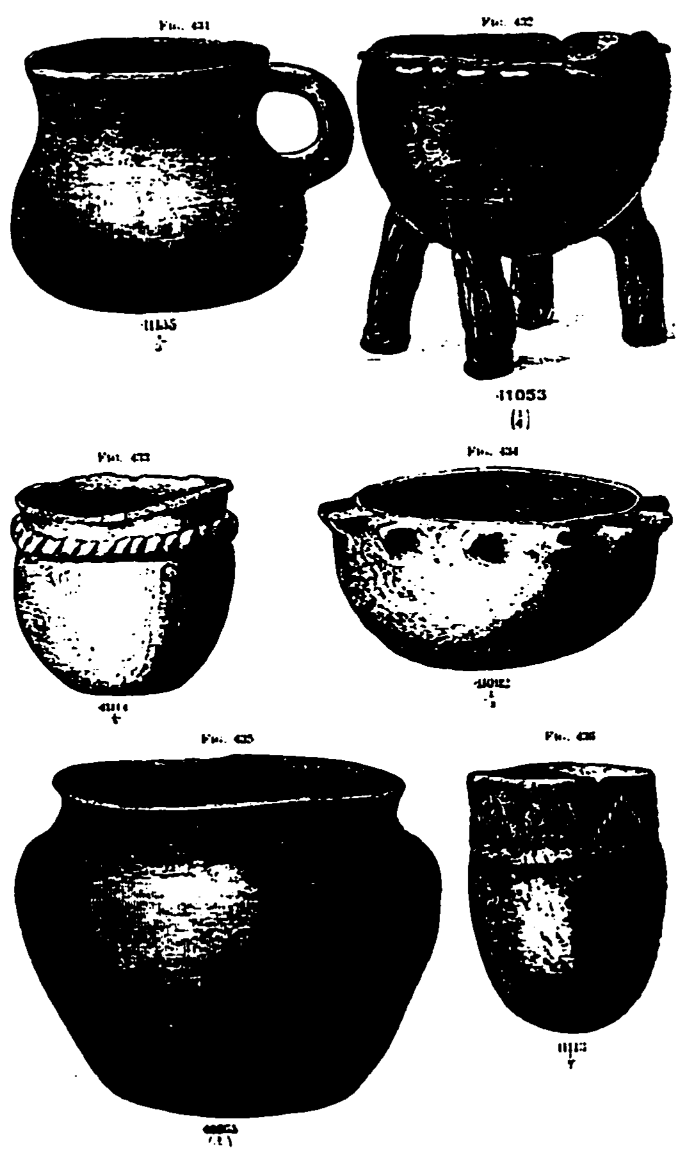


Figure 9.12. Nineteenth-century Zuni Blackware vessels. Illustration is from Stevenson (1883:359).

Polychrome jar closely resembles the Smithsonian specimen #111791, which is said to date to about 1870 (Harlow 1990:plate 3). The Lower Pescado sherds bear brown-black and brown-red paint on a white slip; the design includes what appear to be part of heart-line deer and walking stick motifs. In general, slipped sherds from Lower Pescado Village are often unpainted, and, even when painted, very few elaborate designs are present.

Stevenson names three types of bowls - small eating bowls or *sat-tsan-na*, medium sized bowls, or *i'-ton-a-ka-sa'le*, that were used for eating or serving, and *mo-tsin-i-ka-sa'le*, large bowls that were used in preparing dough for wheat bread. There were also bowl-shaped vessels, such as paint cups, that were not used in foodways; these were classified differently

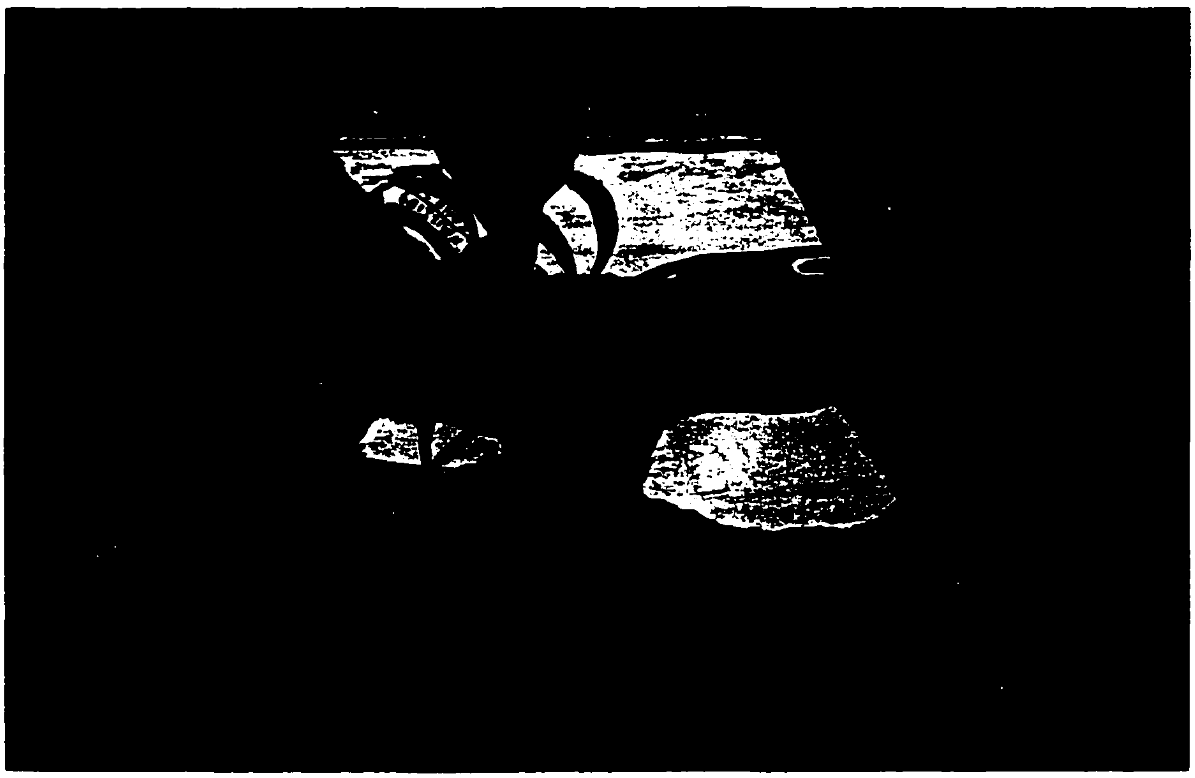


Figure 9.13. Fragments of a Zuni Polychrome jar recovered from the excavations at lower Pescado Village. Designs on the jar included the classic "heartline deer" and "walking stick" motifs.

from eating, serving, and dough bowls, although, as sherds, they would be formally indistinguishable. Zuni Polychrome bowl exteriors were almost always painted with the "hooked feather" or *lapanawe* motif (figure 9.14; Bunzel 1972:106-7; Frank and Harlow 1974:138; Stevenson 1883:Figures 410-30).

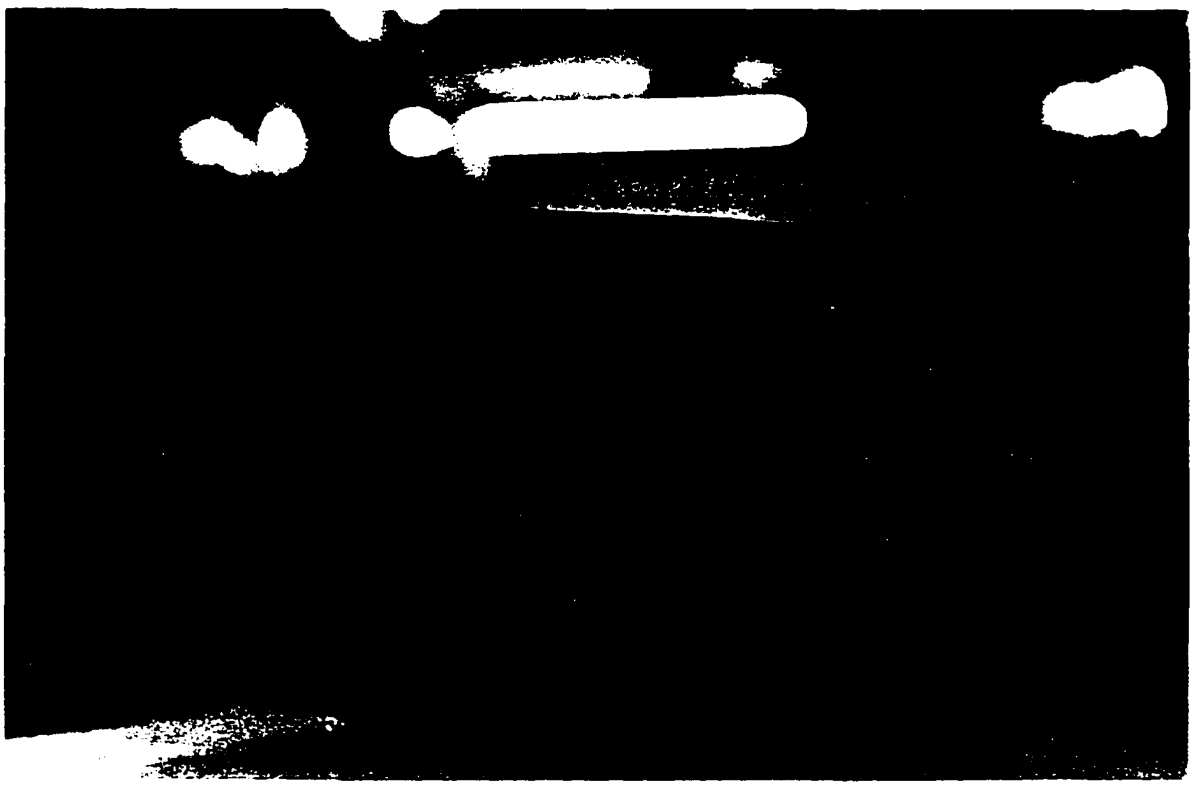


Figure 9.14. A nineteenth-century Zuni Polychrome bowl from the collections of the National Museum of the American Indian. The exterior design is the *lapanwe* or "hooked feather" motif. Note the similarity to the fragmentary motif on the dough bowl from Lower Pescado Village, figure 9.11a.

Some historic observers have described the use of bowls in Zuni foodways. In 1882, the journalist Sylvester Baxter wrote that stew bowls and ladles formed part of the table service during a meal at Patricio Pino's farm house in Pescado:

> Two large bowls of the smoking stew were dished out, one was set before us, and we drew around it, sitting on sheepskins and blankets spread over the earthen floor ... The dish was ... a kind of thick mutton broth, with whole grains of wheat to give it body and agreeably flavored with a kind of herb highly prized by the Zunis. Rolls of the peculiar "paper bread" were given to us. In eating it, it is the custom to dip the end of the roll into the broth. The liquid part was eaten with "a sort of spoon made of pottery ...without a handle, but ... the upper part of the bowl, where the handle should be, ... was curved over backwards so it could be hung on the edge of the dish. (Baxter 1882:78)

Also during the 1880s, John Bourke described the contents of a Zuni household at Nutria that included "tableware, spoons, ladles, &c ... of earthenware" and "two earthen platters of yellow and blue corn, parched with salt" (Bloom 1936:111). In Stevenson's catalog and in the historic accounts, the presence of a diverse range of open vessels can be inferred, including large serving bowls, stew bowls, and ladles.

The open vessel forms from the historic deposits at Lower Pescado Village appear to span the range of small, medium and large bowls with rim diameters ranging from 14 to 40 cm, and ladles. It is not unlikely that the bowl assemblage from Lower Pescado Village contains only vessels associated with food preparation and service, but, without access to whole vessels, it is difficult to be certain. Some open vessel types, however, were not found at Lower Pescado Village. An example is the scalloped or terrace-rimmed pot ("basket") used only for ceremonials (Stevenson 1883:360); the distinctive rim and design motifs that identify these vessels were not found on any sherds from the farming village.

Two historic bowl types found at Lower Pescado Village were associated with introduced foods. One type is the dough bowl, discussed above. Rims from stew or soup bowls were recovered from the historic midden and from a ground surface just inside the perimeter wall of the village. Identified by the presence of a wide flaring rim, stew bowls were smaller than dough bowls. They were used for serving stews and soups that often contained mutton, an introduced domesticate.

Diversity in the Lower Pescado Ceramic Assemblage

In general, the historic ceramics from the farming village at Lower Pescado do not include a large number of vessel types, although many different types were being produced at Zuni during the late nineteenth century. Certain forms that are very distinctive in shape or in surface treatment and therefore easily identifiable from sherds are not present in the sample. These include baskets, effigies, statuettes, square condiment bowls, and probably double condiment or paint bowls, canteens, and pitchers.

The Stevenson collection can be considered a good approximation of the diversity

Table 9.9. Nineteenth-Century Zuni Vessel Forms Represented in the Ceramic Assemblage from Lower Pescado Village.

Zuni Name	Description
kah'wi-na-ka-tehl'le	large water or storage jar
det-tsan-na	small jar
mo-tsin-i-ka-sa-le	dough bowl
i'ton-a-ka-sah-le	medium sized eating or serving bowl
sat-tsan-na	small eating bowl
ma-po-ka-tehl-le[1]	round condiment cup
sa-sho-kon-ne	ladle
sa-mu-yen	bowl-shaped cooking pot
pah-tehl-tsan-na	medium sized cylindrical cooking pot
wah-li-ah-ka-tehl-le	small cylindrical cooking pot

Note: Vessel form classification is from Stevenson (1883).

[1]The identification of the condiment cup is tentative, based on the size of the vessel and the similarity in surface treatment to vessels shown in Stevenson (1883).

present in late nineteenth-century Zuni ceramics, given the collection strategy. By fitting the identifiable sherds from Lower Pescado Village into the Zuni ceramic classification from the catalogue, I was able to assess the relative diversity of the archaeological assemblage. Table 9.9 lists the vessel types identified from the LPVH sherd sample. Most sherds used in this analysis were rims since it was virtually impossible to identify unremarkable body sherds to vessel type with any degree of certainty. Bowls and jars were classified by rim diameter and compared to rim diameters on vessels in the Stevenson collection. As noted above, small jars, *det-tsan-na*, had rim diameters that were less than 14 cm, while rim diameters on large jars, *kah'wi-na-ka-tehl-le*, ranged from 15 to 22 cm. Rim diameters on small eating bowls, *sat-tsan-na*, were less than 20 cm, while rim diameters on dough bowls, *mo-tsin-i-ka-sa-le*, were larger than 38 cm. Most bowls from Lower Pescado Village fell into the middle range from 20 to 37 cm; these were classified as *i'-ton-a-ka-sale*. The ceramic classifications collected by Stevenson did not distinguish between the flaring-rimmed stew bowls and bowls with straight or incurved rims.

Ten ceramic types (out of a possible 39) can be identified in the sample from Lower Pescado Village. Most of these are vessel types associated with foodways, or the daily activities of domestic life. Vessels that were used in ceremonial activities, such as terraced baskets and paint cups, are not represented, nor are figurines or statuettes. A rough index of ceramic diversity can be achieved by dividing the number of vessel types present by the total number of vessel types known to be produced. A simple formula might be stated this way:

$$D = n/N$$

where D = diversity; n = number of types present in sample; and N = total number of types produced. The index for a very diverse sample would approach 1.0, while that of a uniform sample would be closer to 0. Applying this simple formula to the LPVH ceramics yields an index of 0.26. This finding is in keeping with ethnoarchaeological observations that temporary seasonal sites or sites that experience multiple short term occupations yield relatively small ceramic assemblages without much variety in terms of the vessel types represented (Kent 1994; Mills 1989). Although the small sample size undoubtedly contributes to the observed uniformity (Grayson 1984), ethnoarchaeological research indicates that fewer activities and ceramic assemblage formation processes such as transport play an important role in reducing ceramic diversity at seasonal or temporary sites.

Summary

Differences in the three ceramic assemblages suggest that domestic routine was enacted or played out differently at each locality. Domestic routine, an essential part of daily life, is undoubtedly important in structuring places. Two factors contributed to ceramic differences. These were the role that the site played in the regional settlement system--seasonal satellite village or year-round pueblo--and temporal change, in this case the addition of new vessel types during the Historic Period.

Change over Time at Lower Pescado Village

This section of the chapter examines material change during the Historic Period. The focus is on the most common classes of material culture at Lower Pescado Village, ceramics and faunal remains, and on artifacts of Euroamerican manufacture. The archaeological record reveals that the process of change in material culture shifted from addition to replacement during the late nineteenth century.

Ceramics

As noted above, an important distinction between the ceramics from the two components at Lower Pescado Village was the presence in the later component of vessel forms introduced during the Historic Period. Some of these were directly related to additive change in foodways, linking ceramics, faunal and botanical remains, and domestic routine.

Ceramics, an important Zuni manufacture, are a good barometer of the processes of change and stability in Zuni material culture. Although ceramic production for everyday use declined drastically in the twentieth century, Zuni-made pottery continued to be employed in ways that deliberately invoked the past. Hardin (1983:152) cites, for example, the use of Zuni Polychrome jars in the popular dances of the Zuni Olla Maidens and in the periodic revival of design motifs. Elements of traditional surface treatment on ceramics included the use of red and white slips and the presence of motifs, such as the rainbird or the various feather designs, that were derived from older forms (Bunzel 1972).

Previous research outlined a sequence of ceramic change through the Historic Period. By the seventeenth century, European attributes, including foot rings and stew bowls, had found their way onto Zuni pottery (Batkin 1987:83). However, dough bowls used in making wheat bread did not appear at Puebloan sites until the early nineteenth century, about 1830 (Batkin 1987:83). As noted above, I think that this late appearance is related to a relatively late commitment to the cultivation of wheat on the part of historic Puebloan societies.

Zuni manufactured ceramics remained in everyday use through the occupation of Lower Pescado Village, attesting to the persistence of a traditional craft associated with Zuni identity. Ceramic change, however, began to accelerate by the end of the nineteenth century in the face of a burgeoning market economy driven by the railroad, which had reached the Zuni area by the 1880s. In her study of ceramic change at Zuni, Hardin notes two broad types of change, which have been corroborated by other observers. A diminished design repertoire was perhaps exacerbated by collectors' removal of old vessels that had served as models for potters (Hardin 1983:152). This process was apparent in the overuse of the *lapanwe*, or hooked feather motif, on the exteriors of virtually every bowl manufactured at Zuni in the late nineteenth century (Frank and Harlow 1974:144; see figure 9.11 for an example from Lower Pescado Village).

There were dramatic changes in vessel forms as Zuni manufactures began to be replaced by Euroamerican counterparts during the early twentieth century (Hardin 1983:152). This may have begun earlier as an additive process; historic accounts noted the presence of imported Euroamerican vessels, notably "iron pots" and "kettles," alongside Zuni ones in households at Nutria and Pescado during the 1880s (Baxter 1883:78; Bloom 1936:111). In 1916, Kroeber described a typical domestic assemblage that included Zuni and Euroamerican vessels. Zuni manufactures included water jars, bread bowls, "an occasional canteen," and large Redware drum jars that were also used for storage. Some Blackware cooking pots were still in use, but "[t]he Zuni woman now cooks in a frying pan or agate ware, and serves food either in this vessel, or in a china dish or rectangular lava bowl" (Kroeber 1916:12).

By the first decades of the twentieth century, common Zuni vessel forms, such as eating and serving bowls and cooking pots, had already begun to fall out of use. By 1924, Bunzel (1972:11) observed that "cooking pots ... are practically never made any more." Again, according to Bunzel, "[t]he bowl is practically extinct at Zuni. The medium sized food bowl is no longer seen, and its place has been taken by platters and soup plates of white manufacture. The large mixing bowls [dough bowls] are still used, but ... they are not being replaced when broken" (Bunzel 1972:20). The vessel repertoire, like the design repertoire, had been diminished; a few standardized formsof jars and one type of bowl, remained. Zuni water jars continued in use until quite recently; before refrigeration, the unglazed jars kept water cooler and sweeter than did other types of containers (Nahohai and Phelps 1996:45).

The historic and ethnographic accounts depict two kinds of impact on ceramics. The first, the addition of new vessel types and attributes on vessels, was associated with an additive change in foodways that began prior to the nineteenth century and continued into that century. This additive change was keynoted by the incorporation of introduced domesticates--sheep and wheat--into the Zuni economy. The addition of stew bowls and dough bowls to the existing Zuni ceramic vessel repertoire is, to some extent, the ceramic correlate of that shift, discussed in chapter 6.

The late nineteenth century, the coming of the railroad, and the presence of Euroamerican residents at Zuni marked the beginning of Zuni participation in the Euroamerican market economy, that included the development of a core-periphery or dependency relationship whereby manufactured items imported into Zuni were beginning to replace items of Zuni manufacture (Hall 1989; White 1983). This point marked the shift from the process of addition to that of replacment in material culture change (see Rogers 1990), although the shift was by no means as abrupt and dramatic as might be implied in this sentence. These processes are visible to some extent in the archaeological record of Lower Pescado Village in several ways, some of which have been discussed above. The addition of new vessel forms and the diminution of design variability are apparent in the comparison of ceramics from the prehistoric and the historic components at the site. The decline in cooking pots was apparent in the excavated Blackwares from Lower Pescado Village but not from Zuni Pueblo, as the context in which these vessels were used changed.

Materials excavated from the stratified midden deposits in Unit 7 at Lower Pescado

Village indicate an inverse sequence of change in the densities of historic Zuni ceramics and Euroamerican imports. Table 9.10 lists the respective densities of these artifact groups over time; historic ceramics were used as an indirect measure of Zuni manufactures. Because of the lack of adequate wood samples for dendrochronology, there are no absolute dates for the midden levels, but based on artifact densities and ceramics, stratum G is thought to date to the 1880s, at the height of the occupation of the village. It is apparent from the table and the accompanying graph, figure 9.15, that as the density of Zuni-made ceramics declined, the density of Euroamerican imports increased. This appears to have occurred after the 1880s and reflects the increasing availability of Euroamerican consumer goods after the opening of trading posts in the pueblo and the coming of the railroad, events that occurred in 1879 and 1881, respectively.

Table 9.10. Comparative Densities of Historic Zuni Ceramics and Euroamerican Artifacts.

Stratum designation[1]	**I**	**H**	**G**	**E/F**	**D**	**C**
Density of Zuni ceramics[2]	154.9	318.6	663.3	322.3	96.3	43.2
Density of Euroamerican artifacts[2]	4.0	12.0	6.0	22.1	48.1	38.6

[1]Strata are arranged in temporal order from left (earliest) to right (latest).

[2]Densities are in cubic meters.

