MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

ARCHAEOLOGY OF THE MOGOLLON HIGHLANDS: SETTLEMENT SYSTEMS AND ADAPTATIONS

edited by Yvonne R. Oakes and Dorothy A. Zamora

VOLUME 6. SYNTHESIS AND CONCLUSIONS

Yvonne R. Oakes

Submitted by
Timothy D. Maxwell
Principal Investigator

ARCHAEOLOGY NOTES 232

SANTA FE 1999 NEW MEXICO

TABLE OF CONTENTS

VOLUME 6. SYNTHESIS AND CONCLUSIONS

FIGURES

TABLES

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 r²* 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

Table 6.1. Potential Room Sizes by Period or Phase Based on Mean Dispersion

General Southwest

PERIOD/PHASE		STORAGE	HABITATION	POSSIBLY COMMUNAL	MEAN	NUMBER
Archaic	Floor area	<3.47	3.47 to 13.45	13.45+	8.46	46
	Percent	8.69	76.08	15.21		
Pinelawn	Floor area	<6.94	6.94 to 41.88	41.88+	24.41	74
	Percent	6.75	82.43	10.81		
Georgetown	Floor area	<6.73	6.73 to 36.93	36.93+	21.83	87
	Percent	1.14	86.20	12.64		
San Francisco	Floor area	<5.68	5.68 to 30.70	30.70+	18.21	45
	Percent	2.22	86.66	11.11		
Three Circle	Floor area	<6.72	6.72 to 24.60	24.60+	15.66	51
	Percent	3.92	88.23	7.84		
Reserve	Floor area	<4.21	4.21 to 19.47	19.47+	11.84	67
	Percent	5.97	79.10	14.92		
Tularosa	Floor area	<4.11	4.11 to 19.77	19.77+	11.94	114
	Percent	1.75	81.57	16.66		

New Mexico

Archaic	Floor area	<4.77	4.77 to 12.53	12.53+	8.65	21
	Percent	9.55	61.90	28.57		
Pinelawn	Floor area	<11.24	11.24 to 48.40	48.40+	29.82	43
	Percent	11.62	76.74	11.62		
Gerogetown	Floor area	<7.61	7.61 to 45.49	45.49+	26.55	32
	Percent	3.12	84.37	12.50		
San Francisco	Floor area	<5.43	5.43 to 32.65	32.65+	19.04	37
	Percent	2.70	83.78	13.51		
Three Circle	Floor area	<8.10	8.10 to 21.44	21.44+	14.77	42
	Percent	9.52	80.95	9.52		
Reserve	Floor area	<4.21	4.21 to 19.47	19.47+	11.84	67
	Percent	5.97	79.10	14.92		
Tularosa	Floor area	<4.29	4.29 to 21.61	21.61+	12.42	76
	Percent	2.63	81.57	15.78		

Mogollon Highlands

PERIOD/PHASE		STORAGE	HABITATION	POSSIBLY COMMUNAL	MEAN	NUMBER
Archaic	Floor area	<3.29	3.29 to 11.63	11.63+	7.46	4
	Percent	0	75.00	25.00		
Pinelawn	Floor area	<13.46	13.46 to 50.66	50.66+	32.06	38
	Percent	10.52	76.31	13.15		
Georgetown	Floor area	<17.21	17.21 to 66.81	66.81+	42.01	11
	Percent	18.18	54.54	27.27		
San Francisco	Floor area	<4.12	4.12 to 36.00	36.00+	20.06	25
	Percent	0	88.00	12.00		
Three Circle	Floor area	<7.60	7.60 to 23.32	23.32+	15.46	27
	Percent	0	88.88	11.11		
Reserve	Floor area	<3.96	3.96 to 19.28	19.28+	11.62	49
	Percent	4.08	81.63	14.28		
Tularosa	Floor area	<4.90	4.90 to 25.24	25.24+	15.07	36
	Percent	12.5	71.42	16.7		

Table 6.2. Data Sources for Room Size Charts

SITE	LOCATION	AUTHOR
Luna Project Sites	Reserve and Luna	Oakes, this Volume
LA 81172, LA 423-158, LA 442, LA 443 AND H-26-56	Northwest New Mexico	Vierra 1996
Milagro	Tucson, Arizona	Huckell and Huckell 1984
AZ:Q:12:27	St. Johns, Arizona	Westfall 1981
Hay Hollow, Little Jug, and Hardscrabble Wash	East-Central Arizona	Berry 1982
Tumbleweed Canyon	Vernon, Arizona	Martin et al. 1962
OC-8	Chama River, New Mexico	Wills 1988a
Moquino	Mount Taylor, New Mexico	Beckett 1973
Keystone Dam	El Paso, Texas	O'Laughlin 1980
Square Hearth	Tucson, Arizona	Mabry and Clark 1994
SU Site	Reserve, New Mexico	Martin 1940, 1943; Martin and Rinaldo 1947; Wills 1989
Benson 8:3 and Pearce 8:4	Southeast Arizona	Sayles 1945
Wet Leggett	Reserve, New Mexico	Martin et al. 1949
Santa Cruz Bend	Tucson, Arizona	Mabry 1994
Santa Fe Bypass	Santa Fe, New Mexico	S. Post, pers. comm. 1998

SITE	LOCATION	AUTHOR
Coffee Camp, Tator Hills, Valencia, and Wasp Canyon	Tucson, Arizona	Cioleck-Torrello 1995
Cave Creek and Duncan	San Simon Valley, Arizona	Matson 1991
Three Pines Pueblo and Turkey Foot Ridge	Reserve, New Mexico	Martin and Rinaldo 1950b
Bluff Site and Bear Ruin	Forestdale, Arizona	Haury 1985a
LA 5407	Apache Creek, New Mexico	Akins 1998b
Promontory Site	Reserve, New Mexico	Martin et al. 1949
Powerline Site	Reserve, New Mexico	Unknown 1961
Pine Lawn Camp	Reserve, New Mexico	Unknown 1961
LA 2948	Apache Creek, New Mexico	Wendorf 1956b
Gallita Springs and LA 6082	Gallo Mountain, New Mexico	Kayser 1975
Houghton Road	Tucson, Arizona	Ciolek-Torrello 1995
Houck	Houck, Arizona	Gumerman 1966
Flattop	Petrified Forest, Arizona	Jewett and Lightfoot 1986
Wind Mountain	Cliff, New Mexico	Woosley and McIntyre 1996
Crooked Ridge Village	Point of Pines, Arizona	Wheat 1954
Mogollon Village	Alma, New Mexico	Gilman et al. 1991
Starkweather Ruin	Reserve, New Mexico	Nesbitt 1938
Twin Lakes	Tohatchi, New Mexico	Berry 1982
Mesa Verde	Southwestern Colorado	Berry 1982
Jeddito 264	Hopi, Arizona	Berry 1982
Winn Canyon	Gila, New Mexico	Fitting 1973
Cerro Colorado	Quemado, New Mexico	Bullard 1962
Site 30	Vernon, Arizona	Martin and Rinaldo 1960b
Apache Creek Pueblo	Apache Creek, New Mexico	Peckham et al. 1956
LA 2947	Apache Creek, New Mexico	Ferdon 1956
Oak Springs and Twin Bridges	Reserve, New Mexico	Martin et al. 1949
Galaz Ruin	Mimbres Valley, New Mexico	Anyon and LeBlanc 1984
Whiskey Creek	Whiskey Creek, New Mexico	Kayser 1972a
Nantack Ruin	Point of Pines, Arizona	Breternitz 1959
Sawmill Site	Reserve, New Mexico	Bluhm 1957
Saige-McFarland	Cliff, New Mexico	Lekson 1990
Grasshopper	East-Central Arizona	Ciolek-Torrello 1985
Hooper Ranch	Springerville, Arizona	Martin et al. 1952
Joint Site	Snowflake, Arizona	Hanson and Schiffer 1975

SITE	LOCATION	AUTHOR
Hawikuh	Zuni, New Mexico	Adams 1983
AZ:CC:10:1	Willcox, Arizona	Kayser and Fiero 1970
Turkey Creek Pueblo	Point of Pines, Arizona	Lowell 1988
Higgins Flat	Reserve, New Mexico	Martin et al. 1956
Broken K Pueblo	East-Central Arizona	Hill 1970
Sandstone Hill Pueblo	Quemado, New Mexico	Barnett 1974

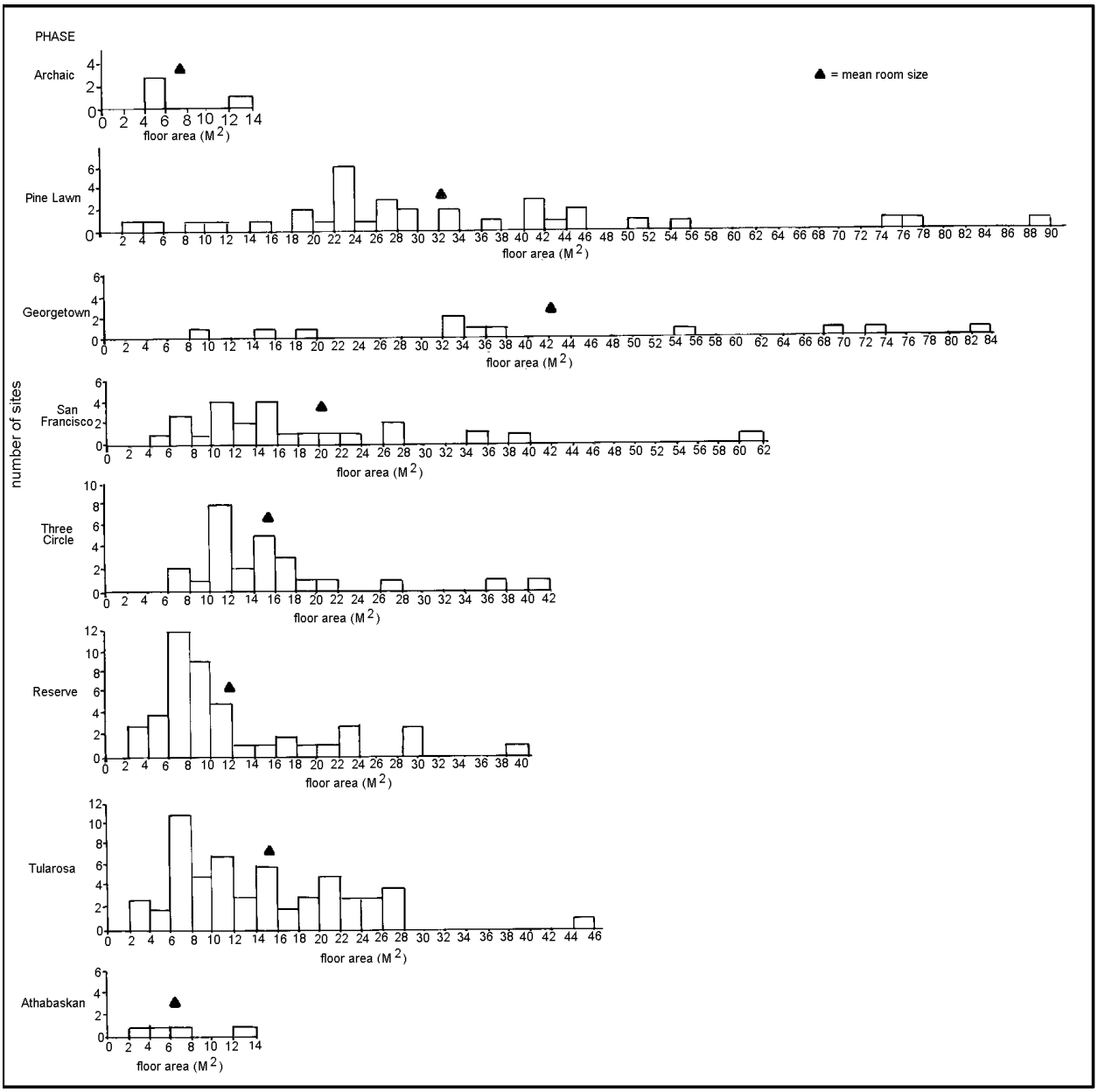


Figure 6.1. Sizes of rooms per period/phase in the Mogollon Highlands.

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 centrally located and occasionally rock-lined. One pit structure at Coffee Camp near Tucson (Ciolek-Torrello 1995) also had an associated ash pit. In another case, at the Square Hearth site also near Tucson, there were square firepits; one had a stone coping. The site dates to ca. A.D. 125 (Mabry and Clark 1994). After examining site locations and elevations, it is thought 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 (Table 6.1) 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 of 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.

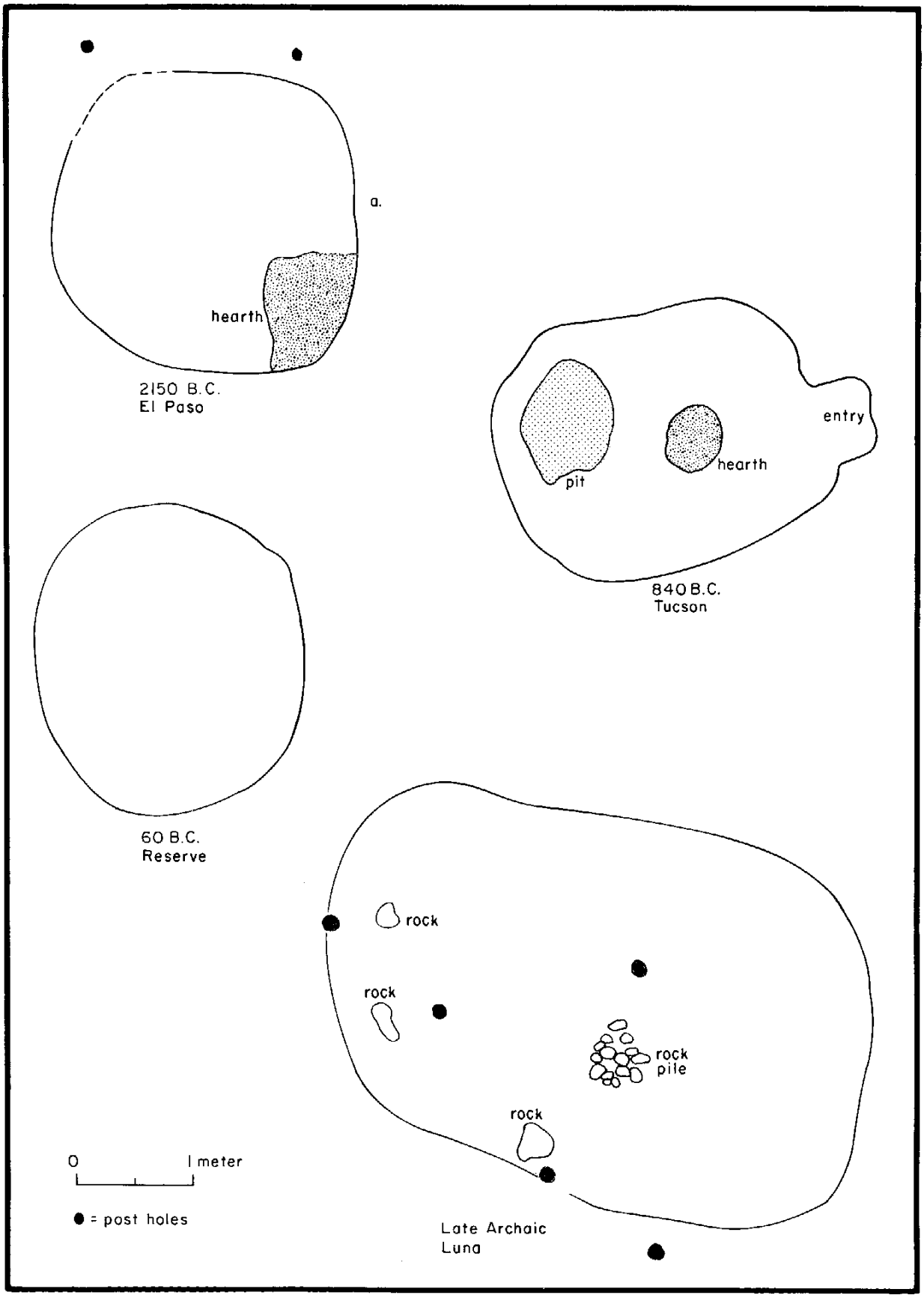


Figure 6.2. Pit structure styles in the Archaic period.

