MUSEUM OF NEW MEXICO
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ARCHAEOLOGY OF THE MOGOLLON HIGHLANDS:
SETTLEMENT SYSTEMS AND ADAPTATIONS

edited by Yvonne R. Oakes and Dorothy A. Zamora

VOLUME 6. SYNTHESIS AND CONCLUSIONS

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Submitted by
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Principal Investigator

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ARCHITECTURAL VARIATION IN MOGOLLON STRUCTURES

Yvonne R. Oakes

The architecture that occurred inside the houses was sufficiently variable that it is next to impossible to describe a typical Mogollon pattern. Clearly, benches, partitions, fireplaces, ash pits, deflectors, heating pits, and storage pits and bins occurred in some Mogollon houses. These features, however, were never characterized by the wide distribution that was present in Anasazi areas. This pattern suggests a pronounced functional variability in the use of roofed space in the Mogollon region . . .

Martin and Plog 1973:92-93

The most consistent statement found in the archaeological literature regarding structural planning by prehistoric peoples within the Mogollon Highlands is that there is no consistent plan. There are apparently wide variations in exterior architectural form and size, design and complexity of interior features, and in site layout (Schroeder and Wendorf 1954:64; Reed 1956:13; Cordell and Plog 1979:414). Several researchers also note a progressive decrease in habitation size through time from the Early Pithouse period (Pinelawn phase) through the Three Circle phase of the Late Pithouse period (Martin and Rinaldo 1950a; Bullard 1962). This chapter examines structural variation within the various temporal periods in the region and specifically addresses these above comments.

STRUCTURAL VARIATION THROUGH TIME

There are only a limited number of basic shapes a habitation unit can take, ranging from irregular to circular, oval, subrectangular, or rectangular. Variations on these would include bilobed, D-shaped, or kidney-shaped. Structural size, on the other hand, can be quite variable as can interior structural features. These attributes are examined for consistency in patterning and in terms of change through time.

Table 6.1 presents the compiled research data on variation in room sizes for three areas: the Southwest in general, New Mexico, and the Mogollon Highlands. The calculation of mean floor area for all circular pit structures was based on $pi r^2$ rather than length times width to give a more accurate comparison with later rectangular rooms of the Pueblo period. (This may result in a smaller floor area than derived by other analysts.) The range of floor areas and the means are shown along with divisions into small, medium, and large units based on the use of one-standard deviations dispersed around the mean floor size for each period within each of the three areas. Other researchers have based size differentiations on data specific to one site or to a group of related sites (Dean 1969; Hill 1970; Bagley-Baumgartner 1984; Saitta 1994). Some equate small, medium, and large-sized units with storage rooms, habitation rooms, and communal rooms, respectively (Adams 1983; Anyon and LeBlanc 1984).

While Table 6.1 has flaws, it removes ambiguity and provides a standardized formula for comparison of sites within different locations and within various temporal periods. Rooms classified as small on the chart may well be for storage and, in some cases, may not. Likewise, rooms that are quite large may indeed serve a communal function. However, in both cases, the individual sites on which these variations occur need to be examined further within the context of potential social dynamics that may have created very small or very large rooms. Table 6.2 presents the data base for all sites used in this study.

Archaic Period

Archaic pit structure sizes are the smallest in all areas for all periods (Table 6.1 and Fig. 6.1). Across the Southwest, Archaic pit rooms average 8.46 sq m, while in the Mogollon Highlands they average 7.46 sq m. Units of this size suggest single-family dwellings and possibly single-person habitations used during short encampments or subsistence forays. Numerous extramural pits have been found that associate with many of the pit dwellings and these mostly represent storage facilities. Large communal structures do not appear to be present during the Archaic period. The largest pit unit in the data base, at 22.89 sq m, was recorded at Tumbleweed Canyon, near Vernon, Arizona (Martin et al. 1962).

The dominant shape of pit structures is circular to ovoid, often consisting of nothing more than shallow, basin-shaped pits. Ciolek-Torrello (1995:535) suggests that superstructures were probably poles covered with brush, hides, or grasses. Depths rarely extend more
### General Southwest

<table>
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<tr>
<th>PERIOD/PHASE</th>
<th>STORAGE</th>
<th>HABITATION</th>
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<th>NUMBER</th>
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<td>Archaic</td>
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<td>3.47 to 13.45</td>
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<tr>
<td></td>
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### Table 6.2. Data Sources for Room Size Charts

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<td>OC-8</td>
<td>Chama River, New Mexico</td>
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<td>Benson 8:3 and Pearce 8:4</td>
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Figure 6.1. Sizes of rooms per period/phase in the Mogollon Highlands.
than 40 cm. Walls and floors are unprepared and frequently slope inward as they approach the floor. Hearths and interior storage pits are not uncommon. Hearths consist of circular basin types or fire areas built directly on floor surfaces. Most of the time they are constructed that sorted pit structures by age; however, during the extensive Archaic period, a scatterplot was used to ask why some houses are much, much larger than in the earlier Archaic period and further studies along this line are certainly warranted.

Hearths consist of circular basin types or fire areas built frequently slope inward as they approach the floor. The actual mean size of pit structures within the primary occupation area of the Pine Lawn Valley is estimated to be between 25 m² (Bullard 1962) and 38.6 sq m for the SU site (Wills 1996). Martin and Rinaldo (1950a) and Bullard (1962) also note a progressive decline in pithouse size beginning with the Pinelawn phase through the end of the Pithouse period. This premise basically holds up (Table 6.1) except during the somewhat anomalous Georgetown phase.

Using comparable sites from Arizona and elsewhere in New Mexico within the same time period, although not classified as Pinelawn sites, the data base shows that the presence or absence of hearths may be a function of season of use rather than longevity of use. Many sites studied had some structures with hearths and others without. Repetition of use of the same site location over time may also be indicated by this pattern.

Storage pits are quite common inside of Archaic pit structures in all areas and some are bell-shaped. One site, Hay Hollow in eastern Arizona, dating A.D. 0, also contained a deflector. Entries are not common in Archaic pit structures but two structures at Hay Hollow and Square Hearth site had side entries. One was 2.0 m long (Berry 1982). Postholes with no apparent patterning have been recorded at Tumbleweed Canyon near Vernon, Arizona, at Hay Hollow, and also on one Luna Project site, Humming Wire. At Hay Hollow, they were located around the periphery of the structure. Sipapus, wall niches, and foot drums seem to be lacking in Archaic pit units.

In general, Archaic sites in south-central Arizona seem to possess more refinements than presently found in the Mogollon Highlands. Sites with entryways, deflectors, ash pits, and square hearths have not been recorded in the Mogollon Highlands. Reasons for these differences are unknown at this time. However, more Archaic pit structures, which generally have earlier dates (300 B.C. and earlier), have been recorded in Arizona. In an attempt to isolate change through time during the extensive Archaic period, a scatterplot was constructed that sorted pit structures by age; however, no patterns were discernable. Shape and size variations among Archaic pit structures from various areas are shown in Figure 6.2, although no one shape or internal feature dominates in any area except for those found in Arizona.

Pinelawn Phase

Pinelawn phase pit structures are supposedly the largest of all habitation units in the Mogollon Highlands (Martin and Rinaldo 1950a; Bullard 1962). The range of variation has been estimated between 12.06 and 56.98 sq m (Martin and Rinaldo 1947:201). The actual mean size of pit structures within the primary occupation area of the Pine Lawn Valley is estimated to be between 25 m² (Bullard 1962) and 38.6 sq m for the SU site (Wills 1996). Martin and Rinaldo (1950a) and Bullard (1962) also note a progressive decline in pithouse size beginning with the Pinelawn phase through the end of the Pithouse period. This premise basically holds up (Table 6.1) except during the somewhat anomalous Georgetown phase.

Using comparable sites from Arizona and elsewhere in New Mexico within the same time period, although not classified as Pinelawn sites, the data base shows that pithouse sizes in all areas at this time are generally very large when compared to the preceding Archaic period and, with one exception, are the largest during any period of occupation. In the Southwest in general, there is an average threefold increase in size, while in the Mogollon Highlands that increase becomes more than fourfold at a mean of 32.06 sq m. This change in structural size is significant and begs further explanation. This project did not address the issue except to suggest that the difference may be related to a change in mobility patterns and in social organization from nuclear to extended families. Why this occurred is not known, although one possibility is that the increasing use of domesticates may have influenced family structure and mobility at this time more than we have realized.

The largest sites at this time period are found within the Mogollon Highlands. Wills (1996) quotes a mean size of 38.6 sq m for the many structures at the SU site (ca. A.D. 460-550) near Reserve. The largest of all is found on the Promontory site, also in the Pine Lawn Valley, dating slightly later in time (Quimby 1949). There, Structure B contains 88.01 sq m of floor space with a short east-facing entryway. Structures A, K, and V at the SU site are close to this in size, with all above 75 sq m. In contrast, the smallest pit structure of the phase is located 1 km south of the SU site at Lazy Meadows, which dates to ca. A.D. 550 and has a floor area of only 3.32 sq m (Zamora, Volume 2). Explanation for this great disparity in sizes among pithouses is offered by Martin and Rinaldo (1947) who suggest that the larger units mentioned above may be ceremonial in nature. Wills (1996) disputes this and notes that there are no distinctive features, not even the presence of hearths, to confirm this idea and says that their only distinction is their large size. He believes they may have been simply larger-than-average domestic structures. While ceremonial attributes are obviously lacking in these very large structures, explanation for their size is also still lacking. We need to ask why some houses are much, much larger than average on some sites of this period. Figure 6.1 indicates no overall bimodal distribution of pithouse sizes and Wills (1996) notes no internal variances. The social organization is apparently much more complex than in the earlier Archaic period and further studies along this line are certainly warranted.
Figure 6.2. Pit structure styles in the Archaic period.
An examination of internal features found on Pinelawn phase sites also indicates some changes from those present in the Archaic period. Pithouses retain their circular or ovoid shapes and are fairly shallow. Most are no deeper than 70 cm. However, Lightfoot and Feinman (1982:79) ran a chi-square test on numerous sites in the Mogollon region and found no significant difference between pithouse depth and size of the structure. Walls and floors remain unprepared and walls sometimes incurve.

Hearths within structures are more common in the Pinelawn phase, although there are still many structures that do not contain them, suggesting a fairly seasonal residential pattern. Lightfoot and Feinman (1982:77) indicate through a chi-square test that there is no relationship between Mogollon pithouse size and the presence of interior hearths. However, Stafford (1980:48) believes that in the Forestdale Valley of Arizona to the east of the Highlands, there was a correlation if pithouse size reached 15 sq m or more. This is not true for the Mogollon Highlands. For example, the large SU village had definable hearths in only 29.6 percent of the units; however, Wills (1996) believes slight depressions in many of the pit rooms may have been hearths expediently built on the floor surface. Another large Pinelawn village, Promontory site, contained only one hearth out of five structures that were excavated (Quimby 1949).

The majority of hearths are basin-shaped depressions located generally in the center of the unit, but sometimes towards the entryway, if one is present. Clay rims ringing the firepit were recorded only at Gallita Springs in the Apache Creek area (Kayser 1975) and in the Pine Lawn Valley at Luna Junction by Peckham (1963). Associated ashpits were also noted only at Gallita Springs and at the Houck site near Vernon, Arizona (Gumerman 1966). No square hearths have been recorded for this phase.

Storage pits within rooms are very common during the Pinelawn phase, but Bagley-Baumgartner (1984:75) observes that at Black Mesa, Arizona, structures lacking hearths usually lack storage pits. This statement may also hold true for the Mogollon Highblunds but was not tested. A few sites in Arizona are notable for their general lack of storage pits—the Bluff site in the Forestdale Valley (Matson 1991) and the Houck site near Vernon (Gumerman 1966). Actual storage bins were present only in the Apache Creek area at LA 5407 (Akins 1998b) and at Whiskey Creek (Kayser 1972a). Many storage pits of this phase are bell-shaped but were only found in the Highlands at the SU site and LA 5407. Wills and Windes (1989) interpret bell-shaped pits as indicators of anticipated reoccupation of sites, arguing for perhaps a seasonal occupation of these sites. An unusually large number and size of pits were found at the SU site with an estimated volume of 3.07 cu m per pit structure (Lightfoot 1984:96). Many are thought to have held maize but may have contained a variety of items, including other foods, caches of ground stone, and pottery vessels.

Entryways also increase in presence during the Pinelawn phase. Wheat's (1955:40) study estimates that 58.6 percent of structures in the Pine Lawn area have entries. A few sites lack entries completely but most have a combination of some structures with them and others without. Entry types range from short and stepped (usually a single step) to long. The majority face east but sometimes southeast or east-northeast. Wheat (1955) also mentions the presence of pear-shaped entries in the region, which may describe the two sites with antechambers located in the Apache Creek area only, LA 5407 and Whiskey Creek. The short, stepped entries seem to dominate, however. Long entryways are only recorded for the SU site. Generally, more sites in the Mogollon Highlands possess entryways than those in central and south-central Arizona, although very small, shallow pit structures in the Highlands seem to lack them. This may correlate with Martin and Rinaldo's (1947) premise that the length of the entry is often proportional to the depth of the pit structure.

Postholes are fairly common in Pinelawn phase structures but present great variety in their placement, both within sites and from site to site. Most sites seem to have postholes rimming the floor area along the walls in varying numbers. Four-post supports are also common. Other combinations include two along the centers of the walls, or one or two centrally located, or some both centrally and peripherally located, suggesting a variety of roofing was employed. In the Tucson Basin, Ciolek-Torrello (1995) notes that posts sometimes flank entryways. The lack of postholes in a structure does not associate with the size of the structure, although smaller sites in the Pine Lawn area, such as Lazy Meadows and Three Pines, do not have postholes.

Pinelawn phase sites that have additional internal features not regionally common to other structures include the Bluff site in Forestdale Valley, Arizona, where one unit has an encircling bench (Haury 1985a). LA 5407 and Gallita Springs in the Apache Creek area and the SU site in the Pine Lawn Valley are the only sites with recorded foot drums. LA 5407 and Whiskey Creek also contain rare antechambers and two possible storage bins. Luna Junction has some rudimentary floor ridges not found elsewhere (Peckham 1963) and posts that flank entries are recorded only in the Tucson Basin (Ciolek-Torrello 1995). Deflectors, wall niches, and sipapus are not present in this phase. For the first time, however, burials have been found inside of pits within structures, specifically at the SU site (Wills 1996); however, they were also located in the pithouse fill at LA 5407 near Apache Creek. The Houghton Road site in the Tucson Basin also contained two dog burials.
In general, we see a growing diversity in pit structures and their internal features during the Pinelawn phase. Site structure is becoming more complex. Numerable variations are present from site to site and also within sites (Fig. 6.3), indicating that there is no unified Pinelawn pattern to be discerned at this point in time. We can say that structural size has increased dramatically suggesting a change in social organization from the preceding Archaic period. And variations between the Mogollon Highlands and comparably dated sites in Arizona seem to be more locally similar. Characteristics from each area are frequently not found in the other. Villages are more common at this time implying further organizational shifts from the Archaic. In the Mogollon Highlands, the most complex and internally developed sites are found in the Apache Creek area at LA 5407, Gallita Springs, and Whiskey Creek. This degree of complex internal development surely had a precedent either in the immediate area or elsewhere and raises an interesting possibility. Most consider the Pine Lawn Valley to be the cradle of pithouse development in the Mogollon Highlands. The SU and Promontory sites are cited as the cradle of pithouse development in the Mogollon Highlands. The SU and Promontory sites are cited as excellent early examples with dates between A.D. 460 and 550 and slightly later. However, the radiocarbon dates for LA 5407 focus at ca. A.D. 517 and thus the most complex and internally developed sites are found in the Apache Creek area at LA 5407, Gallita Springs, and Whiskey Creek. This degree of complex internal development surely had a precedent either in the immediate area or elsewhere and raises an interesting possibility. Most consider the Pine Lawn Valley to be the cradle of pithouse development in the Mogollon Highlands. The SU and Promontory sites are cited as the cradle of pithouse development in the Mogollon Highlands. The SU and Promontory sites are cited as excellent early examples with dates between A.D. 460 and 550 and slightly later. However, the radiocarbon dates for LA 5407 focus at ca. A.D. 517 and thus the site cannot be an outgrowth of development in the Pine Lawn Valley. One must ask if the genesis for the unique architectural styles present in Apache Creek may have come from within the immediate area. Are there earlier pithouses present under the many, very large pueblo sites located on prime land surrounding the valley? This is a tantalizing possibility but we must leave the answer to future researchers.

**Georgetown Phase**

In most areas of the Southwest, Georgetown phase structures are slightly smaller than those in the preceding Pinelawn phase (Table 6.1). However, in the Mogollon Highlands, Georgetown structures are the largest of all at a mean of 42.01 sq m of floor space. This high floor area is somewhat skewed by the presence of three very large pit units at Mogollon Village and Starkweather Ruin and by the low number of phase sites excavated in the Highlands. However, even larger Georgetown structures are found at Crooked Ridge Village in Point of Pines, Arizona (Wheat 1954). Explanation for these unusually large structures, all with over 68 sq m of living space, is generally lacking as it is for the Pinelawn phase. However, Wheat (1954:61) does designate the two over-sized units at Crooked Ridge Village as ceremonial structures on the basis of their size, specialized floor features (such as foot drums, a bench, and wall niches), and their general lack of domestic goods. If we assume this is correct, then by definition, the Pinelawn phase sites of LA 5407 and the Gallita Springs pithouses in the Apache Creek Valley would also be classified as ceremonial.