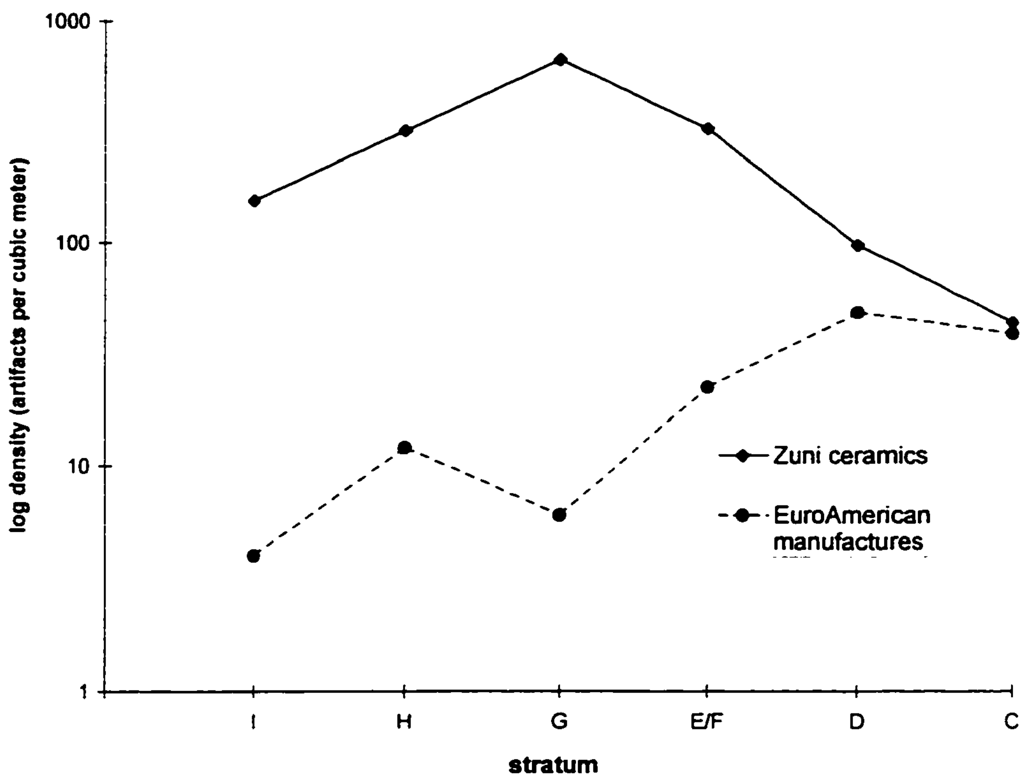


Figure 9.15. Comparative densities of historic Zuni ceramics and Euroamerican imports over time. Data are from Excavation Unit 7 at Lower Pescado Village.

The Zuni Subsistence Base: Faunal Data from Lower Pescado Village

The faunal data from Lower Pescado Village demonstrate differences in the exploitation of animal species during the fourteenth and nineteenth centuries that can be attributed to historical change, notably the introduction and acceptance of European domesticated animals at Zuni. As I noted in chapter 6, the available evidence suggests that Puebloan incorporation of European domesticates occurred relatively late, after the Pueblo Revolt, and that these were added to an existing economic base. Like ceramics, faunal remains constitute a significant portion of the archaeological assemblage from Lower

Pescado Village, 31% of the total assemblage from the site; 8,902 bones were recovered from the excavations (Etnier 1997; Rothschild and Dublin 1995:156).

The faunal remains were sorted and identified by Michael Etnier under the supervision of Professor Donald Grayson at the University of Washington (Etnier 1997; see Appendix J). A total of 2,321 bones, 26.1% of the total number of animal bones, were recovered from prehistoric deposits, while 4,470, or 50.2% of the total faunal collection, were found in deposits that dated to the historic period. The remainder, 2,111 bones (23.7% of the total), were from deposits that were mixed or unassigned to a particular time period. Since they could not be assigned to either component, these latter were not included in the discussion of differences between the two periods.

The Lower Pescado fauna is briefly compared to the faunal material from the waterline monitoring at Zuni Pueblo. The identified Zuni Publo fauna, approximately 10% of the total faunal sample recovered during the waterline monitoring project, included 5,719 specimens, which were analyzed by Sandra Olsen (Ferguson and Mills 1982:390-428). Most are assumed to date to the Historic Period.

Table 9.11 lists the most common animal species recovered from Lower Pescado Village and Zuni Pueblo. Appendix H contains a complete list of the identifiable fauna from Lower Pescado Village. To equalize the differences in the sample sizes, the data are presented as percentages of the total number of bone fragments recovered from deposits belonging to a particular component; frequencies are noted in adjacent columns. Frequencies are expressed as NISP, the number of specimens identified for a given taxon. In order to make the samples from Lower Pescado Village and Zuni Pueblo comparable, some categories

Table 9.11. Common Archaeological Fauna from Lower Pescado Village and Zuni Pueblo.

Taxonomic group	LPVP		LPVH		ZP	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Meleagris gallopavo	6.9	160	0.8	35	0.09	5
Lagomorpha	17.8	414	4.0	177	0.8	43
Sciuridae	8.3	192	1.2	54	0.09	5
Cynomys	2.8	63	0.4	20	0.1	7
Neotoma	1.4	32	0.3	14	0.03	2
Canidae	0.9	21	0.2	8	0.7	39
Odocoileus	0.4	9	0.2	8	1.2	68
Antilocapra	0.04	1	0.3	12	0.7	41
Bos/Bison/Equus	0	0	0.3	14	3.0	172
Ovis/ capra	0	0	6.3	283	32.9	1883
Unidentified artiodactyl	0.9	22	10.4	465	39.5	2261
Other/ unidentified	60.6	1407	75.6	3380	20.7	1181
Total	100.04	2321	100.0	4470	99.8	5707

Notes: Data are from Etnier (1997:Appendix A) and Ferguson and Mills (1982:391-2).
Frequencies are listed in parentheses after the percentages.

have been collapsed. For instance, the genera *Sylvilagus* and *Lepus* as well as the category "unidentified leporid" have been combined in a general category "Lagomorpha," and three genera, *Bos, Bison*, and *Equus*, are combined under the category "*Bos/ Equus*." The histogram, figure 9.16, shows these data in graphic form.

Differences between the prehistoric and historic faunas are immediately apparent.

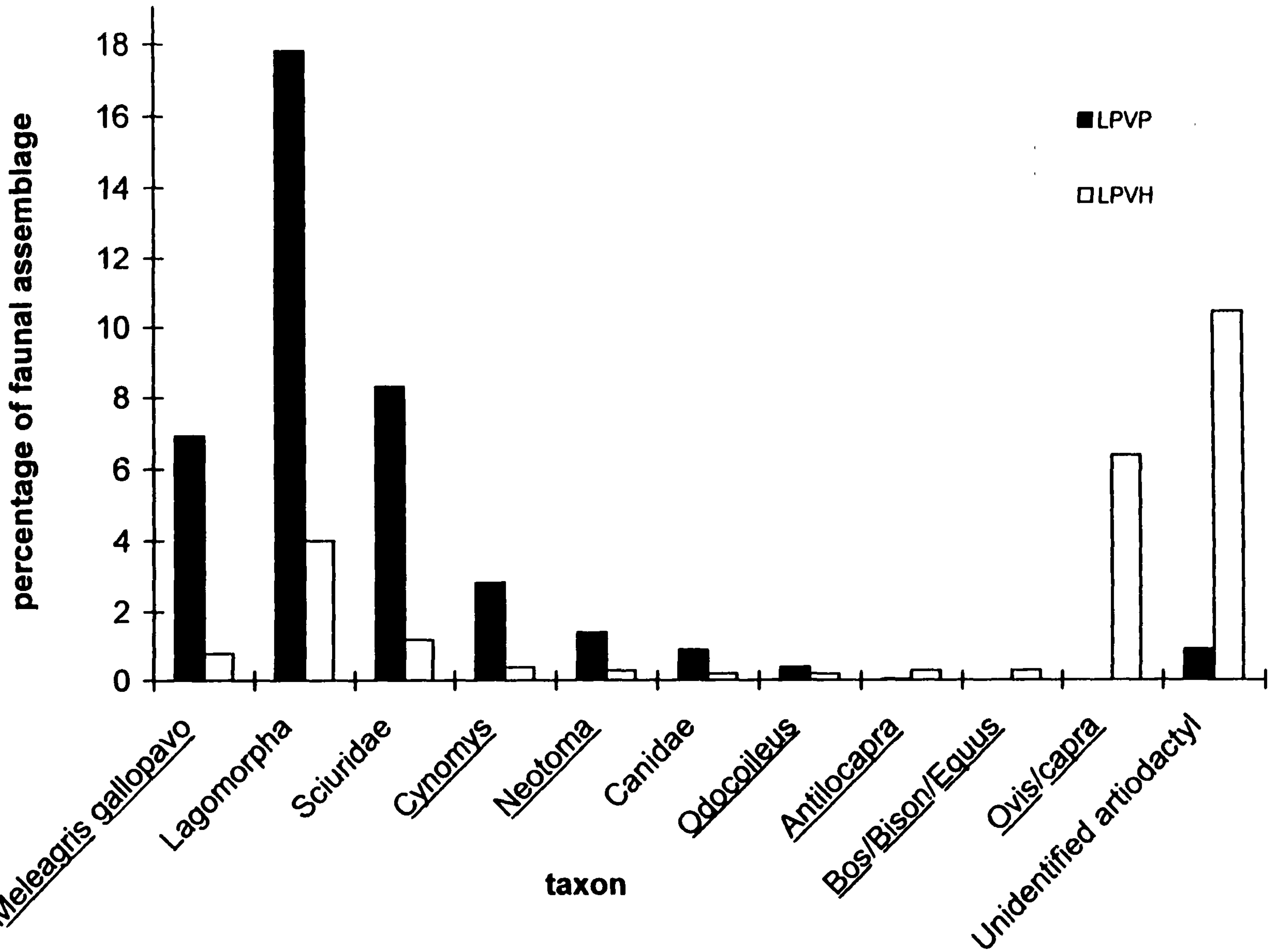


Figure 9.16. Common fauna from prehistoric and historic contexts at Lower Pescado Village.

The Historic Period data show a drop in the proportions of small mammals and the indigenous domesticate, the turkey, and an increase in large mammals, especially artiodactyls. Sheep and goat represent the commonest identified specimens in the historic faunas. Since it is likely, based on sizes of the unidentified artiodactyl remains, that many of these also represented sheep or goats, the occurrence of these species in the historic fauna is even higher than it would appear from these data. Clearly, the importance of sheep pastoralism is manifested in these late nineteenth-century deposits.

Differences in the relative proportions of small and large mammals in the samples from the prehistoric and historic components at Lower Pescado Village reflect an important difference in scheduling and labor demands at the village during the two different occupation periods. The relative abundance of small, readily accessible, and easily trapped animals in the fourteenth-century deposits suggests an opportunistic pattern of taking animals that might have been found in the vicinity of agricultural fields. During the nineteenth century, sheep herding required an allocation of time and labor in addition to requirements for farming (see above, chapter 6) which may have reduced available time for trapping. During both periods, large hunted animals such as deer and pronghorn antelope represented a small portion of the faunal assemblage.

The faunal data reflect the importance of herding during the nineteenth century. To demonstrate this, I calculated the "Artiodactyl Index" for each period. This provides a measure of a group's investment in large animals that yield a high return in meat and presumably hides (Etnier 1997:22). The index is calculated by dividing the number of artiodactyl bones by the total number of bones of small vertebrates (i.e., canids and smaller) plus artiodactyls:

$$\text{Artiodactyl Index} = \frac{\text{number of artiodactyls}}{\text{number of artiodactyls and small vertebrates}}$$

In this application, I also included turkeys in the small vertebrate category since they were an important dietary item. The artiodactyl index for the Historic Period is relatively high, .716, while that of the Prehistoric Period is very low, .035, indicating a very little reliance on large mammals. The importance of introduced species during the Historic Period is clearly demonstrated in both the Lower Pescado Village and in the Zuni Pueblo faunal material. European domesticates represented in the collections included not only sheep and goats, which were the most numerous of all species represented in the faunas, but also cattle, horses, pigs, and, at Zuni Pueblo, burros and domestic cats.

Material Culture Change and Non-indigenous Artifacts at Zuni Sites

Although the kinds of artifacts recovered from Excavation Unit 7, the stratified midden, indicated that the number of Euroamerican goods increased after the 1880s, non-Zuni goods continued to represent a very small portion of the historic assemblage from the site. The midden excavation, which yielded 6,295 artifacts in all, only yielded 67 Euroamerican artifacts, 1.1% of the total number of artifacts recovered from this unit. In this section I will discuss the distribution of non-indigenous material culture at Lower Pescado Village. For the most part, these were Euroamerican artifacts, but I will also briefly discuss the importance of introduced fauna and plants at the site. Where possible, I will compare the Lower Pescado data to those from Zuni Pueblo (Caywood 1972; Ferguson and Mills 1982).

Zuni and the Euroamerican market economy

The Euroamerican artifacts recovered from archaeological deposits at Lower Pescado Village were used to further understand the timing, extent, and areas of change in material culture during the late nineteenth century. Variables used to measure change in these areas included the stratigraphic distribution of Euroamerican artifacts and the functional classes that were represented. I also examined the surface collection from Lower Pescado Village, much of which was deposited after the village was "abandoned," and Euroamerican artifacts from excavations and monitoring at Zuni Pueblo (Caywood 1972; Ferguson and Mills 1982).

Timing and extent

The relative proportion of Euroamerican artifacts excavated from historic contexts at Lower Pescado Village is used to measure the extent of material cultural change related to Zuni participation in the United States market. The provenience of Euroamerican materials in the test units from the site provides a rough idea of the timing of that participation.

A total of 667 artifacts of Euroamerican manufacture was recovered from historic deposits at Lower Pescado Village (Rothschild and Dublin 1995:151-156). Euroamerican manufactures recovered from historic contexts comprised only 4.1% of the total number of artifacts from these deposits, a figure that suggests that market penetration of manufactured goods was not important during the occupation of the farming village. (Alternatively, of course, it maight suggest that imported goods were intensively curated.) It is interesting to contrast the proportion of excavated Euroamerican materials with the proportion of Euroamerican materials that were collected during surface reconnaissance at the site. Much

Table 9.12. Euroamerican Artifacts from Lower Pescado Village and Zuni Pueblo.

	LPVH		**ZPH**		**LPV surface**	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Euroamerican artifacts	4.1%	667	31.8%	6710	40.8%	560
glass	1.5	254	14.9	3145	18.6	256
ceramics	0.1	24	2.6	546	2.5	35
metal	2.1	347	7.8	1638	14.1	193
Total no. of artifacts	100	16427	100	21069	100.0	1373

of the surface collection accrued after the "abandonment" of Lower Pescado Village and thus can be considered relatively late, post-1930s. Table 9.12 presents these data, and summary data from the waterline monitoring at Zuni Pueblo, much of which material is thought to date to the late nineteenth and twentieth centuries (Ferguson and Mills 1982). Artifact totals for the excavations at Lower Pescado Village include only material recovered from historic contexts. The comparison of these three groups provides a rough measure of the influx of Euroamerican manufactures over time.

If we consider the excavated material from Lower Pescado Village the earliest collection (dating from about 1850 to 1930), and the surface collection from Lower Pescado Village the latest (post-dating the "abandonment" of the farming village), it is apparent that the number of Euroamerican artifacts increased over time. This trend is illustrated in the graph, figure 9.17. The proportion of Euroamerican manufactures in relation to Zuni manufactures also increased, indicating, I suggest, increased Zuni involvement in the United States market economy during the early twentieth century. The relative scarcity of

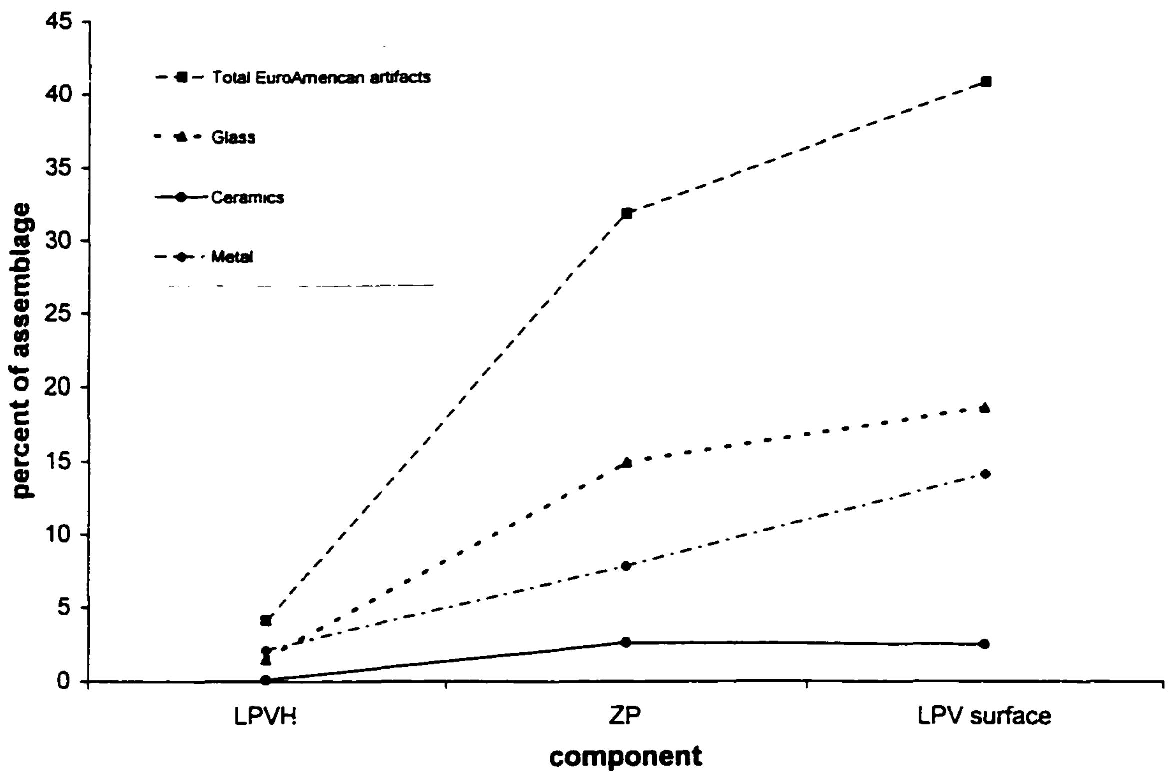


Figure 9.17. Change over time in the percentages of Euroamerican imports in archaeological deposits from Lower Pescado Village and Zuni Pueblo.

Euroamerican artifacts from excavated contexts at Lower Pescado Village, however, indicates that this increased involvement occurred relatively late, more than half a century after the initial American occupation of the Zuni area.

Stratigraphic evidence from the excavations at Lower Pescado Village also support a late date for Zuni involvement in the market economy, despite ethnohistoric accounts of trade in grain early during the American occupation. The histogram, figure 9.18, shows the kinds of excavation contexts at Lower Pescado Village which yielded Euroamerican imports. More than one-half of the Euroamerican artifacts found at Lower Pescado (N=377) were recovered from the top ten centimeters of excavation, from deposits that had accumulated either late in

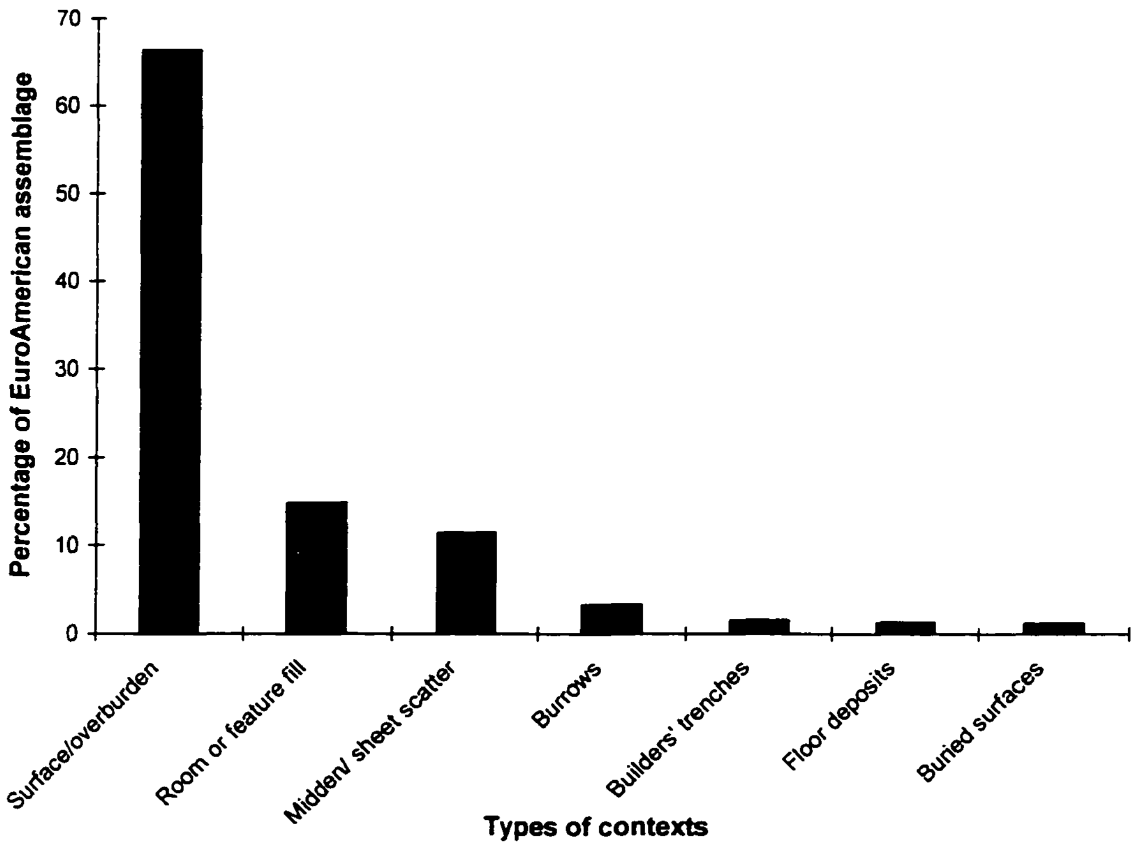


Figure 9.17. Distribution of Euroamerican manufactures by context type, Lower Pescado Village.

the occupation of the village or after the site had been "abandoned." Very few Euroamerican artifacts were recovered from contexts that are thought to be early in the occupation of the farming village. Possible exceptions included window and bottle glass and unidentifiable metal fragments found on the lower room floor in Excavation Unit 9 (stratum 9E), and in two early midden levels from Excavation Unit 7 (strata 7G and 7H).

The distribution of dated bottle glass fragments from the site, listed in table 9.13, corroborated the stratigraphic evidence, as did dates on other historic artifacts. Not all bottle

Table 9.13. Dates and Contexts of Bottle Glass from Lower Pescado Village.

Color	Dates	Frequency	Percent	Contexts
dark green	1815-1885	3	1.4	midden
brown	1880-present	56	26.8	overburden, ground surface; road
"flint"	1930-present	132	63.2	overburden, ground surface; road; builders' trench; midden

Note: Sources for dating glass are McKearin and McKearin (1941) and Riley (1958).

glass from Lower Pescado could be dated by color or the manufacturing range was too wide to be useful, thus there was a discrepancy between the total number of glass fragments and the number of fragments that appear on table 9.13. Three fragments of very dark green bottle glass, probably from the same vessel, were found in stratum 7H, the lowest level of the historic midden; these were the only nineteenth-century glass artifacts recovered. Barbed wire and wire nails found at the site were made after 1880, as were all of the identifiable Euroamerican ceramics with one possible exception. A sherd of blue-on-white earthenware, possibly pearlware was recovered from the uppermost level of Unit 5, an area of sheet scatter; this ceramic type was manufactured during the late eighteenth and early nineteenth centuries.

Although a greater proportion of Euroamerican goods were present in the material from the waterline survey at Zuni Pueblo, it is likely that most of these artifacts were late. Seventy-nine datable bottle bases were recovered from the monitoring; of these, only 5 (6.3%) yielded dates before 1930. Obviously American consumer goods were relatively uncommon at Zuni until the turn of the twentieth century, although it is not clear whether this was by choice or by lack of availability. While Euroamerican material culture was not prevalent during the late nineteenth and early twentieth centuries, the frequency of Euroamerican artifacts, and probably the impact of the Euroamerican market system, was increasing over this period. It would seem from this small data set and from the ceramic evidence noted above that the late nineteenth century saw the beginning of a period of replacement in material culture, during which Zuni became increasingly involved in the market economy. However, it should be emphasized that the bulk of the material culture recovered from these archaeological deposits consisted of Zuni manufactures.

Based on the data from Lower Pescado Village and Zuni Pueblo, replacement occurred more readily in certain areas of Zuni material culture. More than 90% of the Euroamerican material from Lower Pescado Village consisted of metal and glass artifacts. In the collections from Zuni Pueblo and Lower Pescado Village, Euroamerican ceramics represented a very small percentage of imports, although the ethnohistoric evidence and the declining densities of Zuni-made ceramics indicate that imported ceramics were becoming more common at Zuni by the early twentieth century.