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 to 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 Highlands 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

(Ciolek-Torrello 1995).

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 frequently are 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 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

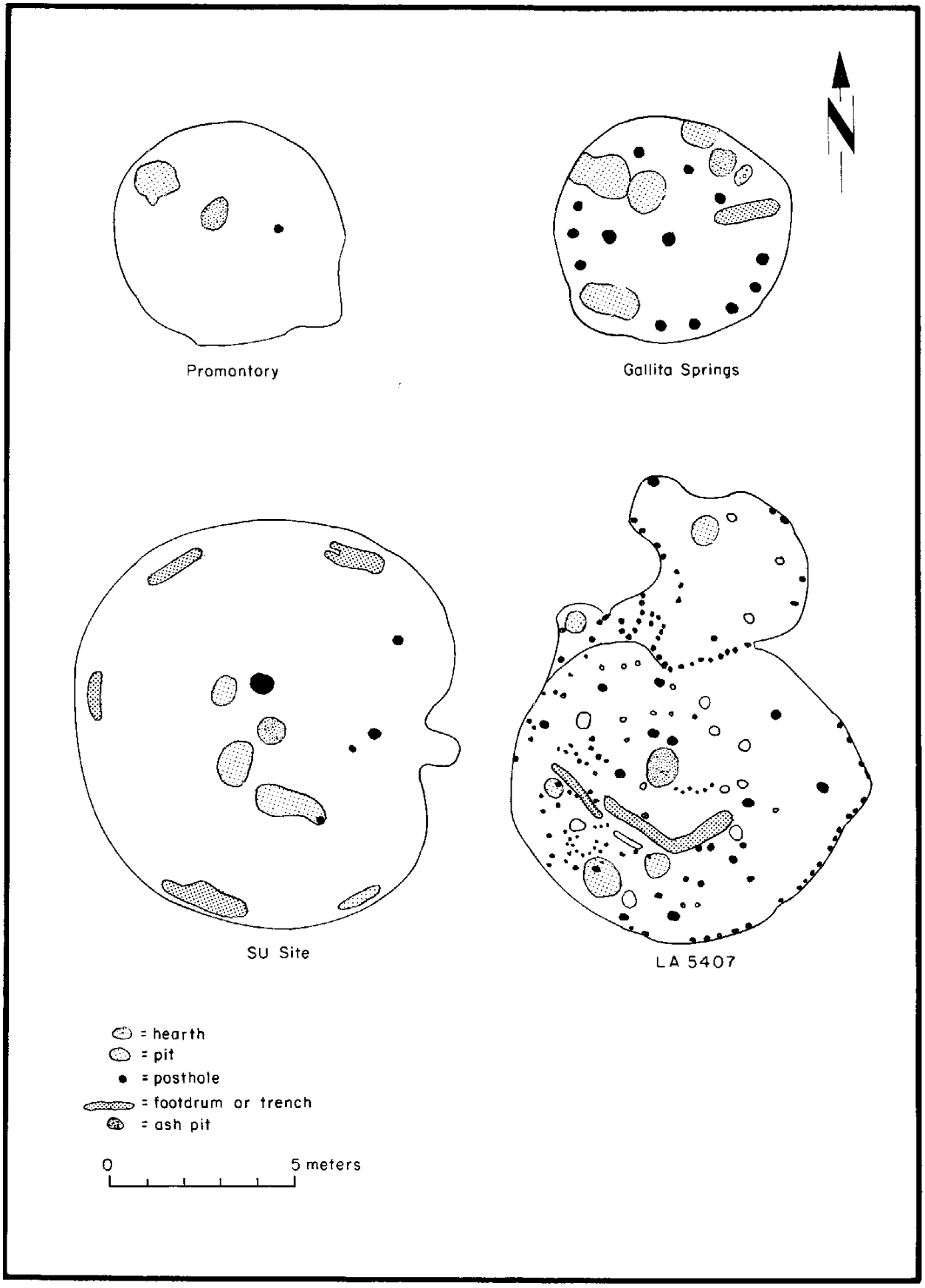


Figure 6.3. Pit structure styles in the Pinelawn phase.

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 as at Wind Mountain or at Fence Corner (a Luna Project site) where the structure had been dug partially into a relict cobble 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

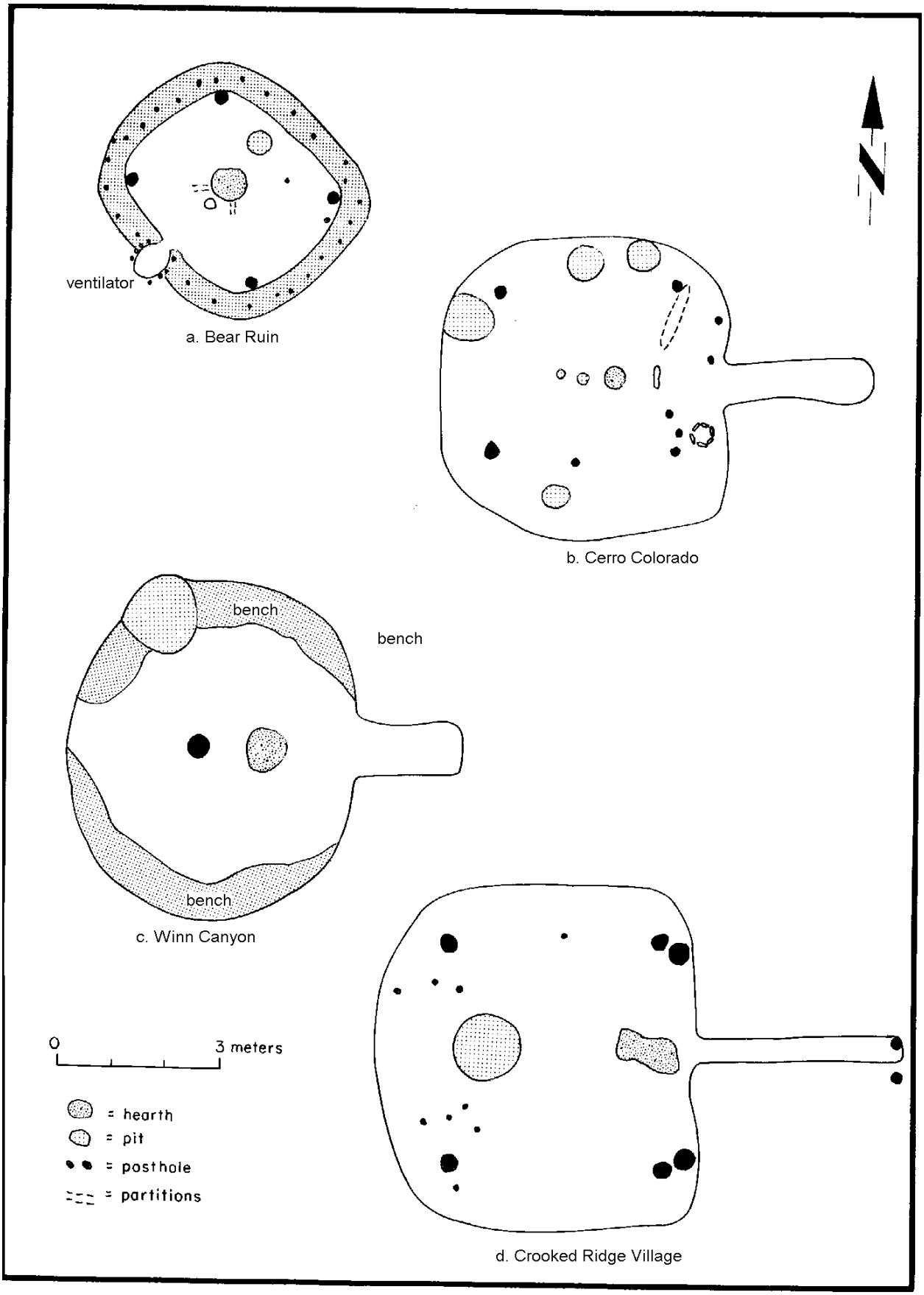


Figure 6.4. Pit structure styles in the Georgetown phase.

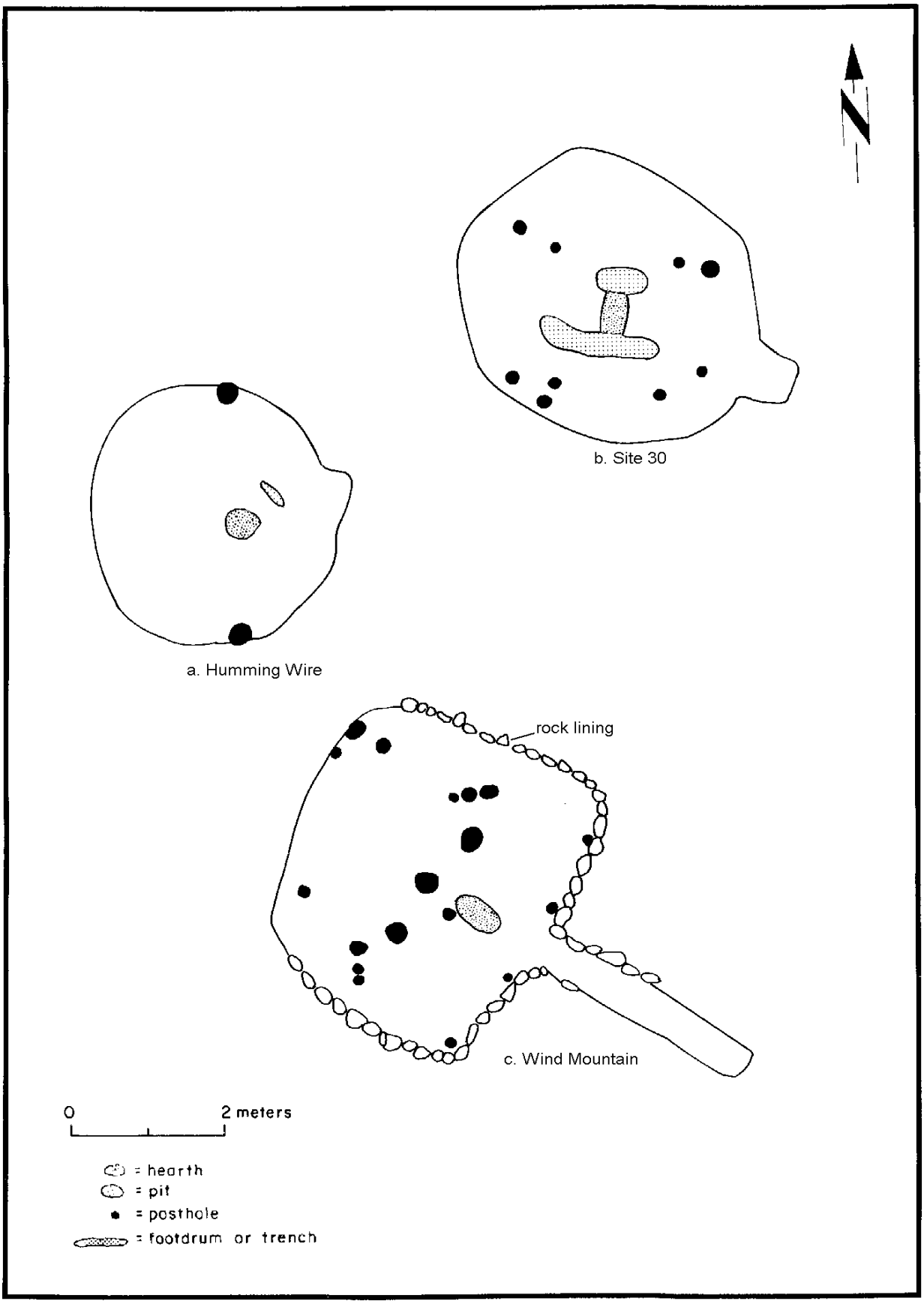


Figure 6.5. Pit structure styles in the San Francisco phase.

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 McIntyre 1996), and Nan Ranch, Cameron Creek, Harris Village, and Lee Village in the Mimbres area (Diehl 1997:188).

Hearths 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 cohese into generally small villages. There remains no unified orientation to entrances or ventilators, no commonality in the use of entries, ventilators, specific post patterns,

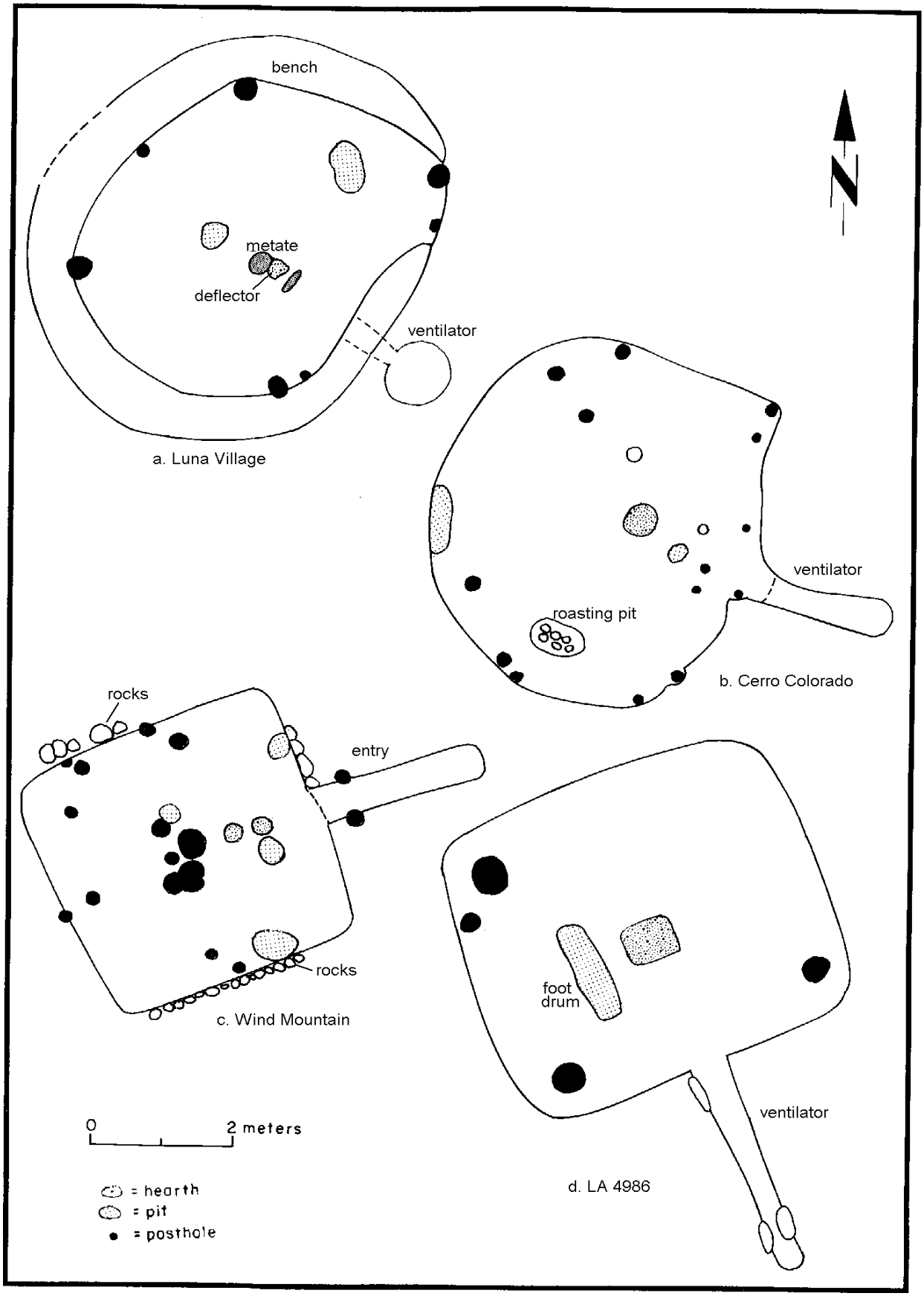


Figure 6.6. Pit structure styles in the Three Circle phase.