Pit structure shapes continue to be mostly roundish but some are more rectangular with rounded corners and appear at Bear Ruin and Crooked Ridge Village in Arizona. Walls may incurve at the bottom and are occasionally plastered.

Internally, hearths are present in almost all of the structures. One Luna Project site, Humming Wire, was the only site notably lacking any interior features whatsoever. All recorded hearths are basin-shaped or consist of ash deposits on floors, generally centrally located or closer to entryways. Hearths on two Arizona sites, Crooked Ridge Village and Jeddito 264, had occasional adobe collars. During the earlier Pinelawn phase, collared hearths were only recorded for the Apache Creek Valley. Also, associated ash pits are slightly more widespread than in the Pinelawn phase.

Storage pits retain a strong presence in the Georgetown phase, but are not nearly as prolific as at the earlier SU site or LA 5407 in the Mogollon Highlands. Some pits are bell-shaped; however, slab-lined cists appear for the first time at Cerro Colorado near Quemado (Bullard 1962).

Entryways are standardly found during this phase but they change from a predominance of short and stepped to longer ramp types. This refinement occurs both in New Mexico and Arizona. Orientation of the entries is variable ranging from east, to southeast, to east-southeast.

Posthole patterns also seem to stabilize from the great variability of the previous phase. Four-post supports become the most common type of roof support, often set in from the corners of structures. However, center post supports are not uncommon. These posthole patterns seem to prevail in all areas of the Southwest at this time.

Benches increase in popularity during the Georgetown phase over the entire Southwest, ranging from partial to fully encircling. There is no indication that they are associated strictly with ceremonial structures. Ventilator shafts, however, are new and seem to be present only at the Bear Ruin in the Forestdale Valley of Arizona (Haury 1985a). These also do not correlate with ceremonial units. Deflectors have been recorded in central Arizona and elsewhere in New Mexico but not in the Mogollon Highlands. Floor grooves, or foot drums, are sometimes present in the Georgetown phase, with only Starkweather Ruin in the Pine Lawn Valley and Crooked Ridge Village in Arizona possessing them. One antechamber has been recorded in northern New Mexico at Twin Lakes (Berry 1982). This is less than in the preceding phase where they appeared in the Apache Creek Valley. Wall niches appear for the first time at Mesa Verde (Berry 1954).
Figure 6.3. Pit structure styles in the Pinelawn phase.
1982) and at Crooked Ridge Village. Clay or adobe partitions also make an appearance in sites outside of the Mogollon Highlands.

In general, the Georgetown phase exhibits the same extremely wide range of pit structure sizes as does the Pinelawn phase. Structural forms are just beginning to reveal a rectangular (with rounded corners) shape. Internal features retain many of the Pinelawn aspects; however, there is not as wide a variety of posthole patterns and entry types. Refinement of pithouse features from the earlier phase seems to be occurring with the general four-post roof supports, elongated ramp entries, and the widespread use of benches. Other features such as antechambers and deflectors seem to be decreasing in popularity. New to this phase are ventilators and wall niches. Figure 6.4 shows several pit structure styles and a variety of internal features that are present at this time.

San Francisco Phase

During the San Francisco phase there is an overall decrease in pit structure size throughout the Southwest. It is most dramatic in the Mogollon Highlands where floor area decreases by half to a mean of 20.06 sq m (Table 6.1). This dimensional decline is reflected in Figure 6.1 where most sites cluster below the mean, between 6 and 16 sq m. The cause for this drop in size is unknown but could be related to a shift in family organization back to the nuclear family rather than an extended family. However, explanation is needed regarding why this would have occurred. Was there a change in subsistence technology or some form of severe climatic stress that caused this reduction in living space? The two largest units are found in the Mogollon Highlands at Starkweather Ruin and Turkey Foot Ridge at over 60 sq m each. The structure at Turkey Foot Ridge has no lateral entry but does have four foot drums placed symmetrically around the hearth (Martin and Rinaldo 1950a:285).

Pithouses take on a decidedly rectangular shape during this phase, ranging from subrectangular with rounded corners to true rectangles; however, circular shapes are still somewhat maintained. Wheat (1955:46) notes that 70.7 percent of San Francisco phase pit structures in the Mogollon Highlands are rectangular. There does seem to be preferences by individual sites, however. At Wind Mountain, near Cliff, pithouses are mostly rectangular but some are subrectangular (Woosley and McIntyre 1996). However, at Site 30 near Vernon, Arizona, most structures are circular, or very irregularly round and a few are subrectangular (Martin and Rinaldo 1960a). The difference between round and rectangular pithouses is explained by Anyon and LeBlanc (1980:261) and Woosley and McIntyre (1996) as functional; rectangular ones are habitation and circular ones are for communal use. This dichotomy does not hold up for Mogollon Highland sites in our data base and will be discussed further at the end of this chapter along with ceremonial structures.

For the first time, walls, or portions thereof, are shored up with cobbles at Wind Mountain or at Fence Corner (a Luna Project site) where the structure had been dug partially into a relict cobbles streambed and then plastered over. Plastering of walls becomes fairly common during this phase.

Internal hearths were present in all recorded structures but they were limited to shallow basin hearths, sometimes clay-lined, or burned areas on floors of structures. However, Starkweather Ruin and Turkey Foot Ridge, both in the Pine Lawn Valley, had evidence of rectangular-shaped hearths as a minor occurrence. Hearths tend to be centrally located or in front of an entryway, if present. Deflectors are still not common, found only at Site 30 near Vernon and possibly at Wind Mountain near Cliff.

Storage pits may or may not be present in San Francisco phase houses. It appears that the smaller structures are those that mostly lack pits, but this has not been verified.

Entryways still seem to be quite variable in their shape and orientation. Many are very long and narrow, others are wide and short and are frequently termed "shelves" (Martin and Rinaldo 1960a). Many also contain steps of rock or are dug out of the soil matrix. Orientation varies from almost due north to northwest to east-southeast, with great variation evident among structures on the same site.

Posthole patterns are more variable in San Francisco phase structures. Four-post patterns may predominate, but center posts are also quite common. Both tend to additionally have ancillary posts placed around the edges of the floor. And occasional two-post placements are found. The four-post patterns tend to be situated away from the corners of structures toward mid-room.

Interestingly, benches appear to have dropped out of domiciliary structures in this phase, as do ventilators. Foot drums, however, are recorded for Turkey Foot Ridge and Site 30 near Vernon. Turkey Foot Ridge had four placed around a hearth, while Site 30 had only two. One wall niche was also present at Site 30. No antechambers or partitioning walls were recorded for this time.

The smooth progression in styles and complexity of internal features that was present between the Pinelawn and Georgetown phases does not seem to be evident during the San Francisco phase. Rather, variation between structures on the same site seems to be more the norm as seen in posthole patterns, entry types and their orientation, and presence or absence of storage pits. However, there is little new innovation. The definite decrease in pit structure size in the
Figure 6.4. Pit structure styles in the Georgetown phase.
Figure 6.5. Pit structure styles in the San Francisco phase.
Mogollon Highlands particularly, is noteworthy, but unexplained. Figure 6.5 illustrates some differences between structures of this phase.

**Three Circle Phase**

Three Circle phase pit structures definitely decrease in size over the preceding San Francisco phase in all areas of the Southwest with a mean floor area of 15.66 sq m (Table 6.1). Only one very large unit was recorded, located at Nantack Village at Point of Pines, Arizona (Breternitz 1959) at 60 sq m. Most all others range between 6 and 22 sq m. While structures are small, they seem to cluster more than preceding phases into villages, such as at Luna Village, where they were more than 50 houses, and also at Turkey Foot Ridge, Apache Creek Pueblo, Twin Bridges, Wind Mountain, and Cerro Colorado. Structure shapes tend to be rectangular or subrectangular although a few are roughly circular existing alongside the others on the same sites.

Walls of pithouses do not slope inward as much as in earlier phases with most meeting the floor at more of a right angle. The practice of lining walls with masonry is more widespread in the Three Circle phase, but almost all of the cases seem to be related to the shoring up of weak infrastructures. Often, rocks or cobbles are pressed directly into the dirt walls rather than a masonry wall being constructed (Anyon and LeBlanc 1984:132). Those with shored-up walls include units at Apache Creek Pueblo (Peckham et al. 1956), Twin Bridges in the Pine Lawn Valley (Martin et al. 1949:114), Wind Mountain near Cliff (Woosley and Bridges 1949:114), and Nan Ranch, Cameron Creek, Harris Village, and Lee Village in the Mimbres area (Diehl 1997:188).

Hearthstones are present in almost all structures and they are generally basin-shaped and clay-lined; however, rectangular slab-lined firepits make a strong showing. Basin hearths frequently are clay-collared and sometimes have small ash pits associated with them. In several cases, flat hearthstones have been set into the rim of basin hearths. Rectangular hearths are mostly lined with sandstone slabs, except at LA 4986 in the Apache Creek area where they are clay-lined (Kayser 1972c). One slab hearth is circular at Cerro Colorado (Bullard 1962). Location of hearths is almost always in front of entries or ventilators, although Hough (1919:411) found one against the west wall at Luna Village flanked by raised jambs of burned clay. Deflectors are present but not common.

Storage pits may or may not be present in Three Circle phase structures. Rock-filled roasting pits, however, show up more frequently. Rock or clay-lined storage bins are only recorded in the Apache Creek area. Occasionally, these bins contain burials. Entryways are not always present. When they are, they range from long and narrow to short, although not wide. Roof entries seem to be almost as common. Some longer side entries have one or two steps within them. Orientation remains widely variable as in preceding phases: east, east-northeast, east-southeast, south-southeast, and south-southwest. Entries facing east-southeast may be slightly more prevalent.

Posthole alignment seems to usually include at least a central posthole with others arranged around the edge or generally, in an irregular pattern. However, four-post placements were the only type found in the several excavated units at Luna Village, the Apache Creek area, and Cerro Colorado, suggesting a northern Mogollon preference for this type.

Benches regain their popularity in the Mogollon Highlands, and are found at Luna Village, Starkweather Ruin, and Turkey Foot Ridge, ranging from full benches to partial ones. Foot drums are only found in the Apache Creek area at LA 4986 and Apache Creek Pueblo. Hough (1919) uncovered one wall niche at Luna Village—the only one noted in the literature. However, ventilators become much more common during this time. They tend to be complex, with long tunnels, sometimes lined with slabs or cobbles and often sharply curving up to the outside surface after passing horizontally through benches and the soil surrounding pit structures. One of this type was found at Luna Village and two at Point of Pines. Most are oriented to the east-southeast as are entrances but are not present if there are also lateral entries.

Jacal structures are noted for the first time during this phase and only at Luna Village. Hough (1923:5) states that they are sometimes associated with pit structures there and consist of shelters with four-post supports, sometimes with mud roofing. Jacals are frequently considered precursors of the above-ground structures found in the following Reserve phase. It would hardly seem likely that these rare, simply constructed features would have led to their widespread use as models for the later totally enclosed and contiguous above-ground surface rooms of masonry. However, Lekson (1988a:227) thinks this likely represents a natural progression.

The Three Circle phase marks the end of regionwide use of pithouses in the Mogollon Highlands. Kivas and occasional pit units retain a subterranean aspect, but the vast majority of structures change dramatically to above-ground units constructed of masonry. The use of masonry to line weak walls during the Three Circle phase is not uncommon; however, the walls were never free-standing. The continuing decrease in the size of living space remains of interest, but is without explanation. As mentioned, these smaller domiciles do seem to cohere into generally small villages. There remains no unified orientation to entrances or ventilators, no commonality in the use of entries, ventilators, specific post patterns,
Figure 6.6. Pit structure styles in the Three Circle phase.
hearth styles, or use of deflectors, benches, or foot drums (Fig. 6.6). The strongest pattern is the tendency for the construction of rectangular or subrectangular pit structures.

Thus, it seems that stylistic variation remains the norm among the Three Circle phase sites recorded in the Mogollon Highlands. This suggests that areal-wide patterns and styles never really come into play, perhaps because of loose, regional social organization throughout this area, where local autonomy was stronger and, therefore, more prevalent. Or perhaps the relative isolation forced by the vast mountain ranges of southwestern New Mexico and east-central Arizona allowed for only minimal social influence.

**Reserve Phase**

Beginning in the Reserve phase, the predominant architectural form quickly changes from pit structures to above-ground masonry rooms, usually arranged in contiguous roomblocks of varying sizes. While we believe this to be a sudden shift in construction technology, others believe the change was part of the natural evolution (LeBlanc 1986; Lekson 1988:227; Woosley and McIntyre 1996). Wendorf (1956b) cites cobble-lined pit houses at LA 2948 in the Apache Creek area and Berman (1979) reports several partially subterranean Reserve phase rooms at Hillside Pueblo near Reserve and at LA 6083 in Apache Creek as examples of possible natural progression. At Wind Mountain, near Cliff, a rock-lined room set into a shallow depression is considered a possible precursor to above-ground rooms by Woosley and McIntyre (1996). Other researchers say that stone-walled structures were first used on the Colorado Plateau ca. A.D. 700-900 (McGuire and Schiffer 1983) and the idea was conveyed to the Mogollon area or brought in by new immigrants. Whatever the stimulus for their use, masonry-walled structures are a more practical construction choice over pit structures dug into dirt because they do not deteriorate, they are less affected by freezing and thawing action (Wilshusen 1988:706), and are more cost-effective.

Size of individual rooms in Mogollon area Reserve phase sites drops to the smallest within any time period at a mean of 11.62 sq m of living space. This smallness is offset by distinct functional variability among rooms being defined for the first time. The increasing segmentation of space is sometimes associated with the growing complexity of a society (Kent 1990). Thus, there may be discrete habitation, storage, activity, or special function rooms all present on one site. Researchers frequently employ size as the major determinant of room function (Bullard 1962; Dean 1969; Hill 1970; Schiffer 1976; Anyon and LeBlanc 1984; Bagley-Baumgartner 1984; Saitta 1994). Also, the lack of hearths within rooms is often seen as an indication of the use of a room as a storage facility (Lowell 1995:361). Cobble or paved floor coverings may also denote storage rooms (Cosgrove and Cosgrove 1932). Rooms are usually joined with others by common walls to form small to very large roomblocks. One-room fieldhouses are also present.

Standing walls of Reserve phase sites are always of masonry, usually basalt or rhyolite cobbles or rocks. Walls vary from crudely stacked and chinked with smaller stone spalls and occasional pottery pieces to well-fitted rocks that are simply coursed. A mud matrix is usually employed. Sometimes walls are a double thickness of rocks. It is standard to have no footings or wall trenches.

Variations among room interiors are described here for what are considered habitation rooms based on the presence of hearths and domestic items and possibly ground stone processing equipment. Of course, it is possible to have habitation rooms that lack hearths if the settlement is only seasonally occupied. Likewise, storage rooms could contain hearths but are usually smaller in size. However, we believe size is too arbitrary a factor upon which to base function. Recorded hearths include both basin-shaped and rectangular slab-lined ones. Rarely are there fires built directly on floor surfaces as at Haury's site in the Pine Lawn Valley (Oakes, Volume 2). It is not uncommon to find both types of hearths in adjoining rooms within a roomblock. At Turkey Creek Pueblo near Point of Pines, Arizona, Lowell (1995:361) states that rectangular hearths tend to occur in the larger rooms. This does not hold true for all sites in the Mogollon Highlands. Rinaldo (1959:278) suggests that rectangular slab-lined hearths are more of an Anasazi trait; however, they become fairly widespread in the Mogollon Highlands after A.D. 900 at sites such as Luna Village, the Apache Creek sites, and Galaz Ruin in the Mimbres Valley. Lowell (1995:367) believes the change to rectangular hearths was made by A.D. 1300 for east-central Arizona, rather late in comparison.

Ash pits are used more frequently than in earlier phases. At Grasshopper Pueblo in east-central Arizona, they are generally located east or northeast of hearths (Adler 1993:330). Often they are separated from hearths only by a slab set into the floor. The contents of excavated ash pits are almost always very fine, compacted white ash with few, if any, artifacts. Wondering why Pueblo residents would have to be continuously dumping ash from hearths into ash pits and then again into outside trash locations, we pursued a literature search regarding the function of ash pits. As a result, we suggest that the compacted white ash may have been used as a cooking supplement. The Hopi Cookbook (Anonymous 1983) states that the Hopi, Zuni, and Navajo are known to add ashes to corn-based meals to raise the mineral content of the food. The ashes are mixed with water, then strained and added to
cornmeal mixtures. Specific bushes or tree branches are used by various groups. If this were true prehistorically, what better place to keep ash than in a pit immediate to the cooking area. Ash pits on both sides of a hearth could represent receptacles for different types of ash. Thus, if specific vegetation was used for making proper ashes, macrobotanical analyses of material from ash pits might yield different species results from charcoal specimens found in other ash pits or in the hearth itself.