Areas of impact on material culture

By the 1830s, Zuni metalsmiths were producing ornaments for trade made from the "yellow metal of old pots and pans" (Adair 1944:121; Walker 1974), and historic observers noted the presence of a forge at Zuni Pueblo in the 1850s (Mollhausen 1858; United States Senate 1853). Metalworking, an important Zuni craft in the late nineteenth century, was in place at least fifty years before; raw material consisted of recycled Euroamerican imports, explaining to some extent the scarcity of metal artifacts in the archaeological record.

Unidentified scraps of metal are among the earliest Euroamerican material excavated at Lower Pescado Village.

Although ethnohistoric accounts provide some insight on areas of Euroamerican impact on Zuni material culture, these accounts are not very detailed. Observers during the early part of the American Period were primarily concerned with collecting information on the topography and natural environment, while the ethnographers who wrote about Zuni during the later part of the century were more interested in recording aspects of "traditional" material culture than in documenting change. Despite this, a brief outline of material change during the second half of the nineteenth century can be compiled.

Ethnohistoric accounts suggest that three areas of Zuni life were affected in differing ways as Euroamerican goods began to replace Zuni goods. These were the material culture of domestic life (discussed above in reference to ceramic change), construction, and subsistence. According to the available ethnohistoric accounts and the archaeological evidence discussed above, change in construction techniques occurred relatively late in the nineteenth century. By the 1880s, introduced construction materials included the use of glass in windows, and doors "made with nails and secured by a chain" (Bloom 1936:116). The use of milled lumber, chisel-cut ashlar masonry and asphalt roofing tiles became popular during the twentieth century, according to Zuni oral history and other historic accounts (Holmes and Fowler 1980; Mills et al. 1982).

Recycling metal into tools, such as shears (Bloom 1936:120), kitchen utensils and food containers (Bloom 1936:111), may have been a common practice during the late nineteenth century. According to historic accounts, agriculture in the 1880s melded indigenous and introduced technologies and tools. John Bourke, one of the most thorough observers of Zuni material culture, described the contents of a storeroom at Nutria Village in 1883; Euroamerican tools housed there included shovels, hoes, pitchforks, picks, and axes (Bloom 1936:111). Plows, on the other hand, do not seem to have been common, perhaps because of the lack of draft animals (Kendrick (1947:178; Murphy 1967:32; United States Congress 1858:544). In 1880, Ealy reported that the Zuni had only one steel plow (Bender 1984:120). Perhaps a reason why introduced agricultural technology did not take hold at Zuni was that it was only introduced partially; for example, plows were provided but not draft animals for pulling those plows. Despite the introduction of metal farming tools, traditional tools such as digging sticks and hoes made from deer scapulae continued in use (Baxter 1882:88; Bloom 1936:121; Cushing 1974; Green 1979). Some accounts indicate that maize was cultivated by traditional means, while introduced tools and techniques were used for cultivating wheat. According to the journalist Edward Curtis, "the corn is planted by punching holes in the ground with a stick, and the wheat is sown by the same method that civilized [sic] farmers use" (Curtis 1883:79).

The ethnohistoric evidence points to a piecemeal incorporation of aspects of Euroamerican material culture. The archaeological data provide additional insight on areas of impact. Table 9.14 lists the frequencies of Euroamerican artifacts from Lower Pescado Village and Zuni Pueblo broken down into functional categories which are based on the work of Ferguson and Mills (1982:358-68), South (1977), and Ward et al. (1977:266-74).

Artifacts associated with domestic routine include vessels and implements used in food preparation, consumption, and storage and artifacts associated with household

Table 9.14. Functional Categories of Euroamerican Artifacts from Lower Pescado Village and Zuni Pueblo.

	Lower Pescado Village		Zuni Pueblo	
Functional category	Count	Percent	Count	Percent
domestic routine	317	47.5	1434	21.4
construction	75	11.2	749	11.2
subsistence	36	5.4	18	0.3
personal use	6	0.8	389	5.8
transportation	5	0.7	44	0.7
household equipment	4	0.6	33	0.5
unclassified/other	224	33.6	4043	60.3

Note: Data are from Ferguson and Mills (1982) and Rothschild and Dublin (1995).

maintenance. The category defined here includes artifacts that Ferguson and Mills placed in "foodstuffs" and "indulgences" (mostly tin cans and beverage containers). Most glass bottle fragments from the excavations at Lower Pescado Village could not be identified as to content, but were clearly designed to hold beverages rather than medicines. Rather than attempting to differentiate among fragments of vessels which were all designed for the storage of foods and beverages, I included all storage vessels in a single category which is more analogous to South's category of "kitchen equipment" (South 1977:167ff.) than to the categories used by Ferguson and Mills. Construction-related materials consisted mostly of window glass, but included some fragments of asphalt, roofing tile, milled lumber and nails. Subsistence-related artifacts included tools and hardware associated with farming and herding, gun parts and spent cartridges; barbed wire fragments comprised the largest part of this category. Personal items included clothing, jewelry, and small artifacts such as keys. Transportation related artifacts included horse tack, automobile and wagon parts, and containers used for motor oil and gasoline. Household equipment included writing and sewing materials as well as miscellaneous small household items such as mouse traps or clothes hangers.

A number of categories were present at Zuni Pueblo but not at Lower Pescado Village, in part because of the functional differences between the two settlements. These included artifacts related to utilities, reflecting the lack of electricity and running water at the farming village. Surprisingly, a number of artifact groups which would have been in daily use, such as medicine and tobacco-related artifacts and artifacts associated with recreation, were absent from the Lower Pescado assemblage. There were very few Euroamerican ceramics at either site, a pattern that Ferguson and Mills (1982) attribute to the strength of Zuni ceramic manufacturing traditions. Based on the Lower Pescado data and some ethnographic evidence discussed above, it is apparent that there was a decline in the production of some vessel types--notably cooking pots and eating bowls--but other ceramic traditions remained strong.

The highest percentage of Euroamerican artifacts from both sites consisted of glass bottles and tin cans that were related to food preparation and consumption. Not only are these kinds of containers very likely to enter the archaeological record in large numbers because of their fragility, but they were intended to be disposable. An increase in disposable material culture marked the entry of various groups into the Euroamerican market economy (Graham 1993; Kelley 1986), and it represents, in my opinion, a shift in attitudes toward material culture from an ethos of conservation to one of disposal.

Construction-related artifacts, mostly window glass, represented the second most common Euroamerican artifact category at both sites, a finding which is in accord with the ethnohistoric accounts. Window glass was recovered from some of the earliest historic contexts at Lower Pescado Village, including midden levels thought to date to about the 1880s and a room floor in Unit 9 that may date to the same time period.

Ferguson and Mills commented on the low number of Euroamerican artifacts related to subsistence that were recovered from the monitoring activities. They thought that, since the farming villages were important loci for many historic subsistence activities, a measure of the impact of Euroamerican farming and herding practices would be more readily assessed at these sites (Ferguson and Mills 1982:383). Although subsistence-related artifacts represent a higher proportion of Euroamerican material from Lower Pescado than they did at Zuni Pueblo, relatively few were recovered from the excavations. Tools and large pieces of equipment, even if broken, would be recycled and thus be less likely to appear in archaeological contexts than small, unusable and often unidentifiable fragments. Most identified subsistence related artifacts from the excavations at Lower Pescado Village were small fragments of barbed wire that attested to the importance of the village as a herding locality, spent cartridges, and small, broken pieces of hardware. Because reusable artifacts were probably curated or recycled, the archaeological record may not be a reliable source of information on more expensive artifact categories like machinery and hardware. The photographs, figure 9.19, show reused metal furniture and large farm equipment at Lower Pescado Village.

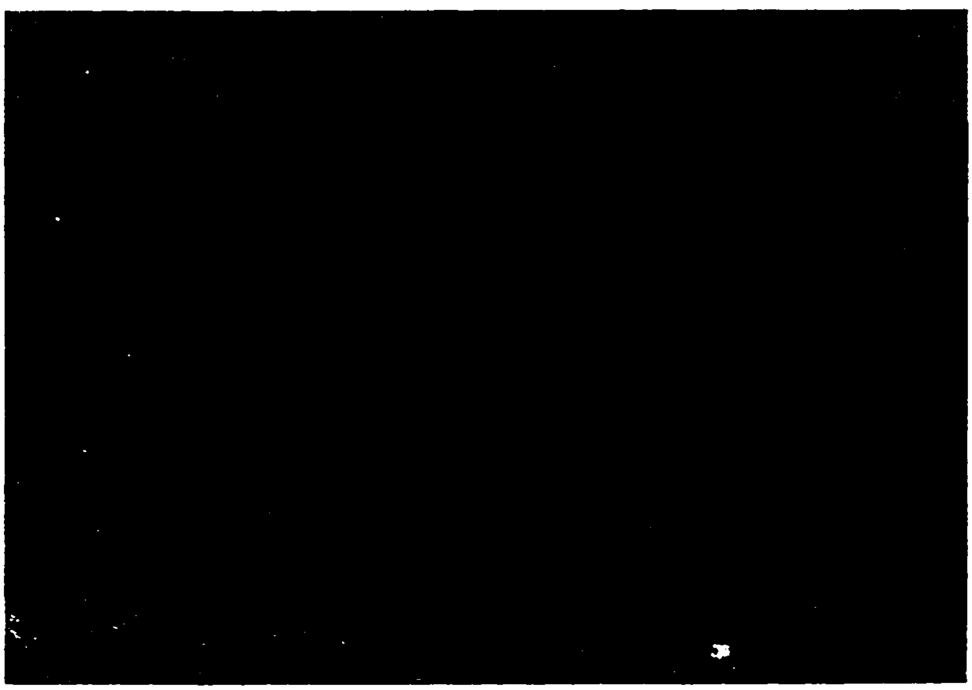


Figure 9.19. Large Euroamerican artifacts that were reused or stored at Lower Pescado Village. The top photograph shows unused farm equipment at the edge of a field, while the bottom picture shows part of an iron bedstead that was reused as a gate.

Although, as always, more data would be helpful in evaluating the impact of Euroamerican material culture at Zuni, some preliminary statements can be made based on the findings of this study. Although some cultigens and domestic animals had become important to the Zuni economy by the beginning of the American Period, Euroamerican manufactures were rare. The scarcity of these artifacts in late nineteenth century deposits at Lower Pescado Village suggests that expensive metal hardware, tools, and machinery were curated or recycled. The most common class of imported material--disposable glass bottles and metal cans-- was related to food storage and consumption and represented the beginning of a shift in attitude toward certain categories of material culture.

Chapter Summary and Conclusions

Material culture, objects that are part of the interface between humans and their environment (Wolf 1982:75), is "involved in exchanges of matter, energy, and information, ... [and thereby] facilitate[s] organizational needs" (Hodder 1986:144). Seen in this context, the linkage between material culture and the use of place is fairly clear. Artifacts and other residue of human occupation of a place define (in part) the relationship between the occupants and the physical location. Hodder (1986:10) also points out that material culture is used in "transforming and renegotiating" cultural traditions. This role of material culture is especially appropriate to this study, which posits that a primary difference in the use of place at Lower Pescado was temporal, related to the exigencies of the differing social landscapes of the fourteenth and nineteenth centuries.

In the chapter, I examined three classes of material culture--ceramics, faunal remains, and Euroamerican artifacts--that provide insights on differences in the use of Lower Pescado Village during the historic and prehistoric occupations. The use of a comparative collection from historic deposits at Zuni Pueblo highlighted differences in material culture that were associated with the role of a site in a settlement system. It was expected that the material culture inventory from the seasonal farming village would differ significantly from those of the fourteenth-century pueblo and of the historic pueblo in assemblage size and in the types of artifacts represented.

Ceramics were the most numerous artifact class recovered from both components at Lower Pescado Village and from historic deposits at Zuni Pueblo. The wide range of diversity in vessel forms, aspects of surface and rim treatments, and vessel size was considered to be functional, based on ethnohistoric accounts. Therefore differences in these attributes were expected to relate to differences in activities conducted at the sites from which they were recovered. Because ceramic production is an ancient and important traditional craft, ceramics might be expected to play an important role in maintaining Zuni identity in the face of "accultúrative" influences (see also Hardin 1983).

As anticipated, there were significant differences among the three ceramic assemblages that underscore functional and temporal distinctions among the three places. These add to our understanding of the material culture of limited-activity sites and of the process and nature of change in material culture after the European conquest. Some of the more important findings included differences in the sizes of the various assemblages, in ceramic diversity, and in the relative abundance of undecorated cookwares. The "impoverished" ceramic assemblage from the farming village at Lower Pescado was seen to be typical of a small temporary settlement where pottery (and other items) were removed at the end of each season. Ethnographic Zuni pottery collections indicate that there were a wide variety of Zuni vessel forms, each associated with a particular set of activities. That very few of these were represented in the ceramic assemblage from the farming village may reflect the limited range of activities at the farming village. In these respects, the role of a specific site in a settlement system appeared to have had relevance in structuring the ceramic assemblage.

Differences in the distribution of cookwares and in cookware vessel sizes also appear to be related to site function. The comparative abundance of sherds from cookwares at Zuni Pueblo (as opposed to historic deposits at Lower Pescado Village) is a particularly interesting finding that may reflect the use of these ceramics in a ceremonial context at the main pueblo. Very large Blackware pots that are ethnographically associated with ceremonial activities were not found in historic contexts at Lower Pescado Village, although very large corrugated pots were recovered from prehistoric contexts. Most likely, ceremonial or communal activities that included meals did not take place at the farming village, again indicative of the limited range of activities at the village.

Differences between ceramics recovered from the prehistoric and historic deposits at Lower Pescado Village include the addition of two vessel types--stew or soup bowls and dough bowls--associated with post-Conquest change in foodways. These data, the changing context of Zuni Blackwares during the late nineteenth century, and the faunal data provide interesting perspectives on the nature of historic change at Zuni. First, change was selective and occurred over a lengthy period of time. Stew bowls, thought to be associated with the addition of mutton soups and stews to the Puebloan diet, were recovered from very early historic deposits at Hawikku. Dough bowls, used in the preparation of wheat bread, began to appear at Puebloan sites in the 1830s and 1840s. If we consider the ceramics indirect evidence of the incorporation of the imported foodstuffs, there was an interval of almost three centuries between the Spanish *entrada* and the incorporation of wheat into the regular diet.

Second, change was additive, in the sense that introduced foods were added onto an existing Zuni repertoire and incorporated via Zuni material culture--in this case new Zuni vessel types. In these situations, Zuni material culture was used to renegotiate cultural traditions in the face of change, in keeping with Hodder's ideas on the dynamic role of material culture cited above. The Zuni Blackware data, although inconclusive, strongly suggest that in this case also, the retention of an element of traditional material culture was associated with negotiating change, the replacement of Zuni ceramic cooking pots with imported metal pots.

Most Euroamerican artifacts, the kind of material that is often used in assessing "acculturative" change, did not appear in archaeological contexts until quite late in the nineteenth century and then only in limited functional settings, according to the evidence from Lower Pescado Village and Zuni Pueblo. The increasing number of Euroamerican artifacts and the changing distribution of Zuni manufactures during the late nineteenth and early twentieth centuries document the beginning of a shift from additive to replacive change in some areas of Zuni life, notably construction and domestic routine. By the end of the nineteenth century, metal hardware and milled lumber were being used in Zuni construction; like ceramics, however, these introduced technologies were incorporated within a Zuni tradition of vernacular architecture. Glass and metal food containers were among the most common classes of Euroamerican material culture found at Lower Pescado Village and at Zuni Pueblo. They represent not only an increased reliance on purchased foods, but also a subtle shift in perspective from reusable to disposable material culture, one which seems to be associated with the introduction of a market economy.

At Lower Pescado Village, an appreciation of historic change required an understanding of the entire assemblage, including Zuni manufactures as well as Euroamerican. The process of material culture change that was revealed at this small site indicates that processes of "acculturative" change are very complex and lengthy, and that areas of stability or persistence will often remain.

CHAPTER 10

CONCLUSION

Introduction

The chapter presents a summary of the research, discusses several themes that unify the archaeology and ethnohistory of Lower Pescado Village, and lists some directions for future research. The basic idea that structures the dissertation is the "use of place," specifically the elucidation of differences in how a place is constructed and reconstructed in two very different time periods and sets of circumstances.

The nineteenth-century use of Lower Pescado Village rests on the social, economic, and geopolitical conditions of the mid-nineteenth century, but it also builds on the Zuni past as expressed in the underlying fourteenth-century aggregated pueblo. My emphasis on the nineteenth-century farming village allowed the exploration of the role of places and landscapes along a colonial frontier. This in turn revealed areas of stability and change in Zuni settlement patterns and material culture, the residue of past Zuni decision-making. Change tended to be gradual and additive, whereby introduced elements were grafted onto a persistent and innately conservative native tradition visible in the architecture and material culture. By the early twentieth century, replacement had occurred in some domains of material culture, especially construction and domestic routine. Stability was expressed in the retention of traditional categories of material culture, and also in the creative reuse of recycled artifacts, materials, and landscapes.

Summary of Chapters

The overview of Zuni culture history presented in chapter 3 provided a historical perspective for the research on Lower Pescado Village. Among the features that characterized a millenium of Zuni history in this area of western New Mexico were ethnic continuity and a flexible settlement organization that enabled Zuni ancestors to persevere in a demanding environment. Mobility, expressed in short site occupations and the use of limited-activity sites, was a feature of settlement patterns during the fourteenth century and earlier, though apparently not during the Protohistoric Period (Kintigh 1985:103-17).

Residential mobility in the form of refuge sites, sheep camps, and farming villages became a settlement strategy that reappeared at Zuni and other pueblos after the Pueblo Revolt. Founded after a long period of demographic decline, these places were not related to population pressure on resources, but rather to the protection of people and resources, especially prime agricultural and pastoral land. In contrast to pueblos, satellite villages were economically oriented, politically subordinate to a pueblo, and often occupied for only a portion of the year (Holmes and Fowler 1980; Nagata 1970).

Research for the dissertation explored the use of satellite villages on a regional level as part of the Zuni settlement system, and on a site level as exemplified by the nineteenth-century river valley farming village of Lower Pescado. Analyses and interpretations were based on the integration of archaeological data from Lower Pescado Village, historic documents, and ethnographies written during the late nineteenth and early twentieth centuries. The regional analysis (chapters 5 and 6) provided a perspective on the larger aspects of historical ecology, land use and sociopolitical relations along the colonial front, while the data from Lower Pescado (chapters 7 through 9) supplied detailed information on the specific use (and reuse) of place in the contested landscape of the late nineteenth century.

Two shifts in Zuni settlement patterns after the Pueblo Revolt effected successive changes in the settlement landscape that involved new uses for various kinds of land. Satellite villages during the eighteenth century were associated with sheep pastoralism, introduced by the Spaniards but perhaps not a major part of Zuni subsistence organization until after the Pueblo Revolt, and the cultivation of tree fruits, also a European introduction. In the mid-nineteenth century, the use of large satellite villages adjacent to valuable springs may have been associated with a commitment to wheat agriculture, feasible only in areas with a permanent and abundant source of water for *acequia* irrigation. Climatological data indicate that this second shift occurred during a period of favorable precipitation and arroyo-filling. Differences in the locations and sizes of the satellite villages can be attributed in part to changing relations of production associated with these introduced subsistence regimens.

Economic change during the eighteenth and nineteenth centuries entailed a series of decisions. According to the available evidence, the incorporation of introduced species and productive regimes at Zuni occurred over a lengthy period. Since introduced elements of production were superimposed on an existing Zuni subsistence regime centered on maize agriculture, incorporation was probably based on the complexity of land, labor and production requirements for introduced species. It is significant that the earliest-appearing cultigens at Zuni sites were those with relatively simple cultivation requirements or cultivation requirements that were similar to existing Zuni crops.

The increasingly complex social landscape of the Historic Period appears to have shaped the settlement landscape in different ways, several of which were explored using documentary records. It has been suggested that conflict, which is endemic in many colonial settings, provided a catalyst for settlement change. There is some evidence for conflict within the pueblo, expressed as factionalism and related in part to policies regarding Athapaskans, Spaniards, and Americans. Seasonal dispersion might have acted to alleviate internal stress and overcrowding at the newly consolidated pueblo (White 1942). The hidden locations and isolated, closed aspects of the room blocks at some of the eighteenth-century satellite sites suggest that "social distancing" may have been a factor in the settings and layouts of these early villages. Defense was undoubtedly also a factor; as Ferguson (1993) pointed out, these villages were "difficult to get to, and difficult to get around in."

The nineteenth-century satellite villages of Lower Pescado and Upper Nutria were structured quite differently than the earlier sites, with well-defined boundaries between interior and exterior space and clustered residential room blocks. By this time, the maintenance of social distance was apparently not a factor in defining residential space, although the protection of resources from raiding parties continued to structure aspects of the use of space at satellite villages, as it did at Zuni Pueblo (Ferguson 1993). Research on Zuni foreign policy and diplomacy during the early years of the American Period was particularly informative, depicting a people who were skilled at maintaining a balance of power during a contentious era.

Other aspects of the nineteenth-century social landscape that were instrumental in the development and expansion of the river valley farming villages were the construction of a string of American forts along the boundaries of Navajo and Apache territory and infilling as non-Zuni settlers established ranches and farmsteads along the edges of the Zuni settlement area after the 1860s. The American military presence is thought to have opened a market for grain and forage that stimulated wheat cultivation at the Zuni farming villages. Locational analysis, botanical evidence, and anecdotal accounts provide some support for the premise that Lower Pescado Village, in any case, expanded in response to a developing market for wheat. Military records, however, do not specify the extent or duration of this market. It would appear that, while there was a small market for Zuni wheat during the early years of the American occupation, the trade was relatively short-lived, dying out by the mid-1860s.

An expansion of Zuni wheat production during the 1850s may have initiated expansion of the spring-fed fields near the farming villages, but it does not explain the continued growth of the villages even after the grain market had collapsed. I have suggested that the villages formed a bulwark against non-Zuni encroachment into valuable farming and herding areas, ensuring Zuni use rights to vital resources, important springs and irrigable farm land. The villages of Lower Pescado and Upper Nutria (and to a lesser extent, Ojo Caliente) were located at "pressure points" along boundaries where encroachment was particularly severe. These two villages were built on fourteenth-century pueblos and reused elements of the ancient architecture, in this way invoking the ancestral past as well as the historic built environment to mark use rights to contested land. This premise is supported by additional lines of evidence, including ethnographic examples of architecture being employed to mark use rights at Zuni and features of the built environment at the villages. The Zuni place names for the villages emphasize the presence of ancient remains and major springs, as well as the importance of the land for farming.

The historic settlement landscape at Zuni developed as a result of decisions made in the context of a complex set of economic, social and political stimuli, and shifting priorities. The resulting construction of landscapes and places, including the relatively small satellite villages, therefore incorporated several layers of meaning (Basso 1996). For the nineteenth-century farming villages, these layers included the physiographic setting--the presence of an abundant and reliable water source, irrigable farm land, and good range land--and the multi-dimensional roles of the satellite villages in the Zuni settlement system. An additional layer of meaning was encoded in the cultural setting and the historical association of these areas with the Zuni past, which was tangible in the archaeological remains. These factors structured the use of space at the farming villages and are apparent in the comparison of the two components at Lower Pescado Village. The comparison between the fourteenth- and nineteenth-century sites also underscores the nature of historic stability and change at Zuni.

Excavation and survey data from Lower Pescado Village were used to compare the built environment, site structure, and material culture of the fourteenth- and nineteenth-century occupations. Differences between the two components were significant, reflecting differences between permanent sites and seasonal, limited activity sites as well as aspects of stability and change in Zuni material culture. A comparison of two historic assemblages, the collection from Lower Pescado Village and a collection from archaeological monitoring at Zuni Pueblo (Ferguson and Mills 1982), allowed me to isolate differences that were related to site type from differences that were related to time.