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 1988a: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). Cobbled 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 a 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 habitation 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, cobble-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 cobble-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 cobble 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; Lipe 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 cobble-veneered. 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 pit 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

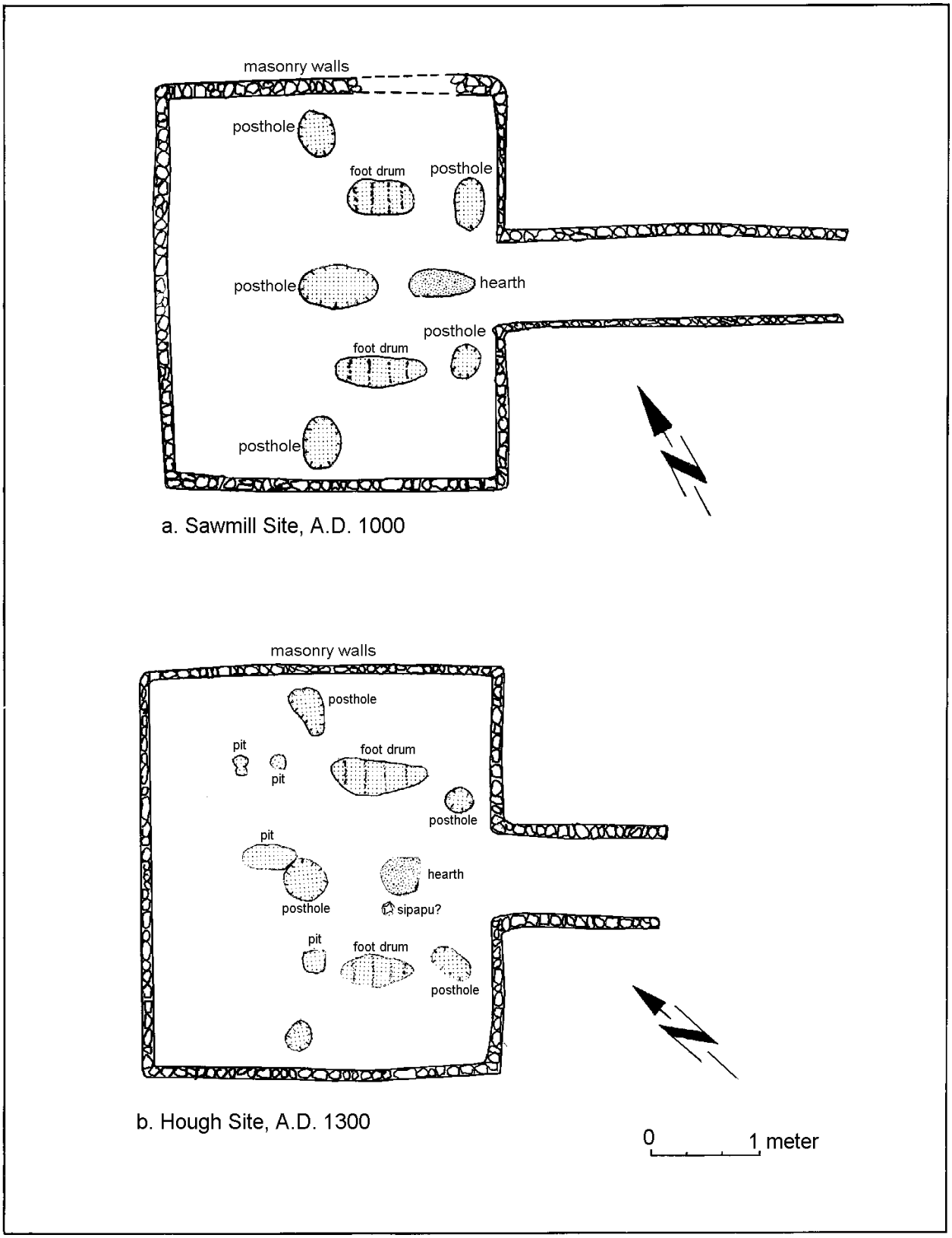


Figure 6.7. Great kivas at the Sawmill and Hough sites.

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.

CHANGING SETTLEMENT PATTERNS IN THE MOGOLLON HIGHLANDS

Yvonne R. Oakes

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 seems to be a truism in Mogollon archaeology. This concept of locational patterning can be attributed initially to Martin and Rinaldo (1950a) who excavated several high, isolated Early Pithouse sites in the Pine Lawn Valley. The idea was further popularized by Bluhm (1960) who adds that after A.D. 700, pithouse sites seem to be situated in lower elevations, closer to streams and arable land. Although available locational site data have increased greatly since then, most Mogollon archaeologists, including ourselves, have accepted these earlier conclusions (Wheat 1955; Anyon and LeBlanc 1984; Hunter-Anderson 1986; Simmons 1989; Oakes 1990; Lekson 1992a; Diehl 1996; Mauldin et al. 1996). Despite all of these apparently confirming statements about high elevational settings for Early Pithouse sites, Graybill (1975) notes that few really good explanations for the pattern have been offered, other than defense. Beginning in the 1980s, a few archaeologists began to question this so-called truism, noting that some early sites are not defensively located and, in fact, are situated in varying topographic settings (Rice 1980; Accola 1981; Ferguson and Hart 1985).

This high elevational 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

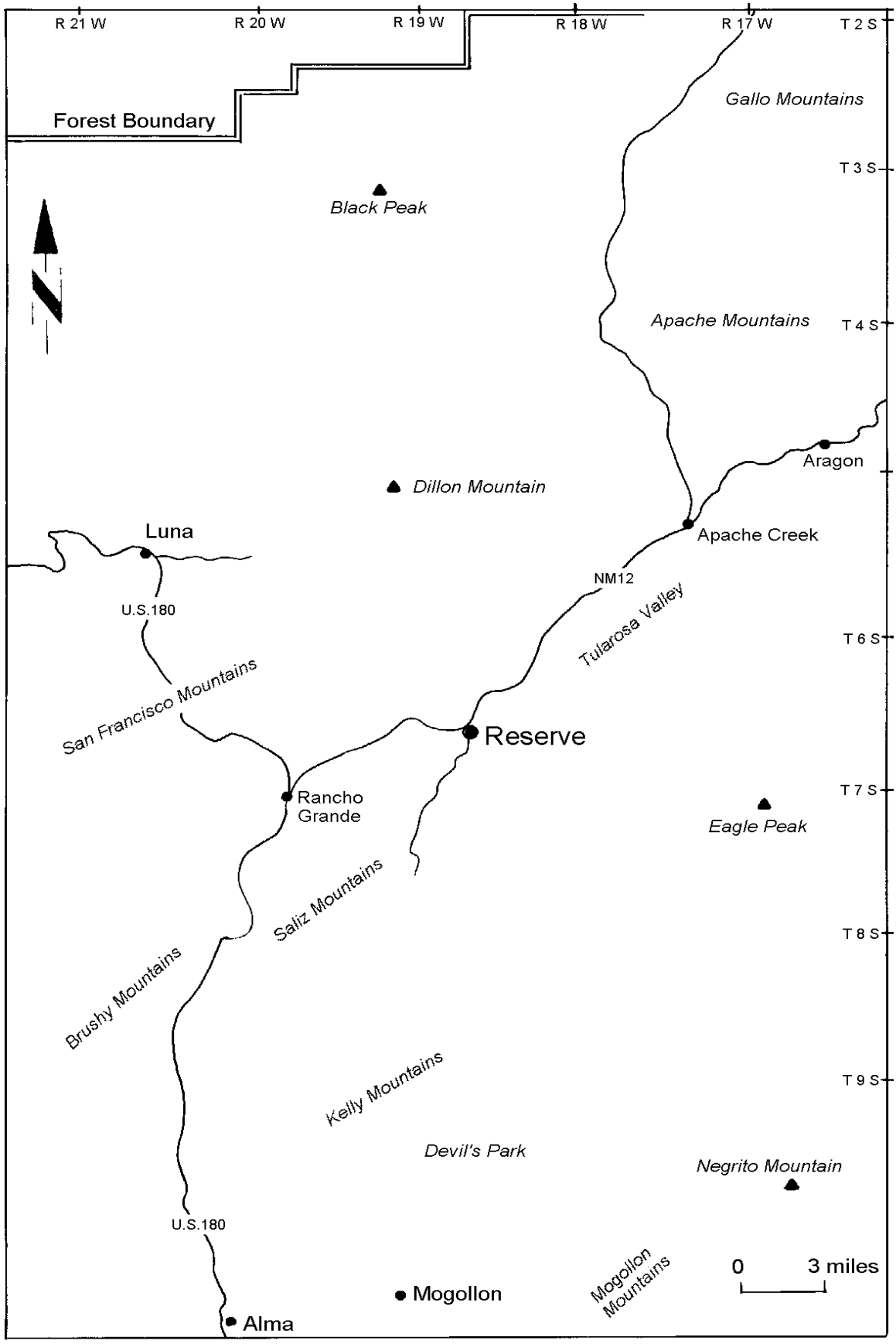


Figure 6.8. Settlement pattern study area.

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 6.3. Mean Elevations by Cultural Period

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

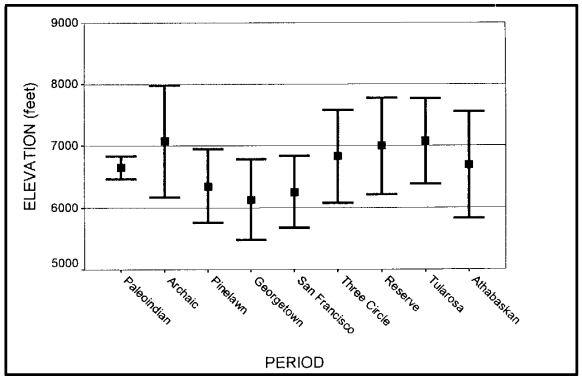


Figure 6.9. Mean site elevations by cultural period.

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

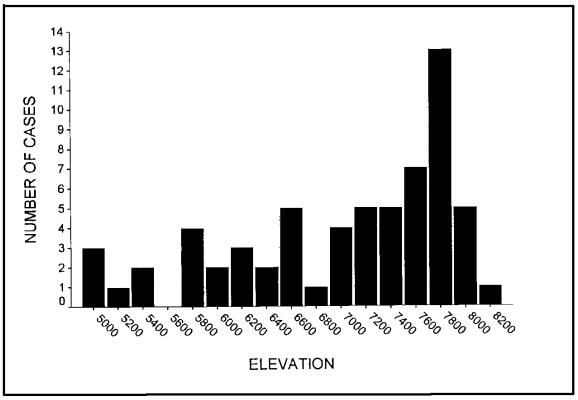


Figure 6.10. Distribution of Archaic sites by elevation.

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.

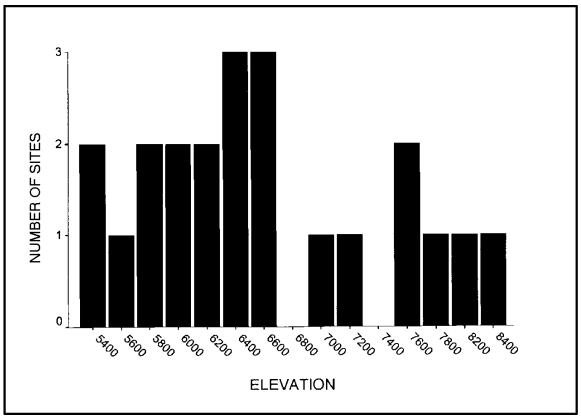


Figure 6.11. Distribution of Athabaskan sites by elevation.

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.

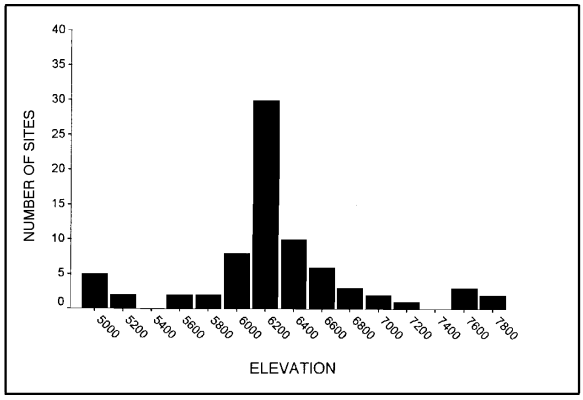


Figure 6.12. Distribution of Pinelawn sites by elevation.

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 preceeding 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

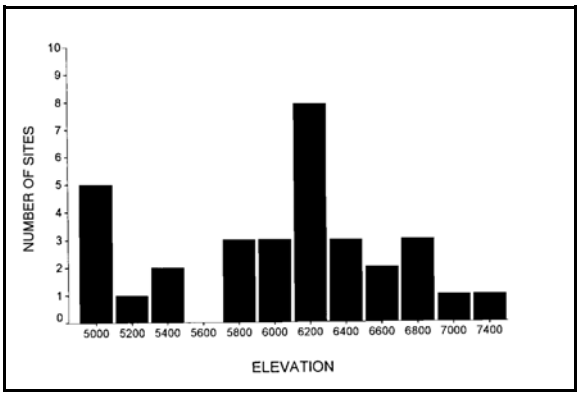


Figure 6.13. Distribution of Georgetown sites by elevation.

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

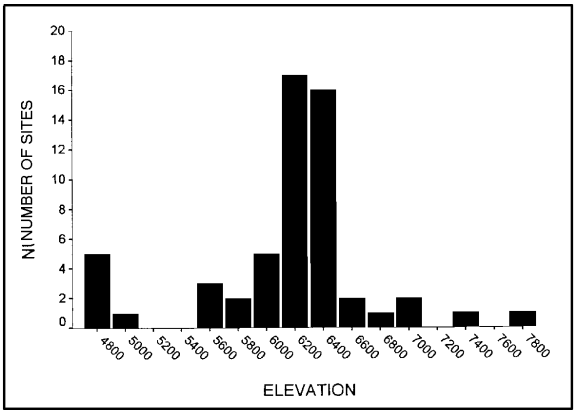


Figure 6.14. Distribution of San Francisco sites by elevation.

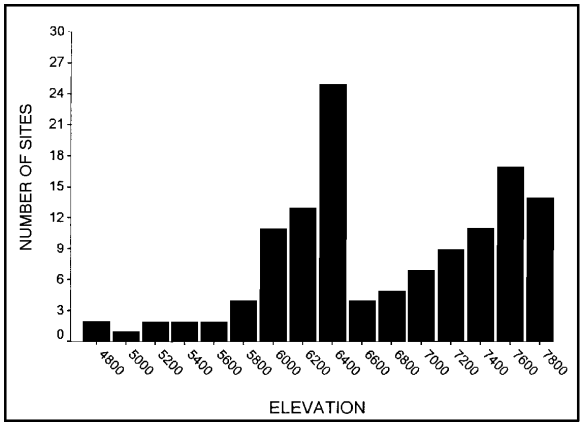


Figure 6.15. Distribution of Three Circle sites by elevation.

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

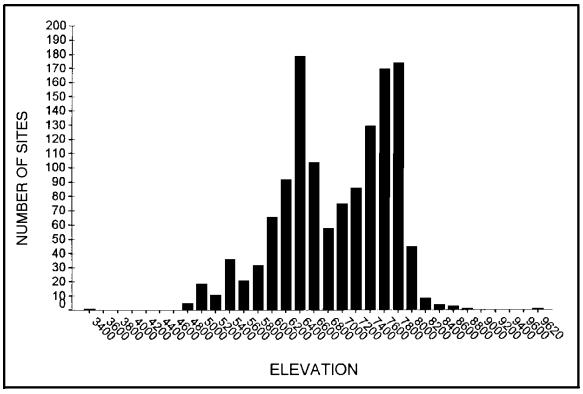


Figure 6.16. Distribution of Reserve sites by elevation.

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.

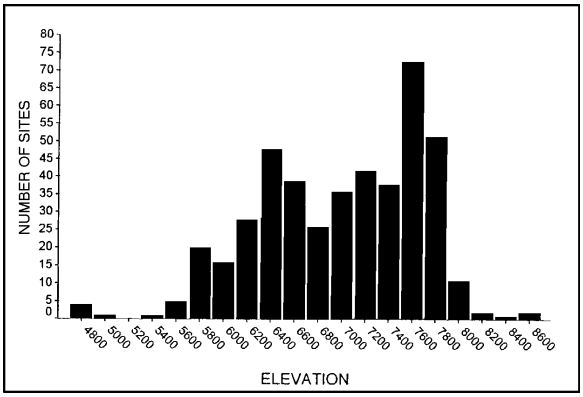


Figure 6.17. Distribution of Tularosa sites by elevation.

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.