Storage pits are present in Reserve phase habitation rooms even though major food storage occurs in rooms specifically for that purpose. Caching of personal, religious, or valuable items would probably tend to remain within the confines of the living quarters within pits. Burials are also found in pits within habitation rooms on occasion. Roasting pits within rooms are likewise not uncommon. Their presence may be indicative of cold-weather habitation.

Another feature found more often in the Pueblo period is the mealing bin where corn or other products are ground. Metates and manos are frequently left in a specific place within the room or are set permanently into clay with occasional partitions separating them from the rest of the room.

Entry to Reserve phase rooms seems to be always by way of the roof. Access to adjoining interior rooms is sometimes by internally connecting doorways, never exterior.

Post supports are not common in masonry-walled rooms. Haury's site had small postholes around the edges of the room. Wind Mountain had very few posts, usually only one to a room as if shoring-up a sagging roof. At Black Mesa in northeastern Arizona, Bagley-Baumgartner (1984:62) reports that 50 percent of the rooms contained no supports at all.

Ventilators continue to be used not only to bring in air from the outside, but to circulate air within interior rooms. There seems to be no preference for which wall they are placed within. Some, however, are more labor-intensive than others with special lintels and sills (Wendorf 1957:71).

Flooring is usually smoothed or plastered clay over leveled native soil. However, for the first time, stone paving appears. The trait seems to be more popular in the Mimbres area where Anyon and LeBlanc (1984:108) found six paved rooms at Galaz Ruin. Some paving consisted of flat slabs, others were cobbled. Occasionally, the cobbles were set into an adobe base. At Mimbres Pueblo near Glenwood, Wendorf (1957:71) reports a flagstone floor placed over two layers of cobbles, another with a clay floor laid over cobbles, and another with three clay floors each covering a layer of cobbles. At Haury's site in the Pine Lawn Valley, flagstone paving was present in two corner areas of the large habitation room while cobbles lined the floors on the two probable storage rooms. The two storage rooms also had raised floor levels compared to the habitation room. This characteristic was also found near Durango, Mexico, at a site dating to the later Tularosa phase (Foster 1986:7). The purpose for these various floor treatments on sites may have been to provide a seal against entry by rodents.

Benches, niches, and foot drums were not recorded for any of the domiciliary Reserve sites in the data base used. Only two sites with jacal structures are reported in the literature at this time, at Three Pines Pueblo in the Pine Lawn Valley (Martin and Rinaldo 1950a:55) and at Black Mesa in Arizona (Bagley-Baumgartner 1984). Another was found at Haury's site and contained no hearth, as is common. It did have a single remaining course of rocks as a base, suggesting mud or brush walls.

Significant architectural change is apparent in the Mogollon country during the Reserve phase. Masonry-walled structures almost totally replace pit structures as habitation units. Individual rooms serve specialized functions, such as storage or living spaces, possibly accounting for the overall reduction in room size during this phase as the need for multipurpose household rooms is eliminated. Interior features of living spaces are somewhat less cluttered than in previous phases. Post supports are fewer and benches, foot drums, and side entryways are lacking. Mealing areas, however, are commonly accorded permanent positions within rooms.

The unification of rooms into contiguous units that may include from one to a multitude of families is a new innovation at this time. There is an obvious aggregation of peoples of like bloodlines or from the same surroundings. We believe these changes are due to influxes of new people into the Mogollon Highlands.

Tularosa Phase

Architecture reached its peak development in terms of refinement during the Tularosa phase immediately prior to abandonment of the Mogollon Highlands. Pueblos became much larger with, sometimes, as many as ten separate roomblocks present on a site. Architectural continuity, rather than diversity, is the norm between this and the earlier Reserve phase, however. The differences are evident more in terms of degrees of detail, such as in wall construction and in doorways and ventilators. Room sizes, particularly in the Mogollon Highlands, show a 22.9 percent increase over the Reserve phase with a mean of 15.07 sq m per room. The largest rooms in the Highlands at this time are at the Hough site where the mean size was 18.5 sq m and at Higgins Flat at 17.51 sq m. Reasons for this increase are unknown, except to note that aggregation into larger pueblos was occurring at this time and the size differential may be related to this phenomenon.
Walls exhibit some refinement in the fairly common placement of the flat sides of rocks facing in towards the room, creating a smoother wall that was usually plastered. Mud mortar is also used more frequently but chinking with spalls remains widespread. At several sites, walls are partially coursed and some portions of the Hough Site and Sandstone Hill Pueblo near Quemado (Barnett 1974) are particularly well done to the point of being compared with Chaco-style structures (Lekson 1984:17-19). A new trend is for some walls to have vertical slab bases like the Hooper Ranch Pueblo near Springerville, Arizona (Martin et al. 1961) and Sandstone Hill Pueblo. Wall footings or trenches continue to not be used as in the earlier phase.

Storage rooms can be quite large during this phase. At the Hough site, the two excavated rooms average 10.34 sq m of floor space per room. The rooms both contained hearths and were linked by doorways to larger habituation rooms. In one, the doorway had been sealed with rocks and only a small ventilator pit connected the two rooms. This smaller room may have been converted to sleeping quarters as the pueblo expanded. Hill and Trierweiler (1986:33) associate larger storage rooms with an increased production of surplus goods, particularly agricultural products. Locationally, store rooms tend to occur on the lower floors of multistoried pueblos (Saitta 1994:43). They also seem to be situated on the interior of pueblo roomblocks, which Crown and Kohler (1994:113) note may be for better protection from pests or possible intruders. This holds true at Hopi today where doorways lead to the exterior (Adams 1983:52).

By the Tularosa phase, hearths are almost always rectangular, slab-lined firepits with the bottoms frequently slabbed. A very few basin hearths persist. Ash pits are also common and those that double-flank hearths were found at the Hough site. Deflectors seem to be present only if ventilators are directly in line with the hearths.

Postholes only occur when it would appear that roofs needed to be shored-up. There is no pattern to their placement.

Mealing bins become much more a part of living spaces in the Tularosa phase. They tend to occur in corners of rooms and often consist of up to four bins with associated metates (sometimes on clay platforms), manos, and bowls for receptacles.

Ventilators between rooms and to the outside are more frequent during this phase and also become more elaborate. At Higgins Flat, the fresh-air intake resembled a slab-lined cist (Martin et al. 1956:35). At the DZ site near Luna, the intake area consisted of a shallow pit. Sometimes vents are masonry-lined and covered with earth or wood. Martin et al. (1957:128) seem to equate rooms that have vents with kivas. This is too exclusionary a statement for such commonly found features.

As pueblo sizes increase during this phase, the use of connecting doorways between rooms also increases. Most have lintels and sills made of stone, wood, or clay (sills only). In almost every case, there are no door openings to the exterior of the roomblock. The reassignment of room function by pueblo occupants may be fairly common and be evidenced in the frequent sealing of doorways such as at Hooper Ranch, the Hough site, and Higgins Flat.

Benches and niches again come into use at this time. Benches may be hollow, formed of stone-walled construction, or they may be solid earth with a stone veneer, or left unadorned. Small platforms or shelves appear along portions of walls at some sites, such as the Hough site.

Floors continue to possess stone paving in some rooms, as at Sandstone Hill Pueblo (Barnett 1974), at Wind Mountain (Woosley and McIntyre 1996), and at the Pettit site near Ramah (Saitta 1991). Cobble-floored rooms were also found west of Durango, Mexico, at a site dating to this same time period (Foster 1986:7).

Social organization during the Tularosa phase becomes inevitably more complex with the aggregation of sites into much larger pueblos. In contrast, architectural change is held to a minimum. There is refinement in wall construction techniques, embellishment of ventilators, doorways, and the paving of floors that give no indication that Mogollon architecture was deteriorating at this time. However, habitation and storage room sizes increase, ventilators insure air is brought to interior rooms, doorways connect family or group living quarters but do not extend to the outside—all variations of earlier adaptations that may signify change occurring in Mogollon society. These specific adaptations could be architectural indications of a contracting society, or, in other words, closing off the outside world, being more self-sufficient. LeBlanc (1989a:357) notes the presence of walk-in wells within pueblo walls in the Cibola area and infers this is an indicator of conflict occurring in the Mogollon area. While there are no other examples of potential conflict taking place at this time, the architectural trends suggest that some type of stress (social or environmental) was occurring. An evaluation of possible stressors and their effects are discussed in a later chapter on abandonment processes.

**Apache Creek Phase**

This phase was created by Peckham et al. (1956:63) to account for specific architectural variations found at sites in the Apache Creek area between ca. A.D. 1050 and 1150. This period overlaps with the Late Reserve and Early Tularosa phases and is, therefore, not an independent Mogollon cultural manifestation. It is discussed after the Tularosa phase because
architecturally and ceramically it fits best with assemblages from that phase.

The distinctive characteristic of this phase is the unattached, masonry-lined rectangular structures that have been dug into the ground as pit structures. Eighteen have been recorded at Apache Creek (Wendorf 1956b) and two near Aragon (Wendorf 1954). The mean size of these units is 15.16 sq m of living space, very close to the mean for above-ground masonry rooms in the Mogollon Highlands at this time. They are unusually deep, ranging over 2.15 m in depth, and are all completely, or mostly, cobbled-lined with the stones set into the earthen walls as a veneer. All have rectangular, slab-lined hearths, ventilators, and mealing areas. Most have slab-lined ash pits, while two have foot drums (one of which is masonry-lined). Postholes are variable; many are set into the walls in varying numbers with usually an associated center post. No ramp entries are present. All of these characteristics are also found in above-ground sites of the Tularosa phase. Peckham et al. (1956) decline to call these structures kivas because their features match in every respect those found in the numerous Tularosa phase domiciles, even though they associate foot drums with possible ceremonial activities. They believe that the two units with foot drums may have served both secular and religious functions.

This particular pit structure type has not been found outside of the Apache Creek area. However, numerous, partially cobbled-lined pithouses have been recorded for the end of the Pithouse period during the Three Circle phase. Masonry lining, in these cases, was for the purpose of shoring weak walls. This does not seem to be the case at Apache Creek. And if it were, it would not explain why people at this time would construct individual, subterranean living quarters when everyone else was living above-ground in contiguous masonry rooms for approximately 100 years. One Tularosa phase, partially cobbled pit structure was found at Spurgeon Draw in the Pine Lawn Valley. The structure was circular, had a ramp entry, and shoring the walls of the deep pit was probably the reason for the cobbled lining. In sum, the Apache Creek structures appear to be a local phenomenon.

Apache Creek pit structures exist coevally with above-ground masonry units. Peckham et al. (1956) attribute this to some peoples preferring one type of housing over another. Cordell and Plog (1979:420) say virtually the same thing, calling the phenomenon an alternative lifestyle with the use of possibly different subsistence strategies, inferring a more mobile adaptation. However, the construction of a 2-m-deep pit room with cobbles impressed into the walls would involve quite a bit more labor to complete than an above-ground room, not a logical choice for mobile populations. In reality, there seems to be no convincing argument why this architectural style would persist for approximately 100 years while above-ground units were in use and more practical to build.

No radiocarbon analyses or other absolute means of dating these structures has been employed. Peckham et al. (1956) base their dating of these sites on the pottery types found within the rooms. Most prevalent is Tularosa Black-on-white associated also with Tularosa Fillet Rim, Reserve Indented Corrugated, Wingate Black-on-red, and Mimbres Boldface. They note that the sites lack the intrusive polychromes and black-on-red glazes found on typical Tularosa phase sites. These last styles represent Late Tularosa ceramic types and, based on pottery and architectural features, we believe these sites fit comfortably within the early Tularosa phase, but as an aberrant local development. Certainly, absolute dates from both the pit rooms and the possibly contemporary above-ground rooms are critical to definitive placement of these sites within a specific time period. Ceramic and other artifact comparisons between the two architectural forms on a more detailed level would also serve to illuminate any differences that may address functional variability.

COMMUNAL STRUCTURES

Form versus Function

Definitions of communal structures abound in the archaeological literature with virtually all of them based on one of two aspects of such structures, either form or function. Never are the two aspects combined into a unified definition—it is always one or the other. Whereas the adage states that "form ever follows function," archaeological definitions promote form to a level whereby it tends to wag definitional attempts. Thus, there are great numbers of definitions based, for example, on trait lists for kivas, none of which seems to agree completely with each other. This chapter separates function and form in an attempt to clarify the many diverse interpretations of ceremonial units that are extant today. The various functional definitions of communal structures are first presented and then architectural correlates are examined.

Defining Communal Structures

One of the earliest written definitions used to describe communal structures, or kivas, was employed at the 1927 Pecos Conference, when Kidder (1927) stated that it was "...a chamber specifically constructed for ceremonial purposes." This was admittedly, by conference participants, a very loose definition, likely the only one that the archaeologists who were present could agree upon. No traits or defining markers were set forth as characteristic of such structures. Elaboration on this broad definition was offered in 1952 by two archaeologists whose statements are
presented here. Smiley (1952:10) states that a kiva is "a room constructed primarily by and for the men for religious functions and rituals but that it is used also for everyday tasks performed by men." In this definition, gender and specific activities are brought into the picture. Again, form is not discussed. Smith (1952) says "... a kiva was regarded as such because it differed in some way from the other rooms of its units and stood apart from them positionally." This definition adds a component of separateness to the mix but basically follows previous statements. No attempts to define that separateness was made, however. Archaeologists, such as Bluhm (1957), Martin et al. (1957), and Martin et al. (1961), supported and used Smith's definition for the Mogollon Highlands but began adding "typical traits" to identify how kivas differed from other rooms.

Lekson (1988a:224) attempts to fuse form and function in his more recent definition, "... a kiva is the architectural correlate, marked by its unique context and unusual formal characteristics, of a village-integrating ceremonial association." In his definition, form is finally brought into play, although not specified. He also did not believe pit structures that also contained indications of domestic activity should be termed kivas. Smith (1990), addressing Lekson's position, states that "... a place was a kiva if residents said it was and despite its occasional use for secular purposes."

All of the above definitions are functional in nature and are used as a basis for defining communal structures by archaeologists today. However, controversy is present because of disagreement with Lekson's belief that domestic activities should not be occurring in true kivas and thus, earlier pit structures that evidence both sacred and secular aspects, should not be termed kivas (Cater and Chenault 1988:20; Lippe and Hegmon 1989:16; Adler 1993:321). The suggestion that kivas were, indeed, used for domestic purposes had one of its first proponents in Mindeleff (1891).

But in reality, the above definitions can usually be selectively employed by archaeologists today without much disagreement, except perhaps for the nondomestic aspect. However, when concerned with what form or characteristics typify communal structures, no one seems to be in agreement.

Identifying Communal Structures

Because there is no one to speak firsthand for the prehistoric past, our only means of identifying these structures is through an assessment of form and limited use of the ethnographic literature. One of the first to attest to the importance of form was Fewkes (1909:20) who said, "The form of the kiva is characteristic and may be used as a basis of classification of Pueblo culture." At present, however, there does not seem to be any consensus as to what form identifies a communal structure; specific forms or characteristics are cited by some and denied by others. Smith (1990:60) takes the position that there is no unusual or exclusive feature that identifies a kiva. And yet, archaeologists have been attempting to identify communal structures through formal characteristics for more than 60 years. An evaluation of some of these traits and their use as nonambiguous, identifying markers of kivas is presented next.

The larger size of many communal structures was one of the first characteristics noted by early archaeologists (Haury 1936b; Martin and Rinaldo 1947; Wheat 1954) working in the Mogollon Highlands. It is also the single most employed trait used to identify ceremonial units today (Anyon and LeBlanc 1984; Kayser 1972a; Woosley and McIntyre 1996). Most follow Smith's 1952 definition whereby if one structure is different from others on the same site (in this case, in terms of size), it must therefore be a communal structure. This is the principal reason why Pithouses A and V at the SU site, Pithouse B at Promontory, and House K at Turkey Foot Ridge were thought to be kivas by early excavators. But what determines if this reasoning is correct? These and other units at Starkweather Ruin, LA 5407, Crooked Ridge Village, and Nantack Village definitely stand out because of their large size, all being over 60 sq m. Can size be used as the most important criterion for defining communal structures, if at all? Wills (1996) does not like the employment of size to define such units and suggests that these may simply be larger residences of village leaders or elders. Regrettably, there is no evidence to support his viewpoint or that of those who rely on this single dimensional attribute. Anyon and LeBlanc (1984:112) use size as a communal trait at Galaz Ruin in the Mimbres Valley, and say that anything over 26 sq m is ceremonial. This would translate into almost half of all structures in the northern Mogollon Highland area being considered ceremonial. Clearly, "large" size is relative to the area or specific site being studied.

Returning to the issue of whether size is a valid criterion of defining a communal structure, we cautiously submit that it might be possible; however, this is more of an intuitive belief, mostly because explanation is needed for the construction of these immense structures, and communal purposes cannot be entirely ruled out, given the lack of verification of other uses. An intensive study of cultural materials found in these versus smaller units needs to be undertaken in order to uncover possible differentiation between the two.