Architecturally, the farming village conformed to the vernacular Zuni building tradition of masonry room block construction, although the buildings were simpler and more informal than those at Zuni Pueblo and probably at the underlying fourteenth-century pueblo. Most of the rooms at Lower Pescado Village were one-storied, the room blocks were smaller than those at Zuni Pueblo, and interiors lacked embellishments such as stone floors and wall paintings. The reuse of older architectural and structural elements during the nineteenth century also included changes in the apparent functions of the features, a creative reuse that was in keeping with the change in the role of the site from pueblo to satellite village. A notable example was the reconstruction of the fourteenth-century perimeter wall, which served as a rear wall for a number of the historic room blocks and also to demarcate "inside" and "outside" space. The central plaza, which had presumably served as public ceremonial and social space during the fourteenth century, was used for corrals and a room block during the nineteenth century.

The reuse of the perimeter wall and the central plaza defined a formal layout that contrasted with the underlying, informal pattern of spatial organization revealed in the analysis of the site structure of the farming village. Site structural analysis uses artifact distributions and densities to ascertain how space is arranged and used at sites (Graham 1994). Expectations for the site structure of the seasonal satellite village were fulfilled in several ways. The use of space at the farming village was characterized by unbounded, overlapping activity areas, an "impoverished" material culture, and a lack of elaborate or expensive site furniture.

The ceramic and faunal assemblages from the two components at Lower Pescado Village underscored differences in how the site was used during the two occupations. Similarities and differences in the assemblages also denote material cultural changes over time, some of which are related to colonial or contact processes. The ceramic assemblage from the farming village is considerably smaller and less diverse than comparable assemblages from the fourteenth-century pueblo or from Zuni Pueblo. This is related to the role of the nineteenth-century site as a seasonal village, reflecting the transport of pottery and other household items between pueblo and satellite village, abandonment processes, and the narrower range of activities conducted at the farming village. Differences in the proportional representation of sherds from cookwares in the two nineteenth-century collections from Lower Pueblo Village and Zuni Pueblo may be indicative of different use contexts for these wares at the satellite and at the pueblo. There are ethnographic accounts of the use of large cooking vessels and plainware serving vessels for ceremonials; the smaller number of plainware sherds at Lower Pescado Village and the lack of very large cooking vessels may be a further indication of the limited range of activities at this satellite village. Size data on cookware rims from fourteenth-century deposits at Lower Pescado Village show a greater diversity in size, and the presence of very large cooking vessels.

The shift from additive to replacive processes of material culture change is apparent in the historic assemblage from Lower Pescado Village. Ceramic data from the farming village included two historic vessel types, the stew or soup bowl and the dough bowl, that are associated with introduced species and corroborate faunal and botanical evidence for sheep and wheat. The faunal remains from the fourteenth and nineteenth-century components at Lower Pescado Village underscore differences in the way the site was used during the two occupation periods. The fourteenth-century fauna consisted mostly of small mammals of the sort that would be taken in the vicinity of fields, while the nineteenth-century fauna included very high proportions of sheep bone, suggesting differences in scheduling and labor demands between the earlier agricultural pueblo and the later farming and herding village.

The replacement of articles of Zuni manufacture by Euroamerican-made items is seen in various domains of material culture, but on a relatively small scale and in stratigraphically late contexts. Most Euroamerican material recovered from Lower Pescado Village and Zuni Pueblo consisted of construction material and metal and glass containers for food. This latter indicates a subtle shift from reusable to disposable material culture as well as an increased reliance on purchased foodstuffs.

The excavation data from Lower Pescado Village are important in a number of ways. To some extent, they provide an "archaeological signature" of the site structure and material culture of a seasonal satellite village, which is a common site type in the Southwest (and other areas), but which is not well known archaeologically. The comparison of the two components provides a window on the distinctive use (and reuse) of a specific place that was connected by geography and ethnicity but separated by time and historical circumstances.

Directions for Future Research

The customary desire for clarification in certain areas emerged from this research. Some of my questions may be fruitfully addressed by a program of documentary and collections research, while others require additional archaeological research, subject to the approval and support of the Zuni people.

The nature and pace of economic change after the Spanish conquest is poorly understood. While the settlement pattern data and the fragmentary faunal and botanical record from the Zuni area indicate that European species were incorporated gradually into Zuni subsistence and productive regimes, this crucial question has not been systematically investigated. To what extent did the Spaniards monopolize certain means of production such as domestic animals? An answer to this question would provide new insights on the nature of colonial relations in this area. Data from other areas of the Americas indicate that selectivity characterized economic decision-making on the part of many indigenous peoples and that change was often gradual and additive.

The faunal collection from Lower Pescado Village has the potential to provide additional information on animal husbandry at Zuni during the late nineteenth century as well as details of the Zuni incorporation of introduced domestic animals. A potential area for research is a comparison of butchering techniques and skeletal elements on domestic and hunted animals. Similarities in butchering and the use of specific cuts of meat on indigenous hunted and imported domestic species might indicate the integration of introduced domesticates in traditional Zuni categories, seen in other areas of material change. The analyses of historic fauna from Lower Pescado Village (Etnier 1997) and Zuni Pueblo (Ferguson and Mills 1982:390-428) provide a good beginning, but more work is needed.

Sheep pastoralism at Zuni was associated with significant shifts in settlement and mobility patterns; in other areas of the American Southwest, pastoralism has also been associated with significant social change, including the onset of ranking (Kelley 1986). Integrated documentary and archaeological research on historic transitions to pastoralism in this area should provide insights on the organization of pastoralism and the relationship between economic and social change. In this context, excavation or survey at the eighteenth-century Zuni satellite villages would be useful.

Although it has been suggested that Zuni participation in the American grain trade was a catalyst for expansion, the data on the extent of this trade are inconclusive, in my estimation. This is an important question, not only because it has been linked to Zuni expansion, but also because it may signal Zuni involvement in a nascent market economy at the very onset of the American occupation. While the anecdotal evidence suggests that this trade was not inconsiderable, there is no record of large purchases of grain from Zuni in the accounts of the Quartermaster General, nor is there an indication in the archaeological record of increased wealth or even an increased frequency of imports that might accrue from this trade. Research on the extent and conduct of trade, with the Americans, but also with Mexicans and Athapaskans, would be a valuable addition to the literature on nineteenth-century frontier relationships in this area.

Additional research on the roles of small, seasonal sites in settlement systems and in settlement system change (Preucel 1988) would be helpful in furthering our understanding of this relatively common site type. Continued research on abandonment processes at the Zuni farming villages (Rothschild et al. 1993) may provide additional insight. Farming villages were founded at many pueblos during the eighteenth and nineteenth centuries. In every instance but Zuni, these villages have become permanent settlements, replacing the central pueblo, which was then used as a part-time "ceremonial center." At Zuni, on the other hand, Zuni Pueblo remains the central settlement, while the farming villages are used on a daily or sporadic basis. An elucidation of the dynamics behind these differing trajectories might help us better understand how settlement sytems change.

The excavation data from Lower Pescado Village have not been used to their full potential. As noted in the introductory chapter, the excavations at Lower Pescado Village, which represented only a small sample of the total site area, produced significant information on two time periods, the fourteenth and nineteenth centuries, and two different kinds of sites. While this research centered on the nineteenth-century occupation, more remains to be done on the fourteenth-century component. One area of potential interest might be the comparison of Lower Pescado Village with the nearby fourteenth-century site of Heshota utla, excavated by Keith Kintigh (Stone 1991).

Thematic Summary

Themes that unify this research include the complexity of the frontier social landscape, residential mobility as an adaptive strategy in this kind of setting, and stability and change in the Zuni settlement landscape and material culture. These themes are expressed on both regional and local levels.

Western New Mexico during the eighteenth and nineteenth centuries, the study period of this research, would be characterized as a frontier landscape in the sense that Forbes (1968) has defined. Complex interactions among Puebloans, Athapaskans, and Euroamericans were expressed in the form of conflict over land and resources, diplomacy, trade, and an interchange of information and ideas. The location of the Zuni settlement area, between the "hammer and anvil" of Navajo and Apache territories (Reeve 1971:249) placed Zuni at the geographic center of the conflict between the Athapaskans and the United States government after 1846. By the 1870s, settlers saw the large Zuni use area as essentially "empty land" available for ranching and timbering; the arrival of the railroad in the 1880s hastened infilling of the area and the encroachment onto Zuni lands. The historic record indicates that the Zuni were active participants in this dynamic social landscape, negotiating relationships with Navajos, Apaches, and Euroamericans in an effort to protect Zuni people, land, and resources and presumably to maintain the Zuni way of life.

The Zuni settlement landscape reflects a balance of stability and change, maintaining traditional and conservative elements, while responding to the needs of this complex and dynamic social landscape. Political unity was expressed in and reinforced by the continuance of a central pueblo with strong religious and symbolic associations; through the Historic Period, political authority remained centralized at this ancient pueblo. The reorganization of the settlement landscape was achieved by the establishment of seasonal sites in areas of farm or range land. To some extent, this involved a restructuring of the land and resource base to accommodate the addition of new means and modes of production--for instance, grasslands for pasture, sandy slopes for orchards, springs to provide water for *acequias*--while maize agriculture continued as a mainstay of the Zuni economy. In this settlement landscape of pueblo and satellite village, residential mobility was a political and an economic strategy.

By the mid-nineteenth century, the expression of residential mobility had shifted to accommodate new conditions, which may have included production for market. By the late nineteenth century, the presence of relatively large farming villages associated with ancestral landscapes served to mark use rights to valuable resources during a period of non-Zuni encroachment into the Zuni area. The historic reorganization of the Zuni settlement landscape was adaptive and multi-dimensional, accommodating many social, economic, and political needs.

In the architecture, use of space and material culture, the satellite farming village of Lower Pescado was qualitatively different from the underlying fourteenth-century pueblo, less formal and more "utilitarian." The archaeological record presents a rather complex picture of stability and change in the material culture of the farming village. The association of the village with elements of economic innovation was evident in the faunal, botanical, and ceramic assemblages, and an important traditional architectural feature, the central plaza, was reused to accommodate corral complexes. The replacement of items of Zuni manufacture by Euroamerican imports, however, was rare and late, and often incorporated within Zuni material culture complexes. Many core areas of traditional material culture remained intact or little changed. The role of material culture in social reproduction and in the renegotiation of cultural traditions (Hodder 1986:144) is evident in the integration of introduced material culture within traditional material categories, such as the vernacular architecture.

Although there have been elements of change in traditional Zuni material culture and significant change in the Zuni land base, I think that the maintenance of a core settlement landscape with its constituent places and resources has been important in Zuni identity and survival. This was accomplished by a flexible settlement strategy that allowed for the incorporation of new ideas while maintaining a core concept of Zuni places and landscapes. In some ways this may have been expressed in the pragmatic reuse of ancestral places and architectural elements that is apparent at Lower Pescado Village. Perhaps the most important invocation of Zuni continuity, however, is the continuity of Zuni Pueblo as the Middle Place of the Zuni people.

The dissertation contributes to a growing literature on historical landscapes, residential mobility and post-Contact stability and change. Research at Lower Pescado Village suggests that the role of small sites in settlement systems may be strategically and politically significant as well as important for resource exploitation. Along a contested colonial frontier, the strategic importance of places becomes significant in the maintenance not only of a land base and valuable resources but also political integrity and identity (Morphy 1996; Spicer 1968).

APPENDIX A.

Northwestern Colorado Plateau Precipitation and Drought Severity Indices (PDSI) A.D.1540-1969.

Year	Precipitation (inches) Oct-Sept	PDSI July	Year	Precipitation (inches) Oct-Sept	PDSI July	Year	Precipitation (inches) Oct-Sept	PDSI July
1540	11.67	0.23	1591	10.28	0.13	1642	9.14	-1.76
1541	10.43	-1.17	1592	8.49	-3.77	1643	10.35	-0.68
1542	6.76	-5.13	1593	7.72	-3.58	1644	10.05	-0.48
1543	11.78	0.92	1594	12.38	1.56	1645	8.47	-2.3
1544	9.51	-1.2	1595	10.54	-0.82	1646	11.62	1.32
1545	8.57	-1.99	1596	11.6	-0.56	1647	11.06	0.64
1546	9.27	-1.01	1597	10.59	-1.89	1648	8.37	-2.92
1547	9.54	-2.01	1598	8.11	-3.06	1649	10.77	0.04
1548	9.32	-1.16	1599	11.39	0.78	1650	10.11	0.16
1549	9.57	0.61	1600	7.56	-4.28	1651	12.28	2.39
1550	11.2	74	1601	9.26	-0.39	1652	10.3	-1.44
1551	8.69	-1.92	1602	9.81	-1.55	1653	10.08	0.12
1552	9.66	-1.31	1603	10.56	-0.54	1654	8.23	-4.38
1553	11.04	0.29	1604	9.86	-1.21	1655	11.98	2.32
1554	8.95	-3.49	1605	11.08	1.19	1656	10.04	0.14
1555	10.83	-0.24	1606	9.74	-1.16	1657	8.12	-3.92
1556	11.12	1.96	1607	9.26	-2.03	1658	8.59	-3.11
1557	11.02	1.01	1608	10.92	1.36	1659	9.26	-1.11
1558	9.56	-1.05	1609	11.03	0.87	1660	10.94	0.61
1559.0	9.74	-1.43	1610	12.9	2.51	1661	10.02	-1.88
1560	8.28	-1.6	1611	11.51	0.91	1662	10.13	-1.48
1561	8.69	-3.48	1612	10.29	-1.15	1663	9.61	-1.53
1562	7.95	-2.91	1613	10.95	0.11	1664	7.41	-4.04
1563	10.04	0.21	1614	9.58	-1.16	1665	11	1.32
1564	10.07	-0.19	1615	10.23	-0.09	1666	8.54	-2.62
1565	11.26	1.37	1616	9.34	-0.52	1667	7.91	-3.84
1566	8.95	-2.69	1617	11.82	2.49	1668	8.23	-3.5
1567	8.43	-3.11	1618	11.72	1.83	1669	9	-1.7
1568	9.92	-0.6	1619	8.81	-3.29	1670	8.64	-2.71
1569	10.78	-0.72	1620	11.78	2.41	1671	9.85	-0.62
1570	11.06	0.95	1621	11.97	2.04	1672	10	-0.4
1571	9.64	-0.48	1622	9.47	-1.92	1673	11	1.07
1572	10.65	-0.02	1623	9.17	-3.61	1674	10.34	-0.08
1573	6.64	-5.14	1624	8.24	-2.84	1675	10.01	-0.13
1574	9.66	-1.63	1625	8.2	-2.75	1676	7.79	-3.77
1575	9.33	-2.04	1626	8.88	-2.84	1677	9.76	-1.35
1576	8.45	-2.89	1627	11.49	1.5	1678	9.67	-0.64
1577	11.34	-0.35	1628	8.8	-1.7	1679	9.47	-1.99
1578	8.97	-2.27	1629	11.42	0.59	1680	11.67	1.4
1579	6.94	-4.42	1630	10.64	0.21	1681	9.42	-0.38
1580	7.58	-3.39	1631	9.04	-2.15	1682	10.29	0.04
1581	8.94	-2.27	1632	8.29	-4.12	1683	11.04	1.04
1582	8.39	-3.36	1633	10.98	1.11	1684	7.69	-4.52
1583	7.38	-4.03	1634	10.6	-0.26	1685	6.46	-5.69
1584	8.12	-4.21	1635	10.74	0.6	1686	10.72	0.44
1585	7.14	-4.76	1636	9.5	-3.18	1687	10.08	-0.77
1586	10.27	-0.37	1637	9.38	-2.53	1688	10.01	-0.2
1587	8.55	-3.14	1638	8.27	-2.35	1689	11.84	1.13
1588	10.43	0.15	1639	10.85	-0.25	1690	10.54	0.68
1589	9.76	-2.14	1640	10.95	0.73	1691	9.58	-1.1
1590	7.5	-4.17	1641	9.42	-0.19	1692	12.15	2.24

Year	Precipitation (inches)	PDSI	Year	Precipitation (inches)	PDSI	Year	Precipitation (inches)	PDSI
1693	10.28	0	1748	5.81	-7.01	1803	9.34	-2.47
1694	9.34	-2.14	1749	12.96	3.76	1804	10.53	1.15
1695	10.33	-0.52	1750	8.72	-2.37	1805	8.45	-3.73
1696	7.59	-3.79	1751	10.42	-1.5	1806	7.34	-3.93
1697	10.63	0.42	1752	7.86	-3.58	1807	11.27	1.01
1698	9.31	-0.78	1753	9.96	-2.13	1808	9.22	-2.13
1699	12.02	3.14	1754	11.22	0.02	1809	9.49	-0.87
1700	9.25	-1.42	1755	8.69	-3.61	1810	9.48	-2.05
1701	11.93	2.68	1756	8.55	-2.9	1811	10.29	-0.19
1702	8.83	-2.36	1757	8.5	-2.04	1812	9.06	-1.59
1703	10.07	-1.02	1758	10.39	-0.42	1813	9.16	-2.48
1704	8.36	-3.04	1759	10.56	0.39	1814	9.82	0.06
1705	9.96	0.78	1760	9.25	-1.45	1815	11.66	2.19
1706	11.95	2.58	1761	10.62	-1.09	1816	13.38	4.99
1707	8.1	-4.25	1762	10.96	-0.05	1817	11.02	1.25
1708	10.26	-1.12	1763	8.04	-2.28	1818	7.23	-5.4
1709	9.39	-0.67	1764	11.46	0.92	1819	7.49	-4.54
1710	12.19	2.44	1765	9.25	-2.3	1820	9.34	-2.96
1711	9.45	-0.61	1766	11.53	1.89	1821	11.24	1.41
1712	11.05	0.74	1767	9.39	-3.05	1822	6.92	-4.16
1713	9.47	-2.72	1768	11.21	0.83	1823	8.24	-3.43
1714	8.6	-1.81	1769	10.25	-0.46	1824	9.08	-2.25
1715	9.48	-0.75	1770	10.93	-0.4	1825	10.19	-0.68
1716	7.89	-3.52	1771	12.96	3.35	1826	9.56	-1.09
1717	9.95	-1.43	1772	10.29	-0.09	1827	9.1	-2.81
1718	10.74	0.85	1773	6.74	-5.22	1828	12.12	2.18
1719	8.81	-1.06	1774	9.92	-0.51	1829	8.68	-3.41
1720	13.26	5.11	1775	9.45	-1.47	1830	10.57	0.21
1721	10	-1.99	1776	9.8	-0.97	1831	9.53	-1.17
1722	9.48	-2.29	1777	8.53	-3.2	1832	10.23	-0.04
1723	11.16	0.98	1778	9.9	-1.34	1833	11.17	0.72
1724	8.7	-4.1	1779	8.58	-2.26	1834	10.59	-1.09
1725	11.49	3.12	1780	7.59	-4.26	1835	10.43	0.47
1726	11.83	1.75	1781	9.8	-0.49	1836	9.85	0.35
1727	10	-0.87	1782	8.19	-4.11	1837	11.02	0.04
1728	8.65	-3.09	1783	11.49	2	1838	11.77	2.19
1729	6.58	-5.79	1784	11.91	1.47	1839	12.95	3.04
1730	9.86	-0.26	1785	9.26	-1.89	1840	12.81	3.15
1731	9.77	-1.3	1786	8.84	-1.97	1841	11.34	0.24
1732	10.52	0.31	1787	11.36	0.76	1842	8.08	-3.44
1733	8.18	-3.37	1788	8.46	-3.6	1843	10.05	-0.92
1734	10.77	0.53	1789	8.98	-1.65	1844	11.06	1.12
1735	7.48	-4.69	1790	9.84	-1.78	1845	8.49	-3.51
1736	10.24	-0.23	1791	11.4	1.65	1846	10.13	-0.64
1737	8.09	-2.31	1792	11.11	0.78	1847	6.68	-6.12
1738	9.27	-0.89	1793	13.05	3.6	1848	10.72	1.28
1739	8.05	-2.63	1794	9.26	-2.16	1849	11.66	0.85
1740	9.34	-1.69	1795	9.9	-1.28	1850	10.36	0.53
1741	9.7	-0.94	1796	9.1	-1.68	1851	7.26	-4.4
1742	9.26	-1.83	1797	9.29	-1.16	1852	11.82	2.89
1743	11.59	1.93	1798	10.26	-1.12	1853	9.72	-0.82
1744	9.21	-1.96	1799	10.15	-0.51	1854	9.86	-1.3
1745	11.99	2.47	1800	10.06	-1.18	1855	11.08	0.63
1746	12.85	3.2	1801	8.81	-1.83	1856	10.71	-0.33
1747	12.69	2.73	1802	10.12	-0.29	1857	9.88	-2.18

Year	Precipitation (inches)	PDSI
1858	11.06	1.03
1859	8.1	-3.1
1860	10.56	0.52
1861	6.36	-6.46
1862	10.42	1.41
1863	9.41	-1.85
1864	7.65	-4.6
1865	10.56	-0.1
1866	11.34	0.55
1867	11.54	1.5
1868	12.28	2.59
1869	11.76	1.38
1870	8.33	3.66
1871	8.7	-4.02
1872	9.54	-2.89
1873	8.85	-2.46
1874	10.1	-0.52
1875	9.36	-1.96
1876	8.29	-4.09
1877	11.67	2.04
1878	8.62	-2.1
1879	8.8	-3.35
1880	7.38	-3.51
1881	9.09	-2.47
1882	10.38	-0.93
1883	8.51	-2.5
1884	10.54	-0.09
1885	10.82	0.33
1886	9.72	-1.35
1887	9.66	-2.87
1888	11.48	2.25
1889	9.53	0.8
1890	9.02	-0.62
1891	11.15	1.55
1892	8.94	-2.19
1893	8.1	-3.64
1894	8.2	-3.52
1895	10.6	0.42
1896	7.17	-5.37
1897	11.4	0.96
1898	9.65	0.66
1899	6.53	-6.32
1900	8.33	-3.32
1901	10.04	-0.4
1902	7.59	-5.66
1903	9.79	0.49
1904	6.7	-6.35
1905	12	2.63
1906	10.67	1.81
1907	12.2	2.65
1908	10.94	1.51
1909	9.24	0.52
1910	8.97	-0.63
1911	11.86	2.97
1912	11.18	0.79
1913	8.55	-3.2
1914	12.08	2.95
1915	11.75	2.9
1916	12.35	3.32
1917	10.11	1.11
1918	8.61	-2.83
1919	12.55	2.52
1920	12.86	3.53
1921	10.55	-0.07
1922	9.49	-0.23
1923	8.89	-2.54
1924	10.81	1.53
1925	7.49	-3.18
1926	12.25	2.84
1927	9.9	0.1
1928	9.57	-2.21
1929	9.46	-1.41
1930	10.35	-0.53
1931	9.45	-2.66
1932	12.27	1.74
1933	9.29	-2.09
1934	8.23	-3.48
1935	11.27	0.99
1936	9.4	-1.65
1937	11.63	1.59
1938	9.61	-0.27
1939	9.25	-1.83
1940	10.25	-0.9
1941	12.75	3.84
1942	11.32	0.63
1943	9.83	-2.08
1944	10.43	-0.39
1945	10.29	-0.18
1946	7.68	-4.36
1947	10.09	0.43
1948	10.92	0.76
1949	11.79	2.13
1950	7.03	-4.03
1951	6.71	-5.6
1952	10.74	2.07
1953	7.82	-3.03
1954	8.94	-2.04
1955	8.04	-2.68
1956	7.74	-3.67
1957	9.45	0.14
1958	10.54	-0.47
1959	8.01	-4.85
1960	10.77	0.11
1961	8.86	-2.38
1962	9.66	-0.4
1963	9.07	-2.09
1964	8.8	-1.99
1965	11.71	2.59
1966	8.95	-1.53
1967	8.17	-2.51
1968	10.87	0.01
1969	10.24	-1.15

APPENDIX B
TREE-RING DATES ON STRUCTURAL WOOD FROM LOWER PESCADO VILLAGE

Source: The Laboratory of Tree-Ring Research
The University of Arizona
Tucson, AZ

Zuni Farming Villages - reported 25 April 1990 - Accession 888

	PROVENIENCE	TRL NO	FIELD	SPEC	INNER	SYM	OUTER	SYM
1	Lower Pescado, Structure 2	ZUN-1279	89-209	PP	1619	p	1807	vv
		ZUN-1278	89-208	PP	1710		1839	vv
		ZUN-1280	89-210	DF	1855		1929	vv
		ZUN-1281	89-211	DF	1876		1931	vv
						Count:	4	
2	Lower Pescado, Structure 5	ZUN-1275	89-184	PP	1795	p	1893	vv
		ZUN-1276	89-185	PP	1823		1894	vv
		ZUN-1274	89-183	PP	1800	p	1894	vv
						Count:	3	
3	Lower Pescado, Structure 6	ZUN-1277	89-186	PP	1654	p	1891	vv
						Count:	1	
4	Lower Nutria, Structure 1	ZUN-1290	89-194	DF	1738		1865	vv
		ZUN-1293	89-197	DF	1750		1884	vv
		ZUN-1291	89-195	DF	1822		1885	vv
		ZUN-1292	89-196	DF	1785		1895	vv
		ZUN-1294	89-198	DF	1792		1895	vv
		ZUN-1289	89-193	DF	1772		1898	vv
		ZUN-1283	89-187	PNN	1695		1910	+vv
		ZUN-1295	89-199	PP	1845		1923	vv
		ZUN-1285	89-189	DF	1826		1923	vv
		ZUN-1284	89-188	DF	1723		1924	vv
		ZUN-1288	89-192	DF	1765		1927	vv
		ZUN-1298	89-202	PP	1878		1929	vv
		ZUN-1297	89-201	PP	1860		1929	vv
		ZUN-1286	89-190	DF	1849		1930	vv
						Count:	14	

LABORATORY OF TREE-RING RESEARCH
ARCHAEOLOGICAL RESEARCH

EXPLANATION OF SYMBOLS

B - bark is present

G - beetle galleries are present on the surface of the sample

L - a characteristic surface patination and smoothness, which develops on beams stripped of bark, is present

c - the outermost ring is continuous around the full circumference of the sample. This symbol is used only for complete cross sections

r - less than a full section is present, but the outermost ring is continuous around available circumference

v - a subjective judgment that, although there is no direct evidence of the true outside on the sample, the date is within a very few years of being a cutting date

vv - there is no way of estimating how far the last ring is from the true outside. Many rings may be lost

+ - one or a few rings may be missing near the outside whose presence or absence cannot be determined because the series does not extend far enough to provide adequate crossdating

++ - a ring count is necessary beyond a certain point in the series because crossdating ceases

The symbols B, G, L, c and r indicate cutting dates in order of decreasing confidence, unless a + or ++ is also present.