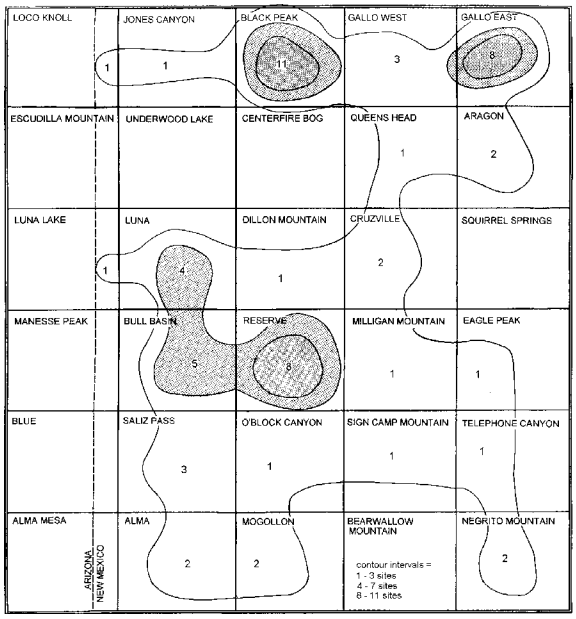


Figure 6.18. Archaic site placement relative to USGS quadrangles.

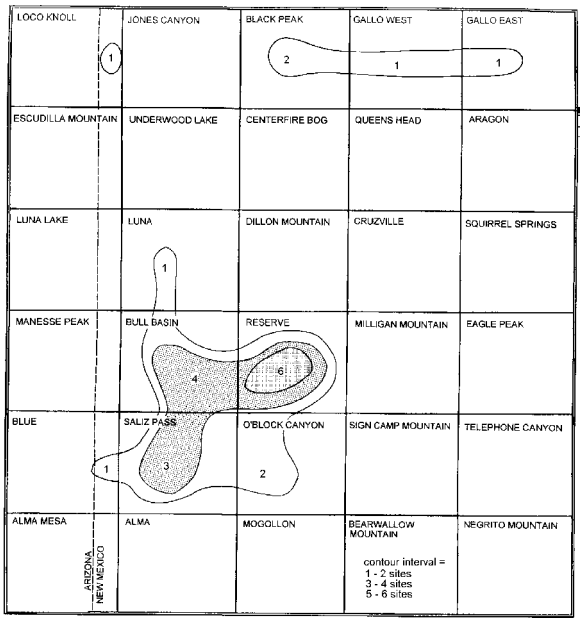


Figure 6.19. Athabascan site placement relative to USGS quadrangles.

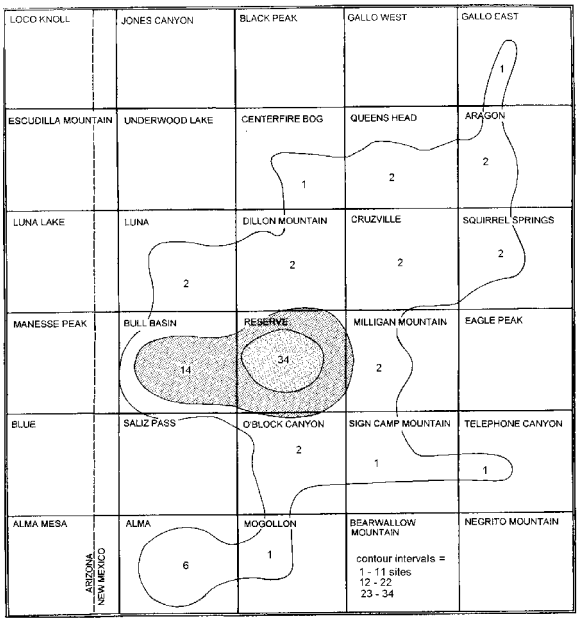


Figure 6.20. Pinelawn site placement relative to USGS quadrangles.

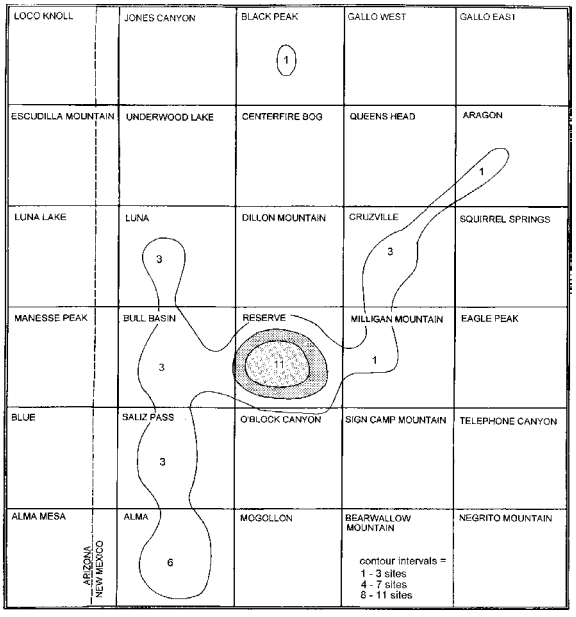


Figure 6.21. Georgetown site placement relative to USGS quadrangles.

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

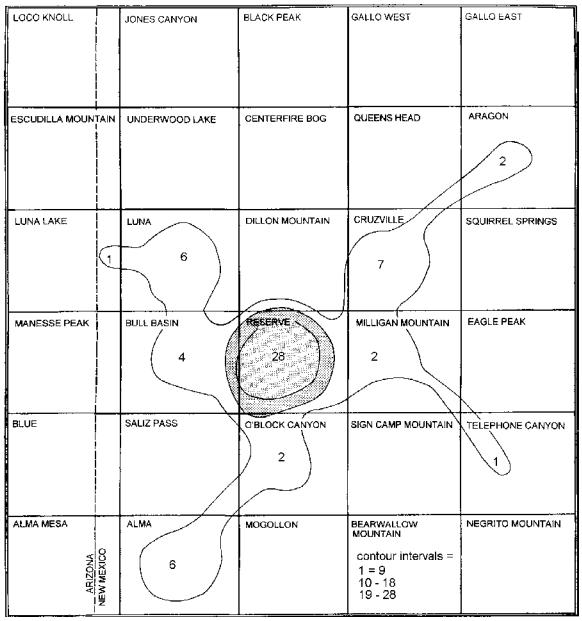


Figure 6.22. San Francisco site placement relative to USGS quadrangles.

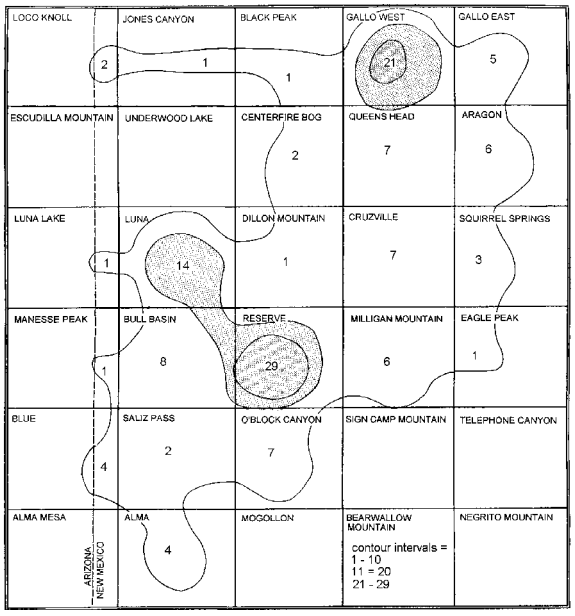


Figure 6.23. Three Circle site placement relative to USGS quadrangles.

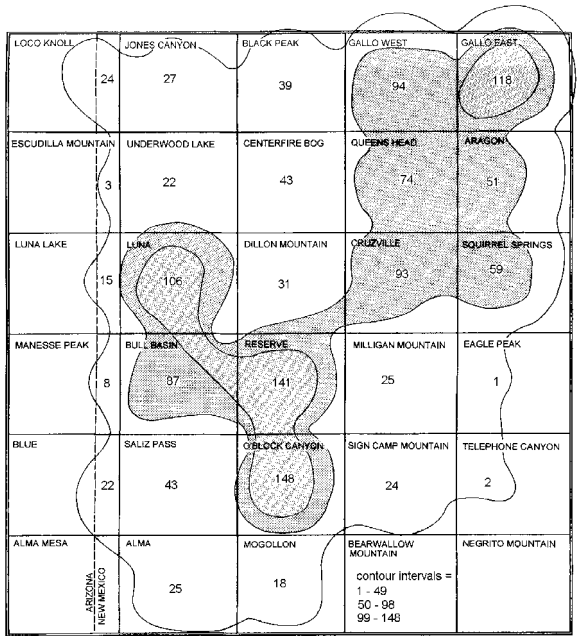


Figure 6.24. Reserve site placement relative to USGS quadrangles.

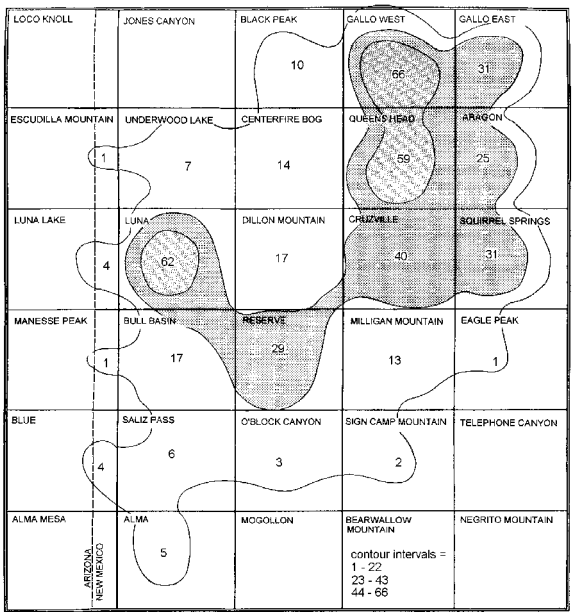


Figure 6.25. Tularosa site placement relative to USGS quadrangles.

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.

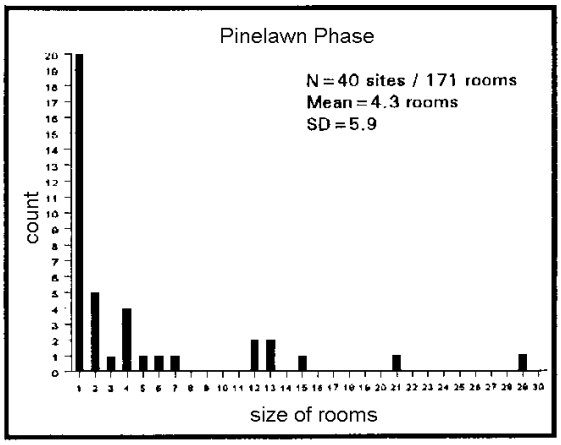
First, a count of all known number of rooms from recorded structural sites of the Pine Lawn through Tularosa phases was produced (Table 6.4). It yielded a total of 9,503 rooms for all periods versus 2,095 sites, averaging 4.5 rooms per site. (Only 25 recorded sites in the region contain 50 or more rooms.) 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 sometimes placing all pithouse sites with a lack or paucity of decorated wares into the earlier Pinelawn phase. Late Pithouse period (Three Circle phase) room counts increase to 302 indicative of a somewhat low population growth rate of .21 percent annually from the Pinelawn phase.

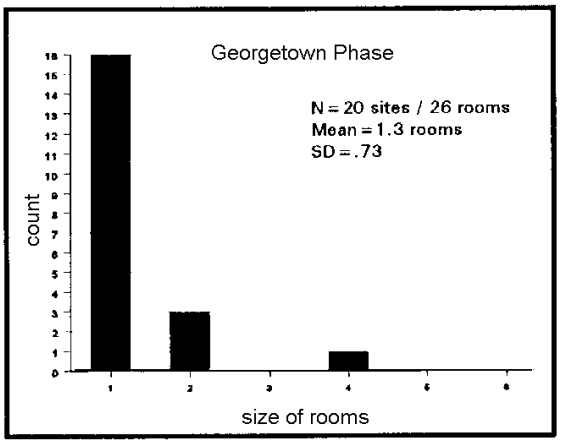
However, the table shows a dramatic increase in room counts during the following Reserve phase by a factor of 15 and a maintenance of that amount during the Tularosa phase. This documented increase is of major significance in understanding settlement dynamics in the Mogollon Highlands. Explanations for this huge increase in sites, room counts, and by deduction, populations must be examined. For room counts to have increased by a 15:1 margin from the Three Circle phase, there was obviously an architectural and population explosion (see Table 6.3) at this time. But how did the population increase so rapidly in such a short a time to require thousands of new structures? During the approximate 150 years (ca. 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 the influx came from the Cibola area to the north.

Table 6.4. Number of Rooms by Period

Culture	Mean	Standard Deviation	Count
Pinelawn	4.28	5.94	171
Georgetown	1.30	.73	26
San Francisco	2.61	3.96	81
Three Circle	3.78	6.94	302
Reserve	4.13	8.91	4492
Tularosa	11.96	20.65	4531

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. 1000 was not part of the Mogollon tradition, but rather came from the Anasazi area to the north. They posed the possibility of an actual migration occurring. By 1956, Martin decided that, indeed, a migration likely took place (Martin et al. 1956:202). Other archaeologists have commented on the abrupt change during the Reserve phase from pithouse architecture to masonry above-ground rooms to a switch to the use of black-on-white pottery (Bussey 1982:37; Hunter-





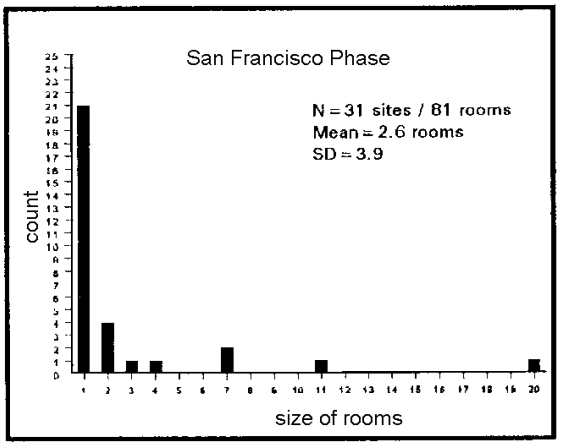


Figure 6.26. Room counts per phase.

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.

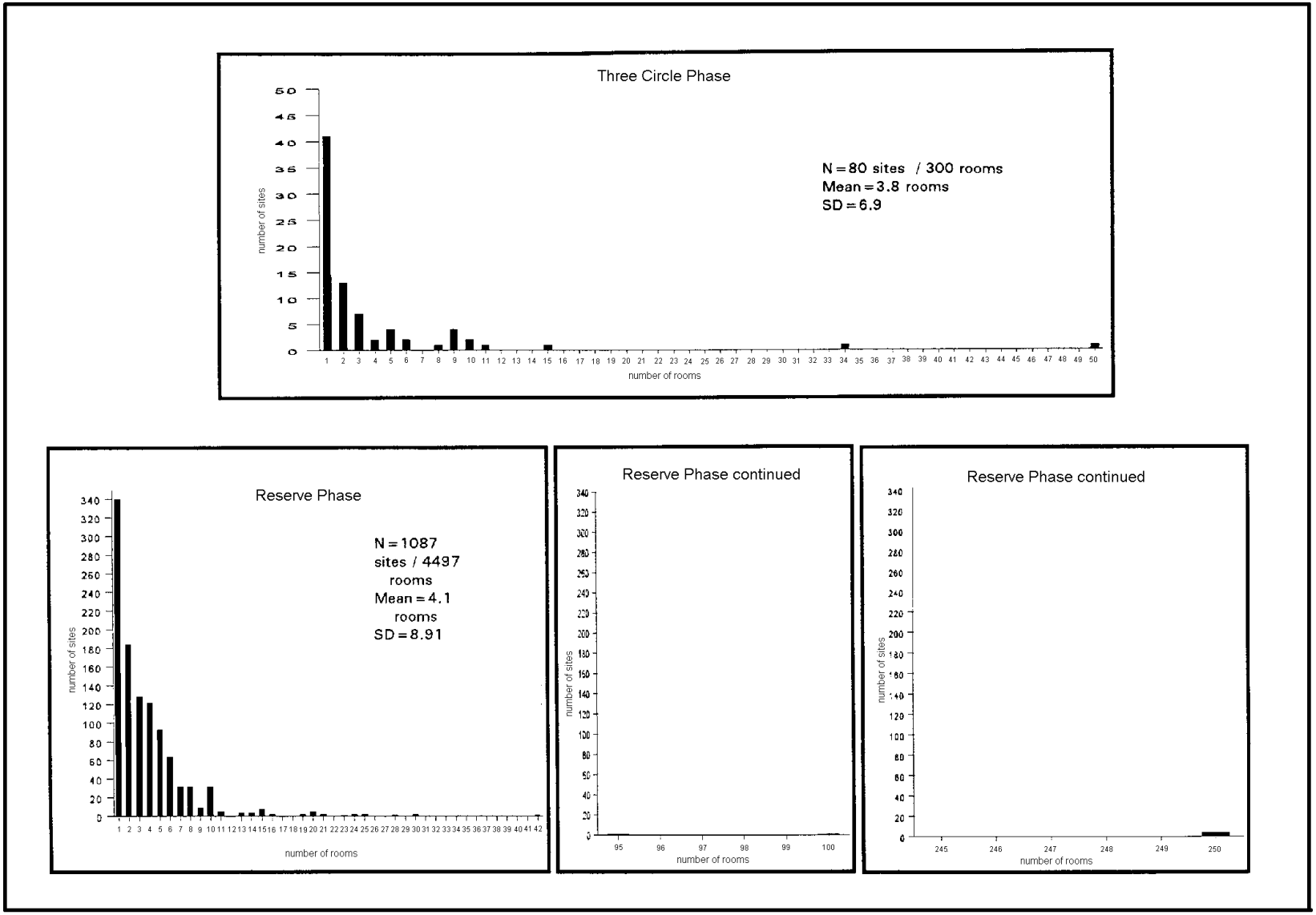


Figure 6.26. Continued. Room counts per phase.