In many cases, size is combined variously with other attributes to define kiva characteristics, such as the presence of foot drums, wall niches, ventilators,
deflectors, antechambers, benches or platforms, sipapus, and lack of domestic goods. Sometimes, one of these traits is used solely to identify communal structures, like foot drums (Bluhm 1960), ventilators (Martin et al. 1957), benches or platforms (Smiley 1952), or entry by roof only (Hill 1970). At other times, specific complexes of these traits are required. However, we find that none of these characteristics hold up on their own as definitive of communal units only, except perhaps for sipapus (Wilshusen 1988). The problem with sipapus, however, is that they are often difficult to detect or to distinguish from postholes or small pits. Foot drums are another problematic feature that may indeed be ceremonial in nature, but because loom anchors also leave the same cultural footprint, we question the ability to distinguish between the two in some cases. Other features such as wall niches, deflectors, and ventilators have been found in so many structures that have not been designated as kivas, that we see little value in their use as ceremonial markers. However, these features may be necessary components of kivas, just not exclusively of kivas.

Trait lists are poor analytical tools because there are always so many exceptions to them and because they present a false sense of being able to identify a culture as if frozen in time. Instead, variations within regions and even within local groups are ever present and evolving dynamically. Thus, the identification of communal structures through an examination of typical characteristics is doomed to fail. We go back to our reference from Smith (1990:60) who says that there is no universal or exclusive feature that identifies a kiva. And yet, archaeologists who subjectively designate specific characteristics unique to a region or locality as ceremonially related, may be actually defining communal structures. But, certainly, no cookie-cutter formula exists. We are forced to evaluate each potential kiva by our own standards, and what identifies a communal structure may vary radically from researcher to researcher.

Possible Ceremonial Features

A brief description of potential ceremonial features that researchers have used to identify communal structures follows.

Sipapus. These are one of the most ritually associated features within a communal structure (Wilshusen 1988:651). Traditionally, they symbolize the place of emergence of ancestors from the underworld (Bullard 1962:166). Sipapus are located near hearths and consist of a hole, of varying size, dug into the kiva floor and sometimes plastered or stone-lined. Often, an object, such as a piece of turquoise, is found within the hole. At times, sipapus may be difficult to distinguish between postholes or shallow pits. At the Hough site, the great kiva may have contained a sipapu represented by a small, slab-enclosed depression to the west of the hearth.

Foot drums. Long, shallow depressions usually surrounding hearths are thought to represent foot drums, sometimes called vaults or resonators. They consist of roughly rectangular pits covered over at floor level with logs or planks upon which ceremonial participants dance to create sound. When recovered in pristine condition, they have a hole in the log with a removable plug. Sometimes a crude shelf is located at the ends of the pit upon which the logs are placed for support. Foot drums occur frequently in pairs, one on either side of the hearth, or on all four sides of the firepit. Wilshusen (1988:657) notes that foot drums may have been also used to store ritual items. Within the great kiva at the Hough site, there were two shelved foot drums, one of which contained a Snowflake-Black-on-white jar, the only one recovered from the site.

Early Mogollon excavators have recorded foot drums at such early sites as SU (Pithouse A), Turkey Foot Ridge (House K), Bluff site (House 5), and Crooked Ridge Village (Pithouses 9 and 19), and have called these structures kivas (Martin et al. 1961:58). This would place the beginning of kiva development in the Mogollon region at ca. A.D. 500. We note, however, that there are several "foot drums" at Pithouse A at the SU site and all are placed along the perimeter walls, a different pattern than for other recorded foot drum features. It is possible that these may instead be loom anchors, wooden logs sunk into floors with slots where loom parts can be attached (Smiley 1952:13-14). The distinction between foot drum and loom anchor may be very difficult to define archaeologically. Location away from hearths may suggest loom anchors. If so, kiva features would not be present in the Mogollon Highlands until at least the A.D. 800s with kivalike House K at Turkey Foot Ridge, which Martin et al. (1957) consider to be the "grandfather" of later great kivas.

Ventilators. Ventilators, alone or in combination with other internal features, are often considered to be indicative of ceremonial structures (Smiley 1952; Hill 1970; Kayser 1972a; Woosley and McIntyre 1996). However, there is disagreement concerning this suggested ceremonial association. Anyon and LeBlanc (1980:270) say there is no reason to associate the two, with which we tend to agree. Any communal structure that contains a lateral entry is in no need of a ventilator system and thus they are not found in such units; roof entry kivas may need them, however. Martin et al. (1957:26) succinctly question how sacred can a ventilator be—occupants of subterranean structures simply needed air.

Ventilators were found in three rooms on the Luna Project, at the DZ site, Luna Village, and the Hough site. The ventilator at the masonry-walled DZ site
(early Tularosa phase) was in a room that also contained a bench along one wall within which was a wall niche. This room was in a very small, three-room unit and was not considered ceremonial in nature. However, it is very possible that both domestic and ritual activities occurred within this room. The ventilator in Pithouse 12 at Luna Village (Three Circle phase) was complex, running horizontally under a full bench and then curving upwards to meet the outside surface. This pithouse was also not considered to be primarily a kiva; however, the structure was the largest and deepest of the five units excavated and was the only one that contained a full bench. Small, pit ventilators were also found between storage rooms and habitation units at the Hough site (late Tularosa phase). No ceremonial connection is postulated for these features.

Thus, ventilators, when present by themselves, do not seem to be good indicators of a ceremonial structure. And their presence in some ceremonial-related units may simply be as practical devices to provide air for the deeper, larger pit structures where many people would congregate.

**Wall Niches.** These are considered part of ceremonially related architectural features by many (Smith 1952; Hill 1970; Woosley and McIntyre 1996). Niches are small features, often only large enough to contain a single object or several small ones. At Hopi today, wall niches are used to hold fetishes (Hill 1970:53). At Casa Malpais, a fourteenth-century pueblo near Springerville, Arizona, a niche was uncovered in a passageway between crevices that contained a variety of stones and feathers (Chris Adams, pers. comm. 1995). One wall niche was found at the DZ site in the center of the north wall, directly above the bench. No objects were within the niche, however. It was associated with a room that may have served both a domestic and ritual function. The niche was perhaps not unlike the small altars that many religious people today have in their homes.

Because there are so few data on wall niches, we cannot rule out the possibility that they are actually restricted to ceremonial usage.

**Benches/Platforms.** Benches or platforms may cover one wall only or be fully encircling and are often found in ceremonial structures. However, they are not present in all kivas and so their identification as strictly ceremonial features is debatable. In fact, their function may range from seating of people, to storage for goods (perhaps to keep them off of floors), or for sleeping. Benches were found at two sites on the Luna project—again at the DZ site and Pithouse 12 of Luna Village. At the DZ site, it extended along the north wall only and was cobbled. At Luna Village, the bench was dirt and was fully encircling. Both of these structures had other features that may have been associated with ceremonialism.

**Deflectors.** Adler (1993:331) states that these are kiva-related features. Smiley (1952:11) says if they are in association with ventilators and hearths, they may be considered ceremonial. Actually, there would seem to be a more logical explanation for their use. If there is a ventilator or lateral entryway that enters the room near a hearth, the use of a deflector is almost imperative.

**Lobing.** Anyon and LeBlanc (1984:115) note that in the Mimbres area, lobing is restricted to ceremonial structures. This is not a common construction technique outside of that area. Lobes are usually columns of earth that occasionally flank lateral entryways, giving a kidney shape to a structure. Anyon and LeBlanc (1984:115) also say that lobes were sometimes replaced by posts or flat stones at entryways. Only one structure on the Luna Project had possible lobing. This was at Luna Village, Pithouse 13, where earth lobes, or possible benches, flanked a disturbed east entry. This structure was not considered ceremonial. At the SU site of the earlier Pinelawn phase, Martin et al. (1940) note the same type of small lobes at Pithouse A. This structure is considered ceremonial by some because it also was one of the largest units on the site and had possible foot drums or anchors. The purpose of lobing is unknown at this time.

**Embedded Floor Stones.** Occasionally, medium-sized stones (which are sometimes flat) are found embedded firmly in floors of ceremonial structures near entryways or ventilators. Their function is unknown. A few exhibit signs of grinding, although they do not appear to be milling stones (Smiley 1952:39). Such a stone was found on one Luna Project site, the DZ site. In a room with a ventilator opening, a large rock was deeply embedded in the floor between the hearth deflector and the ventilator opening on the left side of the vent.

**Cobbled Walls.** Berman (1979:35) suggests that the presence of cobbled walls on Pithouse period sites may be indicative of ceremonial structures. She cites Wheatley Ridge, Turkey Foot Ridge, and LA 6083 as containing partially cobbled rooms to which excavators assigned a ceremonial function. However, so many structures, especially in the Mogollon Highlands, have partially cobbled walls to ostensibly shore up weak structures, that we do not consider this to be a marker of ceremonial activity. Cobbled-walled structures on the Luna Project include Fence Corner (San Francisco phase) and Spurgeon Draw (Tularosa phase), which were considered structurally weak and had no other ceremonial aspects.

In sum, while all of the above features may be found in communal structures in the Mogollon Highlands, no single one, with perhaps the exception of sipapus, stands alone as a marker of ceremonial activity. However, in some cases, certain combinations of these features most surely signified a ceremonial
Figure 6.7. Great kivas at the Sawmill and Hough sites.
activity locus. We just do not know, at this point, what those combinations were and if they were standardized or varied locally or regionally. There is no dominant combination of kiva features at present within the Highlands that stands out above the others in frequency of occurrence. Even lateral entries within suggested communal units vary widely in their orientation ranging anywhere from northeast to south. Thus, structural conformity for communal structures within the Mogollon Highlands seems to be extremely weak and is just as individualized as the nonceremonial units described earlier.

Great Kivas

Great kivas appear to have their origins in the Mogollon cultural tradition. Early archaeologists believed that over-sized pit structures such as Pithouse A at the SU site, Pithouses 9 and 19 at Crooked Ridge Village, House K at Turkey Foot Ridge, and the Bluff site are early predecessors to the great kiva (Wheat 1955:213; Bluhm 1957:26; Martin et al. 1957:127). Some of these date as early as A.D. 320-550 and problems with their designation as great kivas or kivas have been discussed above. Danson (1957:82) considers the great kiva tradition to have started in the Three Circle phase (post-A.D. 900) with the increasingly common use of rectangular, masonry-lined pit structures. Great kivas that may be traced to the A.D. 900s include those at Luna Village (Hough 1907), Wheatley Ridge (Bluhm 1957), Harris Village (Bullard 1962), and possibly Mogollon Village (Haury 1936b), all large communities of the time. By A.D. 1000, they appear to be the most dominant ceremonial architectural form; however, smaller kivas also retain a strong presence. By A.D. 1350, great kivas seem to lose their specific identity and frequently evolve structurally into open, unroofed plaza areas, particularly in eastern Arizona (Kintigh et al. 1996:262).

A total of 21 great kivas are recorded for the Mogollon region thus far, excluding those before A.D. 900. There appears to be no spatial patterning to their placement on the cultural landscape, although most are focused in the Tularosa Valley between Reserve and Aragon, dating between A.D. 1000 and the 1200s. This is also the period when this particular area saw the greatest influx of new settlements. Only two great kivas are known within the Pine Lawn Valley, one a Three Circle phase site (Wheatley Ridge) and the other the Reserve phase Sawmill site. These date in the A.D. 900s and 1000s. No Tularosa phase great kivas lie within the Pine Lawn Valley. In the Luna Valley, there is an early, Three Circle phase great kiva at Luna Village, a Reserve/Tularosa great kiva north of Luna, and possibly one of the last two in the Highlands, at the Hough site (A.D. 1300). The Blue River area in Arizona also has a few such structures associated with larger pueblos that post-date A.D. 1000. A few isolated great kivas have been recorded near Alma at the WS Ranch (the other very late Tularosa phase site) and at Devil's Park in the middle San Francisco River area. In Arizona, the structures are mostly focused in the Little Colorado River drainage near Springerville and on to the north and west. These extend in time through the A.D. 1400s—the latest known great kivas of the Mogollon area.

Characteristically, a great kiva is a very large, usually masonry-lined, rectangular subterranean unit with a long, wide lateral entryway. Infrequently, structures sit above ground or are circular. One, at Higgins Flat, is D-shaped (Martin et al. 1957:26). The size of these units varies from 83.7 sq m at Mineral Creek Pueblo (Martin et al. 1961:23) to 331.2 sq m at Foote Canyon (Hough 1907:53), both in eastern Arizona. The mean size is 179.3 sq m. Depths run fairly deep, ranging from 1.2 m to 2.4 m below ground surface. Walls are generally cobble-veneered, rarely are they left as natural surfaces. All have entryways, usually ramped, that extend from 3.0 m to 10.4 m in length and from 1.5 to 4.15 m wide. Entry orientations are more uniform than in earlier kivas, facing either southeast (75 percent of the time) or east (25 percent of the remainder).

Interior features of great kivas still exhibit individual characteristics as do earlier kivas and dwellings, although Adler and Wilshusen (1990:141) note that the majority of earlier ones consist mostly of empty space. Foot drums are the most consistent element found in great kivas, usually in pairs flanking the hearth area. At the Hough site, one foot drum contained a Snowflake Black-on-white jar buried within the drum pit. hearths may be slab-lined or, as is often the case, simply a shallow, burned area directly in front of the ramp entry. At Higgins Flat (Martin et al. 1956:26), two painted pebbles had been placed on either side of the hearth area. Benches are frequently missing, with only the extremely large ones seeming to possess them. Cysts, pilasters, and sipapus are also infrequently present. Two Late Tularosa phase kivas, at Foote Canyon and Hooper Ranch, were paved or partially paved. Posthole patterning varies from a single central post with others peripherally located to a linear three-post alignment through the middle of the structure. The Hough site (Oakes, Volume 2) and the Sawmill site (Bluhm 1957) both have additional support posts flanking the ramp entries, suggesting that they too were roofed. These two great kivas are extremely similar in form, size, and interior layout (Fig. 6.7). The striking difference is that they were constructed approximately 200 years apart, one in the Pine Lawn Valley and the other in the Luna Valley. Two other kiva structures in the Blue River area (Hough 1907) also exhibit this particular layout. Bluhm
(1957) comments that Wheatly Ridge, an earlier Three Circle phase great kiva, is also very similar to the Sawmill unit although it lacks foot drums. While consistency is not noted for great kiva styles and forms, these structures reveal that patterning may be present in some cases. So while there are variances of omission in the structures, these that are very similar may define the archetypal Mogollon great kiva (see Fig. 6.7).

It is generally agreed that kivas are integrative units that may involve a single community or a regional network of related settlements. Great kivas may serve an additional function as redistribution centers for the exchange of surplus goods. Lightfoot (1979:323) believes that the locational shift of storerooms within habitation units to placement adjacent to great kivas is indicative of such a function. If great kivas are redistribution centers, then the location of storerooms peripheral to them is to be expected (Stafford 1980:63).

These rooms have been found at the Hough site (but not excavated) flanking the entryway and at other great kivas such as Corduroy Creek (Rice 1980:177). However, Vivian (1959:85) suggests these adjoining rooms may function as storage for ceremonial items such as masks, costumes, figurines, painted slabs, and medicine, as listed by Smiley (1952:11).

In sum, development of the Mogollon great kiva extends back at least to the A.D. 900s with prototypes evident as early as the A.D. 700-800s. Martin et al. (1957:26) state that House K at Turkey Foot Ridge in the Pine Lawn Valley is the "grandfather" of the later great kivas. This structure dates to A.D. 800s. A few great kivas seem to represent a standardized form such as at the Sawmill and Hough sites and in the Blue River area, although there is continued variation in size, internal features, and layout. Storerooms are not uncommonly associated with great kivas and their presence leads to the generally held belief that the kivas are redistribution centers. These variations do not appear to be particularly localized or temporally sensitive; however, some later sites in the Little Colorado River area exhibit local adaptations.

Interestingly, the geographical locations of great kivas seem to follow settlement pattern shifts from old population centers to new ones within the Mogollon Highlands. Early, possible great kiva prototypes are located specifically in the Pine Lawn Valley. By the A.D. 900s, these structures are found in the three general settlement centers of Luna Valley, Tularosa Valley, and the Pine Lawn Valley. After A.D. 1000, as populations shift away from the Pine Lawn Valley into the Tularosa Valley, the majority of great kivas focus here also. The latest great kivas serve the populations in the Luna Valley and near Alma, away from the Tularosa and Pine Lawn valleys. Structures of this time period and later now concentrate in the Little Colorado River area in Arizona, indicating possibly yet another population shift.
For years, archaeologists have claimed that the Early Pithouse sites of the Mogollon Highlands in west-central New Mexico are situated at high elevations in isolated, defensive locations. This chapter examines these assertions and evaluates the Early Pithouse data in comparison with sites from subsequent time periods in the region. Also, patterns of site placement in various topographic zones are plotted to delineate elevational partitioning of sites on a regional scale. Population estimates, based on room count data, are provided for each phase during the Mogollon occupation of the region.