The symbols L, G, and B may be used in any combination with each other or with the other symbols except v and vv. The r and c symbols are mutually exclusive, but may be used with L, G, B, + and ++. The v and vv are also mutually exclusive and may be used with the + and ++. The + and ++ are mutually exclusive but may be used in combination with all the other symbols.

SPECIES CODES

DF = Pseudotsuga menziesii, "Douglas-fir"

PP = Pinus ponderosa, "ponderosa pine"

PNN = Pinus edulis, "pinyon"

JUN = Juniperus spp., "juniper"

FIR = Abies cf. concolor, "white fir"

SPR = Picea cf. engelmanni, "Engelmann spruce"

QUER = Quercus spp., "oak"

POP = Populus spp., "cottonwood or aspen"

Non-con = Non-coniferous species; none of above - usually unidentified shrub

APPENDIX C
SUMMARY OF THE STRATIGRAPHY OF EXCAVATION UNITS AT LOWER PESCADO VILLAGE

EXCAVATION UNIT 1

Strat.	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
A	31-51(L 1); 37-45 (L4)	loose silt	10YR5/3	wall fall (L4)	overburden	slopes southeast from historic wall
B	-55(L1)	hard-packed silt	10YR5/3	ash, charcoal	buried historic surface	slopes southeast ; rodent burrows, burned areas
C	12 - 32 (l4)	hard-packed silt	10YR5/3	wall fall. adobe	upper levels of historic builders' trench	mottled with 7.5YR 4/6; str. 2&3 on east wall profile L.4
C1	32-56	soft silt	10YR4/2	ash, charcoal	lower levels of historic builders' trench	rodent burrows; str. 6-8 on east wall profile L.4
D	-68	silt	10YR5/3	charcoal, ash, ceramic, bone	upper levels of prehistoric midden	post-dep. disturbance related to rodent activity, historic construction
E	-97 (l1); -90 (l4)	soft silt	10YR5/3	charcoal, ash, ceramic, bone	prehistoric midden	rodent burrows, burned patches
F	125	silt	10YR5/3	charcoal, ash	lower levels of prehistoric midden	harder packed than above with less cultural material
G	-160	sandy silt	10YR5/3	charcoal, ash, decayed sandstone	base of midden slumping inside room	discrete pockets of ash and charcoal; fewer artifacts
H	-185	silt	10YR5/3-4	ash	roomfill	less ash; lower artifact density
I	205	soft silt and ash	!0YR4/3; 10YR3/2	ash, charcoal	hearth fill; ash pit outside hearth	excavated together
J	187 -205	hard-packed clayey silt	10YR4/4	charcoal flecks	room floor	hard packed area outside hearthstones
Fea. 1	-60cm (L4)	masonry	n/a	n/a	historic foundation wall	
Fea 2	130 - 205	masonry wall	n/a	n/a	prehistoric foundation	
Fea 3	187 -205	stones	n/a	n/a	hearth	

EXCAVATION UNIT 2						
Strat.	**Depths (cm)**	**Texture**	**Munsell**	**Inclusions**	**Interpretation**	**Comments**
A	14 -31(NW); -40(SW)	loose silty loam	10YR 4/3	milled lumber	historic overburden	
B	-37 (NW); -42(SW)	hard-packed silt	10YR 4/3	milled lumber	deposits overlying historic roomfloor	
C	-41(NW)	hard-packed silt	10YR5/3	wood	historic roomfloor	mixed with slopewash in Locus 5 (10YR 3/3)
D	39-67	silt	10YR 4/3	charcoal bits; ash	fill underlying historic floor	
E	67-108 (L4); ->86 (L5)	silt	10YR 4/3	wallfall	debris associated with historic structure	deeper in northern end
F	86-91	silt	10YR 4/2	charcoal bits, ash	trench associated with historic wall II	some wallfall along west end Loc 5
G	91-146 (L1); ->120 (L4&5)	silt	5YR 5/3	charcoal	prehistoric roomfill	below base of fea 1 in Locus 4
H	-178(NW); -190(NE)	silt	10YR 5/2	charcoal, ash	prehistoric roomfill	
I	-198	silt	10YR 5/2		roomfill overlying floor	at same level as unexcavated burial
J	196-225	silt	10YR 3/3	ash, charcoal, burned earth	hearth fill	
K	198-203	hard-packed silt	10YR 4/3	small sandstone slabs	prehistoric room floor	
L	203-234	hard-packed silt	10YR 5/3	charcoal flecks	deposits under floor (Str. K)	extended below base of fea. 3 and 4 at 224 cm
Fea 1	85-113	masonry	N/A	N/A	room wall	
Fea 2	54-86	masonry	N/A	N/A	historic room wall (see unit plan)	
Fea 3	114-224	masonry	N/A	N/A	prehistoric room wall (see unit plan)	
Fea 4	104-224	masonry	N/A	N/A	prehistoric room wall (see unit plan)	
Fea 5	196-225	N/A	N/A	N/A	stone hearth lined with adobe	

EXCAVATION UNIT 3

strat.	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
A	27-37(N); 39 -44(S)	silty loam	10YR4/2	charcoal flecks	overburden	entire unit
B	37-73(N); 44-82(S)	silt	10YR4/2	wallfall, charcoal	ext. collapse zone	outside feature
C	40-75	silt	10YR4/2	wallfall, charcoal, ash	int. collapse zone	inside feature; rocks are burned
D	-102	silt	10YR4/3	charcoal, ash	deposits assoc. with use of oven	inside feature
E	-95	silt	10YR4/2; 4/3	scattered charcoal, ash	surface associated with oven	outside feature
Wall 1	74	masonry wall	N/A	N/A	oven platform	These 3 masonry walls functioned as the
Wall 2	80(N); 87(S)	masonry wall	N/A	N/A	oven platform	oven platform. Surface finish of rocks indicate that
Wall 3	82	masonry wall	N/A	N/A	oven platform	they are remnants of recycled prehistoric wall.
Wall 4	N/A	masonry	N/A	N/A	oven wall (collapsed)	

EXCAVATION UNIT 4

Overburden and deposits inside the perimeter wall

Strat.	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
A	19-34NE; 15-27SE	compacted dusty silt	10YR6/2; 10YR4/3;	wall fall, charcoal, adobe	overburden, including road surface and	
B	7-30NW; 4-23SW		10YR5/4		grader debris	
C	23-33SW	silt	10YR4/1; 10YR3/2	ash, charcoal	grader debris	
D	33-41SW	compact silt	10YR5/2; 10YR5/1	wall fall, ash, charcoal, burned wood	pre-road surface	west side
D1	33-43SE	mixed sand and silt	10YR4/2	wall fall	pre-road surface	adjacent to perimeter wall
E	43-59SE	loose sand	10YR4/2	wall fall, burned organics	debris associated with historic occupation	extended 50cm. west of perimeter wall
F	59-73SE; -67NW	silt	10YR5/2; 10YR5/3	wall fall, burned debris, clay lens	debris associated with historic occupation	clay lens at 65cm.
G	67-91NW; -107SW	soft sand	10YR6/2	wall fall, black streaks	prehistoric	
H	-120	sand	10YR4/4	black streaks	prehistoric	
Wall I	15-?	masonry	n/a	n/a	perimeter wall	
Wall IV	73-?	masonry	n/a	n/a	prehistoric wall	abuts perimeter wall

Deposits outside perimeter wall (loci 1,4, 6-9) and under the overburden

Strat.	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
B	27-75	compact silt	10YR5/3	wall fall, ash, charcoal	prehistoric room fill mixed with historic debris	south of wall II; burning along wall I at 42-75cm.
floor I	75 (opening depth)	sandstone	n/a		prehistoric room floor associated with wall II	south of wall II
wall II	38-?					
C	75 (opening depth)	ash and charcoal			remains of hearth associated with stone floor	south of wall II
D	34-44NE; 28-40SE	banded compact silt	10YR3/3; 10YR5/3; 10YR6/2	charcoal	superimposed road surfaces (?)	north of wall II
E	42-92	loose sand and silt			burrow	not excavated separately
F	44-52NE; 40-50SE	silt	10YR6/2	charcoal, botanicals	prehistoric surface?	between walls II and III

Excavation Unit 4, continued

G	52-69NE; 50-66SE	compact fine silt	10YR5/2	charcoal, white clay	prehistoric ground surface	between walls II and III; associated with feature Stratum G1
G1	50-54SE	compact fine silt	10YR5/2	maize	feature cut into surface (G)	between walls II and III; double row of shallow holes containing maize kernels
wall III	68-?	masonry	n/a		prehistoric wall	abuts perimeter wall
H	66-72	silt	10YR5/3		underlying prehistoric surface	between walls II and III;
I	72-100	silt	10YR3/4	charcoal	underlying prehistoric surface	between walls II and III
J	44-64NE	silt	10YR5/3		prehistoric room fill (?)	north of wall III
K	64-72NE	banded silts	10YR5/3; 10YR5/2	charcoal	prehistoric room fill (?)	north of wall III
L	72-78NE	silt	10YR5/3		prehistoric room fill (?)	north of wall III
M	78-88NE	silt	10YR5/3		prehistoric room fill (?)	north of wall III
N	88-110NE	silt	10YR5/3	lens (10YR8/1) at 90cm.	prehistoric room fill (?)	north of wall III

EXCAVATION UNIT 5

Strat	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
A	3-20(NW); 8-12(SW)	loose fine silt	10YR 4/2	burned wood, charcoal, ash	overburden with historic sheet scatter	Str. A cut by 2 burrows (loci 5 and6)
B	12-22(SW)	mixed sand and silt	10YR2/2; 10YR3/3	burned wood, charcoal, ash	trash deposits	lenses with ash and charcoal
C	-25(NW); -31(SW)	fine silt	10YR4/2	burned wood, charcoal, ash	historic sheet scatter	
D	25-36(NW) 31-34(SW) -40 (SE)	sandy silt	7.5YR3/2	sandstone, charcoal flecks	historic surface	associated feature 1
E	32-54	sand	10YR4/3		pit (feature 1)fill	associated stratum D
F	36-45NW, 34-54SW	compact silt	5YR3/2	sandstone, charcoal flecks	historic surface	burrows (l. 10, 14)
G	45-84NW; 54-76SW	loose sandy silt	10YR 4/2		aeolian deposition during abandonment period	burrows (l. 10, 14)
H	84-95NW	compact sandy silt	10YR 3/3	charcoal, gray clay lens	prehistoric ground surface	southern end of unit; burrow (L.14)
I	95-98NW;76 -81SW	compact silty loam	10YR 3/3	charcoal, rootlets	prehistoric ground surface	associated feature 2, burrow (L.18)
J	89-94	silt	7 5 5/2	charcoal, ash, clay	pit (feature 2) fill	not on profile assoc str I
K	98-113NW; 81-100SW	silt	10YR 5/3	charcoal flecks	river deposited soils	burrow (L.18)
L	100-104SW	silt	10YR 5/2		charcoal lens	assoc str M
M	113-119NW 104-112SW	hard-packed silt	10YR 5/2	charcoal	prehistoric surface	burrow (L.18) assoc str L
N	119-146NW	loose, fine sand	10YR 5/4		river deposited soils	burrow (L.20)
O	146-158	sandy loam	10YR 5/3	ash, charcoal, rootlets	prehistoric ground surface	associated feature 3
P	145-162	charcoal	10YR 4/3	charcoal, ash	pit (feature 3) fill	not on profile assoc str O
Q	158-169	sand	10YR4/4		river deposited soils	
R	169 -180	mottled sand	10YR3/4	charcoal, ash, clay	river deposited soils	
S	180-202	compact sand	10YR 2/3	charcoal, burned earth and sandstone	prehistoric ground surface	
T	202-230	sand	10YR 4/5		river deposited soils	associated feature 4
U	202-230	ash/ charcoal	10YR 5/3	charcoal, ash	pit (feature 4) fill	assoc str T

EXCAVATION UNIT 6

Strat.	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
A	17-20NE; 13-18SE	hard-packed sand	10YR6/2	stones, burned wood	overburden	
B	-44NW; -64SW	hard-packed sand and silt	10YR5/3	stones	fill of historic well	heavily mottled
C	44-180NW; 64-165SW	sandy silt	10YR5/4	stones	fill of historic well	siltier with depth; yellow sand and ash lenses
D	-238NW&SW	silt	10YR3/3	charcoal, ash	fill of historic well	
E	-250	ash			base of well (?)	bottom of wall at 248cm.
F	15-248	red clay			liner	thin (<2cm) layer on interior of wall 1
Wall 1	15-248	masonry	n/a		north wall of well	
post 1	120-200	wood	n/a		part of well structure (?)	14cm wide; pointed base
post 2	155-180	wood	n/a		part of well structure (?)	leaning west into unexcavated area

EXCAVATION UNIT 7

Strat	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
A	13-22NW; 10-23SW; 25-31SE	fine silty sand	10YR5/2		overburden	loose, powdery
A1	52-57NW; 52-61SW; 63-68NE; 64-67SE	fine silty sand	10YR4/2	ash	overburden	erosion, slopewash
B	22-36NW; 23-43SW	fine sandy silt	10YR 3/3		buried surface	hard-packed
C	36-60NW; 43-62SW 29-64NE; 31-62SE	banded fine silt	10YR3/3; 10YR5/3; 10YR4/2	ash, charcoal, bone	late historic midden	sloping toward village
C1	68-97NE; 67-99SE	mottled silt	10YR5/2; 10YR5/3	ash, charcoal, bone	late historic midden	some slopewash, erosion
D	60-70NW; 62-66SW 64-70NE; 62-64SE	hard-packed silt	10YR 5/2	ash charcoa	buried surface	relatively level burrow in NE corner
E	70-81NW; 66-81SW	mottled silt	10YR 5/3; 10YR5/4	ash lenses	midden	west side of unit
F	70-90NE; 64-98SE	banded silt	10YR 5/1; 10YR5/3 10YR5/4	ash, charcoal, bone	midden	east side of unit
G	81-94NW; 81-98SW 90-102NE	silt	10YR 5/2	charcoa	midden	sloping toward river
H	94=111NW; 98-106SW 102-120NE; 98-116SE	hard-packed silt	10YR 5/3	ash, charcoa	base of midden	sloping toward river
I	111-143NW; 106-135SW 120-140NE; 116-140SE	hard-packed silt	10YR5/2	rocks	buried surface	sloping toward river
J	143-150NW; 135-150SW	hard-packed silt	10YR 5/2		transitional?	burrow in west wall
K	to 190	silt with sand lens	10YR5/3; 10YR4/4	charcoal	prehistoric	hard-packed in upper levels

EXCAVATION UNIT 8

Strat.	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
A	7-29NW; 11-27SW	loose sandy silt	10YR4/3	pebbles	overburden	
	27-34NE; 24-28SE					
B	29-48NW; 27-52SW	fine silt	10YR4/2	charcoal, ash flecks	midden	many burrows
	34-44NE; 28-58SE					
B1	48-53NW	silt	10YR5/4		midden	lens in NW corner
C	53-68NW; 52-64SW	hard-packed banded	10YR5/2,3,4;	charcoal, ash	midden	many burrows;
	44-63NE	silts	10YR4/2,3;			north side of unit
			10YR3/1; 10YR6/1,2			
D	68-93NW; 63-90NE	silt	10YR4/3-2	ash	midden	north side of unit; many burrows
E	64-73SW; 58-80SE	hard-packed banded	10YR3/1; 10YR4/2,3	ash, charcoal	midden	south side of unit; many burrows
		silts	10YR5/2,4			
F1	73-78SW	sandy silt	10YR5/3	charcoal, ash	midden	south side of unit
F2	78-88SW	hard-packed silt	10YR5/3	pockets of ash	midden	south side of unit
F3	88-94SW	mottled silt	10YR4/2; 10YR5/2	ash	midden	south side of unit
G	93-98NW; 90-98NE	silt	10YR5/2; 10YR6/2	ash lenses	midden	north and west side of unit
H	98-110NW; 94-110SW	mottled hard-packed silt	10YR5/2; 10YR6/2		midden	less ash than Stratum G
	98-110NE; 80-110SE					

EXCAVATION UNIT 9

Strat.	Depths (cm)	Texture	Munsell	Inclusions	Interpretation	Comments
A	16-24NW; 22-26SW	fine,loose sandy silt	10YR4/3	building debris	overburden	
	9-29NE; 15-29SE	becoming harder w. depth				
A1	9-19	silt	10YR4/2		burrow in NE corner	
B	24-37NW; 30-33NE	hard-packed silt	10YR 5/3	milled lumber, botanicals	deposits associated with use of room	
	30-36SE					
B1	37-40NW; 33-40NE	soft silt	10YR3/3	charcoal	deposits associated with use of room	
	36-42SE					
C	33-38SW	silt	10YR 5/3, 3/3	charcoal	deposits associated with use of room	adjacent to hearth
D	40NW; 38-42SW	hard-packed sand	10YR 5/4	ash, charcoal, adobe	room floor	
	40-45NE; 42-45SE					
D1	42-48	loose silt	10YR5/4		burrow in SE corner	
E	45-47NE; 45-48SE	hard-packed sand	10YR 5/4		lower floor (?)	cracked
F	26-31SW	ash	10YR 4/2	charcoal	hearth fill	
F1	31-35SW	sand	7.5YR5/6		hearth fill	burned
G	35-44SW	sand	10YR5/4	charcoal, ash	burned debris sifted through hearth floor	
H	45-58NW; 44-58SW	hard-packed sand	10YR 5/2	rocks	underlying historic material	
	47-58NE; 48-58SE					
H1	46-58	loose sand	10YR3/3		burrow in south wall	
wall 1	surface to ?	blocky sandstone	n/a	n/a	south wall of room	
wall 2	surface to ?	blocky sandstone	n/a	n/a	west wall of room	
wall 3	15-52	sandstone slabs	n/a	n/a	wall of hearth	laid on end
floor 1	31-35	flagstones	n/a	n/a	floor of hearth	burned

APPENDIX D
AREAS OF ROOMS AND UNROOFED ENCLOSURES AT LOWER PESCADO VILLAGE IN 1885

RB	Room	Area (m^2)	Comments	RB	Room	Area (m^2)	Comments
I	1	7.11	unroofed				
I	2	27.27	two stories	III	9	20.38	
I	2a	27.27		III	10	15.41	unroofed
I	3	21.34	unroofed	III	11	35.57	two stories
I	4	32.39	two stories	III	11a	35.57	
I	4a	32.39		III	12	11.93	
I	5	26.46		III	13	21.57	unroofed
I	6	31.13		III	14	31.87	
I	7	21.42	unroofed	IV	1	32.02	
I	8	41.5		IV	2	33.05	
I	9	32.61	two stories	V	11	15.34	
I	9a	32.61		V	12	67.59	
I	11	16.3	unroofed	V	13	19.57	
I	12	17.1	unroofed	V	14	3.13	unroofed
I	13	45.36	unroofed	V	15	21.31	unroofed
I	14	35.57		V	16	9.78	
I	15	16.01		V	17	36.46	
I	16	55.58		V	18	23.86	
I	17	39.13		V	19	30.68	
I	18	17.64	unroofed	V	20	20.53	
II	1	42.4		V	21	16.3	
II	2	24.64		V	22	20.23	
II	3	28.46		V	23	49.21	
III	1	40.31		V	24	28.8	two stories
III	2	31.53		V	24a	28.8	
III	3	41.5		V	25	31.13	
III	4	24.68		V	26	53.51	
III	5	14.67	unroofed	V	27	92.05	
III	6	18.68		V	28	23.72	
III	7	28.01		V	29	29.35	
III	8	15.34		V	30	32.02	

RB	Room	Area (m^2)	Comments
V	32	53.1	
V	33	34.24	
V	1	34.68	
V	2	29.83	
V	3	16.01	unroofed
V	4	19.45	unroofed
V	5	26.16	
V	6	18.71	
V	7	14.23	unroofed
V	8	38.91	
V	9	20.01	
V	10	33.64	
VI	1	33.8	
VI	2	12.23	
VI	3	43.95	
VI	4	29.35	two stories
VI	5	29.35	
VI	6	15.56	
VI	7	5.3	
VI	8	22.68	
VI	9	16.6	
VI	10	26.46	two stories
VI	10a	26.46	
VI	11	16.08	unroofed
VI	12	21.34	
VI	13	17.64	unroofed

RB	Room	Area (m^2)	Comments
VI	14	62.25	
VI	15	20.16	
VI	16	31.13	
VI	17	13.49	
VI	18	21.2	unroofed
VI	19	36.02	
VI	20	33.8	
VI	21	39.43	
VI	22	45.28	two stories
VI	22a	45.28	
VI	23	55.66	
VI	24	73.78	
VI	25	46.25	
VII	1	62	
VII	2	38.32	
VII	3	25.68	
VII	4	15.42	
VII	5	21.34	
VII	6	40.02	
VII	7	13.86	
VII	8	18.16	
VII	9	28.16	
VII	10	53.36	
VII	11	32.02	unroofed
VIII	1	69.37	unroofed