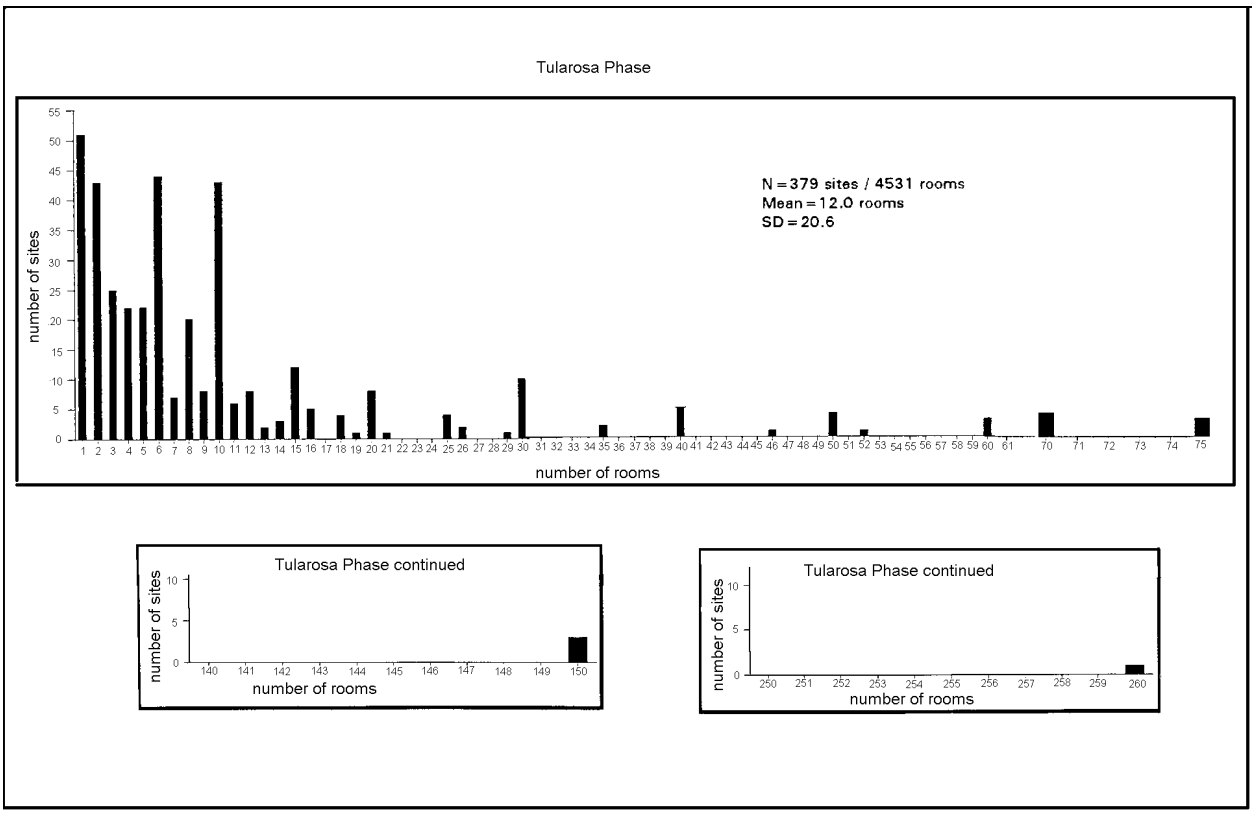


Figure 6.26. Continued. Room counts per phase.

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 breaks 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

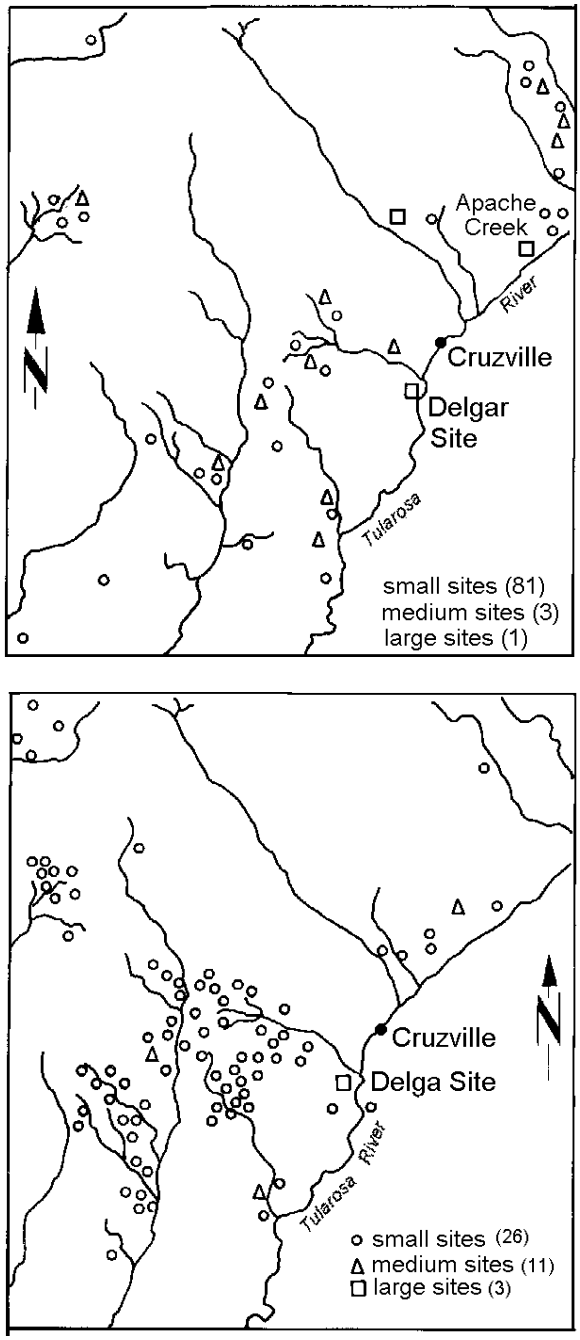


Figure 6.27. Comparison of settlement patterns during Reserve and Tularosa phases in the USGS Cruzville quadrangle: (top) Reserve sites, (bottom) Tularosa sites.

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

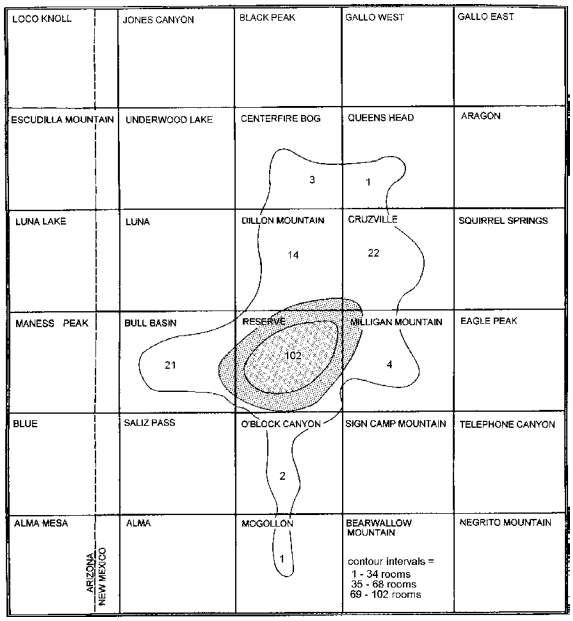


Figure 6.28. Frequency of rooms in the Pinelawn phase relative to USGS quadrangles.

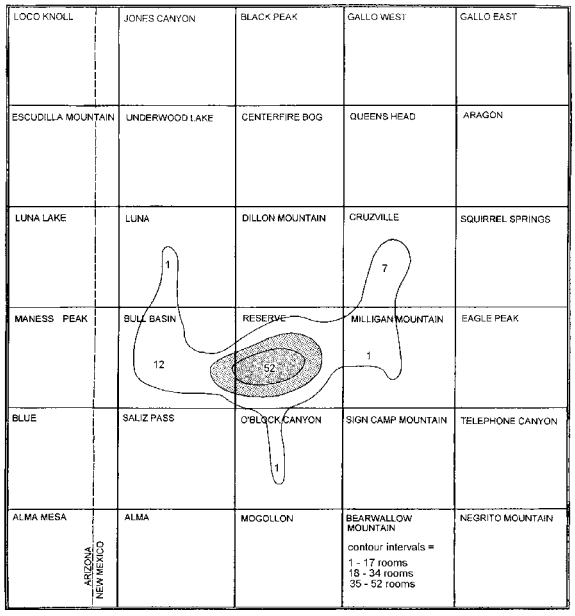


Figure 6.28. Continued. Frequency of rooms in the San Francisco phase relative to USGS quadrangles.

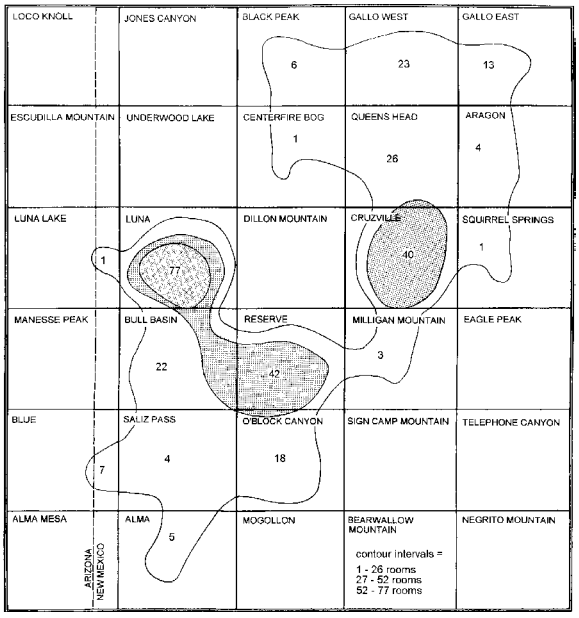


Figure 6.28. Continued. Frequency of rooms in the Three Circle phase relative to USGS quadrangles.

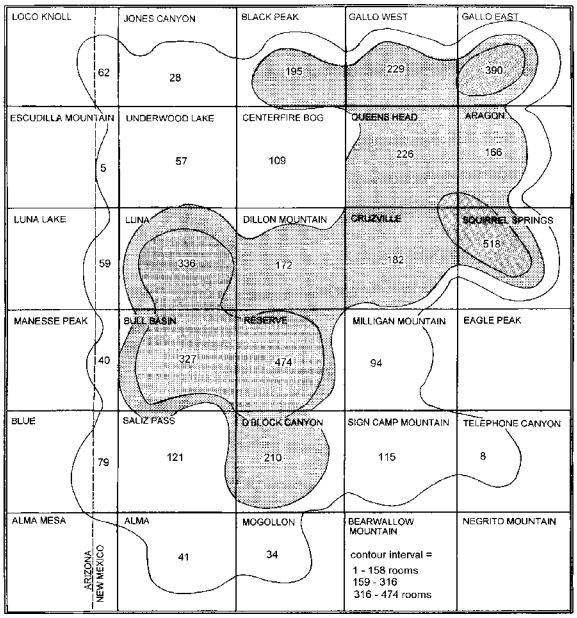


Figure 6.28. Continued. Frequency of rooms in the Reserve phase relative to USGS quadrangles.

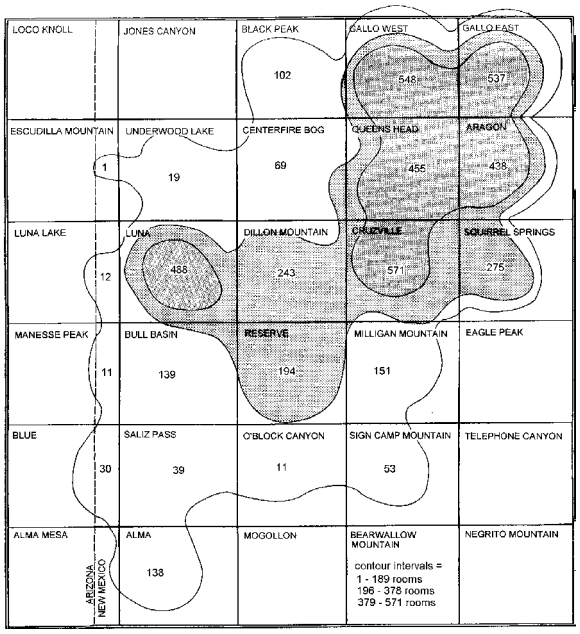


Figure 6.28. Continued. Frequency of rooms in the Tularosa phase relative to USGS quadrangles.

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

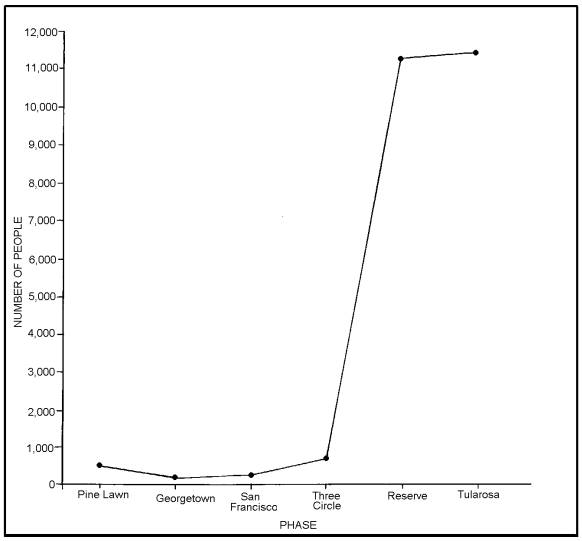


Figure 6.29. Population estimates for the Mogollon Highlands.

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?

REGIONAL ABANDONMENT PROCESSES IN THE MOGOLLON HIGHLANDS

Yvonne R. Oakes

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. At about this time, however, there is a dramatic increase by a factor of almost 15 in the number of rooms present with an increase from 302 to 4,492. This increase in population has been attributed to a major influx of immigrants from pueblo sites probably to the north. Along with this huge rise in populations, there is a dispersal of sites over the Mogollon landscape, from localized valleys into high mesas, ridges, into areas of entrenched arroyos, and beside large streamflows. It appears that all available habitable areas are being utilized at this time. Sites do cluster, however, into the better-watered Reserve-Luna area, the Tularosa Valley, and the Gallo Mountains, each at different elevations and topographic settings. Evidence of agricultural intensification through the use of irrigation is rarely found. Sites on the whole remain small with a mean of 4.1 rooms per site with only a handful having over 20 rooms. Kivas are not uncommon; great kivas are present, although more rare. There is no evidence of large-scale, intersite economic relations.