RESEARCH ORIENTATION

The OAS excavations include sites ranging from the Archaic period at ca. 1440 B.C. through the Pithouse and Pueblo periods to 1500-1700 Athabaskan sites. Through archival research, placing the sites within a cultural context, it became evident that there were major differences in the suggested settlement patterns of the various Mogollon periods. Particularly, the Early Pithouse sites (Pinelawn phase), dating ca. A.D. 200-550, were noted for being frequently isolated and situated at high elevations. This setting selection generally has been interpreted as defensively motivated (Wendorf 1956a; LeBlanc 1989a; Lekson 1992a). The Promontory site, on a high ridge top, is often cited as an excellent example of a defensive site of the Early Pithouse period. It contains several walls running across the easiest access to the ridge; however, the walls are not, and probably never were, high enough to restrain anyone wishing to gain access to the site. Other explanations offered for high-elevation choices include availability of better drainage, more moderate temperatures, or desire for a better view (Wheat 1955:35).

Lekson (1992b) comments that high-elevation patterning for early sites is also called into question by the recent work of OAS in the Mogollon Highlands. Many early Pinelawn phase sites have been field-checked and topographic maps studied. We found that only a few of these sites actually sit at high elevations—7 out of 70 monitored sites, or 10 percent. Within the study area, 3 Early Pithouse sites are in the valley bottom, the majority (N = 35 or 50 percent) are on low ridges or knolls (e.g., the SU site and Turkey Foot Ridge) within the piñon-juniper zone, 16 are on gradually sloping hills or open areas, and 9 are on medium-high landforms (13 percent). It is apparent, then, that Early Pithouse sites do not exhibit the elevational patterning presumed for them for almost the past 50 years. Therefore, the current interpretation of Mogollon settlement patterns with characteristically high, early sites and a subsequent movement to lower elevations in later sites, must be flawed. This chapter looks at the sites in the Mogollon Highlands and their actual placement on the landscape and frequency of room counts in order to gain a more accurate representation of settlement dynamics of the region.

METHODOLOGY

To gain a perspective on the settlement patterns of the various cultural periods, an in-depth study on a regional scale was undertaken. To insure comprehensive coverage, the study area was defined as a 4,381-sq-km (1,691 sq miles) block in west-central New Mexico encompassing the Mogollon Highlands...
Figure 6.8. Settlement pattern study area.
area within the northern Gila National Forest (Fig. 6.8). This area includes most of 30 USGS topographic quadrangles and extends from the New Mexico border on the west, south to approximately Alma, east to just past Aragon and Eagle Peak, and north to the Forest Service boundary south of U.S. 60. Reserve, Apache Creek, Cruzville, Alma, and Luna are the towns included in the region. The area is mostly mountainous with elevations reaching over 2,865 m (9,400 ft); however, narrow valleys and broad mesas are interspersed throughout.

To create the data base for the region, files of the Archeological Records Management Section (ARMS) of the Historic Preservation Division, Santa Fe, were used, supplemented by files from the Reserve and Luna Ranger Stations and OAS survey findings. This produced 30 USGS quadrangle maps with each site plotted topographically and individual site descriptions compiled from the various site files. All sites of unknown cultural affiliation and all unknown lithic scatters were eliminated from the data base. The remaining sites were classified by phase or period (based on survey or report data), elevation, number of rooms or pithouses, and number of kivas. This produced a data base of 2,187 sites.

Some biases were introduced in the creation of this particular data base. First, there is no guarantee that the selected study area corresponds with the actual prehistoric cultural boundaries of the northern Mogollon peoples (Paynter 1983:284). It became obvious that Mogollon sites do extend beyond the boundaries of the regional data base, but they rapidly dwindle off, except to the north toward Quemado. Also, some Archaic and pithouse sites may be invisible to investigators because of erosional or alluvial processes. The use of personal experience and judgment concerning ceramic classification and forms of architecture were used to assign some poorly recorded sites to a cultural phase and undoubtedly introduce some bias. In addition, some subareas may be underrepresented because of a lack of field work in those areas. These areas are consistently found in the higher, more rugged mountainous zones. However, all major valleys and drainages have been recorded and these are where most of the sites are found. Therefore, the patterns produced by this study should prevail, given the size of the data base.

### Examination of Settlement Patterns

First, a table indicating the break-down of cultural periods by frequency of sites and by elevation (Table 6.3) was generated. Elevations are given in feet for ease of use with topographic maps. The Georgetown phase is included, but in actuality, it may not be that distinguishable from the earlier Pinelawn phase. The data is also represented graphically in another manner (Fig. 6.9), whereby definite mean elevational shifts from one period to the next can be seen along with the corresponding one-standard deviations. This pattern is extremely provocative and will be explored in the following paragraphs.

<table>
<thead>
<tr>
<th>Culture</th>
<th>Mean Elevation</th>
<th>Standard Deviation</th>
<th>No. of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paleoindian</td>
<td>6653</td>
<td>185</td>
<td>3</td>
</tr>
<tr>
<td>Archaic</td>
<td>7078</td>
<td>896</td>
<td>62</td>
</tr>
<tr>
<td>Pinelawn</td>
<td>6352</td>
<td>600</td>
<td>80</td>
</tr>
<tr>
<td>Georgetown</td>
<td>6133</td>
<td>652</td>
<td>30</td>
</tr>
<tr>
<td>San Francisco</td>
<td>6257</td>
<td>598</td>
<td>61</td>
</tr>
<tr>
<td>Three Circle</td>
<td>6830</td>
<td>755</td>
<td>131</td>
</tr>
<tr>
<td>Reserve</td>
<td>6995</td>
<td>778</td>
<td>1344</td>
</tr>
<tr>
<td>Tularosa</td>
<td>7076</td>
<td>688</td>
<td>449</td>
</tr>
<tr>
<td>Athabaskan</td>
<td>6691</td>
<td>901</td>
<td>20</td>
</tr>
<tr>
<td>Zuni</td>
<td>7000</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Salado</td>
<td>4990</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Only three Paleoindian, one Zuni, and one Salado site have been recorded in the region and they will not be considered further because of the small sample size. First, a histogram for each Mogollon cultural period showing actual elevation figures, not means, was created. The first chart (Fig. 6.10) shows that the Archaic sites are found at the highest elevations of all sites in the Mogollon Highlands. This is not actually surprising, considering they are mobile nonagriculturalists. There is a preference for elevations between approximately 7,000 and 8,000 ft with most at many Archaic sites in the Colorado Rocky Mountain area. However, bimodality could be implied by the extended tail of sites to lower elevations suggesting...
7,800 ft. Matson (1991:152) notes this same pattern or seasonal rounds for Archaic populations. Or the graph could be representative of different Archaic groups occupying different environmental zones. Given the occupation of elevations above 7,000 ft, we would favor an interpretation that suggests movement of these populations out of this high zone to lower elevations in winter and spring. However, more Archaic site data are needed before definite seasonal rounds can be verified in the archaeological record. The fact that two of the project Archaic sites were buried up to a meter in depth by various depositional processes suggests that many more Archaic sites may be likewise buried and archaeologically invisible.

The other highly mobile group, the Athabaskans, are also found at the high end of the elevation scale. They are known to have practiced horticulture, but reportedly, not to the point of dependency. In Figure 6.11, although the sample size is small, there is a break in the elevational patterning of the sites. This also suggests the possibility of bimodal site locations during this period. The majority of sites (70 percent) lie below 6,700 ft, suggesting main occupations at lower elevations and forays or seasonal rounds into the higher locations. Other interpretations are also possible, however. Of interest is the fact that while both the Archaic and the Athabaskan charts hint at the presence of seasonal adaptations, the individual patterns are reversed. The Archaic pattern indicates a preference for higher elevations around 7,800 ft while the Athabaskan chart suggests that most sites are located in the lower zones focused around 6,100 ft. It is tempting to consider that a limited use of maize agriculture may have influenced Athabaskan settlement ranges. However, the recovery of many more economic macrobotanical and palynological samples is critical to the validation of this suggested seasonal use of the Mogollon Highlands by both Archaic and Athabaskan populations.

Next, the mean elevations for the Pinelawn phase (ca. A.D. 200-500) sites of the Early Pithouse period are examined (Fig. 6.12). The mean site elevation drops measurably from the preceding Archaic period by 750 ft to almost the lowest elevations used by prehistoric populations in the Mogollon Highlands. This is not the graph that would be expected of consistently high elevation, defensive sites. Rather, it suggests opting to locate near streams and potential arable land during the Early Pithouse period, prior to A.D. 700. No bimodality is indicated. There is a strong preference for site locations around 6,200 ft. This has been described as the period of increased reliance on agricultural products. The graph could reflect that incipient dependency.

The other Early Pithouse period sites are of the Georgetown phase (ca. A.D. 500-700) and are fewer in number than the Pinelawn sites. Several researchers (Wheat 1955; Bullard 1962; LeBlanc and Whalen 1980) consider the Georgetown phase to not be valid, but rather a part of the Pinelawn adaptation because of the unexplained low number of sites representative of this period. Looking at Figure 6.13, we see the same concentration of sites at 6,200 ft; however, there is a
general increase in sites located at lower elevations and a drop in use of the very highest elevations. In fact, this phase has the lowest site elevations of any and populations may be continuing to focus on lower lands suitable for agriculture.

This particular pattern seems to hold for the beginning of the Late Pithouse period also, during the San Francisco phase in the A.D. 800s (Fig. 6.14). Sites continue to concentrate in the 6,200-6,400 ft elevations with no bimodality evident. Then, for some reason there is a significant 550 ft change to higher elevations in the following Three Circle phase (ca. A.D. 900-1000). At this time, there is a preference for site locations at 6,400 ft, but obvious bimodality appears with a number of sites appearing at elevations between 7,000 and 7,800 ft also (Fig. 6.15). It is not possible to determine if this is because increased populations during this period are spreading out over the landscape, seasonal rounds are being employed, new peoples are moving into the area and occupying vacant niches, or if there are other factors at work. Wood (1978:206) suggests that movement to such high elevations is related to seeking better water sources, such as springs at heads of drainages, and avoiding floodplain channeling. However, in reality, this is actually a progressive pattern, starting at the end of the Early Pithouse period, continuing through the Late Pithouse period, and culminating at a mean elevation of over 7,000 ft in the Tularosa phase sometime between A.D. 1100 and 1350. After this time, the Mogollon people abandoned the region.

Early in the following Pueblo period (ca. A.D. 1000-1100), during the Reserve phase, there is only a slight overall increase in mean elevation. But the bimodality intensifies (Fig. 6.16). While one cluster of sites is located at 6,200 ft, another centers around 7,500 ft. Populations are at their very highest during this phase and a connection between the two is most probable. Rice (1980:31) also notes this dispersal across the landscape and believes it is related to the need for better agricultural land. However, the feasibility of growing maize at the higher elevations is doubtful and, therefore, the data beg the question of what are so many Pueblo period sites doing in these higher locations?

The latest Pueblo period sites in the Mogollon Highlands at ca. A.D. 1100-1350 increase even more in mean elevation. And the settlement pattern changes. There is still a bimodal distribution of sites focused at
6,400 and 7,600 ft, but the pattern is much weaker than in the Reserve phase (Fig. 6.17). Spatial separation between site elevational choices becomes blurred. It appears that the population is maintaining use of high elevations but using more of the surrounding landscape at lower elevations.

Figure 6.17. Distribution of Tularosa sites by elevation.

This dramatic fluctuation in the placement of sites on the Mogollon landscape is in obvious contrast to what so many researchers studying this region have formerly believed. The previous, and logical rationale was, that with an increasing reliance on maize agriculture and increased sedentism, one would certainly expect the valleys and drainage slopes to be the prime targets of later settlement. This apparently did not occur. Some unknown mechanism created a decided shift in land-use patterns. A number of complex factors could be contributing to this pattern—population expansion at lower elevations causing competition for resources, overutilization of fuel and game areas in site environs, or climatic degradation, specifically drought, to mention several.

Thus far, the study of the placement of sites on the landscape in terms of elevation has produced clear patterns of increasing bimodality and use of higher elevations through time. In order to look at these patterns further, the topographic quadrangle maps with all of the sites plotted on them were reexamined and actual counts for each type of site on each map were produced, looking specifically at where in the Mogollon Highlands these patterns were occurring.

Starting with the Archaic period (Fig. 6.18), we see that sites are distributed over much of the Mogollon Highlands. Sample size is small, but concentrations do appear in the Pine Lawn Valley and the Gallo Mountain-Black Peak area. Lower elevation sites in the southern part of the study area are more dispersed and may be the focus of winter occupations. However, it is likely that the range for Archaic populations extended beyond those of the study area and that even more Archaic sites may be associated with those recorded from this area, especially in the northern area.

Because the Athabaskan occupation of the Mogollon Highlands also is basically a hunter-gatherer adaptation comparable to the Archaic, we examine site distribution for this period next (Fig. 6.19). Site locations are more limited and the majority centered in the Pine Lawn area. Minor numbers of sites are found in the northern Black Peak area. The sample size is one-third that of the Archaic and may account for the poor distribution. Nonetheless, Athabaskan occupations do seem to favor the southern part of the Mogollon Highlands.

In the Pinelawn phase (Early Pithouse period), sites are spread mostly in the central areas of the study area and seem to have withdrawn from the higher elevations in the northern area (Fig. 6.20). There is a major concentration of sites in the Pine Lawn Valley near Reserve. This is probably the best agricultural land in the Mogollon Highlands and could be the reason for settlement focus in this location.

The following Georgetown phase, very similar in its adaptations to the Pinelawn, has a small sample size. If these sites are indeed later in time than the Pinelawn sites, then Figure 6.21 exhibits a constriction of sites from higher elevations to lower areas in the southwestern portion of the study region. The concentration of sites, however, remains in the Pine Lawn Valley. Climatic charts, shown in Volume 1, do not indicate severe variations in rainfall at this time, so the reason for the withdrawal at this time is unknown.

In the San Francisco phase (ca. A.D. 800-900), sites spread out again slightly (Fig. 6.22) from the central portion of the study area. However, the vast majority of sites continue to occupy the Pine Lawn Valley. No bimodality in distribution is present.

In the Late Pithouse period, during the Three Circle phase (ca. A.D. 900-1000), the pattern shifts dramatically. The Pine Lawn Valley no longer contains a majority of the sites. There is a definite spreading into the Luna area, along the Tularosa Valley, and also into the Gallo Mountain region in the north. Bimodality seen in the elevation histograms is readily visible in Figure 6.23. In the northern areas, elevations average 7,700 to 7,800 ft rather than the 6,000 to 6,200 ft in the Reserve area. Whether the sudden concentration of pithouse sites in the northern Gallo Mountains is the result of fissioning from the Reserve area or the result of new populations from the north is not apparent at this time. However, a high frequency of Red Mesa Black-on-white ceramics shows up in the northern area during this period in contrast to the Mimbres Black-on-white from the central and southern highland areas and may indicate closer ties to Anasazi groups than previously thought.
seen in the elevation histograms is readily visible in
Reviewing Table 6.3, which shows frequencies of
the sites in the various periods, it is evident that sites
more than double in number from the beginning of the
Three Circle phase to the end of the phase. But was this
increase enough to cause the perceivable splintering of
the population into two discrete centers of settlement?
In the Early Pueblo period, during the Reserve
phase at ca. A.D. 1000-1100, an exceptional change
can be seen in site settlement patterns. Sites increase
tenfold and fill up almost all areas of the Mogollon
Highlands except for the rugged mountains in the
southeast corner (Fig. 6.24). The bimodality is very
evident between the Pine Lawn-Luna area and the
northeast section around the Gallo Mountains with
settlement densities almost equally divided between the
two. The elevational differences between the two areas
average about 1,000 ft. Sites to the south of the Gallo
Mountains and northeast of Reserve, lying in the
Tularosa Valley, would seem to be more closely
aligned with the northern area, according to Figure 6.24. The huge explosion in site counts needs explanation beyond that of normal site growth.

The Late Pueblo period sites (Tularosa phase, ca. A.D. 1100-1350) exhibit the same overall pattern as the Early period in that they are separated into two distinct areas (Fig. 6.25). However, the Pine Lawn Valley, for the first time, no longer retains a major portion of the sites. Sites have substantially shifted to a higher elevation into the Luna Valley and increased in count in the Gallo Mountains-Jewett Gap-Tularosa Valley region of the Mogollon Highlands. This northeast corner of the study area also has the highest elevations (7,800 to 8,000 ft) utilized by Mogollon peoples throughout their history. The practice of agriculture at these heights is precarious at best. However, Shoberg (1998:108) indicates that there are a number of potential water and soil control devices in this area during both the Reserve and Tularosa phases, making
agriculture feasible.

**POPULATION MOVEMENTS**

In the previous section, the data show that site placement varies dynamically in mean elevation over time throughout the Mogollon Highlands. Sites also change their focus of settlement, switching from the Reserve area to the Luna-Tularosa Valley and Gallo Mountain area. This section looks at those changes in terms of actual population shifts. Do the various Mogollon populations demonstrably concentrate in specific areas? Are the higher elevation sites, such as in the Gallo Mountains, large population centers or are they 1-10 room fieldhouses or small farmsteads?