APPENDIX E
CATALOGUE OF SHERDS FROM LOWER PESCADO VILLAGE

FS#	U/L/L	SJP	Hesh	Kwa	WMR	PlPolR	UnidR	t. RW	Tul	Pnd	ClbW	PPW	UnidW	Pico	t. WW	Pnd/w
1	1/1/0		71	21	3	46		141			2		5		7	
91	1/4/0		11	1	3	9		24							0	
12	1/1/1		32	3	19	46	8	108			2	2	2		6	
96	1/4/1		18	4		19		41			4	2			6	
134	1/4/2		29	2	10	32		73		1			1		2	2
140	1/4/3		35	12	10	42		99		5			1		6	2
19	1/1/2		48	5		26	13	92	1	2					3	
28	1/1/3	2	44	8		30	50	134		4	3		1		8	
144	1/4/4	1	35	8		28	7	79					4		4	
34	1/1/4		64	12		20	29	125	1	5			5	1	12	
41	1/1/5	6	83	15		29	48	181	1	3			2		6	1
49	1/1/6	2	64	21	45	74	14	220		1	3	6			10	2
147	1/4/5	4	32	16	6	31		89				3	2		5	2
151	1/4/6		27	2		13	22	64	1	1			1		3	1
54/7	1/1/7		44	2		30		76	2	1	4		2		9	2
61/6	1/1/8	1	63	7		29	8	108		5	1				6	
70	1/1/9	1	57	10	5	40	3	116		4					4	3
156	1/4/7		9	2		15		26		1	1	1			3	
193	1/float			1				1		1					1	
121	1/float					1		1							0	
73	1/2/1		36	6	3	25	11	81		1	2	1			4	1
78	1/2/2		9	1		5		15							0	
81	1/2/3		9			3	6	18		2					2	
122	1/2/4		9			1	2	12					1		1	
129	1/2/5		4				1	5					1		1	
163	1/2/6S		1					1							0	
166	1/2/7S	1	2					3							0	
164	1/2/6H	1	1		1			3							0	
168	1/2/7H		1					1							0	
85	1/3/1	4	1	1		2	1	9							0	
89	1/3/2		4					4							0	
103	1/3/3				1	3		4							0	
105	1/3/4		4					4		2					2	
111/5	1/3/5		3			5		8							0	
1157	2/4/1		7	2	4	7		20				1			1	
1168	2/4/2		4		2	2		8							0	
1223	2/5/1				2	1		3							0	
1173/1	2/4/3		9		1	6	1	17					1		1	
1229	2/5/2		15			15		30					1		1	
1181	2/4/4		11	3	7	10		31					1		1	
1197	2/4/5		7	1	4	5		17				1	1		2	
1206	2/4/6		8		2	4		14					1		1	
1233	2/5/3		9	2	7	14		32				2	3		5	
1236	2/5/4	2	5	5	5		1	18				2	1		3	
1211	2/4/7	5	22		2	18	13	60					1		1	
1238	2/5/5	1	6	1				8							0	
1241	2/5/6		5	1	1	2		9							0	
1002	2/1/0		36	1	8	17		62				2	5	1	8	1

FS#	U/L/L	SJP	Hesh	Kwa	WMR	PlPolR	UnidR	t. RW	Tul	PndI	CtbW	PlPW	UnidW	Proo	t. WW	Pnl/w
1252-	2/4/9	1	13	1	4	3	1	23				5			5	
1243	2/5/7		2		4			6							0	
1248	2/5/8		19	3	1	7	2	32				2			2	
1258	2/5/7-8		2					2								
1022	2/1/1	2	2			3		7	1		1				2	2
1024/	2/1/2	1	8		1	6	1	17			1		1		2	
1040/	2/1/3	4	14	1	1	5		25	0	15	1	2	2		20	
1080	2/2/1		0					0							0	
1085	2/2/2		0					0							0	
1094/	2/2/3		3			4		7							0	
1113	2/1/4	7	17	2	2	3	14	45	2	1	6		3		12	
1119.	2/1/5	1	14		12	26	3	56	2	1	4	2	1		10	
1141	2/3/1	11	8		7	6		32	1	5	1	2	2	2	13	
1151	2/3/2		0		1	3		4							0	
1136	2/expr	1	1					2		3	1				4	
1045	3/1/0	3	17	3		25		48	1	1			2		4	
1050	3/1/1		7		7	14		28					2		2	
1058/	3/1/2	1	0	1	1	3	2	8							0	
1073	3/1/3	3	4	3		7		17							0	
1093	3/1/4		11	2	1	11		25				4			4	
1102	3/1/5		10	1	4	4		19							0	
1109	3/2/1		0					0							0	
1131	3/2/2		6	1				7							0	
1149	3/2/4		1		1	1		3							0	
2000	4/1/0	3	25	4	12	41	1	86		2	3	8	6		19	1
2040	4/5/0	1	43	1		30	9	84				4			4	1
2086	4/6/0		7	2		4		13				2			2	1
2019	4/3/1		1		2		1	4							0	
2145	4/2/0		0	1				1							0	
2007	4/2/1		0			2		2					1		1	
2050	4/5/1		1			1		2							0	
2024	4/2/2		0			2		2							0	
2071	4/2/3		8	1	3	14		26		2	1	1			4	
2081	4/2/4		3	3		6		12					1		1	1
2056	4/5/2		3	1		3		7				1			1	
2092	4/2/5		0			2		2			1				1	
2097	4/2/6		0												0	
2171	4/2/9		0			1		1							0	
2149	4/2/S ex		9	2	2	15		28							0	
2094	4/6/1		0	2	1	2		5							0	
2102	4/6/2		0												0	
2102	4/6/3		0		1	4	1	6							0	
2109	4/6/4		6		1	9		16		1	1		2		4	
2119	4/6/5		1			1	2	4			1				1	
2148	4/9/1		3			1		4							0	
2011	4/1/1	2	22		3	5	9	41		1	2		3		6	
2031	4/1/2	1	16	4	3	15		39		2		2			4	
2035	4/1/3		21			6		27	1						1	3

SS#	D/L/L	SJP	Hesh	Kwo	WMR	PiPoiR	UnidR	t. RW	Tul	PndX	ClbW	PiPW	UnidW	Prco	t. WW	PnB/w
2067	4/1/4		15					15				2			2	
2063	4/4/1		1			1		2							0	
2077	4/1/5		14			1	4	19			1				1	
2122	4/7/1		7			5		12							0	
2129	4/7/2		2	1		3	1	7		3	1				4	1
2173	4/8/N	5	33	1	5	14	9	67	4		5				9	5
2122	4/8/1		1					1							0	
2124	4/8/2		7		10			17		3	3	3			9	
2136	4/8/3	1	11	1	5		2	20	1	4	1				6	
2139	4/6-7w	1	1	1		1		4								
3003	5/1/0		5			9	2	16		1		2	8		11	
3010	5/4/1												2		2	
3012	5/1/1		5	1		7	1	14				1			1	
3017	5/1/2		10	1		13		24					2		2	
3024	5/7/1		29	4		37	5	75	4				3		7	
3030	5/8/1	3	14	3		21	5	46	1			5			6	
3037	5/9/1		7	2		6	1	16							0	
3038	5/9/2		11		3	9	4	27				1			1	
3043	5/9/3		37	9	11	21		78				2	1		3	3
3050	5/9/4		16	2	7	26		51	2	2			2		6	1
3065	5/11/1		2			2		4							0	
3057	5/12/1					5		6							0	
3073/	5/13/2	1	22	5		10	5	43							0	
3095	5/15/1		1					1							0	
3080	5/13/3		15	18	4	20	5	62	2	1	1				4	
3103	5/13/4		3	1	1	2		7							0	
3105	5/17/1		47	3		18		68	1	1					2	
3128	5/17/3		9	1	4	1		15		1	1		1		3	1
3135	5/19/1	1	6			7		14					1		1	1
3143	5/19/2		12	1		8		21					1		1	4
3152	5/21/1		5			2		7							0	
3156	5/19/3		2			1		3				1			1	1
3161	5/19/4	3	13			4		20					1		1	
3169	5/19/5	3	22	5			11	41	6				4	1	11	1
3172	5/19/6		1					1		1			1		2	
3176	5/22/6		3			1		4							0	
3019	5/5/1		1		6	3		10			2		1		3	
3023	5/6/1	2	15	7		8		32				1			1	
3046	5/10/1		2			2		4					3		3	1
3054	5/10/2		5	1	3	7		16							0	
3063	5/10/3		8			1	1	10		3		1	3		7	
3063A	5/10/3	1	16	4	3	16		40								
3071	5/14/1		1			1	2	4							0	
3075	5/14/2		12	3	1	9		25							0	1
3088	5/14/3		20	2	6	9	6	43		1	2		2		5	
3091	5/16/1	1		2		5		8							0	1
3108	5/14/4		1			1	1	3							0	
3117	5/14/5		2	1		8		11							0	

FS#	U/I/L	SJP	Hesh	Kwo	WMR	PiPolR	UnidR	t. RW	Tul	Pndl	ClbW	PIPW	UnidW	Proo	t. WW	Pnl/w
3131	5/14/6		2	1		4		7		1			1		2	
3122	5/18/1														0	
3139	5/20/1		10		2	7		19					1		1	
3146	5/20/2		17		6	3		26							0	1
3159	5/20/3		2			1		3					1		1	
3160	5/20/4		4	1		4		9		1					1	1
4000	6/1/0	0	22	3	0	27	6	58	0	0	2	0	7	0	9	0
4008	6/1/1	0	40	15	18	55	0	128	1	0	0	5	0	0	6	4
4022	6/2/1	0	31	8	8	32	0	79	0	2	0	1	0	0	3	1
4024	6/2/2	0	13	6	8	20	0	47	0	0	0	1	0	0	1	
4030	6/2/3	0	3	4	3	4	0	14	0	2	1	0	0	0	3	0
4017	6/3/1	0	4	0	1	3	0	8	0	0	0	0	1	0	1	
4035	6/4/1	0	0	1	0	1	0	2							0	
4037	6/4/2	0	0	0	0	2	0	2							0	
4039	6/5/1	0	2	6	0	2	0	10	0	1	0	0	0	0	1	
4041	6/6/1							0							0	
4043	6/6/2	0	2	5	0	3	0	10	0	0	0	1	1	0	2	
4045	6/7/1	0	10	1	6	3	0	20	0	0	0	0	3	0	3	
4057	6/7/2	0	10	0	3	12	0	25	0	0	0	6	0	0	6	0
4058	6/8/1	0	20	4	5	9	0	38							0	0
4063	6/8/2	0	11	1	2	3	1	18	0	0	0	1	3	0	4	
4049	6/wc	0	30	4	9	9	0	52	0	1	1	0	2	0	4	0
5000	7/1/0	0	8	2	0	0	7	17	0	0	0	0	1	0	1	0
5075	7/5/0	0	1	0	0	0	0	1							0	
5081	7/5/1	0	0	1	0	0	1	2							0	0
5007	7/1/1	0	4	0	0	0	5	9							0	0
5011	7/1/2	0	0	0	0	0	1	1							0	0
5018	7/1/3	0	9	1	0	0	3	13	0	0	0	0	4	0	4	2
5088	7/5/2															
5089	7/5/3	0	1	0	0	0	1	2							0	0
5128	7/5/4	0	10	1	1	0	4	16	0	1	0	0	1	0	2	0
5132	7/5/5	0	10	0	2	0	6	18	0	0	0	0	4	0	4	0
5029	7/1/4	0	21	3	0	0	24	48	0	2	0	0	0	0	2	
5039	7/2/1	0	3	0	0	0	0	3	0	1	0	0	0	0	1	1
5034	7/1/5	0	39	7	0	0	47	93	0	4	0	0	5	0	9	0
5042	7/1/6	1	29	2	0	0	28	60	0	3	0	0	4	0	7	0
5046	7/1/6	0	3	1	0	0	3	7							0	0
5055	7/3/1	0	3	1	0	2	0	6							0	0
5068	7/3/2	0	1	1	0	4	0	6	0	1	0	0	0	0	1	0
5060	7/4/1	0	3	0	0	0	1	4							0	0
5073	7/4/2	0	3	1	0	8	0	12							0	0
5049	7/1/7	0	12	2	0	0	9	23	0	1	0	0	2	0	3	0
5063	7/1/8	0	14	2	4	0	30	50	0	5	0	0	6	0	11	0
5093	7/1/p8	0	5	0	0	0	9	14							0	0
5096	7/1/9	0	22	6	6	0	30	64	0	3	0	0	7	0	10	0
5102	7/1/10	0	6	0	0	0	7	13	0	1	0	0	1	0	2	0
5108	7/1/11	0	14	3	0	0	27	44	0	1	0	0	7	0	8	0
5114	7/1/12	0	1	3	0	0	3	7							0	0
5139	7/5/6	0	11	0	0	0	12	23							0	0
5146	7/5/7	0	11	0	0	0	2	13	1	0	1	0	0	0	2	0
5105	7/6/1	0	12	0	0	9	0	21	0	1	0	0	4	0	5	0
5117	7/6/2	0	18	2	6	11	2	39	0	5	0	0	3	0	8	0
5120	7/7/1	0	18	3	0	0	20	41	0	3	0	0	1	0	4	0
5124	7/7/2	0	11	0	0	0	23	34	0	2	0	0	4	0	6	0
5133	7/7/3	0	4	0	0	0	0	4							0	
5137	7/7/3	0	16	1	1	0	15	33							0	0
5143	7/7/4	0	38	0	0	0	20	58	0	4	0	0	12	0	16	0

FSF	U/L/L	SJP	Hesh	Kwa	WMR	PiPolR	UnidR	t. RW	Tut	Pnd	CibW	PiPW	UnidW	Prca	t. WW	PnR/w
5149	7/7/5	4	27	0	0	0	17	48	1	3	0	0	0	0	4	0
6000	8/1/0	0	29	0	0	14	0	43	3	3	0	0	10	0	16	12
6008	8/1/1	0	6	0	0	5	0	11	0	4	0	1	0	0	5	1
6014	8/2/1	0	4	0	0	7	0	11	0	1	0	0	1	0	2	0
6025	8/2/2	0	11	1	0	5	0	17	0	0	0	0	3	0	3	0
6031	8/2/3	0	47	3	0	17	0	67	2	10	0	0	6	0	18	3
6039	8/2/4	1	38	0	0	18	1	58	3	7	7	5	0	0	22	2
6019	8/3/0	4	13	0	0	2	7	26	0	0	1	0	1	0	2	0
6038	8/3/1	0	13	0	0	1	4	18	0	0	0	0	1	0	1	
6045	8/3/2	0	3	0	0	6	0	9	0	1	0	0	0	0	1	0
6059	8/3/3	0	0	1	0	0	0	1	0	0	0	0	0	0	0	
6066	8/3/4	0	1	0	0	0	0	1	0	0	0	0	0	0	0	
6053	8/4/0	0	15	1	5	7	0	28	0	11	7	0	0	0	18	2
6049	8/5/0	0	11	0	0	1	0	12	1	9	1	2	0	0	13	
6063	8/5/1	0	16	0	0	7	0	23	3	9	0	0	7	0	19	1
6068	8/6/0	0	12	0	0	4	0	16	4	6	5	8	0	0	23	1
6072	8/6/1	0	7	0	2	3	1	13	0	10	0	5	3	0	18	0
6075	8/6/2	0	10	0	0	5	0	15	1	3	0	0	1	1	6	1
7000	9/1/0	0	10	2	0	9	0	21	0	1	0	0	0	0	1	0
7005	9/1/1	0	29	3	8	28	0	68	0	3	0	3	0	0	6	0
7041	9/9/0	0	7	0	0	1	0	8	0	1	0	0	0	0	1	0
7004	9/2/0							0							0	
7012	9/2/1	0	1	0	0	0	0	1	0	0	1	0	0	0	1	
7019	9/3/1	0	13	2	0	14	0	29	0	1	0	0	0	0	1	1
7047	9/9/1	0	7	0	0	12	0	19	0	0	0	0	1	0	1	1
7058	9/9/2							0							0	
7015	9/4/1	0	6	2	0	5	0	13	1	2	0	6	0	0	9	0
7027	9/6/1	0	6	0	0	6	0	12	0	2	0	1	0	0	3	0
7034	9/7/1							0							0	
7035	9/8/1	0	9	1	0	6	0	16							0	0
7059	9/5/1	0	0	0	0	0	1	1							0	
7062	9/5/2							0							0	
7066	9/5/3	0	6	0	2	4	0	12	0	0	0	0	2	0	2	0
7042	9/10/1	0	12	3	0	18	0	33	1	2	0	0	5	0	8	
7054	9/11/1							0							0	
8001	10/1/0		3			2		5							0	
8003	10/1/1		3			2		5							0	
8010	10/1/2		4					4					2		2	
8013	10/1/3		1					1							0	
8014	10/1/4		1					1							0	
8017	10/1/5		1					1	1	2					3	
8007	10/2/1		1					1					1		1	
	Totals	105	2771	417	403	1772	727	6195	58	231	90	123	235	6	743	82

U/U/L	LGlz	Mais	Br/bf	t.Proto	GtCor	BfCor	SmCor	t. Corr	Bkwt	SPBW	t.BW	ZPoly	B/bf	B/w	Ashw	Bt/w
1/1/0				0	82	5	16	103	1		1	1				
1/4/0				0	6	4	3	13			0					
1/1/1	3			3	53	43	7	103	1		1					
1/4/1	1			1	8	13		21		2	2					
1/4/2				2	34	30	21	85	1		1					
1/4/3				2	72	26	20	118	6		6					
1/1/2	3			3	92	8	4	104		1	1					
1/1/3	5			5	71	28	26	125			0					
1/4/4	1			1	73	13	25	111	15		15					
1/1/4	2			2	60	37	33	130			0					
1/1/5				1	68	66	43	177	1		1		1			
1/1/6	2			4	230	115	35	380	1		1					
1/4/5				2	79	11	10	100			0					
1/4/6	1	1		3	64	35	14	113			0					
1/1/7	2			4	59	53	29	141			0					1
1/1/8	2			2	104	87	47	238			0					1
1/1/9				3	144	69	30	243	6		6					
1/4/7	2			2	23	11	6	40			0					
1/float					4			4								
1/float								0								
1/2/1				1	78	20	18	116	1		1					
1/2/2				0	12	3	8	23			0					
1/2/3		1		1	25	4	9	38			0		1			1
1/2/4				0	5	4	4	13			0					
1/2/5				0	3	1	1	5			0					
1/2/6S				0			1	1			0					
1/2/7S				0	2	2	1	5			0					
1/2/6H				0	9		2	11			0					
1/2/7H				0	1			1			0					
1/3/1				0	2	5	5	12			0					
1/3/2	3			3	4	2	0	6			0					
1/3/3	1			1	2	2	1	5			0					
1/3/4				0	2	3	1	6			0					
1/3/5				0				0			0					
2/4/1	3			3	10	7	4	21			0	3				
2/4/2				0	4	2		6			0					
2/5/1				0	1	3		4	1		1					
2/4/3				0	8	9	1	18			0					
2/5/2				0	25	3	3	31	7		7					1
2/4/4				0	13	7		20			0					
2/4/5				0	11	7	4	22	1	3	4	4				
2/4/6		2		2	6	11	1	18		1	1					
2/5/3				0	19	10	1	30	1	3	4	2				
2/5/4	1			1	10	7		17		3	3					
2/4/7	3			3	17	17	15	49	1		1					
2/5/5				0	7	2		9			0					
2/5/6				0	3	14	4	21			0					
2/1/0	8	1		10	79	31	44	154	1		1					

U/L/L	LGlz	Mats	Br/Df	t.Proto	GrCor	BfCor	SmCor	t. Cor	Bkwr	SPBW	t.BW	2Poly	R/Df	R/w	Ashw	Br/w
2/4/9				0	55	52	3	110			0					
2/5/7				0	13	11	2	26			0					
2/5/8				0	22	8	22	52			0					
2/5/7-8																
2/1/1				2	9	5	4	18			0					
2/1/2				0	30	8	2	40			0					
2/1/3	3			3	73	22	8	103			0					
2/2/1				0	2	4	1	7			0	1				
2/2/2				0			0	0	1		1					
2/2/3				0	8	4	1	13			0					
2/1/4		3		3	76	20	4	100			0					
2/1/5				0				0			0					
2/3/1				0	29	11		40			0					
2/3/2				0		6		6			0					
2/exprf					3			3								
3/1/0				0	27	8	6	41	3	5	8					
3/1/1				0	4	6	1	11			0					
3/1/2				0	11	5		16			0					
3/1/3				0	12	1	1	14		1	1					
3/1/4	2			2	14	4	1	19			0					
3/1/5				0				0			0					
3/2/1				0	1			1			0					
3/2/2	1			1	5	6	1	12			0					
3/2/4				0	3	1	2	6	1		1					
4/1/0	5			4	38	16	18	72	1	3	4	4				
4/5/0	1			2	26	8	7	41	17		17	6				
4/6/0				1	6		1	7			0					
4/3/1				0	2		1	3			0					
4/2/0				0				0			0					
4/2/1				0	2	1		3	1	1	2					
4/5/1				0	3			3	1		1					
4/2/2				0	5	1	2	8	6		6					
4/2/3				0	9	4	2	15	3	3	6					
4/2/4				1	9	2		11		9	9	4				
4/5/2				0	6			6	4	1	5					
4/2/5				0	1			1			0					
4/2/6				0		1		1			0					
4/2/9				0	2			2			0					
4/2/S ex				0	2	1		3		1	1					
4/6/1				0	3			3			0					
4/6/2				0	4			4	6		6	2				
4/6/3				0	4	6		10			0					
4/6/4				0	7	2		9		3	3	1				
4/6/5				0	1			1			0					
4/9/1				0	2	6		8			0					
4/1/1	1			1	57	9	15	81	3	1	4	2				
4/1/2				0	40	28	6	74			0					
4/1/3				3	33	20	10	63	1	1	2					

U/E/L	LGlz	Mass	Br/bf	t.Proto	GrCor	BrCor	SmCor	t. Corr	Blkwt	SPBW	t. BW	2Poly	R/bf	R/w	Ashw	Br/w
4/1/4				0	20	16	1	37		1	1					
4/4/1				0	8			8			0					
4/1/5				0	22	2	6	30			0					
4/7/1				0	6	2		8			0					
4/7/2				1	16		1	17			0					
4/8/N ex				5	86	15	10	111	2		2	2				
4/8/1				0	7		1	8			0					
4/8/2	1			1	17	3		20			0					
4/8/3				0	28	8		36			0					
4/6-7w																
5/1/0				0	4	5		9		1	1	4				
5/4/1				0				0			0					
5/1/1				0		2	1	3			0					
5/1/2	2		1	3	15	9	2	26	1		1		1			
5/7/1				0	100	38	2	140			0					
5/8/1	1			1	42	16	8	66	1		1					
5/9/1	1	1		2	10	13		23	1		1	1				
5/9/2				0	28	21	5	54			0					
5/9/3				3	47	38	11	96	1		1					
5/9/4	1			2	51	25	12	88	5		5		1			
5/11/1				0	9	1	1	11			0					
5/12/1				0	6	2	1	9	3	1	4					
5/13/2				0	40	3	9	52		1	1					
5/15/1				0	4	2	2	8			0					
5/13/3				0	58	25	10	93			0					
5/13/4				0	10	7	2	19			0					
5/17/1	1			1	126	50	35	211	4		4					
5/17/3				1	19	9		28			0					
5/19/1				1	16	10	4	30	1		1					
5/19/2				4	22	6	7	35			0					
5/21/1				0	5	6	1	12			0					
5/19/3				1	8	4	2	14	1		1					
5/19/4				0	15	9	2	26	2		2					
5/19/5				1	33	2		35			0					
5/19/6				0	12		1	13			0					
5/22/6				0	4			4			0					
5/5/1				0	3	4	2	9			0					
5/6/1				0	25	13	7	45	2		2					
5/10/1			1	2	4	3	4	11			0	1				
5/10/2				0	3	4		7			0					
5/10/3				0	4	2	4	10	2		2					
5/10/3					27	17	7	51								
5/14/1	1			1	20	2	2	24	2		2					
5/14/2				1	47	15	11	73	3		3	1				
5/14/3				0	51	36	5	92	1		1					
5/16/1				1	12	5		17			0					
5/14/4				0	10			10			0					
5/14/5				0	15	2		17			0					