Between A.D. 1100 and 1300 in the Mogollon Highlands, a different pattern emerges. Sites maintain a high frequency in room count (with almost zero growth), but with only one-third the number of sites and an average of three times as many rooms. Aggregation is evident throughout all areas with concentrations in the Gallo, Tularosa Valley, and Luna areas, while the Reserve (Pine Lawn Valley) is greatly depopulated. Sites concentrate along major drainages, away from less-watered areas. Great kivas are more common and evidence of their use as redistribution centers may be seen in the increasing size of storerooms and their frequent spatial association with great kivas. But by A.D. 1350, the entire Mogollon region is abandoned by the Pueblo peoples.

The pattern presented above is one of generally slow population growth, followed by a huge infusion of peoples into the region along with new architectural and ceramic forms, resulting in diffusion of the many, many small sites into almost every habitable area. After approximately 200 years, by the A.D. 1200s, there is another dramatic shift into large, aggregated communities along larger streams and rivers. Then, by A.D. 1350, all are gone.

This almost identical pattern seems to have been repeated by the Anasazi on the Colorado Plateau, the Mogollon in eastern Arizona, and the Hohokam, to a degree (Fish et al. 1994). The Western Anasazi occupied similar topographic landforms and by A.D. 1000 were living in small sites of usually less than 20 rooms. By A.D. 1100, populations also show a large increase with occupation spread over broad areas, into almost all available habitats. Environmental conditions were good with adequate precipitation and high ground water tables. There is no indication of intensive agricultural practices at this time. Large-scale socioeconomic networks were also not in evidence

(Fish et al. 1994:146-148). Between A.D. 1150 and 1250, precipitation decreases, erosion increases, and populations no longer occupy the higher elevations and less-watered areas. Sites cluster around reliable water sources, with fewer but larger sites. By A.D. 1300, there is a greater dependence on agriculture and some intensification technologies employed. Between A.D. 1300 and 1450, a severe drop in the water table is documented along with increased arroyo cutting. Populations greatly decrease and many areas become uninhabitable. By A.D. 1450, sites aggregate into much larger units, new ceramic forms are present, and the katsina cult is introduced. By this time in both the Anasazi and Mogollon areas, most villages are uninhabited with settlements occurring mostly on the Hopi mesas where agricultural productivity was dependent on irrigation from seeps and springs and not large streams or rivers as earlier (Fish et al. 1994:149-150).

The similarities between the Mogollon Highlands and the Colorado Plateau in population growth and subsequent decline, site dispersal followed by site aggregation, and ensuing abandonment of the areas is striking. To summarize, the pattern in both cases is one of *growth -- dispersion -- aggregation -- abandonment.* Other areas of the Southwest may well follow suit. For example, Kintigh (1994; 1995) reports the same sequence at Zuni where prior to A.D. 1250 populations are dispersed into small pueblos and after that date are gathered into much larger units until by A.D. 1300, there are a relatively small number of very large pueblos. By A.D. 1400, all were abandoned, and new settlements were inhabited (Kintigh 1990:267). We next look at some of the reasons why this particular trajectory would have developed.

Causes 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 also have 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 answered our own question 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

drum in the kiva). According to Schlanger and Wilshusen (1993:92), this pattern would indicate that return to the pueblo was not anticipated and that departure was organized and orderly.

Faunal analyses from the site revealed that a wide variety of animals were being exploited. Large-sized mammals are the most frequently occurring category (34.3 percent of all fauna recovered). Small mammals, mostly rabbits, appear at 26.5 percent of the assemblage. Access to faunal resources does not seem to have been limited for site occupants; however, were the resources abundant enough to support the population? Likewise, macrobotanical and palynological data indicate at least a moderate dependence on maize, but was the supply large enough to maintain the population? If the answer to the two above questions is affirmative, then we must look at causal factors other than resource stress, which includes limited resource access, resource depletion, and overutilization of agricultural fields to explain abandonment of the Hough site. For one, disintegrating trade relationships are a possibility for explanation; from ceramic studies, it appears that most nonlocal goods came from the Upper Little Colorado River area and west towards Showlow. On the other hand, if the answer to the two questions is negative, then we may suggest that resource stress as a possible result of aggregation and its attendant problems was definitely a factor in the abandonment of the site. Regrettably, because approximately only one-third of the site was excavated, we do not know how many storerooms, food caches, or subsistence items remain on the site and what the level of sustainability might be.

If Not the Mogollon Highlands, Then Where?

While it is clear from the archaeological record that the Mogollon Highlands were abandoned by A.D. 1350, the next line of inquiry must address where the estimated population of over 11,000 people migrated to. Several areas present themselves as possible choices for this massive movement that may have occurred over a 100-150 year period in an apparently organized and planned manner.

One of the earliest mentioned destinations in the archaeological literature is the Acoma area. Wendorf (1956a:25) and Dittert (1968:15) suggest this region as the recipient of an influx after A.D. 1350. Dittert cites the presence of Mogollon architectural styles and new cultural traditions as verification of this idea. Hogan (1985:44) thinks that people from the Quemado area also migrated to the region. The Acoma area did contain very large sites of over 50 rooms in the A.D. 1300s (Upham 1982:58), so movement to this region from the Mogollon Highlands was definitely possible.

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

Period	Archaic			Pinelawn	Georgetown	San Francisco	Three Circle		Reserve			Tularosa	
Site	43766	89846	70188	39975	45508	70196	45507	45510	39972	39969	70185	39968	3279
Sample/ Diversity	9/ 9	3/ 11	18/ 10	24/ 12	9/ 14	13/ 7	72/ 22	6/ 9	8/ 6	54/ 19	48/ 18	66/ 21	118/ 31
Grasses	2.2	100.0	27.7	41.6	66.6	15.3	31.9	16.6	50.0	38.8	33.3	51.5	38.1
Cheno-ams	100.0	100.0	55.5	62.5	88.8	69.2	91.6	33.3	87.5	70.3	89.5	80.3	100.0
Low Spine Asters	23.1	33.3	44.4	45.8	33.3	46.1	19.4	33.3		24.0	27.0	24.2	19.4
High Spine Asters	22.2		22.2	33.3		30.7	18.0	33.3	12.5	27.7	16.6	27.2	14.4
Purslane	33.3	33.3		25.0	22.2		22.2	16.6	37.5	9.2	8.3	6.0	72.8
Sagebrush	11.1		22.2	8.3	44.4	7.6	12.5			14.8	12.5	15.1	12.7
Mormon Tea			5.5	4.1	11.1	7.6	4.1			3.7	4.1		.8
Prickly Pear	11.1		5.5	12.5	22.2		5.5	33.3				1.5	.8
Buckwheat		33.3			22.2		1.3	16.6			2.0		.8
Nightshade Family	1.1		5.5		11.1		1.3		12.5	1.8		1.5	1.6
Evening Primrose		33.3	5.5			7.6	1.3				2.0	1.5	5.0
Globe Mallow				8.3			1.3					1.5	5.0
Spurge					11.1				25.0	1.8	2.0		9.2
Cholla										9.2		3.0	3.3
Milkwort				4.1			1.3					1.5	
Bean Family										1.8			1.6
Yucca												1.5	
Rose Family							2.7			3.7			
Stickleaf												7.5	10.1
Knotweed										1.8	2.0		
Bellflower							1.3				2.0		
Buttercup							1.3				2.0		
Tobacco													
												3.0	5.0
Greasewood							1.3				2.0		
Patata							1.3					3.0	

Period	Archaic			Pinelawn	Georgetown	San Francisco	Three Circle		Reserve		Tularosa		
Site	43766	89846	70188	39975	45508	70196	45507	45510	39972	39969	70185	39968	3279
Sample/ Diversity	9/ 9	3/ 11	18/ 10	24/ 12	9/ 14	13/ 7	72/ 22	6/ 9	8/ 6	54/ 19	48/ 18	66/ 21	118/ 31
Seepweed			11.1				1.3					1.5	
Winged Pigweed							1.3			3.7			1.6
Scorpionweed	11.1				11.1			16.6				1.5	6.7
Sun Flower		33.3						16.6				1.5	14.4
Tansy Mustard		33.3								1.8		1.5	.8
Groundcherry		33.3					1.3						4.2
Mullein		33.3											12.7
Sedge													4.2
Composite					11.1					3.7	2.0		
Bee Plant													.8
Cactus													.8
Prickly Poppy											2.0		7.6
Verbena													1.6
Hedgehog Cactus										1.8			
Piñon										5.5			18.6
Squash													5.0
Mint													.8
Plantain											2.0		
Bugseed							2.7						
Sweet Clover		33.03											

Table 6.6. Percentages of Faunal Species by Period

	Archaic	Pinelawn/ Gerorgetown	San Francisco	Three Circle	Reserve	Tularosa
Squirrel			.5	3.0	.6	.3
Prairie Dog		1.3	.5	1.5	5.8	3.1
Pocket Gopher	.4	3.8	.2	6.0	1.3	1.1
Mouse/Rat			2.2	5.1		.5
Vole/Nutria						.0*
Muskrat/Porcupine						.2
Rodent			.2	5.5		.7
Cottontail Rabbit	.2		1.0	4.5	8.4	8.5
Jack Rabbit	1.0		2.7	2.2	4.7	4.2
Rabbit	.1			.0		.6
Canid	.1			1.5	6.0	1.3
Fox				.0	.6	.2
Bear	.1					.2
Raccoon				5.0		.0
Weasel/Badger						.0
Bobcat						.0
Skunk						.0
Carnivore						.0
Deer	6.1	1.3	8.4	2.0	15.2	5.4
Antelope	.1		.7	1.5	1.3	.6
Elk	.1			.0		
Bison				1.0		.1
Big Horned Sheep	1.3		.7	1.0	.6	.1
Artiodactyl	20.8	5.1	9.1	2.4	6.6	3.5
Duck/Mallard						.1
Hawk/Falcon				.6		.2
Quail/Mourning Dove				1.4		.2
Turkey			7.4	.2	11.0	4.3
Jay/Raven/Crow				.7		.1
Bird	.1		4.9	2.7	35.9	7.0
Amphibians/Turtles						.1
Snake						.2
Frog/Toad				1.0		.4
Sucker/Catfish					1.3	.1
Small Mammal	6.5	1.3	10.6	19.2	12.6	19.5
Medium Mammal	20.3	2.5	6.7	13.9	14.6	12.9
Large Mammal	42.5	84.6	42.8	35.3	27.8	22.8

*Less than 0.1 percent.

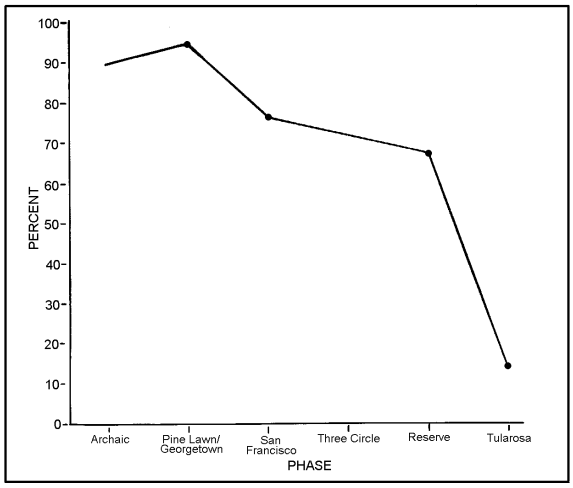


Figure 6.30. Faunal decline through time.

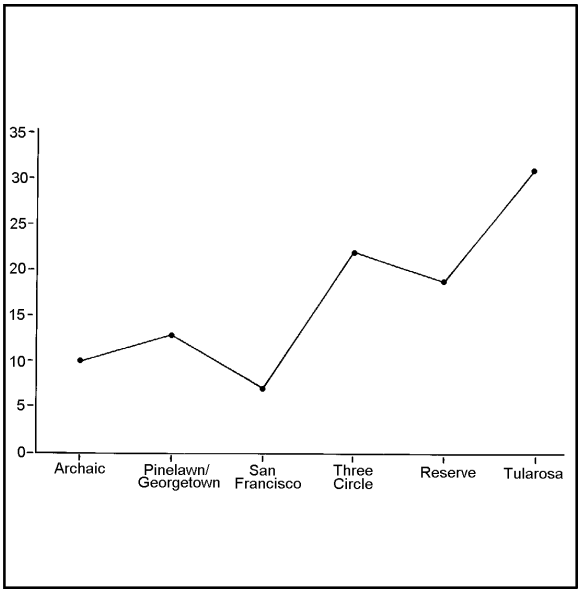


Figure 6.31. Wild plant increase through time.

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

Table 6.7. Corn Ubiquity Based on Macrobotanical and Pollen Samples

Period	Archaic	Pinelawn	Georgetown	San Francisco	Three Circle	Reserve	Tularosa*		
Site	70188	39975	45508	70196	45507	39969	70185	39968	3279
Sample Size	18	24	9	13	72	54	48	66	118
Maize Percent	22.2	41.6	66.6	53.8	25.0	11.1	37.5	22.7	67.7

*Mean=42.6

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. Woolsley 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

to be the norm with much differentiation in form, size, and interior layout of features.

Early pit structures in the Southwest, including the Mogollon Highlands, were basically circular or ovoid. Most are shallow, basin-shaped pits with probably pole or brush superstructures. Interior features may or may not be present. In the Highlands, there is a gradual form shift through 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 partioned 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

hearths 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.

REFERENCES CITED

Accola, Richard M.
1981 Mogollon Settlement Patterns in the Middle San Francisco River Drainage, West-Central New Mexico. *The Kiva 46(3)*:285-296.

Acklen, John C.
1983 *Supplemental Inventory of 53 Prehistoric Archeological Sites for the Ute Mountain Land Exchange.* PNM Archeological Report No. 4 (draft). Public Service Company of New Mexico, Albuquerque.

Acklen, John C., Gary M. Brown, and G. Robert Phippen
1991 Lithic Debitage Analysis. In *Archaeological Data Recovery at San Juan Coal Company's La Plata Mine, San Juan County, New Mexico,* edited by G. Brown, pp. 561-592. Technical Report No. 355. Mariah Associates, Inc., Albuquerque.

Adams, D. P., and P. J. Mehringer
1977 Modern Pollen Surface Samples: An Analysis of Subsamples. *Journal of Research USGS* 3:733-736.

Adams, E. Charles
1979 Cold Air Drainage and Length of Growing Season in the Hopi Mesas Area. *The Kiva* 44(4):285-296.

1983 The Architectural Analogue to Hopi Social Organization and Room Use, and Implications for Prehistoric Northern Southwestern Culture. *American Antiquity* 48:44-61.

1989 Changing Form and Function in Western Pueblo Ceremonial Architecture from A.D. 1000 to A.D. 1500. In *The Architecture of Social Integration in Prehistoric Pueblos,* edited by W. D. Lipe and M. Hegmon, pp. 155-160. Crow Canyon Archaeological Center, Occasional Paper No. 1. Cortez, Colorado.

1991 *The Origin and Development of the Pueblo Katsina Cult.* University of Arizona Press, Tucson.

Adams, Jenny L.
1988 Use-Wear Analyses on Mano and Hide-Processing Stones. *Journal of Field Archaeology* 15:307-315.

1993 Mechanisms of Wear on Ground Stone Surfaces. *Pacific Coast Archaeological Society Quarterly* 29(4):61-74.

1994 *The Development of Prehistoric Grinding Technology in the Point of Pines Area, East-Central Arizona.* Ph.D. dissertation, Department of Anthropology. University of Michigan Microfilms, Ann Arbor.

1995 Ground Stone Assemblage: Development of a Prehistoric Grinding Technology in the Eastern Tonto Basin. In *The Roosevelt Community Development Study,* vol. 1, edited by M. D. Elson and J. J. Clark. Anthropological Papers No. 14. Center for Desert Archaeology, Tucson, Arizona.

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

Adler, Michael A.
1993 Why Is a Kiva? New Interpretations of Prehistoric Social Integrative Architecture in the Northern Rio Grande Region of New Mexico. *Journal of Anthropological Research* 49:319-346.

1994 Population Aggregation and the Anasazi Social Landscape: A View from the Four Corners. In *The Ancient Southwestern Community: Models and Methods for the Study of Prehistoric Social Organization,* edited by W. H. Wills and R. D. Leonard, pp. 85-101. University of New Mexico Press, Albuquerque.

Adler, Michael A., and Richard H. Wilshusen
1990 Large-Scale Integrative Facilities in Tribal Societies: Cross-Cultural and Southwestern U.S. Examples. *World Archaeology* 22(2):133-146.

Agenbroad, Larry D.
1978 Cultural Implications from the Distributional Analysis of a Lithic Site, San Pedro Valley, Arizona. In *Discovering Past Behavior: Experiments in the Archaeology of the American Southwest,* edited by P. Grebinger,

pp. 55-71. Gordon and Breach, New York.