Population studies generally focus on producing quantitative person counts for specific areas. Because much of the project data derive from survey information, size of rooms is unavailable or unknown; therefore, population estimates based on room sizes, or floor areas, are not appropriate for this study. Other methods used for population frequencies are based on site counts, number of rooms, or artifact counts (Powell 1989:169). To arrive at our primary goal of obtaining an idea of actual site sizes during the various Mogollon periods and rough population estimates based on our findings, we opted to use room counts as our basis for estimation. However, there are problems with this choice of measurement, as with all methods, which involve not being able to take into account the variability in room sizes or function (for example, storage versus living quarters) present on individual sites. Therefore, in our study, size of sites is likely to be slightly more accurately estimated than population figures.

First, a count of all known number of rooms from recorded structural sites of the Pine Lawn through Tularosa phases was produced (Table 6.4). It yielded a total of 9,503 rooms for all periods versus 2,095 sites, averaging 4.5 rooms per site. (Only 25 recorded sites in the region contain 50 or more rooms.) This room count is based on very conservative estimates and is bound to rise as more sites in the Mogollon Highlands are recorded. The Pinelawn phase is represented by 171 individual pit structures, a higher than expected frequency. The following two Pithouse periods are not nearly as well represented in the archaeological record. This may be partially due to survey biases of various methods used for population frequencies are based on site counts, number of rooms, or artifact counts (Powell 1989:169). To arrive at our primary goal of obtaining an idea of actual site sizes during the various Mogollon periods and rough population estimates based on our findings, we opted to use room counts as our basis for estimation. However, there are problems with this choice of measurement, as with all methods, which involve not being able to take into account the variability in room sizes or function (for example, storage versus living quarters) present on individual sites. Therefore, in our study, size of sites is likely to be slightly more accurately estimated than population figures.

Table 6.4. Number of Rooms by Period

<table>
<thead>
<tr>
<th>Culture</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinelawn</td>
<td>4.28</td>
<td>5.94</td>
<td>171</td>
</tr>
<tr>
<td>Georgetown</td>
<td>1.30</td>
<td>.73</td>
<td>26</td>
</tr>
<tr>
<td>San Francisco</td>
<td>2.61</td>
<td>3.96</td>
<td>81</td>
</tr>
<tr>
<td>Three Circle</td>
<td>3.78</td>
<td>6.94</td>
<td>302</td>
</tr>
<tr>
<td>Reserve</td>
<td>4.13</td>
<td>8.91</td>
<td>4492</td>
</tr>
<tr>
<td>Tularosa</td>
<td>11.96</td>
<td>20.65</td>
<td>4531</td>
</tr>
</tbody>
</table>

The influx came from the Cibola area to the north.

In the past, migrations were used as causal mechanisms for unexplained changes in a culture's "traits" (Cameron 1995:106). As a result, migrations are often disregarded as explanatory tools. However, the concept of migrations of people from one area to another had a serious following in the early days of Mogollon research. Martin and Rinaldo (1950a:415) believed that the masonry architecture that appeared suddenly in the Mogollon Highlands at about A.D. 950 to 1100 during which this explosion could have occurred, populations would have had to produce offspring at an impossible rate of 1,500 percent. Therefore, anything approaching normal population growth for this period cannot account for this sudden room expansion. Based on site and room counts, and radical changes in adaptations that were occurring at this time in the Mogollon Highlands, we suggest that an actual migration of new peoples may have taken place. And given the location of most of the Reserve and Tularosa phase sites (see below), we believe that this influx came from the Cibola area to the north.

Table 6.4. Number of Rooms by Period

<table>
<thead>
<tr>
<th>Culture</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinelawn</td>
<td>4.28</td>
<td>5.94</td>
<td>171</td>
</tr>
<tr>
<td>Georgetown</td>
<td>1.30</td>
<td>.73</td>
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<td>San Francisco</td>
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<td>3.96</td>
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</tr>
<tr>
<td>Tularosa</td>
<td>11.96</td>
<td>20.65</td>
<td>4531</td>
</tr>
</tbody>
</table>
Figure 6.26: Room counts per phase.

Anderson 1986:90; Cordell 1984a:116; Lekson 1992a:15). However, they see the absorption of these traits as either a slow process of gradual local adaptation (Anyon et al. 1981; LeBlanc 1986; Lekson 1988b; Woosley and McIntyre 1996) or as a borrowed Anasazi phenomenon without accompanying migrations (Schroeder and Wendorf 1954; Nelson et al. 1978; Hunter-Anderson 1986). Still other researchers seem open to the idea of the migration of Anasazi people into the northern Mogollon area, but believe that there has been no supporting demographic or environmental evidence of such a correlation between documented changes at ca. A.D. 1000 and population movements (Cordell and Plog 1979:406; Cordell 1984a:117). A few archaeologists suggest an Anasazi migration into the Mogollon Highlands in the late A.D. 1200s and early 1300s as a result of severe drought on the Colorado Plateau (Berry 1982; McGuire and Schiffer 1983; Dean et al. 1985). The problem with this last viewpoint is that the migrations appear to have occurred earlier in the A.D. 1000s (see Tables 6.3 and 6.4). By the 1200s, room counts show a maintenance of the status quo with the preceding period, indicating no influx of populations at this time.

Most explanations for migrations of peoples into new areas focus on environmental factors (Adams 1989:155). As noted above, this seems to be the primary reason suggested for populations moving into the Mogollon Highlands. And although the later, severe droughts on the Colorado Plateau do not seem to be a factor in the earlier southern Anasazi movement at ca. A.D. 1000, environmental conditions could still have played a role in the exodus. A significant climatic variation with a change to a very wet regime is noted in the areas of Reserve, Luna, and the Tularosa Valley between A.D. 1040 to 1080 (see Figs. 1.12, 1.13). If, in contrast, droughts were occurring on the Colorado Plateau at the same time, this could have triggered a southerly migration. Other plausible causes for an Anasazi migration could have been overpopulation, competition over choice or scarce lands, or overexploitation of available resources. None of these above possibilities, including an environmental deterioration, have been explored, however.

To more closely examine room counts by phase, frequencies of recorded room counts were plotted on histograms (Fig. 6.26). These display a breakdown by number of rooms per site per phase. It is apparent that through all Mogollon phases, one-room sites predominate. For the Pithouse periods, excluding the small sample of Georgetown and San Francisco phases, percentages of one-room sites range from 50 to 52 percent. By the Pueblo period, there are several notable changes. The Reserve phase (ca. A.D. 1000-1100) drops to having only 31 percent of one-room sites and the following Tularosa phase further declines to a 13 percent count. Many archaeologists consider one-room Pueblo sites to be fieldhouses and this is likely true. If so, there is a significant drop in this type of site from the Reserve to the Tularosa phase while larger sites increase in number.
Figure 6.26. Continued. Room counts per phase.
Overall site sizes are strikingly similar for the Pithouse period sites. Larger-sized sites do not show up in the histograms until the end of the Pithouse period. For this study, small sites are defined as 1-9 rooms, medium-sized sites as 10-49 rooms, and large sites as over 50 rooms. There are also a small number of very large sites of 100 rooms or more. Figure 6.26 shows that the size differentiations for the Tularosa phase break the skewed distribution pattern for all other preceding phases. Smaller sites still predominate but at a lower percentage, 64 percent, with much more variation in site size. Large and very large sites appreciably increase in number while, according to Table 6.3, site counts drop to one-third of that during the Reserve phase, and population figures stay the same.

This site size dispersion in the Tularosa phase seems to confirm the widely held understanding that aggregation of sites into larger roomblocks occurred at this time, with a concomitant dropping off of smaller sites (Martin et al. 1956:199; Rice 1980:32; Cordell et al. 1994:129; Lekson 1996:171). Of interest is the implied lack of population growth during this time, suggesting that aggregation was internally organized within the Mogollon area. Environmental stress and competition for arable land has been put forth (Stafford 1980:74; Kohler 1993:301; Cordell et al. 1994) as a primary cause for the aggregation of populations. Another suggested cause includes the need for defense (Cordell 1984a; LeBlanc 1989a; Lowell 1991). LeBlanc (1989a:357) cites the presence of walk-in wells and springs within roomblocks in the Cibola area and two-story structures as possible evidence of conflict in the area. However, Rice (1980:37) sees no indication of violent conflict in Mogollon sites and we concur.

During the Reserve phase, sites remain basically small but dispersed over the landscape into various niches of the Mogollon Highlands, including higher elevations, upland settings, and frequently along minor drainages. Rice (1980:31) notes that there does not seem to be any particular association of sites with good arable land. In fact, Cordell and Plog (1979:419) consider many of these site locations to be environmentally marginal. In terms of elevation alone (see Fig. 6.16), this would tend to be true. Then, in the Tularosa phase, aggregation occurs. The dispersal of numerous sites over varying landforms in the previous phase could have likely created competition for available arable land and nearby faunal and flora resources. Adler (1994:85, 95) believes that when resources become scarce, competition for those commodities ensues. If populations were also at their peak sizes, as they may well have been (given dispersal into often marginal zones), then aggregation would have reduced competition among smaller sites and
allowed for better control over nearby resources, primarily arable land, allowing for a shift from extensive to intensive agricultural pursuits (Enloe and Hogan 1985:203). The presence of Anasazi immigrants that we propose for the earlier Reserve phase may have influenced these aggregation strategies, according to Adams (1991:151-152). He suggests that the inclusion of immigrants into larger villages may reduce the potential for conflict between them and native inhabitants. The larger labor force in an aggregated community also would allow for the use of a broader land base.

This pattern of many dispersed sites in the Reserve phase to fewer, more aggregated sites in the Tularosa phase is illustrated in Figure 6.27. Taking the Cruzville quadrangle in the Tularosa Valley as representative of an area with a number of sites of all sizes from both phases, we charted site locations. For Reserve, sites are mostly small and located away from the larger drainage of the Tularosa River. During the Tularosa phase, aggregation into more medium and large-sized sites with fewer small sites is evident, and is concentrated along the Tularosa River.

Our next question concerned the placement of the various sized sites on the Mogollon landscape. The elevation study demonstrated movement of sites from a focus in the Pine Lawn Valley to the Tularosa Valley-Gallo Mountain areas. However, do the site sizes (based on room counts) and population increase in this northeast portion as well or are these small splinter sites? Figure 6.28 shows the concentration of room counts during each Mogollon phase. The graphs match well with the elevational data through the Reserve phase. From the Pinelawn through San Francisco phases, the majority of rooms remain centered in the Pine Lawn Valley. In the Three Circle phase, the highest counts shift to the Luna Valley and begin to appear in the Tularosa Valley while maintaining a strong presence in the Pine Lawn Valley. During the Reserve phase, there is a broad dispersion of the population throughout almost all of the Mogollon Highlands. The Tularosa Valley now contains the highest number of rooms. In the Tularosa phase, however, they show that the vast majority of larger sites are concentrated in the Tularosa Valley-Gallo Mountain areas. This implies that populations were also centered here. The data reveal that this is not an area where small sites have splintered off from the Reserve area, but one that has experienced phenomenal growth independently from other Mogollon areas.

An estimation of the population patterns within the Mogollon Highlands through time can be presented in conjunction with the room counts given for each phase. Our population estimates are based strictly on these room counts as stated earlier. Different researchers provide varying estimates of populations based on room counts and these range from 2.0 persons per room as at modern-day Zuni, to a 2.8 count, to 3.1 for the Hopi (Hill 1970; Longacre 1976). We have selected a conservative 2.5 persons per room as the basis for our population figures, allowing that storage rooms and abandoned rooms are unavoidably included in our room counts. Counterbalancing these inclusions is the fact that there are many more unrecorded sites present within the region that would subsequently increase.
Figure 6.28. Frequency of rooms in the Pinelawn phase relative to USGS quadrangles.

Figure 6.28. Continued. Frequency of rooms in the San Francisco phase relative to USGS quadrangles.

Figure 6.28. Continued. Frequency of rooms in the Three Circle phase relative to USGS quadrangles.

Figure 6.28. Continued. Frequency of rooms in the Reserve phase relative to USGS quadrangles.
room counts. An earlier estimation of population size in the Mogollon Highlands was produced by Dean et al. (1985:70), whereby they projected approximately 1,000-2,500 people present in the Early Pithouse period to 3,500 by the end of the Late Pithouse period. During the Reserve phase, their estimate climbs to only 4,000 people and with some minor shifts, is maintained in the Tularosa phase. Our estimates are quite different and are shown in Figure 6.29. Early Pinelawn sites yield an estimate of 427 people in the region. Disregarding the Georgetown and San Francisco phases because of small samples, by the Late Pithouse period (Three Circle phase), populations almost double to 755 persons during a period of approximately 400 years. The huge increase during the following Reserve phase to a population of 11,230 people is dramatic. And this represents a conservative count because some sites were uncounted because of a lack of data and others remain unrecorded. During the Tularosa phase, populations increase only slightly to 11,327 persons. This count seems to actually reflect a loss of population because, based on a .3 percent rate of growth annually (Diehl 1996:105), Tularosa populations should have reached a count of 14,599. Abandonment processes may be beginning to show in the room count data.

CONCLUSIONS

Although the settlement study was limited to the elevational partitioning of sites within the Mogollon Highlands and population estimates based on room counts, the resulting data document some very strong patterns. During the various Mogollon phases, sites are located at different elevations within the region, but perhaps not in the same manner as previously thought. Early Pithouse period sites are not concentrated at higher elevations but, rather, display an affinity for lower locations on terraces and low hills of drainage areas. By the Late Pithouse period, sites are ascending vertically to higher zones and by the Early Pueblo period they have reached a mean elevation of 6,995 ft. Laterally, sites also spread across different environmental niches at this time. During the Late Pueblo period, an even broader range of environmental zones are occupied. Sites at this time are located mostly in the northeast portion of the Highlands in the Tularosa Valley-Gallo Mountain areas.

The shift to higher elevations and new upland areas of the Mogollon region could be the result of environmental stress caused by increasing periodicity of droughts. However, when increased site frequencies and room count data are factored into the picture, the possibility of new peoples moving into the region at ca. A.D. 1000 cannot be overlooked. The suggested population growth from 750 persons at ca. A.D. 900 to 11,230 approximately 150 years later is a phenomenal increase that coincides with the introduction of masonry, above-ground rooms, and the introduction and ensuing preponderance of black-on-white pottery. Populations do not increase during the following Late Pueblo period and, in fact, show almost a zero growth rate. However, aggregation of the population at this time into larger pueblos located often along major drainages is apparent. Causes for this aggregation have been suggested as being the result of populations reaching maximum size with resulting competition for available resources. Aggregation ensures use of the surrounding land and its products and provides a labor force to protect and exploit it.
Our research goal was to better understand settlement pattern dynamics in the Mogollon Highlands and place our project sites within the context of regional patterns. The results of the study have revealed patterning in the archaeological record far beyond what was anticipated. The data have demonstrated site locational movement through time and a potential population explosion within the Mogollon Highlands between A.D. 1000 and 1100; however, the causes of these major shifts have only been put forth as best-fit explanations. For example, the role that deteriorating climatic conditions played in vertical and lateral site displacement needs further examination. Also, a heavy reliance on maize agriculture at such high elevations late in Mogollon prehistory is questioned, but much more subsistence data need to be recovered from both early and late sites in order to understand any changing dependencies that may have occurred. And finally, a much closer examination of the regional dynamics between the populations of the northeastern Highlands and the Cibola area, ca. A.D. 950-1050, is required. Do these northern sites have a higher frequency of Red Mesa Black-on-white or other Anasazi-based ceramics than other areas of the Highlands? What were the environmental and sociopolitical conditions present in the southern Cibola region at the time? What were the underlying causes of the apparent migration into the northern Mogollon Highlands?
BACKGROUND FOR STUDYING ABANDONMENT PROCESSES

To abandon something (in this case, the Mogollon Highlands), according to Webster's New World Dictionary of the American Language (1974), means to relinquish or give it up completely or forever, or to leave out of necessity. While this is precisely what occurred by ca. A.D. 1350 in the Mogollon Highlands, the process itself is complex, varying in intensity of duration, causal factors or triggering mechanisms, and means of setting the abandonment into motion. The scale of abandonments described in the archaeological literature also varies from small-scale involving specific sites, to abandonment of valleys and river systems, to large-scale regional abandonments. This chapter is concerned specifically with abandonment on a regional scale within the Mogollon Highlands. Large-scale abandonments of regions in the Southwest are not that uncommon with most occurring late in prehistory, after A.D. 1300. Some rather large abandonments of areas occurred earlier, but with a subsequent return of prehistoric populations into the same region. In the case of the Highlands, abandonment was virtually complete, with only minor, later Zuni forays into the mountains for hunting and gathering. Post-Pueblo occupation of the area also involved the relatively small numbers of mobile Athabaskans; Pueblo groups never lived there again.

Settlement pattern studies (see previous chapter) document a fluctuating population within the Mogollon Highlands from the Archaic through the Late Pithouse period, based on room counts for the region. Much of the variation may be due to lack of fine-grained control in identifying closely dated phases of a period (i.e., the Pinelawn and Georgetown phases). However, when examined in terms of broad periods (Early versus Late Pithouse periods), there is steady incremental growth up to A.D. 1000. Some rather large abandonments of areas occurred earlier, but with a subsequent return of prehistoric populations into the same region. In the case of the Highlands, abandonment was virtually complete, with only minor, later Zuni forays into the mountains for hunting and gathering. Post-Pueblo occupation of the area also involved the relatively small numbers of mobile Athabaskans; Pueblo groups never lived there again.