Ct/U/L	LGit	Mats	Br/bf	t.Prota	GtCor	BrCor	SmCor	t. Corl	Bkwr	SPBW	t.BW	ZPoly	Z/bf	Z/w	Aslw	Br/w
5/14/6				0	11			11			0					
5/18/1				0	17	9		26			0	1				
5/20/1				0	17	7	4	28			0					
5/20/2	2			3	33	10	3	46			0					
5/20/3				0	1	3	3	7			0					
5/20/4				1	12	3	1	16			0					
6/1/0	5	0	0	5	11	5	0	16	3	0	3	0	0	0	0	0
6/1/1	4	0	0	8	25	27	16	68	0	0	0	0	0	0	0	0
6/2/1	0	0	0	1	45	2	2	49	0	0	0	0	0	0	0	0
6/2/2				0	53	9	2	64	0	0	0	0	0	0	0	0
6/2/3	1	0	0	1	27	0	7	34	0	0	0	0	0	0	0	0
6/3/1				0	2	0	0	2	0	0	0	0	0	0	0	0
6/4/1				0	2	0	1	3	0	0	0	0	0	0	0	0
6/4/2				0	2	0	0	2	0	0	0	0	0	0	0	0
6/5/1				0	10	4	0	14	0	0	0	0	0	0	0	0
6/6/1				0	2	1	1	4	1	0	1	0	0	0	0	0
6/6/2				0	4	0	0	4	0	0	0	0	0	0	0	0
6/7/1				0	26	3	6	35	0	0	0	0	0	0	0	0
6/7/2	6	0	0	6	46	11	44	101	7	0	7	0	0	0	0	0
6/8/1	1	0	0	1	72	0	14	86	0	0	0	0	0	0	0	0
6/8/2				0	25	32	2	59	1	0	1	0	0	0	0	0
6/wc	4	0	0	4	11	7	0	18	0	0	0	0	0	0	0	0
7/1/0	1	2	1	4	4	4	4	12	0	5	5	6	0	0	0	0
7/5/0				0	1	0	1	2	1	1	2	0	0	0	0	0
7/5/1	0	0	0	0	2	0	0	2	1	0	1	1	0	0	0	0
7/1/1	0	1	0	1	2	4	2	8	0	5	5	1	0	0	0	0
7/1/2	0	0	0	0	1	1	1	3	0	1	1	0	0	0	0	0
7/1/3	0	0	0	2	6	3	1	10	1	3	4	7	0	0	0	0
7/5/2						1		1		1	1					
7/5/3	0	0	0	0	2	0	0	2	2	0	2	0	0	0	0	0
7/5/4	1	0	0	1	16	9	9	34	18	5	23	7	0	0	0	0
7/5/5	2	0	0	2	13	16	4	33	2	5	7	1	0	0	0	0
7/1/4				0	5	4	3	12	2	6	8	6	1	2	0	0
7/2/1	0	0	0	1	1	0	0	1	0	1	1	0	0	0	0	0
7/1/5	0	0	0	0	19	10	7	36	10	6	16	5	2	2	0	0
7/1/6	0	0	0	0	6	11	5	22	14	25	39	10	0	0	0	0
7/1/6	0	0	0	0	8	2	1	11	3	2	5	1	0	0	0	1
7/3/1	0	0	0	0	3	0	10	13	1	2	3	0	1	0	0	0
7/3/2	0	0	0	0	1	0	0	1	0	5	5	1	0	0	0	0
7/4/1	0	0	0	0	2	0	2	4	4	4	8	1	0	0	0	0
7/4/2	0	0	0	0	1	2	3	6	1	1	2	5	2	0	0	0
7/1/7	0	0	0	0	4	1	5	10	5	8	13	4	0	1	0	0
7/1/8	1	0	0	1	10	4	1	15	19	67	86	25	6	0	0	0
7/1/p8	0	0	0	0	3	1	1	5	1	0	1	0	0	0	0	0
7/1/9	0	0	0	0	12	13	2	27	7	25	32	8	2	0	0	0
7/1/10	1	0	0	1	2	2	2	6	2	2	4	3	0	0	0	0
7/1/11	1	0	0	1	9	5	4	18	18	28	46	13	6	0	0	0
7/1/12	0	0	0	0	3	1	2	6	2	1	3	1	0	0	0	0
7/5/6	0	1	0	1	4	5	3	12	10	3	13	7	0	0	0	0
7/5/7	0	0	0	0	2	2	0	4	7	6	13	3	0	0	0	0
7/6/1	0	0	0	0	8	7	4	19	3	20	23	0	1	0	3	0
7/6/2	0	0	0	0	13	12	15	40	0	4	4	1	0	0	0	0
7/7/1	1	0	0	1	36	28	27	91	6	0	6	0	0	0	0	0
7/7/2	0	0	0	0	47	19	0	66	0	0	0	0	0	0	0	0
7/7/3				0	4	0	1	5	0	0	0	0	0	0	0	0
7/7/3	1	2	0	3				0			0					
7/7/4	2	3	0	5	62	15	27	104	1	0	1	0	0	0	0	0

U/U/L	LOls	Mats	Br/bf	t.Proto	GrCor	BrCor	SmCor	t. Corr	Bkwt	SPBW	t. BW	2Poly	E/bf	R/w	Adhw	Br/w
7/7/5	2	0	0	2	25	6	5	36	0	0	0	0	0	0	0	0
8/1/0	0	1	0	13	23	10	4	37	5	0	5	1	0	0	0	0
8/1/1	0	0	0	1	7	0	2	9	0	0	0	0	0	0	0	0
8/2/1	0	0	0	0	2	1	2	5	0	0	0	0	0	0	0	0
8/2/2	0	0	0	0	13	4	9	26	0	0	0	0	0	0	0	0
8/2/3	0	0	0	3	32	19	9	60	0	0	0	0	0	0	0	0
8/2/4	0	0	0	2	38	7	7	52	0	0	0	0	1	0	0	0
8/3/0	0	0	0	0	11	18	9	38	0	1	1	2	0	0	0	3
8/3/1				0	0	7	15	22	0	0	0	0	0	0	0	0
8/3/2	0	0	0	0	12	1	0	13	0	0	0	0	0	0	0	0
8/3/3				0	0	2	0	2	0	1	1	0	0	0	0	0
8/3/4				0		2		2			0					
8/4/0	1	0	0	3	48	14	0	62	0	0	0	0	0	0	0	0
8/5/0				0	22	0	0	22	0	0	0	0	0	0	0	0
8/5/1	0	0	0	1	35	8	2	45	0	1	1	0	0	0	0	0
8/6/0	0	0	0	1	38	1	0	39	2	0	2	0	0	0	0	0
8/6/1	1	0	0	1	14	5	0	19	2	0	2	0	0	0	0	0
8/6/2	1	0	0	2	9	4	2	15	1	0	1	0	0	0	0	0
9/1/0	0	0	0	0	16	10	6	32	0	10	10	0	3	0	0	0
9/1/1	2	1	0	3	44	45	4	93	1	10	11	3	0	0	0	0
9/9/0	0	0	0	0	3	2	3	8	0	23	23	1	0	0	0	0
9/2/0					1	1		2								
9/2/1				0	4	1	0	5	0	1	1	0	0	0	0	0
9/3/1	0	0	0	1	26	26	4	56	0	6	6	0	0	0	0	0
9/9/1	0	0	0	1	12	23	6	41	55	0	55	0	0	1	0	4
9/9/2						1		1		5	5					
9/4/1	0	0	0	0	12	8	5	25	0	3	3	1	0	0	0	0
9/6/1	0	0	0	0	12	6	3	21	0	5	5	1	0	0	0	0
9/7/1					3	1		4								
9/8/1	0	0	0	0	9	4	1	14	0	1	1	0	0	0	0	2
9/5/1				0	1	0	0	1	0	0	0	0	0	0	0	0
9/5/2				0	0	1	1	2	0	1	1	0	0	0	0	0
9/5/3	1	0	0	1	4	5	0	9	4	10	14	1	1	0	0	0
9/10/1				0	16	17	3	36	0	14	14	2	0	0	0	9
9/11/1						1		1		1	1	1	1			
10/1/0				0	5		1	6			0					
10/1/1				0	4		1	5	1		1					
10/1/2				0	5		3	8	1		1		1			
10/1/3				0	2			2			0					
10/1/4				0	3			3			0					
10/1/5				0	2			2			0					
10/2/1				0	4			4			0					
Totals	106	20	3	211	4741	2642	1157	8043	350	381	731	170	32	6	3	23

U/L/L	HBr/bf	Z. hist	Euro	PPotBf	t. Hist	Uni bf	Unid	t. Unid	t. Cer
1/1/0					1		16	16	269
1/4/0					0		1	1	38
1/1/1					0		9	9	230
1/4/1					0		4	4	75
1/4/2			1	2	3		4	4	170
1/4/3				3	3		35	35	269
1/1/2					0		17	17	220
1/1/3					0		28	28	300
1/4/4					0			0	210
1/1/4				1	1		4	4	274
1/1/5				3	4		10	10	380
1/1/6				2	2		15	15	632
1/4/5					0		4	4	200
1/4/6				3	3		3	3	189
1/1/7				4	5		7	7	242
1/1/8					1		3	3	358
1/1/9					0		7	7	379
1/4/7					0		1	1	72
1/float									6
1/float									1
1/2/1				4	4		4	4	211
1/2/2					0			0	38
1/2/3					2			0	61
1/2/4					0		2	2	28
1/2/5					0			0	11
1/2/6S				1	1		1	1	4
1/2/7S					0			0	8
1/2/6H					0			0	14
1/2/7H					0			0	2
1/3/1					0			0	21
1/3/2					0			0	13
1/3/3					0		1	1	11
1/3/4					0			0	12
1/3/5					0			0	8
2/4/1					3		3	3	51
2/4/2					0		2	2	16
2/5/1					0			0	8
2/4/3					0			0	36
2/5/2				2	3			0	72
2/4/4					0		2	2	54
2/4/5					4		2	2	51
2/4/6					0		2	2	38
2/5/3				9	11		1	1	83
2/5/4				2	2		7	7	51
2/4/7					0		9	9	123
2/5/5				1	1		1	1	19
2/5/6					0		2	2	32
2/1/0					0		5	5	240

U/L/L	Hbr/bf	Z. hist	Euro	PiPolBr	t. Hist	Uni bf	Unid	t. Unid	t. Cer
2/4/9					0			0	138
2/5/7					0		6	6	38
2/5/8			1		1		2	2	89
2/5/7-8									2
2/1/1					0			0	29
2/1/2					0			0	59
2/1/3					0		5	5	156
2/2/1					1			0	8
2/2/2					0		1	1	2
2/2/3					0			0	20
2/1/4				2	2		11	11	173
2/1/5					0		3	3	69
2/3/1					0			0	85
2/3/2					0			0	10
2/exprf									9
3/1/0				3	3		20	20	124
3/1/1					0		1	1	42
3/1/2					0			0	24
3/1/3				2	2		1	1	35
3/1/4					0		4	4	54
3/1/5					0		1	1	20
3/2/1					0			0	1
3/2/2					0		4	4	24
3/2/4					0			0	10
4/1/0				11	15			0	202
4/5/0				1	7		5	5	160
4/6/0					0		3	3	26
4/3/1				1	1			0	8
4/2/0					0		10	10	11
4/2/1				2	2			0	10
4/5/1					0		1	1	7
4/2/2				1	1		1	1	18
4/2/3					0		3	3	54
4/2/4					4		1	1	39
4/5/2				1	1		4	4	24
4/2/5					0		2	2	6
4/2/6					0			0	1
4/2/9				1	1		2	2	6
4/2/S ex					0			0	32
4/6/1					0		1	1	9
4/6/2				11	13		9	9	32
4/6/3					0		3	3	19
4/6/4				1	2		8	8	42
4/6/5				4	4		7	7	17
4/9/1				1	1		5	5	18
4/1/1					2		9	9	144
4/1/2				17	17		10	10	144
4/1/3					0		4	4	100

U/UL	Här/bf	Z. hist	Euro	PlPolBf	t. Hist	Uni bf	Unid	t. Unid	t. Cer
4/1/4					0			0	55
4/4/1				1	1		1	1	12
4/1/5					0		11	11	61
4/7/1					0		3	3	23
4/7/2				2	2		4	4	35
4/8/N ex				1	3			0	197
4/8/1				6	6		5	5	20
4/8/2				4	4		3	3	54
4/8/3					0		1	1	63
4/6-7w									4
5/1/0			12		16		1	1	54
5/4/1			1	1	2			0	4
5/1/1			1		1		1	1	20
5/1/2			1	2	4			0	60
5/7/1				3	3		2	2	227
5/8/1					0		8	8	128
5/9/1					1		9	9	52
5/9/2					0			0	82
5/9/3					0		4	4	185
5/9/4				1	2			0	154
5/11/1					0		2	2	17
5/12/1					0		4	4	22
5/13/2					0		1	1	97
5/15/1					0			0	9
5/13/3					0			0	159
5/13/4					0			0	26
5/17/1					0			0	286
5/17/3					0			0	47
5/19/1					0			0	47
5/19/2					0			0	61
5/21/1					0			0	19
5/19/3					0			0	20
5/19/4					0			0	49
5/19/5					0			0	88
5/19/6					0			0	16
5/22/6					0			0	8
5/5/1					0			0	22
5/6/1					0		3	3	83
5/10/1				5	6			0	26
5/10/2			1		1			0	24
5/10/3				2	2		7	7	38
5/10/3							2	2	93
5/14/1					0		1	1	32
5/14/2					1			0	103
5/14/3					0			0	141
5/16/1					0			0	26
5/14/4					0			0	13
5/14/5					0			0	28

U/E/L	Hbr/bf	Z. hist	Euro	P/Pollf	t. Hist	Uni bf	Unid	t. Unid	t. Cer
5/14/6					0			0	20
5/18/1					1			0	27
5/20/1					0			0	48
5/20/2					0			0	75
5/20/3					0			0	11
5/20/4					0			0	27
6/1/0	0	0	0	0	0	0	0	0	91
6/1/1	0	0	0	0	0	0	0	0	210
6/2/1	0	0	0	1	1	0	0	0	133
6/2/2	0	0	0		0			0	112
6/2/3	0	0	0	0	0	0	0	0	52
6/3/1	0	0	0		0			0	11
6/4/1	0	0	0		0			0	5
6/4/2	0	0	0		0			0	4
6/5/1	0	0	0		0			0	25
6/6/1	0	0	0		0			0	5
6/6/2	0	0	0		0			0	16
6/7/1	0	0	0		0			0	58
6/7/2	0	0	0	0	0	0	0	0	145
6/8/1	0	0	0	0	0	0	0	0	125
6/8/2	0	0	0		0			0	82
6/wc	0	0	5	0	5	0	0	0	83
7/1/0	0	1	1	0	8	9	0	9	56
7/5/0	1	0	0		1			0	6
7/5/1	0	0	0	1	2	0	0	0	7
7/1/1	0	0	0	0	1	1	0	1	25
7/1/2	0	1	0	3	4	0	0	0	9
7/1/3	0	2	0	8	17	0	1	1	51
7/5/2						1		1	3
7/5/3	0	0	0	2	2	0	0	0	8
7/5/4	0	0	0	0	7	6	2	8	91
7/5/5	0	0	0	7	8	2	2	4	76
7/1/4	0	1	0		10			0	80
7/2/1	0	0	0	1	1	0	0	0	8
7/1/5	0	4	0	13	26	0	0	0	180
7/1/6	0	0	0	27	37	0	0	0	165
7/1/6	0	0	0	4	6	0	0	0	29
7/3/1	0	0	0	5	6	0	1	1	29
7/3/2	0	0	0	2	3	0	3	3	19
7/4/1	0	0	0	0	1	2	0	2	19
7/4/2	0	0	0	6	13	0	0	0	33
7/1/7	1	0	0	7	13	0	0	0	62
7/1/8	6	19	0	74	130	0	0	0	293
7/1/p8	0	0	0	0	0	2	1	3	23
7/1/9	0	0	0	0	10	5	7	12	155
7/1/10	0	0	0	0	3	0	1	1	30
7/1/11	0	3	0	0	22	5	0	5	144
7/1/12	0	0	0	0	1	1	0	1	18
7/5/6	0	0	0	0	7	12	0	12	68
7/5/7	0	0	0	5	8	0	1	1	41
7/6/1	0	0	0	5	9	0	1	1	78
7/6/2	0	0	0	3	4	0	6	6	101
7/7/1	0	0	0	0	0	0	0	0	143
7/7/2	0	0	0	0	0	0	5	5	111
7/7/3	0	0	0	0	0	0	1	1	10
7/7/3					0			0	36
7/7/4	0	0	0	0	0	0	2	2	186

U/L/L	Hbr/bf	Z. hist	Euro	PiPolBf	t. Hist	Uni bf	Unid	t. Unid	t. Cer
7/7/5	0	2	0	0	2	2	0	2	94
8/1/0	0	0	0	5	6	0	0	0	120
8/1/1	0	0	0	0	0	0	0	0	26
8/2/1	0	0	0	1	1	0	0	0	19
8/2/2	1	0	0	2	3	0	0	0	49
8/2/3	0	0	0	9	9	0	2	2	159
8/2/4	0	0	0	4	5	0	0	0	139
8/3/0	0	0	0	0	5	0	1	1	73
8/3/1	0	0	0		0			0	41
8/3/2	0	0	0	0	0	0	1	1	24
8/3/3	0	0	0		0			0	4
8/3/4					0			0	3
8/4/0	0	0	0	0	0	0	4	4	115
8/5/0	0	0	0		0			0	47
8/5/1	0	0	0	1	1	0	0	0	90
8/6/0	0	0	0	0	0	0	0	0	81
8/6/1	0	0	0	0	0	0	0	0	53
8/6/2	0	0	0	0	0	0	0	0	39
9/1/0	0	0	0	2	5	0	3	3	72
9/1/1	0	0	0	6	9	0	5	5	195
9/9/0	0	0	0	1	2	0	1	1	43
9/2/0							1	1	3
9/2/1	0	0	0		0			0	8
9/3/1	1	0	0	0	1	0	1	1	95
9/9/1	3	0	0	4	12	0	6	6	135
9/9/2									6
9/4/1	0	0	0	3	4	0	5	5	59
9/6/1	0	0	0	0	1	0	5	5	47
9/7/1									4
9/8/1	0	0	0	1	3	0	2	2	36
9/5/1	0	0	0		0			0	2
9/5/2	0	0	0		0			0	3
9/5/3	0	1	0	2	5	0	0	0	43
9/10/1	0	0	0		11			0	102
9/11/1				2	4		1	1	7
10/1/0					0			0	11
10/1/1					0			0	11
10/1/2					1			0	16
10/1/3					0			0	3
10/1/4					0			0	4
10/1/5					0			0	6
10/2/1					0			0	6
Totals	13	34	24	341	646	48	504	552	17121

APPENDIX F
ZUNI POTTERY CLASSIFICATONS

Sources: Hardin 1983; Stevenson 1883

Introductory notes:

1. There were two criteria for classification:
   a) vessel shape with two designations,
      sa' le open bowl forms
      de' le closed jar forms or storage vessels
   b) vessel size
2. Zuni pottery classifications identified vessel function (how a vessel was used) and context or setting (where a vessel was used).
3. Cookwares were classified differently than slipped wares.
4. Zuni terms are spelled using Stevenson's spelling rather than the new Zuni orthography.

Cookware classifications

Zuni name	Shape	Size
pa-teh-le	cylindrical, closed	large
pah-tehl-tsan-na	cylindrical, closed	medium
wah-li-ah-ka-tehl-le	cylindrical, closed	small
sa-mu-yen	open, bowl form	
sa-mu-yen-sa-qui-pa	open, bowl form; tripod base	

Slipped ware classifications

Zuni name	Shape	Size	Comments
kah'wi-na-ka-tehl-le	closed	large	water or storage jar rim diameter of sample = 16-22 cm
det-tsan-na	closed	small	water or child's jar rim diameter of sample = 9-14 cm
me-he-to-tsan-na	closed	small	canteen
me-wi-i-pa-chin	closed		double canteen
me-wi-ke-lik-ton-ne	closed		double canteen
ko'-se-tom-me	closed		barrel shaped canteen
e-yah-me-he-to	closed		duck-shaped canteen

Zuni name	Shape	Size	Comments
e'-musch-ton-ne	closed	small	pitcher; 1 pint- 1/2 gallon capacity
mo-tsin-i-ka-sa-le	open	large	dough bowl
i'ton-a-ka-sah-le	open	medium	eating and serving bowls
sat-tsan-na	open	small	eating bowls
sat-tsan-na-mu-ya	open	small	cups with handles
ma-po-ka-tehl-le	open	small	round or vaseshaped condiment cup
ma-po-ka-thle-lo-ne	open	small	square condiment cup
sa-sho-kon-ne	open	small	ladle
hel-i-po-ka-tehl-le	open	small	paint cup
hel-i-po-ka-ehl-tsan-na	open	small	paint cup
hel-i-po-ka-tehl-i-pa-chin	open	small	double paint cup
ah wehl-wi-ah-pa-sahl	open		general term for basket
tkha-po-ka-tehl-le	open		round or cup-shaped basket
ah-wehl-wi-ah-pa-sahl-tsan-na	open	small	basket
mu-hu-que	effigy		owl
mu-hu-que-tsan-sa	effigy		owl

APPENDIX G
RIM DIAMETERS ON SHERDS FROM LOWER PESCADO VILLAGE

Prehistoric rims

FS	ULL	stratum	definition	ware type	rim(cm)	comments
28	113	1D	midden	Heshotautla	30	
28	113	1D	midden	Heshotautla	28	
28	113	1D	midden	Heshotautla	32	
28	113	1D	midden	Heshotautla	32	
28	113	1D	midden	Heshotautla	24	
28	113	1D	midden	Heshotautla	28	
28	113	1D	midden	Plain Polished Red	30	
28	113	1D	midden	Plain Polished Red	8	
28	113	1D	midden	White Mtn. Redware	25	
28	113	1D	midden	Cibola Whiteware	8	jar
28	113	1D	midden	corrugated	30	
28	113	1D	midden	corrugated	14	
41	115	1E	midden	Kwakina	26	sherd nos. 35,49
41	115	1E	midden	Kwakina	27	
41	115	1E	midden	Kwakina	24	7,13,80,113
41	115	1E	midden	Kwakina	28	
41	115	1E	midden	Glaze-on-white	11	
41	115	1E	midden	Glaze-on-white	12	
41	115	1E	midden	Heshotautla	18	sherds 68,82,144
41	115	1E	midden	Heshotautla	32	
41	115	1E	midden	Heshotautla	20	
41	115	1E	midden	Heshotautla	22	
41	115	1E	midden	Heshotautla	26	
41	115	1E	midden	Heshotautla	14	
41	115	1E	midden	Heshotautla	20	
41	115	1E	midden	White Mtn. Redware	34	
41	115	1E	midden	Plain Polished Red	28	sherds 10,225
A41	115	1E	midden	Heshotautla	26	
A41	115	1E	midden	Heshotautla	16	
A41	115	1E	midden	Heshotautla	28	
A41	115	1E	midden	Heshotautla	22	
A41	115	1E	midden	Heshotautla	22	