Agogino, George, and Jim Hester
1956 A Reevaluation of the San Jose Non-Ceramic Cultures. *El Palacio* 63:6-21.

Aikens, C. Melvin, and David B. Madsen
1986 Prehistory of the Eastern Area. In *Handbook of North American Indians,* vol. 11, *Great Basin,* edited by W. d'Azevedo, pp. 149-160. Smithsonian Institution Press, Washington, D.C.

Akins, Nancy J.
1998a Ormand Fauna. In *The Ormand Village: Final Report on the 1965-1966 Excavation,* by Laurel T. Wallace, pp. 335-343. Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 229. Santa Fe.

1998b *Excavations at the Gallo Mountain Sites, NM 32 in Catron County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 65. Santa Fe.

Akins, Nancy J., Pamela J. McBride, and Mollie S. Toll
1998 Early Pit House Period Household Organization and Subsistence in the Mogollon Highlands. In *60 Years of Mogollon Archaeology: Papers from the 9th Mogollon Conference, Silver City, New Mexico, 1996,* edited by S. M. Whittlesey, pp. 143-147. SRI Press, Tucson, Arizona.

Allen, Joe W.
1969 *Archaeological Salvage Excavations along State Road 32 near Apache Creek, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Notes No. 51. Santa Fe.

Altschul, Jeffrey H., Cesar Quijada Lopez, and Robert Heckman
1996 Villa Verde and the Late Classic Period along the San Pedro River. Paper presented at the 9th Mogollon Archaeology Conference, Silver City, New Mexico.

Ambler, J. Richard
1993 Fuelwood and Anasazi Mobile Sedentism. Paper delivered at 66th Pecos Conference, Springerville, Arizona.

Ambrose, W., and Christopher Stevenson
1995 Estimating Obsidian Water Content and Hydration Rate from Density Measurements. Manuscript in possession of authors.

Amick, Daniel S.
1996 Regional Patterns of Folsom Mobility and Land Use in the American Southwest. *World Archaeology* 27(3):411-426.

Amsden, Charles Avery
1932 Navajo Origins. *New Mexico Historical Review* 7(3).

1935 The Pinto Basin Artifacts. In *The Pinto Basin Site: An Ancient Aboriginal Camping Ground in the California Desert,* by E. Campbell and W. Campbell, pp. 35-51. Southwest Museum Papers No. 9. Los Angeles, California.

1937 The Lake Mojave Artifacts. In *The Archeology of Pleistocene Lake Mojave,* by E. Campbell, W. Crozier, E. Antevs, C. Amsden, J. Barbieri, and F. Bode, pp. 51-98. Southwest Museum Papers No. 11. Los Angeles, California.

Anderson, Joseph K., and Steven E. Sessions
1979 Archaic Settlement. In *The Archaeology of Southwest Gallegos Mesa: The EPCC Survey Project,* edited by S. E. Sessions, pp. 61-127. Navajo Nation Papers in Anthropology No. 1. Window Rock, Arizona.

Anonymous
1983 *Hopi Food Stuffs.*

Antevs, Ernst
1949 Age of Cochise Artifacts on the Wet Leggett. In *Cochise and Mogollon Sites,* by Paul S. Martin, John B. Rinaldo, and Ernst Antevs, pp. 34-78. *Fieldiana: Anthropology* 38(1). Field Museum of Natural History, Chicago, Illinois.

1955 Geologic-Climate in the West. *American Antiquity* 20(4):307-335.

1962 Late Quaternary Climates in Arizona. *American Antiquity* 28(2):193-198.

Anyon, Roger
1984 The Late Pithouse Period. In *An Archaeological Synthesis of South-Central and Southwestern New Mexico,* edited by S. A. LeBlanc and M. E. Whalen, pp. 142-204. Office of Contract Archeology, University of New Mexico, Albuquerque.

Anyon, Roger, and T. J. Ferguson
1983 Settlement Patterns and Changing Adaptations in the Zuni Area after A.D. 1000. Paper presented at the Anasazi Symposium, San Juan Museum Research Center, Dolores, Colorado.

Anyon, Roger, and Steven A. LeBlanc
1980 The Architectural Evolution of Mogollon-Mimbres Communal Structures. *The Kiva* 45(3):253-277.

1984 *The Galaz Ruin: A Prehistoric Mimbres Village in Southwestern New Mexico.* Maxwell Museum of Anthropology and University of New Mexico Press, Albuquerque.

Anyon, Roger, Patricia Gilman, and Steven A. LeBlanc
1981 A Re-evaluation of the Mogollon-Mimbres Archaeological Sequence. *The Kiva* 46:209-222.

Arnold, Dean E.
1976 Ecological Variables and Ceramic Production; Towards a General Model. In *Primitive Art and Technology,* edited by J. S. Raymond, B. Loveseth, C. Arnold, and B. Beardon, pp. 92-108. Archaeological Association, Department of Archaeology, University of Calgary, Canada.

1981 A Model for the Identification of Nonlocal Ceramic Distribution from the Present. In *Production and Distribution: A Ceramic Viewpoint,* edited by H. Howard and E. Morris, pp. 31-44. BAR International Series No. 120, Oxford.

1985 *Ceramic Theory and Cultural Process.* Cambridge University Press, Cambridge.

Asch, C. M.
1960 Post-Pueblo Occupation at the Willow Creek Ruin, Point of Pines. *The Kiva* 26:31-42.

Aschmann, Homer
1974 Terrain and Ecological Conditions in the Western Apache Range. *American Indian Ethnohistory: Indians of the Southwest, Apache Indians* 5:233-260.

Ayer, Mrs. Edward E. (translator)
1916 *The Memorial of Fray Alonso de Benavides, 1630.* Private printing, Chicago.

Bagley-Baumgartner, Kathy
1984 Toward a Functional Classification of Nonceremonial Structures on Black Mesa, Northeastern Arizona. In *Papers on the Archaeology of Black Mesa, Arizona,* vol. 2, edited by Stephen Plog and Shirley Powell, pp. 47-86. University of Southern Illinois Press, Carbondale.

Bahti, Mark
1970 A Cache at Huerfano Butte. *The Kiva* 36(2):17-22.

Bailey, F. L.
1940 Navajo Foods and Cooking Methods. *American Anthropologist* 42:270-290.

Bailey, Vernon
1913 *Life Zones and Crop Zones of New Mexico.* North American Fauna 35, USDA Bureau of Biological Survey, Washington, D.C.

1971 *Mammals of the Southwestern United States.* Dover Publications, New York.

Ball, Eve
1970 *In the Days of Victorio: Recollections of a Warm Springs Apache.* University of Arizona Press, Tucson.

Bamforth, Douglas B.
1985 The Technical Organization of the Paleo-Indian Small-Group Bison Hunting on the Llano Estacado. *Plains Anthropologist* 30:243-258.

1986 Technological Efficiency and Tool Curation. *American Antiquity* 51:38-50.

Bannister, Bryant, John W. Hannah, and William J. Robinson
1970 *Tree-Ring Dates from New Mexico, M-N, S, Z: Southwestern New Mexico Area.* Laboratory of Tree Ring Research, University of Arizona, Tucson.

Barkley, F. A.
1934 The Statistical Theory of Pollen Analysis. *Ecology* 15:283-289.

Barnett, Franklin
1974 *Sandstone Hill Pueblo: Cibola Culture in Catron County, New Mexico.* Albuquerque Archaeological Society, Albuquerque.

Barter, Eloise
1957a Pottery of the Reserve Area. In *Late Mogollon Communities: Four Sites of the Tularosa Phase,* by P. S. Martin, J. B. Rinaldo, and E. R. Barter, pp. 85-105. *Fieldiana: Anthropology* 49(1). Field Museum of Natural History, Chicago, Illinois.

1957b Pottery of the Jewett Gap. In *Late Mogollon Communities:Four Sites of the Tularosa Phase,* by P. S. Martin, J. B. Rinaldo, and E. R. Barter, pp. 106-120. *Fieldiana: Anthropology* 49(1). Field Museum of Natural History, Chicago, Illinois.

Bartlett, Katherine
1933 *Pueblo Milling Stones of the Flagstaff Region and Their Relation to Others in the Southwest.* Museum of Northern Arizona, Bulletin 3. Flagstaff.

1939 A Prehistoric Mine of Red Argillite, Resembling Pipestone, near Del Rio, Arizona. *Museum of Northern Arizona Museum Notes* 11(12):75-78.

Basehart, Harry W.
1959 Chiricahua Apache Subsistence and Socio-Political Organization. Manuscript on file, Department of Anthropology, University of New Mexico, Albuquerque.

1960 Mescalero Apache Subsistence Patterns and Socio-Political Organization. Paper in possession of author.

1973 Mescalero Apache Subsistence Patterns. In *1973 Survey of the Tularosa Basin.* Human Systems Research, Inc., Tularosa, New Mexico.

Bass, William M.
1987 *Human Osteology: A Laboratory and Field Manual.* Missouri Archaeological Society, Columbia.

Basso, Keith H.
1971 *Western Apache Raiding and Warfare: From the Notes of Grenville Goodwin.* University of Arizona Press, Tucson.

Baugh, Timothy G., and Frank W. Eddy
1987 Rethinking Apachean Ceramics: The 1985 Southern Athapaskan Ceramics Conference. *American Antiquity* 52:793-798.

Baugh, Timothy G., and F. W. Nelson, Jr.
1987 New Mexico Obsidian Sources and Exchange on the Southern Plains. *Journal of Field Archaeology* 14:313-329.

Bayham, Frank E.
1979 Factors Influencing the Archaic Pattern of Animal Exploitation. *The Kiva* 44(2-3):219-235.

1982 *A Diachronic Analysis of Prehistoric Animal Exploitation at Ventana Cave.* Unpublished Ph.D. dissertation, Arizona State University, Tempe.

Bayham, Frank E., and Donald H. Morris
1990 Thermal Maxima and Episodic Occupation of the Picacho Reservoir Dune Field. In *Perspectives on Southwestern Prehistory,* edited by P. E. Minnis and C. L. Redman, pp. 15-25. Westview Press, Boulder, Colorado.

Bayham, Frank E., Donald H. Morris, and M. Steven Shackley
1986 *Prehistoric Hunter-Gatherers of South Central Arizona: The Picacho Reservoir Archaic Project.* Arizona State University, Anthropological Field Studies 13. Tempe.

Beckett, Patrick H.
1973 *Cochise Culture Sites in South Central and North Central New Mexico.* M.A. thesis, Eastern New Mexico University, Portales.

1980 *The AKE Site: Collection and Excavation of LA 13423, Catron County, New Mexico.* New Mexico State University, Cultural Resource Management Division Report 357. Las Cruces.

Beckner, Morton
1959 *The Biological Way of Thought.* Columbia University, New York.

Bender, Barbara
1985 Prehistoric Developments in the American Midcontinent and in Brittany, Northwest France. In *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity,* edited by T. D. Price and J. A. Brown, pp. 21-57. Academic Press, San Diego.

Benedict, James B.
1979 Getting Away from It All: A Study of Man,

Mountains, and the Two-Drought Altithermal. *Southwestern Lore* 45(3):1-12.

Berman, Mary Jane
1979 *Cultural Resources Overview of Socorro, New Mexico.* USDA Forest Service, Albuquerque and Bureau of Land Management, Santa Fe.

1989 *Prehistoric Abandonment of the Upper San Francisco River Valley, West-Central New Mexico: An Economic Case Study.* Unpublished Ph.D dissertation, Department of Anthropology, University of New York at Binghamton, Binghamton.

Berry, Claudia F., and Michael S. Berry
1986 Chronological and Conceptual Models of the Southwestern Archaic. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings,* edited by C. Condie and D. Fowler, pp. 253-327. University of Utah Anthropological Papers No. 110, Salt Lake City.

Berry, Claudia F., and William Marmaduke
1982 *Cultural Resources Overview: The Middle Gila Basin, an Archaeological and Historical Overview.* Northland Research, Flagstaff, Arizona.

Berry, Michael S.
1982 *Time, Space, and Transition in Anasazi Prehistory.* University of Utah Press, Salt Lake City.

1985 The Age of Maize in the Greater Southwest: A Critical Review. In *Prehistoric Food Production in North America*, edited by R. I. Ford, pp. 279-307. University of Michigan, Ann Arbor.

Bettinger, Robert L.
1980 Explanatory/Predictive Models of Hunter-Gatherer Adaptation. In *Advances in Archaeological Method and Theory,* vol. 3, edited by Michael B. Schiffer, pp. 189-255. Academic Press, New York.

Binford, Lewis R.
1973 Interassemblage Variability—The Mousterian and the "Functional" Argument. In *The Explanation of Cultural Change,* edited by C. Renfrew, pp. 227-254. Duckworth Press, London.

1977 Forty-Seven Trips. In *Stone Tools as Cultural Markers,* edited by R. Wright, pp. 24-36. Australian Institute of Aboriginal Studies, Canberra.

1979 Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research 35:255-273.*

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

Birkeland, Peter W.
1984 *Soils and Geomorphology.* Oxford University Press, London.

Bleed, Peter
1986 The Optimal Design of Hunting Weapons: Maintainability or Reliability. *American Antiquity* 51:737-747.

Bleed, Peter, and Marlene Meier
1980 An Objective Test of the Effects of Heat Treatment of Flakeable Stone. *American Antiquity* 45:502-507.

Blinman, Eric
1988 *The Interpretation of Ceramic Variability: A Case Study from the Dolores Anasazi.* Unpublished Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.

1989 Potluck in the Protokiva: Ceramics and Ceremonialism in Pueblo I Villages. In *The Architecture of Social Integration in Prehistoric Pueblos*, edited by W. D. Lipe and M. Hegmon, pp. 113-124. Crow Canyon Archaeological Center, Cortez, Colorado.

Blinman, Eric, and C. Dean Wilson
1993 Ceramic Perspectives on Northern Anasazi Exchange. In *The American Southwest and MesoAmerica: Systems of Prehistoric Exchange,* edited by J. E. Ericson and T. G. Baugh, pp. 65-94. Plenum Publishing Corp., New York.

Bluhm, E.
1957 *The Sawmill Site, a Reserve Phase Village. Fieldiana: Anthropology* 47(1). Field Museum of Natural History, Chicago, Illinois.

1960 Mogollon Settlement Patterns in the Pine Lawn Valley, New Mexico. *American Antiquity* 25(4):538-546.

Bohrer, Vorsila L.
1972 Paleoecology of the Hay Hollow Site, Arizona. *Fieldiana:Anthropology* 63(1). Field Museum of Natural History, Chicago, Illinois.

1981 Methods of Recognizing Cultural Activity from Pollen in Archaeological Sites. *The Kiva* 46:135-142.

Bohrer, Vorsila L., and Karen R. Adams
1977 *Ethnobotanical Techniques and Approaches at the Salmon Ruin, New Mexico.* San Juan Valley Archeological Project, Technical Series 2. Eastern New Mexico University Contributions in Anthropology 8(1). Portales.

Borhegyi, S. D.
1956 The Excavation of Site 9 near Apache Creek, Catron County, New Mexico. In *Highway Salvage Archaeology,* edited by F. Wendorf, pp. 1-9. New Mexico State Highway Department, Santa Fe.

Boyer, Jeffrey L.
1997 *Dating the Valdez Phase: Chronometric Re-evaluation of the Initial Anasazi Occupation of North-Central New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 164. Santa Fe.

Bradfield, Wesley
1931 *Cameron Creek Village, a Site in the Mimbres Area in Grant County, New Mexico.* School of American Research, Monograph No. 1. Santa Fe, New Mexico.

Brand, Donald D.
1935 Prehistoric Trade in the Southwest. *New Mexico Business Review* 4 (4):202-209.

1938 Aboriginal Trade Routes of Sea Shells in the Southwest. *Yearbook of the Association of Pacific Coast Geographers* 4:3-9. Cheney.

Breternitz, Cory Dale
1982 Bone Tools from the Bis sa'ani Community. In *Bis sa'ani: A Late Bonito Phase Community of Escavada Wash, Northwest New Mexico,* vol. 3, edited by C. D. Breternitz, D. E. Doyel, and M. P. Marshall. Navajo Nation Papers in Anthropology 14. Window Rock, Arizona.