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settlements were inhabited (Kintigh 1990:267). We pueblo. By A.D. 1400, all were abandoned, and new gathered into much larger units until by A.D. 1300, are dispersed into small pueblos and after that date are sequence at Zuni where prior to A.D. 1250 populations trajectory would have developed.

CARES OF REGIONAL ABANDONMENT

As Fish and Fish (1993:100) state: "Abandonments are solutions to problems caused by remaining in the same area." When considering abandonment as the cure for alleviating these problems, prehistoric peoples must have also considered the benefits or possible pitfalls of moving to a selected destination. This is often stated in terms of push-pull factors whereby the "pushes" and "pulls" outweigh whatever benefits accrue from staying put. What were some of the "push" factors that would have motivated Mogollon people to leave the region en masse over a 100-150 year period? Potential causes for abandonment of a region are innumerable. Several unicausal factors have often been offered as the prime movers in abandonment events, such as the Great Drought or population growth. These explanations, when examined in detail, are too simplistic (Lillios 1993:110). Single disasters are more probably contributing factors or, perhaps, the final straw in a series of interdependent events or situations that eventually provided the impetus for such a dramatic regionwide resolution to problems. Various researchers have espoused one cause over another or acceded to the possibility of a multiplicity of reasons for abandonments to occur. An evaluation of some of these potential causes is presented.

Loss of Agricultural Land

The Mogollon Highlands have often been considered a marginal environment for growing agricultural products. The mountainous terrain and narrow valleys watered by rivers and streams that frequently dry up do not provide a dependable environment for agricultural pursuit (Reid 1989:90; McGuire and Saitta 1996). Prior to A.D. 1000, sufficient land would have been available to support the low-density pithouse populations and their occasional large villages. Even with tremendous population growth after A.D. 1000, the dispersion of the people into small communities spread over the Highlands diluted the necessity to reuse the same lands over and over and leach the soil of valuable nutrients or deplete the resources. However, competition for the limited resources available may have ensued because of dense population packing around those resources. Communities may then have aggregated into large villages to combat competition and acquire access to more land (Adler 1994:85). But with massive aggregation of the population in the A.D. 1200s, available agricultural land surrounding these large enclaves may not have been adequate even with intensive use (Fish et al. 1994:137). Not enough suitable land, the overutilization of available fields, or the depletion of natural resources upon that land would have created the same effect—a drop in carrying capacity. Rindos (1980:762) and Kohler (1993:296) believe that this situation is often the cause of emigrations from an area. Rindos (1980:763) suggests that if the decline in agricultural productivity is drastic, populations will immediately concentrate on the exploitation of alternative food sources. However, there is no evidence from the excavations of large Late Pueblo period sites in the Mogollon Highlands that such a return to hunting and gathering occurred.

The ultimate failure of intensive agricultural systems as practiced by aggregated populations in a marginal environment is thus proposed as a prime reason for abandonment of regions (Stafford 1980:72). The subsistence technology simply could not support such large populations (Cordell and Plog 1979:418). Population shifts to areas with better water and capable of supporting intensified agriculture are posited (Fish and Fish 1993).
Climatic Perturbations

A suggested contributor to the loss of potential agricultural land is a drying of the soil from deficient rainfall which has the effect of lowering the water table and possibly initiating deep arroyo cutting (Cordell 1984a:310). However, Cordell notes that the Hopi mesas were not abandoned because of dry spells even when other better-watered areas were. Instead, they utilized a system of developing small plots of land and irrigating from seeps and springs (Fish et al. 1994:150). Also, an examination of tree-ring data do not support an unusually poor climatic regimen for this area in the A.D. 1200s (Figs. 1.12, 1.13; Cordell 1984a:311), but several others think that even low-frequency climatic fluctuations could make an area uninhabitable (Plog et al. 1988; Peterson 1992). Lipe (1995) agrees with this opinion believing the structure of society was so complex and interconnected that even a minor perturbation could effect an abandonment.

The Great Drought of A.D. 1276-1299 has often been credited with the shifting of populations on the Colorado Plateau to other areas of the Southwest (Adams 1989; Schlanger and Wilshusen 1993). However, Cordell (1984a:310) believes the evidence does not support such a proposition. She notes that areas with higher precipitation rates, such as the Mogollon Rim and the Mogollon Highlands, also suffered a population loss at this time. Other earlier droughts in the Southwest have perhaps been as severe at the Great Drought but without an accompanying emigration of people (Johnson 1996). However, it may have served as a last straw in some areas. But even on the Colorado Plateau where drought effects were perhaps most severe, Van West (1990) provides evidence that the population could have grown enough corn to have supported itself throughout the drought.

As suggested by Graves (1983:309-310), it would seem that climatic factors alone would not have been the only motivation for deserting whole regions. But, as Graves states, climatic perturbations may have instituted subtle changes that, together with other environmental or social events, triggered intolerable conditions.

Cultural Factors

A decline in population has sometimes been suggested as a cause for abandonment of the Mogollon Highlands. Death by epidemic disease is one postulated reason for this decline. However, Upham (1984:247) notes that a review of burial populations prior to the A.D. 1400s shows no indication of large numbers of deaths. Excavation data from sites of all periods also do not indicate any rises in mortality rates.

Wills et al. (1994) also suggest that there may have been a decline in population prior to abandonment of the region that was tied to a complex series of events. They believe that resource exchange both between the region and outside of it was an important part of allowing the population to grow beyond its locally available means. They suggest that a decline in exchange relations because of increasing competition over resources occurred in the mid-A.D. 1300s and led to severe resource depletions, creating greater competition for those goods that were still available. With the significant loss of its resource base, populations declined rapidly as people moved away, producing a lower birth rate among those left behind (Wills et al. 1994:310). While exchange agreements may have dried up, there is no indication from settlement pattern studies to confirm that populations declined immediately prior to abandonment in the A.D. 1300s.

Warfare among Late Pueblo groups or with outsiders is also given as a possible cause for abandonment of the area. No evidence for the general killing of Pueblo peoples by each other or outsiders has yet been presented in the archaeological record. Athabaskans were likely in the region in the A.D. 1400s, but this would have been after widespread abandonment in the A.D. 1300s. If, perchance, they arrived in the area in the A.D. 1300s, then the simple practice of raiding corn fields and depleting game and vegetal resources (without resorting to warfare) could have contributed to subsistence stress by the Pueblo groups. Factionalism and internal strife over declining resources, however, could have taken a heavy toll on large aggregated sites and contributed to the decision to leave the region for better areas.

Some have suggested the influence of a new religion served as a "pull," drawing people out of stressed regions. This was the katsina cult (Adams 1991; Lipe 1995). Its appeal to struggling populations may have been immense. Critics of this religion as a drawing card question whether the cult was a strong enough force in the mid-A.D. 1300s or if it was even present by then. Others ask why the cult itself didn't take hold in these depressed regions rather than the people moving to it (Johnson 1996).

Population Aggregation

Adler (1994:85) believes that population aggregation is the result of changes in resource availability in a group's surrounding environment and an ultimate cause of abandonment. He suggests that as groups reach maximum size (or all environmental niches are filled), there will be increased competition for the available resources. Therefore, previously dispersed groups may aggregate into larger settlements whereby they can control access to those resources (Adler 1994:95). New
organizational modes were, therefore, necessary to accommodate these aggregated groups and the resulting intensification of agricultural productivity (Fish and Fish 1993:100). As a consequence, intense pressure may have been felt by smaller, outlying communities in terms of competition and territoriality over available resources. In sum, large-scale abandonments are suggested to be the result of populations aggregating within a marginal environment such as the Mogollon Highlands because of resource stress and, then, not being able to sustain the agricultural and resource productivity needed to maintain the enlarged society, triggering movement to new areas by both them and the smaller groups.

ABANDONMENT PATTERNS IN THE MOGOLLON HIGHLANDS

Settlement pattern shifts during the Pueblo period are graphed in the previous chapter and some may be forerunners of ensuing abandonment processes. Between A.D. 1000 and 1100, a dispersed settlement pattern is shown with heavy site densities in the Luna, Reserve (Pine Lawn Valley), Tularosa Valley, Gallo Mountains, and the immediate surrounding areas. Abandonment events are first noted in the Reserve area between A.D. 1000 and A.D. 1100. Early investigations found no indication of subsequent post-A.D. 1100 occupation within the Pine Lawn Valley (Bluhm 1957). This finding has been carried forth by Berman (1979) and Stuart and Gauthier (1981). However, our studies indicate that while this area lost population at this time, it was not devoid of post-A.D. 1100 pueblo sites, with a minimum of 29 sites present. In contrast, the Gallo Mountain-Tularosa Valley areas gained sites at the same time suggesting dispersal into these areas by Reserve populations. Movement out of the Reserve area definitely occurred, however, and may have been a precursor of things to come. We have no indication of why this may have taken place in this particular locale; however, room counts are very high prior to this time and the available valley land may not have been able to support this large population without competition and possible confrontation. Movement to the nearby Tularosa Valley and Gallo Mountains may have been the best choice for alleviating local resource stress. But why did they not attempt to aggregate in the Pine Lawn Valley rather than move? We may have an alternative explanation by suggesting that resource depletion and overutilization of agricultural lands by the large population may have already occurred in the Reserve area, and thus the decision to move. These are topics that need much more research before definitive answers are obtained, however.

Other areas of the Mogollon Highlands do not evidence a population movement out of the region until the later part of the A.D. 1200s and into the early 1300s. OAS excavations at the Hough site along the San Francisco River near Luna document an aggregated occupation in that area until the early A.D. 1300s. In the Tularosa Valley, where most of Late Pueblo aggregations are found, sites are scattered along the terraces of the Tularosa River. Only a few sites postdate A.D. 1250 (Stuart and Gauthier 1981) and the area is abandoned by A.D. 1300. The Gallo Mountains experienced the identical pattern of large aggregated villages appearing after A.D. 1100 and disappearing by the A.D. 1300s. The whole of the Mogollon Highlands is most certainly abandoned by A.D. 1325-1350.

Surrounding areas underwent abandonment in like manner. The Quemado area, directly north of the Mogollon Highlands, seems to have begun losing population at ca. A.D. 1150-1200 with no sites present past A.D. 1350 (Hogan 1985:44; Lekson 1996:171). To the west, near Springerville, Arizona, Danson (1957:7) records few sites dating after A.D. 1250; however, some do extend past A.D. 1325 to the A.D. 1400s (Kintigh 1996:134). Further south near Grasshopper Pueblo, sites were still present in the mid-1300s (Tuggle et al. 1984:102). At Zuni, dispersal into higher elevations and varying topographic zones is documented beginning in A.D. 1000 (Anyon and Ferguson 1983:4). Aggregation followed in the late A.D. 1200s (Kintigh et al. 1985:1), somewhat later than in the Mogollon Highlands. By A.D. 1350, there are fewer sites in previously occupied locales and by A.D. 1400, new settlements near Zuni are founded (Kintigh 1990:267). In contrast, in the Mimbres Valley to the south, populations decline as early as A.D. 1100 and were almost gone by A.D. 1200 (Dean et al. 1994; Hegmon et al. 1998). Farther afield, the Chaco Canyon complex of settlements saw no new construction as early as the mid-A.D. 1100s (Dean and Ravesloot 1993) with only a minimal population present into the A.D. 1200s (W. Toll, pers. comm. 1998).

A closer look at one of the last occupied sites in the Mogollon Highlands, the Hough site near Luna, may provide the best opportunity for understanding abandonment processes within the region. Unfortunately, there was little evidence from the archaeological record to indicate impending abandonment. The approximately 30-room pueblo also contained a great kiva with ancillary side rooms. We do know that when abandonment did occur, it was not sudden or chaotic; there was no sign of warfare or epidemic disease. Rooms were not burned, although post-occupation burning of some roofs did occur. Remodeling of hearth areas and reorganization of some room functions is suggested by the remaining architecture. However, all of the rooms, including the great kiva, were cleared out, few artifacts were left in situ (mostly those in subfloor or storage pits or in a foot
Northern Mexico was also suggested in early days to have been a migratory destination. Roberts (1937:23) proposes that Mogollon peoples moved south and fused with northern Chihuahuan groups. The Mimbres area, however, is more generally seen as the source of Mexican migrations. LeBlanc and Whalen (1980:13) suggest this as a possibility in post-A.D. 1150 when the Casas Grandes area, in particular, experienced a rapid growth with the development of numerous large towns. Another destination for the Mimbres people apparently was the Black Range area not far to the east (Hegmon et al. 1998:150).

A frequently mentioned locality of Mogollon emigrations is the Zuni area with apparently long-standing ties to the Mogollon Highlands. Even before the Highlands were abandoned, Zuni peoples were supposedly exploiting the high peaks of the Highlands and eastern Arizona as sacred areas for retrieval of important plant materials and using several forested zones as traditional hunting grounds, which are maintained to this day (Ladd 1983:174,188; Ferguson and Hart 1985:43). Frisbie (1984:101) notes that the Mogollon rectangular kiva appeared in the Zuni area by A.D. 1250, another indication of strong social influence. Between A.D. 1250 and 1350, Kintigh (1984:217) documents an increase in Zuni room count to about 11,250 rooms. Lekson (1990:104) notes this same change and calls these Tularosa phase sites. Between A.D. 1300 and 1350, the Zuni River Valley had one of the heaviest concentrations of aggregated pueblos in this area of the Southwest (Kintigh 1990:264). By the A.D. 1400s, this valley lost population but new settlements sprang up nearby.

A final, but strong possibility for a Mogollon abandonment route is from the Highlands to east-central Arizona, particularly the Upper Little Colorado River area. As a result of Danson's extensive surveys here and in western New Mexico, he notes that most of the Late Pueblo period sites were concentrated in this area (Danson 1957:64). Whether using Danson's data or as a result of their own investigations, Martin et al. (1961:3) believed that Mogollon people moved to this Arizona area from the Mogollon Highlands. Increasing pueblo aggregation is frequently noted in this region. By the A.D. 1280s, Reid et al. (1996:73) state that a rapid increase in sites in the Grasshopper region is due to immigrations into the area. The population in this particular area apparently did not peak until after A.D. 1350 (Kintigh 1990:267; Fish et al. 1994:160), after the Mogollon Highlands were abandoned. The Upper Little Colorado area also saw several sites existing beyond A.D. 1325 (Danson 1957:7). One possible "pull" for this region may have been the recent development of the katsina cult (Adams 1991), giving people new hope after disastrous environmental and social events in their old habitats. Kohler (1993:298) indicates that all of the...
areas of the Little Colorado River Valley, White Mountains, and Gila-Salt Creek were occupied up to the mid-1400s. Afterwards, most of this region was also abandoned. However, it is known that many people from this area migrated to the Hopi area at this time (Upham 1984:247; Kintigh 1990:267) and Hopi may well have been the final destination of many of the Mogollon peoples.
CONCLUSIONS

by Yvonne R. Oakes

USE OF THE MOGOLLON CONCEPT

Rarely are archaeologists given the opportunity to conduct extensive excavations on 25 sites within a bounded area such as the Mogollon Highlands. Findings exceeded expectations and as a result a deeper understanding of cultural processes in the Mogollon region was realized. Extended study of the sites, which include a great kiva, several possible ceremonial rooms, numerous pueblo rooms and pithouses, roasting pits, hearths, and lithic artifact scatters, led to the question, first of all, of whether there is a separate Mogollon identity. It is ironic that it took over 30 years from Haury’s first proposal for a distinct Mogollon culture as opposed to Anasazi or Hohokam (Haury 1936b) for it to be grudgingly accepted among archaeologists, such as Brew (1946) and Kidder (1954), and another 30 years for the validity of the concept to be again questioned.

Today, the properties of uniqueness, independent development, and cultural separateness are being reevaluated; however, the scale of observation has changed. Early archaeologists were looking only out their own backdoors, trying to promote the cultural distinctness of the system that filled their particular view. Haury’s originally proposed Mogollon culture was argued to have subsumed a little bit of this or that adaptation and not much of anything really substantially different from other Southwestern cultures. Archaeologists today are looking at culture from a broader perspective. From this wider viewpoint, no culture seems to be all that unique—all are interwoven into the complex cultural fabric of the prehistoric Southwest more than they stand apart. Several researchers have suggested dropping terms such as Anasazi and Mogollon culture and using the words Pueblo, Southern Pueblo, or pan-Southwesternism (Haury 1988; Speth 1988; Wilcox 1988). This approach is significant because it allows us to examine a much broader picture of symbiotic cultural relationships on a regional scale. Differences become slightly blurred but developmental similarities attain a sharper focus. The Mogollon entity thus becomes part of the larger expression of Southwestern culture, which is seen as a dynamic process meshing all areas of the region. However, as stated earlier in this report, the term "Mogollon culture" is retained by us as a useful concept when describing adaptations for the Mogollon Highlands area and comparing them with similar manifestations elsewhere.