A41	115	1E	midden	Heshotautla	34	
151	146	1E	midden	Heshotautla	26	
151	146	1E	midden	Heshotautla	26	
151	146	1E	midden	Heshotautla	28	
151	146	1E	midden	White Mtn. Redware	26	
151	146	1E	midden	Plain Polished Red	6	jar; sherds 14,15
151	146	1E	midden	Pinnawa Red/white	10	
151	146	1E	midden	corrugated	24	
151	146	1E	midden	corrugated	30	
151	146	1E	midden	corrugated	32	
151	146	1E	midden	corrugated	16	
151	146	1E	midden	Buffware	10	
54	117	1F	midden	Heshotautla	20	
54	117	1F	midden	Heshotautla	20	
54	117	1F	midden	Heshotautla	22	
54	117	1F	midden	Heshotautla	28	
54	117	1F	midden	Kwakina	28	
54	117	1F	midden	corrugated	22	
54	117	1F	midden	Blackware	8	
57	117	1F	midden	Heshotautla	20	
57	117	1F	midden	Late Glazeware	16	
57	117	1F	midden	corrugated	32	
57	117	1F	midden	corrugated	30	
57	117	1F	midden	corrugated	28	
70	119	1F	midden	Kwakina	22	sherds 101,107
70	119	1F	midden	Kwakina	22	
70	119	1F	midden	Heshotautla	8	jar; sherds 3,4
70	119	1F	midden	Heshotautla	28	
70	119	1F	midden	Heshotautla	28	
70	119	1F	midden	Heshotautla	20	
70	119	1F	midden	Heshotautla	16	
70	119	1F	midden	Heshotautla	24	
70	119	1F	midden	Heshotautla	12	
70	119	1F	midden	Heshotautla	20	
70	119	1F	midden	Heshotautla	21	
70	119	1F	midden	White Mtn. Redware	29	
70	119	1F	midden	White Mtn. Redware	30	

70	119	1F	midden	White Mtn. Redware	12	
70	119	1F	midden	White Mtn. Redware	12	
70	119	1F	midden	Plain Polished Red	30	
70	119	1F	midden	corrugated	28	
70	119	1F	midden	corrugated	34	
70	119	1F	midden	corrugated	48	
70	119	1F	midden	corrugated	47	
70	119	1F	midden	corrugated	32	
70	119	1F	midden	Blackware	4	"pinch pot"
1002	210	2G	room fill	Heshotautla	18	
1002	210	2G	room fill	Heshotautla	20	sherds 9.14
1002	210	2G	room fill	Heshotautla	26	
1002	210	2G	room fill	Heshotautla	20	
1002	210	2G	room fill	White Mtn. Redware	14	
1002	210	2G	room fill	White Mtn. Redware	10	
1002	210	2G	room fill	Pinedale	20	
1002	210	2G	room fill	Pinedale	6	jar
1002	210	2G	room fill	corrugated	40	
1002	210	2G	room fill	corrugated	40	
1002	210	2G	room fill	corrugated	10	
1002	210	2G	room fill	corrugated	20	
1002	210	2G	room fill	corrugated	26	
1002	210	2G	room fill	corrugated	32	
1002	210	2G	room fill	corrugated	26	
1002	210	2G	room fill	corrugated	22	
1002	210	2G	room fill	corrugated	32	
1002	210	2G	room fill	corrugated	32	
1002	210	2G	room fill	corrugated	24	
1013	210	2G	room fill	Heshotautla	20	
1248	258	2G	room fill	Heshotautla	34	
1248	258	2G	room fill	Heshotautla	34	
1248	258	2G	room fill	White Mtn. Redware	20	
1248	258	2G	room fill	Plain Polished Red	37	
1248	258	2G	room fill	corrugated	28	
1248	258	2G	room fill	corrugated	20	
1248	258	2G	room fill	corrugated	24	
1024	212	2H	room fill	Heshotautla	24	

1024	212	2H	room fill	White Mtn. Redware	32	
1033	212	2H	room fill	St. Johns Polychrome	20	
1033	212	2H	room fill	corrugated	24	
1113	214	2K	floor	Heshotautla	14	
1113	214	2K	floor	Heshotautla	16	
1113	214	2K	floor	White Mtn. Redware	14	
1113	214	2K	floor	White Mtn. Redware	30	
1113	214	2K	floor	Pinedale	10	jar
1113	214	2K	floor	Puerco	8	jar
1113	214	2K	floor	Plain Polished Buff	14	sherds 3.24
1113	214	2K	floor	corrugated	38	
1113	214	2K	floor	corrugated	14	
1113	214	2K	floor	corrugated	22	
1113	214	2K	floor	corrugated	14	
1141	231	2L	subfloor	St. Johns Polychrome	34	
1141	231	2L	subfloor	St. Johns Polychrome	26	
1141	231	2L	subfloor	White Mtn. Redware	20	
1141	231	2L	subfloor	White Mtn. Redware	22	
1141	231	2L	subfloor	Cibola Whiteware	12	
1141	231	2L	subfloor	corrugated	28	
1143	231	2L	subfloor	White Mtn. Redware	14	
1143	231	2L	subfloor	White Mtn. Redware	20	
1143	231	2L	subfloor	Cibola Whiteware	14	sherds 5.8
1143	231	2L	subfloor	corrugated	40	
3024	571	5D	buried surface	White Mtn. Redware	4	jar
3024	571	5D	buried surface	White Mtn. Redware	20	
3024	571	5D	buried surface	White Mtn. Redware	26	
3024	571	5D	buried surface	Pinnawa Red/white	12	jar
3024	571	5D	buried surface	Plain Polished Red	12	
3024	571	5D	buried surface	Plain Polished Red	6	
3024	571	5D	buried surface	Cibola Whiteware	8	jar
3024	571	5D	buried surface	corrugated	22	
3024	571	5D	buried surface	corrugated	40	
3024	571	5D	buried surface	corrugated	32	
3024	571	5D	buried surface	corrugated	20	
3024	571	5D	buried surface	corrugated	30	
3037	591	5F	buried surface	Heshotautla	30	

3037	591	5F	buried surface	Heshotautla	18
3073	5132	5I	buried surface	Heshotautla	22
3073	5132	5I	buried surface	Heshotautla	24
3073	5132	5I	buried surface	Heshotautla	24
3073	5132	5I	buried surface	Heshotautla	18
3073	5132	5I	buried surface	St. Johns Polychrome	22
3073	5132	5I	buried surface	White Mtn. Redware	24
3073	5132	5I	buried surface	corrugated	20
3143	5192	5O	buried surface	White Mtn. Redware	14
3143	5192	5O	buried surface	corrugated	30

Historic rims

FS	ULL	stratum	definition	ware type	rim(cm)	comments
1157	241	2A	overburden	Zuni Polychrome	16	bowl
1157	241	2A	overburden	Zuni Polychrome	14	bowl
1233	253	2D	room fill	Plain Polished Red	16	soup bowl
1236	254	2D	room fill	Smudged/Polished Black	17	
1236	254	2D	room fill	Smudged/Polished Black	20	
1045	310	3A	overburden	Blackware	16	
2007	450	4C	ash lens	Plain Polished Buff	24	Xmend2040
2081	424	4G	surface	Zuni Polychrome	28	soup bowl
2081	424	4G	surface	Zuni Polychrome	16	jar
2101	462	4J	mixed room fill	Zuni Polychrome	22	soup bowl
5075	750	7A	overburden	Blackware	28	
5018	713	7C	midden	Plain Polished Buff	28	
5018	713	7C	midden	Zuni Polychrome	16	jar
5088	752	7C	midden	Red/buff	18	bowl
5029	714	7D	midden	Buff/white	24	
5034	715	7F	midden	Zuni Polychrome	23	
5042	716	7F	midden	Smudged/Polished Black	18	
5042	716	7F	midden	Smudged/Polished Black	15	
5042	716	7F	midden	Smudged/Polished Black	17	
5042	716	7F	midden	Plain Polished Buff	20	
5042	716	7F	midden	Plain Polished Buff	24	sherds 12,31
5042	716	7F	midden	Plain Polished Buff	27	
5049	717	7G	midden	Smudged/Polished Black	23	

5049	717	7G	midden	Zuni Polychrome	12	jar;Xmend 5128.39
5049	717	7G	midden	Brown/buff	35	Xmend 5063.5
5063	718	7G	midden	Blackware	27	
5063	718	7G	midden	Smudged/Polished Black	21	
5063	718	7G	midden	Smudged/Polished Black	25	
5063	718	7G	midden	Brown/buff	35	Xmend5049.1
5063	718	7G	midden	Plain Polished Red	20	
5063	718	7G	midden	Zuni Polychrome	22	
5063	718	7G	midden	Zuni Polychrome	31	
5063	718	7G	midden	Zuni Polychrome	26	
5063	718	7G	midden	Zuni Polychrome	28	
5063	718	7G	midden	Zuni Polychrome	27	sherds 1, 65
5063	718	7G	midden	Red/buff	39	
5063	718	7G	midden	Plain Polished Red	22	
5063	718	7G	midden	Plain Polished Red	39	
5063	718	7G	midden	Plain Polished Buff	18	jar
5063	718	7G	midden	Plain Polished Buff	30	
5063	718	7G	midden	Plain Polished Buff	40	sherds 31,271
5063	718	7G	midden	Plain Polished Buff	32	sherds 26,28
5063	718	7G	midden	Plain Polished Buff	39	
5055	731	7G	midden	Black/red	33	sherds 1to5
5060	741	7G	midden	Smudged/Polished Black	26	sherds 6,10
5128	754	7G	midden	Smudged/Polished Black	25	
5128	754	7G	midden	Zuni Polychrome	12	Xmend 5049.30
5128	754	7G	midden	Zuni Polychrome	26	
5096	719	7H	midden	Smudged/Polished Black	34	
5096	719	7H	midden	Smudged/Polished Black	39	
5096	719	7H	midden	Smudged/Polished Black	30	
5096	719	7H	midden	Plain Polished Red	24	Xmend 5015.13
5102	7110	7H	midden	Zuni Polychrome	20	
5108	7111	7H	midden	Blackware	25	
5108	7111	7H	midden	Ashiwi	22	
5139	756	7H	midden	Smudged/Polished Black	39	
5139	756	7H	midden	Red/buff	37	Xmend 5063.12
5146	757	7H	midden	Blkware	38	
5105	761	7I	buried surface	Ashiwi	22	
5105	761	7I	buried surface	Plain Polished Buff	29	

5105	761	7I	buried surface	Zuni Polychrome	27	
5105	761	7I	buried surface	Plain Polished Red	24	Xmend 5096.11
5117	762	7I	buried surface	Blackware	9	"pinch pot"
7000	910	9A	overburden	Plain Polished Buff	25	
7041	990	9A	overburden	Smudged/Polished Black	30	
7047	991	9B	room fill	Smudged/Polished Black	24	
7047	991	9B	room fill	Red/buff	23	
7047	991	9B	room fill	Red/buff	24	
7015	941	9C	hearth	Plain Polished Red	23	
7042	9101	9H	subfloor	Blackware	19	

APPENDIX G
FAUNAL REMAINS FROM LOWER PESCADO VILLAGE
Prehistoric Levels

stratum	1C	1D	1E	1F	1G	1H	1I	1J	2G	2H	2I	2J	2K	2L	4H	4I	4M	4N	4P	4 I5	5G	5H	5I	5K	5L
Reptiles and amphibians																									
unident herptile																					1	1			
unident anuran																									
unident snake																									
Birds																									
unident ardeid																									
unident anatid																									
Aquila chrysaetos		1																			1				
Buteo sp		3	1	1																			1		
unident accipitrid		1	1	2																					
Falco sparverious														1											
Meleagris gallopavo	6	25	38	20	3	2	1		34	2	1	1					1	2	1		4	1	1	2	
unident tetraonid																									
Asio sp																									
Colaptis auratis																									
Mammals																									
unident leporid	17	3	15	20	1	1			2												5	1	1	1	
Sylvilagus sp	24	27	74	73	4	3			8	1			1	3			1	3	1	1	11	4	4	6	1
Sylvilagus audobonii				1														1							
Lepus sp		5	16	6								1		4				1						1	
unident sciurid	9	34	65	51	2				4	1				1			3				5	3	3	4	
Eutamias quadrivittatus																									
Spermophilus sp																									
Cynomys sp		5	23	16							1										1	1		2	
Cynomys gunnisoni		3	4	4																	1			1	
Thomomys sp			2	2	1																1				
Thomomys cf. *bottae*																									
Dipodomys sp	1		1																						
Peromyscus sp	3			1																					
Neotoma sp		1	10	9	1				1			2				1								2	
unident arvicoline				1																					
Microtus sp																								1	
Ondrata zibethicus																									
Erethizon dorsatum		1																							
unident canid				1										2											
Canis sp	2	1	6	5						1				1										1	
Taxidea taxus							1																		
Sus scrofa																									
unident artiodactyl		2	5	6	1	2			2						1						1				
Odocoileus sp			3	4	1																			/	
Odocoileus hemionus																									
Antilocapra americana			1																						
Bos/ bison																									
Bos/ bison or *Equus*																									
Bos taurus																									
Ovis/ capra			1	2																					
Equus sp																									
Total NISP	62	112	266	225	14	8	2		51	5	2	4	1	12	1	1	5	7	2	1	31	11	10	21	1
scrap/unident	73	126	290	327	24	0	2	1	106	12	4	9	82	25	45	0	11	7	2	0	40	5	11	40	0
Total faunal	135	238	556	552	38	8	4	1	157	17	6	13	83	37	46	1	16	14	4	1	71	16	21	61	1

APPENDIX G

Prehistoric fauna, continued

	5M	5N	5O	5P	5Q	5R	5S	5T	5U	7K	8C	8D/E	8F	8G	8H	10A	Total
Reptiles and amphibians																	
unident herptile																	2
unident anuran																	0
unident snake																	0
Birds																	
unident ardeid																	0
unident anatid																	0
Aquila chrysaetos																	2
Buteo sp																	6
unident accipitrid																	4
Falco sparverious																	1
Meleagris gallopavo		2					3			4	1	1	1	1	1	1	160
unident tetraonid																	0
Asio sp																	0
Colaptis auratis																	0
Mammals																	
unident leporid		1					2					3				1	74
Sylvilagus sp		3	1	1			5		1	5	3	13	4	3	1	3	293
Sylvilagus audobonii							1			1	1					1	6
Lepus sp										1	1		2	3			41
unident sciurid	2						1				2	1		1			192
Eutamias quadrivittatus												1					1
Spermophilus sp															1		1
Cynomys sp										1							50
Cynomys gunnisoni																	13
Thomomys sp																	6
Thomomys cf *bottae*										1							1
Dipodomys sp																	2
Peromyscus sp																	4
Neotoma sp												2	2			1	32
unident arvicoline																	1
Microtus sp																	1
Ondrata zibethicus																	0
Erethizon dorsatum										1							2
unident canid																	3
Canis sp	1																18
Taxidea taxus																	1
Sus scrofa																	0
unident artiodactyl										2							22
Odocoileus sp										1							9
Odocoileus hemionus																	0
Antilocapra americana																	1
Bos/ bison																	0
Bos/ bison or *Equus*																	0
Bos taurus																	0
Ovis/ capra																	3
Equus sp																	0
Total NISP	3	6	1	1	0	0	12	0	1	17	8	21	9	8	3	7	952
	9	8	4	1	1	1	19	1	0	16	29	13	12	3	5	5	1369
	12	14	5	2	1	1	31	1	1	33	37	34	21	11	8	12	2321

Appendix G
Historic levels

stratum	1A	1B	1C	2A	2B	2C	2D	2E	2F	3A	3B	3C	3E	4A	4B	4C/D	4E	4F	4G	4 f1	5B	5C	5D
Reptiles and amphibians																							
unident herptile																							
unident anuran																			7				
unident snake																							
Birds																							
unident ardeid																							
unident anatid																							
Aquila chrysaetos	1																						
Buteo sp.											1												
unident accipitrid																							
Falco sparverious																							
Meleagris gallopavo	5	2	2				1	4	2			2	1										1
unident tetraonid																							
Asio sp.																	1						
Colaptis auratis																							
Mammals																							
unident leporid	11	2	8				2			1	2			1					1				
Sylvilagus sp.	16	10	12	1		2	7	3			8		3	3	1		1	1		1		5	2
Sylvilagus audobonii																							
Lepus sp.	1	1									1												
unident sciurid	10	2	1					4			3		1	2								1	3
Eutamias quadrivittatus																							
Spermophilus sp.											1												
Cynomys sp.	3	2									2											1	
Cynomys gunnisoni	1													2			1						
Thomomys sp.							1	1											1				
Thomomys cf. *bottae*																							
Dipodomys sp											1												
Peromyscus sp																							
Neotoma sp	1		1								2			1				1					1
unident arvicoline																							
Microtus sp														1									
Ondrata zibethicus																							
Erethizon dorsatum																							
unident canid																							
Canis sp.	1									3													
Taxidea taxus																							
Sus scrofa																							
unident artiodactyl	5	2			1	5	23	1		4	1			6	2		1	1	4		1	3	
Odocoileus sp.										1													
Odocoileus hemionus																							
Antilocapra americana							2																
Bos/ bison																			1				
Bos/ bison or *Equus*																							
Bos taurus																							
Ovis/ capra	1	1	1		1	2	20				2			5	2		1				1	3	
Equus sp.																							
Total NISP	56	22	25	1	2	9	56	13	2	9	24	2	5	21	5	0	5	3	14	1	2	13	7
scrap/unident	39	21	110	50	6	26	219	42	30	26	14	17	7	294	15	5	14	20	27	17	4	75	14
Total faunal	95	43	135	51	8	35	275	55	32	35	38	19	12	315	20	5	19	23	41	18	6	88	21

Appendix G
Historic fauna, continued

	5E	5F	6A	6B	7A	7B	7C	7D	7E	7F	7G	7H	7I	8A	8B	9A	9B	9C	9D	9E	9G	9H	Total
Reptiles and amphibians																							
unident herptile											1												1
unident anuran		1																					8
unident snake															1								1
Birds																							
unident ardeid																							0
unident anatid						1	1																2
Aquila chrysaetos																							1
Buteo sp																							1
unident accipitrid				1																			1
Falco sparverious																							0
Meleagris gallopavo	2	1	1	1	1					2		1			3		2					1	35
unident tetraonid					1																		1
Asio sp																							1
Colaptis auratis																							0
Mammals																							
unident leporid				1			2							2			1	1					35
Sylvilagus sp.		4	7	25		1	1	1		5		3		1	5	1	3		3				136
Sylvilagus audobonii																	1						1
Lepus sp								1									1						5
unident sciurid		3	1	2	1					4	3	5	1	3	1		3						54
Eutamias quadrivittatus																							0
Spermophilus sp				1																			2
Cynomys sp				2						3		1					1						15
Cynomys gunnisoni															1								5
Thomomys sp										1	1												5
Thomomys cf *bottae*																							0
Dipodomys sp												2											3
Peromyscus sp																							0
Neotoma sp		1	2	3				1															14
unident arvicoline																							0
Microtus sp																							1
Ondrata zibethicus										1													1
Erethizon dorsatum																							0
unident canid																							0
Canis sp																1	3						8
Taxidea taxus												1											1
Sus scrofa																							0
unident artiodactyl			2	1	17	4	69	22	6	64	37	120	41	4	6		2		2		1	7	465
Odocoileus sp						1	2			2	2												8
Odocoileus hemionus																							0
Antilocapra americana				1			2			2		4			1								12
Bos/ bison										2	1	2		1								1	8
Bos/ bison or *Equus*											1												1
Bos taurus										2		1											3
Ovis/ capra					5	1	51	16	1	34	20	77	29		1			1	1			6	283
Equus sp										1	1												2
	2	10	13	38	25	8	126	41	7	123	67	217	71	11	19	2	17	2	6	0	1	15	1120
	7	25	0	0	94	63	486	315	37	1015	333	995	179	53	133	45	31	13	5	27	38	141	2239
	9	35	13	38	119	71	614	356	44	1138	400	1212	250	64	152	47	48	15	11	27	37	156	4470

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ABBREVIATIONS FOR ARCHIVAL SOURCES

AGO	Records of the Adjutant General's Office
DNM	Records of the Ninth Military District, District of New Mexico
FWLB	Fort Wingate Letter Books
MISC	Miscellaneous Papers Pertaining to Indian Affairs, Record Group 282
OCG	Records of the Office of the Commissary General
QMG	Records of the Quartermaster General
USCC	United States Claims Court

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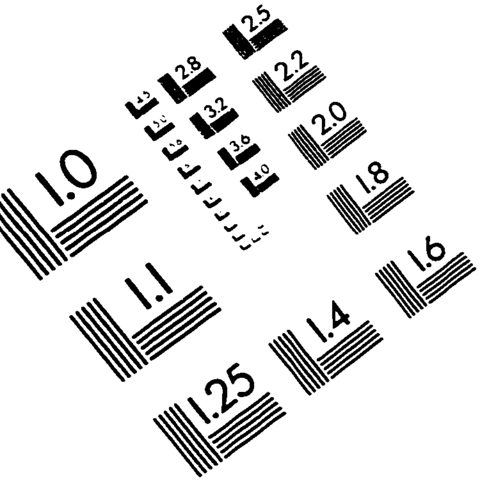

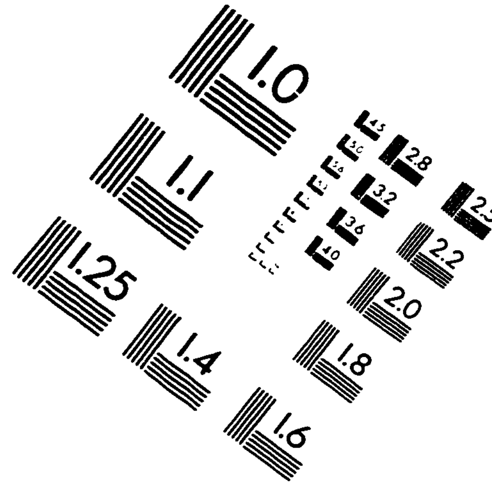

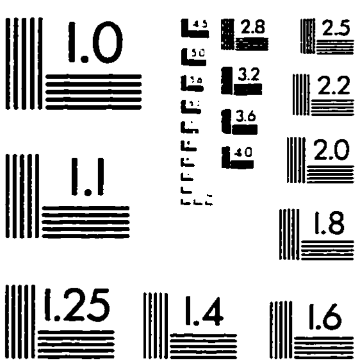

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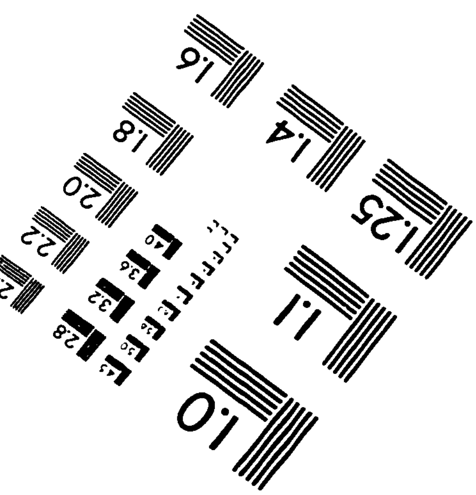

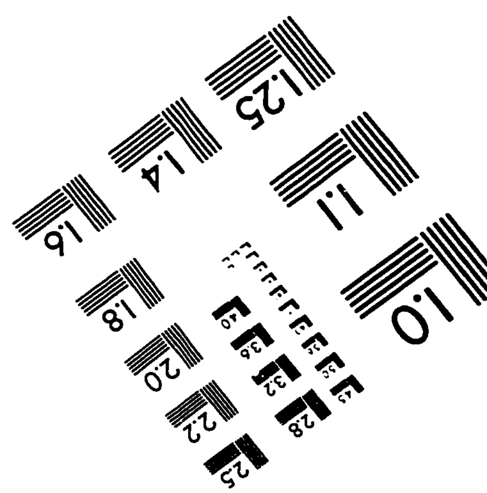

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