THE DATA RECOVERY PLAN

Data recovery plans are often larger than life with nearly unattainable goals and premises that would make archaeological headlines if only they could be proven. And yet, it is difficult to prepare a simple excavation plan because we always have high expectations for the data and, with it, hope to make important contributions to archaeological theory. The research plan for the Luna project was an attempt to select a basic premise that could be tested with seemingly abundant data. It, too, however, was somewhat out of reach given some limitations of the data. But progress was made not only in understanding Mogollon mobility patterns but in defining the various cultural adaptations, refining chronologies, assessing settlement patterns, and perhaps identifying several causal mechanisms for abandonment of the region.

Because sites potentially spanned over 3,500 years, a data recovery plan was selected that was applicable to all periods of occupation in the Mogollon Highlands. The temporal span was advantageous because variations as well as a continuum in adaptations through time could be more easily identified. The focus of interest came to rest on the degree of mobility evidenced over the several cultural periods as related to the utilization of agriculture. Therefore, what amounts to a normative premise of cultural change was subjected to testing in hopes of establishing or disproving its veracity in this particular area of the Southwest. The premise states that if there is indeed a continuum from full mobility in the Archaic period to full sedentism by the Pueblo period, with the change influenced by increasing dependence on agriculture, then that shift should be evident in the archaeological record. In other words, is there evidence of decreasing residential mobility as cultigen dependence increases?

Of importance to the model was whether or not mobility strategies could be observed in the archaeological record. We proposed that evidence could be sought in a wide variety of cultural manifestations. Focus, however, was on two aspects of Mogollon adaptations in order to study variability in mobility strategies: subsistence activities and site structure through time. Other refinements in understanding Mogollon culture were also obtained and are reviewed in this chapter.
SUBSISTENCE ADAPTATIONS

There are three basic subsistence resources potentially available to prehistoric occupants of the Mogollon Highlands: harvested domestic crops such as corn, gathered wild plant food, such as acorns, cacti, and berries, and hunted wild game. Their appearance in a site assemblage is dependent, to varying degrees, on the vagaries of climate (such as drought), seasonal abundance, food preferences, and competition for those resources. Thus, reliable dependence on any one particular resource can never be a given assumption. Abundances of food items on a site no doubt also fluctuated yearly and in order to understand any progressive dependence on agriculture, changing reliance on wild plants and game through time must also be examined.

Wild Plant Food

It is assumed that wild plants have always been important dietary items in the food regimen of prehistoric populations. Plant foods can vary greatly in type from grasses, berries, vegetables, and nuts to shrubs, flowers, pods, and seeds. Availability is usually restricted, however, to seasonal maturities. Prior to any dependence on cultigens, wild food resources nutritionally balanced the taking of wild game. Because of seasonal and spatial limitations on both types of resources, movement over the landscape from resource to resource is almost a necessity. Thus, we have Archaic and Athabaskan hunter-gatherers practicing seasonal rounds in pursuit of sufficient food. But did wild plant intake drop after the development of agriculture within Mogollon cultural systems?

Wild plant data for the Luna project are derived primarily from botanical and palynological material recovered from the sites (Table 6.5). We looked mostly for fluctuation in diversity of the types of plant products utilized through time, following the proposition that an increase in the diversity of wild plants used is an indication of resource depletion (Shaffer and Schick 1995). While wild plants are important to any cultural system, we previously proposed in Volume 4 that it is fauna that drives the prehistoric economies of the Mogollon Highlands. Therefore, a drop in abundance and availability of economic fauna is likely to produce resource depletion of faunal foods. As a result, a shift in subsistence strategies will become evident in the utilization of smaller and diversified game, diversified and less popular plant products, and an increase in domestication of crops in the archaeological record. The decline in the availability of large game through time in the Mogollon Highlands has been documented in Volume 4. Table 6.5 also verifies an increasing diversity of wild plant foods, which we read as another signal of resource stress. Wild plant diversity remains low from the Archaic through the San Francisco phase, indicating probable adequate availability of preferred food choices during these early occupation periods.

Mirroring the faunal data, there is a threefold increase in wild plant diversity for the Three Circle phase (Late Pithouse). Villages are often larger, remaining in one place longer, which apparently stressed the resource base through overexploitation or created competition for resources with smaller communities. Climatic factors could also have played a role in reducing available resources and this possibility needs further study. As villages broke down and spread into new environmental niches during the following Reserve phase, diversity of plant food drops slightly. However, as large game use drops to an all-time low by the Tularosa phase, the diversity of plant foods on one of the latest sites in the region, the Hough site, rises to an all-time high (Fig. 6.30).

Wild Game

Based on comparisons with surrounding areas of the Southwest, dependence on hunted game in the Mogollon Highlands was probably of great importance, ranging from a large-game high of 91.0 percent in the Pinelawn-Georgetown phases, to a low of 37.8 percent during the Tularosa phase, with an overall mean of 61.1 percent. The times of lowest dependency occurred during the Three Circle and Tularosa phases (Table 6.6) and are suggested as periods of intensive resource stress as corroborated by settlement pattern, floral, and abandonment data. Conversely, as large game dependency declines (presumably as a result of lessened availability) from a high during the early Mogollon periods to a low in the Late Pueblo period, small game (rabbits and rodents) reliance rises until there is almost equal dependence on both in the Tularosa phase. Diversity in faunal resources, however, rises through time and is another indicator of resource stress (Minnis 1985:35). It is most evident in the Three Circle and Tularosa phases (see Table 6.6). Reasons for lessened availability and utilization of a more diversified faunal base may have included overexploitation of fauna, human populations becoming too large within a given area, competition for available resources, environmental perturbations, and change in dietary preferences. Diversification is a frequent response to a falling resource base and one means of diversifying is to rely more heavily on other subsistence items. As noted in Figure 6.31, wild plant food utilization dramatically increases on sites in the Mogollon Highlands as faunal resources decline.
Table 6.5. Percentages of Wild Plants in Site Samples

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*Less than 0.1 percent.
The Archaic period produced one of the highest artiodactyl indices in the Southwest based on comparative data from Szuter and Bayham (1989). Abundance and availability are not restricted and there is no indication of resource depletion or selection of a diversified subsistence base. Strong wild plant dependency is also not indicated by the data. This same pattern of heavy large-game usage continues into the Pinelawn-Georgetown phases. A slight decline in large game indices is evident in the following San Francisco phase; however, turkey remains are found for the first time in small but perhaps important numbers. The use of turkeys for food as opposed to sources for feathers has not been resolved, however, for the Luna site data.

By the Late Pithouse period (Three Circle phase), there is a significant decline in large game utilization and a greater diversity of species types found on sites. Both would seem to indicate faunal stress was occurring. One result of this subsistence imbalance may have been the dispersion of populations into smaller communities and into new environmental niches, specifically higher elevations and more distant from larger water sources. The following Reserve phase may have experienced a rejuvenation of faunal resources in some areas as a result of this settlement pattern change because faunal percentages slightly increase for this period. During the Late Pueblo period, populations aggregate into lower, more arable locations, but faunal indices do not improve based on this movement. Rather, faunal percentages decline to an all-time low and small species surpass those of large. There is also an accompanying increase in the diversity of species found on sites. These should probably be interpreted as evidence of resource depletion at this time and may have eventually contributed to the final abandonment of the region.

**Domesticated Crops**

The practice of agriculture is documented for all periods of occupation in the Mogollon Highlands, from Archaic through Late Pueblo. However, degree of dependency on agriculture is of most concern to the Luna data recovery plan. Reliance on maize for this report is expressed in terms of percentage of maize found in macrobotanical and palynological samples (Table 6.7). For the Archaic period, the corn ubiquity score is 22.2 percent, a fairly low number as would be expected for this time. It is not thought that Archaic populations were practicing full-scale agriculture, although small storage pits were found at Raven's Roost, dating to ca. A.D. 0, that may have contained some corn. Cultivation was most likely a supplemental strategy to hunting and gathering. Even though it may have been an ancillary adaptation at first, the pursuit of agriculture would have involved a conscious decision to embrace it, however opportunistic first attempts may have been. Earliest maize dates in the Mogollon Highlands seem to predate 2000 B.C. (Wills 1995:218).

In the following Pinelawn-Georgetown phases, most sites in the Mogollon Highlands reveal evidence of maize use. Lazy Meadows (LA 39975) produced a corn ubiquity score of 41.6 percent, double that for the Archaic period. Combining this site data with that of the SU site and LA 5407 in the Gallo Mountains (Akins 1998b), a ubiquity score of 80.6 percent was obtained, indicating there was generally a large amount of maize on Pinelawn-Georgetown sites. Clearly, growing maize was an important adjunct to Early Pithouse adaptations. However, as Wills et al. (1994:310) state, and we agree, hunting and gathering...
remained the primary source of food items. Even though corn presence at the later San Francisco phase Fence Corner site is higher than the Pinelawn phase sites, there is no indication of increased storage of crops for use over winter. And at the pithouse village of Site 31 near Vernon, Arizona, no maize remains were found at all (Martin and Rinaldo 1960a:119).

The Late Pithouse period (Three Circle phase) data are somewhat ambivalent. From five pithouses at Luna Village we obtained a combined maize ubiquity score of a low 25.0 percent. However, Diehl (1996:112), with admittedly scanty data, suggests that dependency on corn agriculture increases in this phase. Given the large data base from Luna Village, we must conclude that in the Luna Valley at least, dependence on agriculture had greatly decreased, probably as a result of the same stress observed in the faunal material from the site. The fact that both faunal and agricultural indices are low strongly suggests there must have been environmental degradation, lack of sufficient land to ensure crop growth or rejuvenation of fauna, or population pressure on resources at this time. Luna Village is a substantial site with at least 50 pit structures likely present. One excavated structure was 1.6 m deep with an encircling bench, complex ventilator system, and a formal hearth. All five of the pit units had formal hearths, but none had storage pits within them. Overwintering is indicated by the detailed hearths and deep structures, but the lack of storage units, at least in the excavated portion of the site, confirms a low reliance on domesticated crops, even though occupation time may have been lengthy.

With the development of more permanent above-ground masonry rooms at the beginning of the Pueblo period (Reserve phase), there is often a presumption of dependency on agriculture at this time; however, the data do not seem to confirm this. Large game use actually increases as sites move into new locations, often at higher elevations. At the same time, corn ubiquity scores are the lowest for any period in Mogollon prehistory, at 11.1 percent. Thus, major reliance on corn is not suggested by the data. Also, while one-hand mano use decreases and two-hand mano use increases, there are no significant changes in length to indicate intensified corn processing. Water control devices, used frequently in association with growing crops, are not common at this time nor in any other period in the Mogollon Highlands. In the Late Pueblo period (Tularosa phase), the aggregation of many sites into large villages, located in areas of lower, more arable land adjacent to larger stream flows, allowed for more intensive agricultural pursuit as seen by the corn ubiquity index of 42.6 percent for the phase. For the Highlands, that ubiquity score is high, but still not indicative of a major reliance on crops over that of fauna and gathered food.

Whether it was climate-induced droughts or the presence of too many people in the habitable areas, the Mogollon Highlands did not seem capable of supporting long-term agricultural involvement no matter how permanent the communities were. Diversity among the various subsistence resources used is much more characteristic of the region, especially immediately prior to abandonment.

### Site Structure Through Time

Architectural complexity is often used as an indicator of the mobility patterns of occupants of sites (Kent 1991). Therefore, in order to address the research question of whether or not changing mobility patterns are influenced by increasing reliance on agriculture in the Mogollon Highlands, we looked for evidence of mobility strategies in the archaeological record, specifically through the examination of adaptive site structure.

The correlation of house form with function has interested modern archaeology since a provocative study by Rapaport (1969). For the Southwest, Whalen and Gilman (1990) have associated circular dwellings with mobile groups and rectangular structures with sedentary ones, although they do caution that there are many levels of mobility in any given society. Woolley and McIntyre (1996) believe, for sites at Wind Mountain near Silver City, that rectangular structures equate with habitation units while circular ones are ceremonial. This does not hold true for the Mogollon Highlands, at least. Here, considerable variation tends
structures to large, with often functionally partitioned into large pueblos. Site structure does become more complex through time, as sites aggregate over time. Rounded corners begin to appear by about A.D. 600. By the A.D. 800s, rectangular forms dominate; however, circular pit structures continue to be built throughout the entire Pithouse period. Size changes through time also, although not progressively larger, as would be assumed. From very small Archaic structures, sites in the following Early Pithouse period proved to have the largest pit units of all periods at a mean area of 32.06 sq m. Then there is a significant decrease in room size throughout the remainder of the occupation of the Highlands. Changing social organization from extended to nuclear families may be occurring and thus causing this pattern.

Then, at around A.D. 1000, major structural changes involving form and design occur. Habitation units are now rectangular, built above-ground, and are constructed from cobbles, most times with rooms contiguously arranged. Several reasons for this change have been postulated including being part of the normal evolutionary trajectory of dwellings from simple to complex which leads to more efficient use of space, reduction in labor investment, and easier access to stored goods (LeBlanc 1986; Lekson 1992a). Other reasons for this architectural change include the abrupt introduction of new populations or new construction ideas into the area (Cordell 1984a; Adams 1991). We concur that the change seems to be abrupt and cite the huge increase in site frequencies at this time, the locational shifting of sites into new areas, the introduction of Cibola White Wares, and the suddenness of the appearance of above-ground masonry rooms as grounds for outside stimulus.

However, in summary, there is a persistent diversity in structure form, size, and type or style of interior features in Mogollon Highlands architecture. Site structure does become more complex through time, but with a myriad of variation between and among sites of the same and differing periods. Standardization of interior features in habitation units and kivas is not as apparent as in, for example, the Colorado Plateau to the north. This lack of structural patterning suggests possibly loose social organization on an areal scale throughout the Mogollon Highlands. Only in the Late Pueblo period, ca. A.D. 1200, does social organization become measurably more complex as sites aggregate into large pueblos.

Does this trend from simple, featureless pit structures to large, with often functionally partitioned and interconnected rooms, signify a lessening of mobility for site occupants in the Mogollon Highlands? The labor investment, complexity of features, increase in storage facilities, and permanence of architecture all point to some degree of planned sedentariness. Overwintering is certainly practiced in many cases where rooms have interior hearths, storage units, roasting pits, and mealing bins. The pueblo sites are most likely to evidence longer-term habitation - for years, in many instances. However, given that sedentism is often not a constant in the adaptation of any given prehistoric society, what may be taken as signs of sedentism in the Late Pithouse period, for example, may only hold for several months or seasons at a time. Mobility combined with a degree of sedentism is an option we must consider for many seemingly sedentary sites. The investigation of nonpermanent sedentism is fairly new and needs further development of unambiguous methods of verification. Floral data are useful in this regard but were insufficient on the Luna project to determine degree of sedentism.

RESEARCH SUMMARY

The important question is whether increasing sedentism relates to the practice of agriculture. Does agriculture tether sites to the landscape? Our studies on the Luna project suggest that agriculture may never have been the primary source of sustenance for the residents of the Mogollon Highlands. If anything, corn dependency was higher in the Early and Middle Pithouse periods, ca. A.D. 500-900, than in later times. However, architectural complexity did not reach its zenith until the later Pueblo period. For the Highland region, at least, there seems to be no direct correlation between increasing permanence of structures and dependence on agriculture. While corn agriculture may have played some part in increasing sedentism in the region, it was likely not the prime mover. Complex factors such as the presence of competing groups and the need to define a territory, the development of trade networks, and abundance of natural resources may have all contributed to any decisions to establish more permanent dwellings and reduce mobility.

However, while the primary purpose of our research was to investigate the correlation between mobility and dependency on agriculture, the site data generated on the Luna project led us down other significant avenues of inquiry. Perhaps most unexpected was the discovery that Athabaskan sites were present in our data base and we were able to obtain radiocarbon dates for them falling between the 1400s and 1800s. The archaeological study of Athabaskans in the Mogollon Highlands is virtually untapped and wide open for further exploration. The finding of buried and datable Archaic structures and...
hearth was significant also. The excavation of a great kiva at the Hough site allowed us to compile needed data on this Mogollon phenomenon. In fact, the excavation of one of the latest, large pueblos to have existed in the Highlands prior to abandonment of the region (the Hough site at ca. A.D. 1275-1325) permitted us to examine abandonment processes and compare site data with that of earlier sites for indicators of subsistence stress at this time.

In all, the entire range of sites on this project, from Archaic to Late Pueblo and protohistoric, provided an unusual opportunity to compare sites from various temporal periods within a fairly localized area of the Mogollon Highlands. Our settlement pattern studies also allowed us to examine changing residential patterns through time in terms of elevation and location on a regional scale. We also proposed some ideas as to why the region was abandoned by ca. A.D. 1350. However, much data is still needed on a variety of topics, such as the mobility range of pithouse dwellers, extent of Athabaskan occupation, subsistence stress in the Late Pueblo period, correlation of great kivas to communities both within and outside of the region, migration destinations in the thirteenth and fourteenth centuries, and the relationship of the Mogollon peoples to those in the Cibola area to the north. Give us another five years and we will gladly tackle any of these important subjects.
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