Breternitz, David A.
1959 *Excavations at Nantack Village, Point of Pines, Arizona.* Anthropological Papers of the University of Arizona No. 1. Tucson.

Brew, J. O.
1946 *Archaeology of Alkali Ridge, Southeastern Utah.* Papers of the Peabody Museum of American Archaeology and Ethnology, vol. 21. Cambridge, Massachusetts.

Brew, J. O., and Edward B. Danson
1948 The 1947 Reconnaissance and the Proposed Upper Gila Expedition of the Peabody Museum of Harvard University. *El Palacio* 55:211-222.

Brody, J. J.
1977 *Mimbres Painted Pottery.* University of New Mexico Press, Albuquerque.

Bronitsky, Gordon, and James D. Merritt
1986 *The Archaeology of Southwestern Arizona: A Class I Cultural Resource Inventory.* Cultural Resource Series No. 2. U.S. Bureau of Land Management. Phoenix, Arizona.

Brookes, D., and K. W. Thomas
1967 The Distribution of Pollen Grains on Microscope Slides. Part 1. The Non-Randomness of the Distribution. *Pollen et Spores* 9:621-629.

Brooks, J.
1971 Some Chemical and Geochemical Studies on Sporopollenin. In *Sporopollenin*, edited by J. Brooks, P. R. Grant, M. Muir, P. Van Gyzel, and G. Shaw, pp. 351-408. Academic Press, New York.

Brothwell, Don R.
1965 *Digging Up Bones: The Excavation, Treatment and Study of Human Skeletal Remains.* Trustees of the British Museum, London.

1972 *Digging Up Bones* (2d edition). Trustees of The British Museum, London.

Brown, D. A.
1984 Prospects and Limits of Phytolith Key for Grasses in the Central United States. *Journal of Archaeological Science* 11:345-368.

Brown, David E.
1994 *Biotic Communities: Southwestern United States and Northwestern Mexico.* University of Utah Press, Salt Lake City.

Brown, Gary M.
1990 Old Wood and Early Navajos: A Chronometric Analysis of the Dinetah Phase. Paper presented at the 5th Annual Navajo Studies Conference, Shiprock, New Mexico.

1991 *Archaeological Data Recovery at San Juan Coal Company's La Plata Mine, San Juan County, New Mexico.* Technical Report No. 355, Mariah Associates, Inc. Albuquerque, New Mexico.

1996 The Protohistoric Transition in the Northern San Juan Region. In *The Archaeology of Navajo Origins,* edited by R. H. Towner, pp. 47-69. University of Utah Press, Salt Lake City.

Brown, Gary M., and Patricia M. Hancock
1992 The Dinetah Phase in the La Plata Valley. In *Cultural Diversity and Adaptation: The Archaic, Anasazi, and Navajo Occupation of the Upper San Juan Basin,* edited by L. Reed and P. Reed, pp. 69-89. New Mexico Bureau of Land Management, Cultural Resources Series No. 9. Santa Fe.

Brown, Gary M., Peter T. Noyes, and G. Robert Phippen, Jr.
1991 Chipped Stone Tool Analysis. In *Archaeological Data Recovery at San Juan Coal Company's La Plata Mine, San Juan County, New Mexico,* edited by G. Brown, pp. 479-593. Technical Report No. 355, Mariah Associates, Inc. Albuquerque, New Mexico.

Brown, Gary M., John C. Acklen, Peter T. Noyes, Richard W. Lang, Mary-Ellen Walsh-Anduze, Jannifer Gish, Christopher M. Stevenson, and Richard Holloway
1993 Analytical Results. In *Archaeological Site Testing for the Ojo Line Extension 345kv Transmission Project in the Jemez Mountains, New Mexico,* edited by J. Acklen, pp. 319-443. Mariah Associates, Inc. Report No. MAI 527-9. Albuquerque, New Mexico.

Brugge, David M.
1981 Discussion. In *The Protohistoric Period in the North American Southwest,* edited by D. Wilcox and W. Masse, pp. 282-290. Arizona State University, Anthropological Research Papers No. 24. Tempe.

1982 Apache and Navajo Ceramics. In *Southwestern Ceramics: A Comparative Review.* The Arizona Archaeologist 15, Arizona Archaeological Society, Phoenix.

1983 Navajo Prehistory and History to 1850. In *Handbook of North American Indians,* vol. 10, *Southwest,* edited by A. Ortiz, pp. 489-501. Smithsonian Institution, Washington, D.C.

1992 Discussion of Athabaskan Research. In *Current Research on the Late Prehistory and Early History of New Mexico,* edited by B. J. Vierra, pp. 337-342. New Mexico Archaeological Council, Albuquerque.

Bryant, V. M.
1969 *Pollen Analysis of Late-Glacial and Post-Glacial Texas Sediments*. Ph.D. dissertation, University of Texas, Austin.

Buckles, William G.
1988 Discussion. In *Archaeology of the Eastern Ute: A Symposium,* edited by P. Nickens, pp. 218-232. Colorado Council of Professional Archaeologists Occasional Papers No. 1. Denver.

Buikstra, Jane E., and Douglas H. Ubelaker
1994 *Standards for Data Collection from Human Skeletal Remains.* Arkansas Archeological Survey Research Series 44. Fayetteville.

Bullard, William R.
1962 *The Cerro Colorado Site and Pithouse Architecture in the Southwestern United States Prior to A.D. 900.* Papers of the Peabody Museum of Archaeology and Ethnology, vol. 44(2). Cambridge, Massachusetts.

Bullock, Peter Y., Signa L. Larralde, and Sarah H. Schlanger
1994 *Standardized Ground Stone Artifact Analysis: A Manual For the Office of Archaeological Studies.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 24b. Santa Fe.

Buskirk, Winfred
1949 *Western Apache Subsistence Economy.*

Unpublished Ph.D. dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

1986 *The Western Apache: Living with the Land before 1950.* University of Oklahoma Press, Norman.

Bussey, Stanley D.
1982 Early Mogollon Development West of Reserve, New Mexico. In *Mogollon Archaeology: Proceedings of the 1980 Mogollon Conference,* edited by P. H. Beckett, pp. 37-40. Acoma Books, Ramona, California.

Calamia, Mark A.
1990 Ground Stone Variability among Jornada Mogollon Sites and Its Implications for Interpreting Residential Mobility. In *Perspectives on Southwestern Prehistory,* edited by P. Minnis and C. L. Redman, pp. 135-149. Westview Press, Oxford.

Callahan, Evrett
1979 *The Basics of Biface Knapping in the Eastern Fluted Point Tradition: A Manual for Flintknappers and Lithic Analysts.* Archaeology of Eastern North America 7. Reprinted by the Eastern States Archaeological Federation (1990).

Cameron, Catherine M.
1995 Migration and the Movement of Southwestern Peoples. *Journal of Anthropological Archaeology* 14:104-124.

Camilli, Eileen L.
1988 Lithic Raw Material Selection and Use in the Desert Basins of South-Central New Mexico. *The Kiva* 53:147-163.

Camilli, Eileen L., LuAnn Wandsnider, and James I. Ebert
1988 *Distributional Survey and Excavation of Archaeological Landscapes in the Vicinity of El Paso, Texas.* USDA Bureau of Land Management, Las Cruces, New Mexico.

Campbell, Elizabeth W. Crozer, and William H. Campbell
1935 *The Pinto Basin Site: An Ancient Aboriginal Camping Ground in the California Desert.* Southwest Museum Papers No. 9. Los Angeles, California.

Campbell, John M., and Florence H. Ellis
1952 The Atrisco Sites: Cochise Manifestations in the Middle Rio Grande Valley. *American Antiquity* 18:211-221.

Cannon, Michael D.
1998 Artiodactyl Relative Abundance in Pithouse and Pueblo Period Fauna from Southwestern New Mexico: Resource Depression among the Prehistoric Mogollon? Paper presented at the Mogollon Conference, Silver City, New Mexico.

Carlson, Roy L.
1970 *White Mountain Redware: A Pottery Tradition of East-Central Arizona.* University of Arizona Anthropological Papers No. 19. University of Arizona Press, Tucson.

Carmichael, David L.
1986 *Archaeological Survey in the Southern Tularosa Basin of New Mexico.* Historic and Natural Resources Report No. 3. Environmental Management Office, Directorate of Engineering and Housing, United States Army Air Defense Artillery Center, Fort Bliss.

Castetter, Edward F.
1935 *Uncultivated Native Plants as Sources of Food.* University of New Mexico Bulletin 266, Ethnobotanical Series 1. Albuquerque.

Castetter, Edward F., Willis H. Bell, and Alvin R. Grove
1938 *The Early Utilization and Distribution of Agave in the American Southwest.* University of New Mexico Bulletin 355. Albuquerque.

Cater, John D., and Mark L. Chenault
1988 Kiva Use Reinterpreted. *Southwest Lore* 54(3):19-32.

Cather, Steven M., and Bruce D. Johnson
1984 *Ecocene Tectonics and Depositional Setting of West-Central New Mexico and Eastern Arizona.* New Mexico Bureau of Mines and Mineral Resources, Circular 192, Socorro.

Cattanach, George S., Jr.
1966 A San Pedro Stage Site near Fairbank, Arizona. *The Kiva* 32:1-24.

CDG Architects
1993 *Fort Apache Historic Site Master Plan.* CDG Architects, Tucson, Arizona.

Cepeda, Joseph C., and Pamela S. Allison
1994 Common Plants and Plant Associations of the Mogollon Slope. In *Mogollon Slope, West-Central New Mexico and East-Central Arizona,* edited by R. M. Chamberlin, B. S. Kues, S. M. Cather, J. M. Barker, and W. C. McIntosh, pp. 331-335. New Mexico Geological Society, Forty-Fifth Field Conference, Socorro.

Chadderdon, Tom
1990 Chipped Stone and Ground and Pecked Stone Analysis. In *Archaeological Studies along the Arizona Interconnection Project Transmission Line Corridor.* Zuni Archaeology Program Report No. 293. Zuni, New Mexico.

Chamberlin, Richard M., and Steven M. Cather
1994 Definition of the Mogollon Slope, West-Central New Mexico. In *Mogollon Slope, West-Central New Mexico and East-Central Arizona,* edited by R. M. Chamberlin, B. S. Kues, S. M. Cather, J. M. Barker, and W. C. McIntosh, pp. 5-9 . New Mexico Geological Society, Forty-Fifth Field Conference. Socorro.

Chamberlin, Richard M., Barry S. Kues, Steven M. Cather, James M. Barker, and William C. McIntosh (editors)
1994 *Mogollon Slope, West-Central New Mexico and East-Central Arizona.* New Mexico Geological Society, Forty-Fifth Field Conference. Socorro.

Chambers, John M., William S. Cleveland, Bert Kleiner, and Paul A. Tukey
1983 *Graphical Methods for Data Analysis.* Wadsworth & Brooks/Cole Publishing Company, Pacific Grove, California.

Chapman, Richard C.
1977 Analysis of the Lithic Assemblage. In *Settlement and Subsistence along the Lower Chaco River: The CGP Survey,* edited by C. Rehr, pp. 371-452. University of New Mexico Press, Albuquerque.

Chapman, Richard C., and Jeanne A. Schutt
1977 Methodology of Lithic Analysis. In *Archaeological Investigations in Cochiti Reservoir, New Mexico,* vol. 2, *Excavation and Analysis, 1975 Season,* edited by R. Chapman, J. Biella, and S. Bussey, pp. 83-96. Office of Contract Archeology, University of New Mexico, Albuquerque.

Christenson, Andrew L.
1995 Nonbuffware Decorated Ceramics and mean Ceramic Dating. In *TheRoosevelt Commuity Development Study,* vol. 2, *Ceramic Chronology, Technology, and Economics,* edited by J. M. Heike and M. T. Stark, pp. 85-132. Anthropological Papers 14. Center for Desert Archaeology, Tucson.

Ciolek-Torello, Richard S.
1985 A Typology of Room Function at Grasshopper Pueblo. *Journal of Field Archaeology* 12:41-63.

1987 *Archaeology of the Mazatzal Piedmont, Central Arizona.* Museum of Northern Arizona, Research Paper No. 33. Flagstaff.

1995 The Houghton Road Site, the Agua Caliente Phase, and the Early Formative Period in the Tucson Basin. *The Kiva* 60:531-574.

Clark, Tiffany C.
1998 Assessing Room Function Using Unmodified Faunal Bone: A Case Study from East-Central Arizona. *Kiva* 64(1):27-51.

Clifton, Don
1990 *An Archaeological Survey of the Swapp-Booth Timber Sale, Luna Ranger District, Apache National Forest, Catron County, New Mexico.* Report No. 14. Don Clifton, consultant, Las Cruces, New Mexico.

Cohen, Mark
1985 Prehistoric Hunter-Gatherers: The Meaning of Social Complexity. In *Prehistoric Hunters and Gatherers: The Emergence of Cultural Complexity,* edited by T. D. Price and J. A. Brown, pp. 99-119. Academic Press, New York.

Colton, Harold S.
1939 *Prehistoric Culture Units and Their Relationship in Northern Arizona.* Museum of Northern Arizona, Bulletin No. 17. Flagstaff.

1941 Prehistoric Trade in the Southwest. *The Scientific Monthly* 52:308-319.

1953 *Potsherds: An Introduction to the Study of Prehistoric Southwestern Ceramics and Their Use in Historic Reconstruction.* Museum of

Northern Arizona, Bulletin No. 25. Flagstaff.

Colton, Harold S., and Lyndon L. Hargrave
1937 *Handbook of Northern Arizona Pottery Wares.* Museum of Northern Arizona Bulletin No. 11. Flagstaff.

Colyer, Vincent
1872 *Report on the Apache Indians of Arizona and New Mexico,* pp. 41-68. In *Report of the Commissioner of Indian Affairs for the Year 1871.* Government Printing Office, Washington, D.C.

Cordell, Linda S.
1984a *Prehistory of the Southwest.* Academic Press, New York.

1984b Southwestern Archaeology. *Annual Review of Anthropology* 13:301-332.

Cordell, Linda S., David E. Doyel, and Keith W. Kintigh
1994 Processes of Aggregation in the Prehistoric Southwest. In *Themes in Southwest Prehistory,* edited by G. J. Gumerman, pp. 109-133. School of American Research Press, Santa Fe, New Mexico.

Cordell, Linda S., and George Gumerman
1989 *Dynamics of Southwest Prehistory.* Smithsonian Institution Press, Washington, D.C.

Cordell, Linda S., and Fred Plog
1979 Escaping the Confines of Normative Thought: A Reevaluation of Puebloan Prehistory. *American Antiquity* 44(3):405-429.

Cosgrove, C. B.
1947 *Caves of the Upper Gila and Hueco Areas in New Mexico and Texas.* Papers of the Peabody Museum of Archaeology and Ethnology, vol. 24, no. 2. Cambridge, Massachusetts.

Cosgrove, H. S., and C. B. Cosgrove
1932 *The Swarts Ruin: A Typical Mimbres Site in Southwest New Mexico.* Papers of the Peabody Museum of Archaeology and Ethnology, vol. 15, no. 1. Cambridge, Massachusetts.

Crabtree, Donald E., and B. Robert Butler
1964 Notes on Experiment in Flint Knapping: 1. Heat Treatment of Silica materials. *Tebiwa* 7(1):1-6.

Creel, Darrell
1989 A Primary Cremation at the NAN Ranch Ruin, with Comparative Data on Other Cremations in the Mimbres Area, New Mexico. *Journal of Field Archaeology* 16:309-329.

Cremony, John C.
1868 *Life among the Apaches.* San Francisco, California.

Crown, Patricia L.
1981 The Ceramic Assemblage. In *Prehistory of the St. John's Area, East Central Arizona: The TEP St. John's Project,* edited by D. A. Westfall, pp. 233-290. Arizona State Museum Archaeological Series No. 153, Tucson.

1987 Water Storage in the Prehistoric Southwest. *Kiva* 52(3):209-228.

1995 The Production of the Salado Polychromes in the American Southwest. In *Ceramic Production in the American Southwest,* edited by B. J. Mills and P. L. Crown, pp. 143-166. University of Arizona Press, Tucson.

Crown, Patricia L., and Timothy A. Kohler
1994 Community Dynamics, Site Structure, and Aggregation in the Northern Rio Grande. In *The Ancient Southwestern Community: Models and Methods for the Study of Prehistoric Social Organization,* edited by W. H. Wills and R. D. Leonard, pp. 103-117. University of New Mexico Press, Albuquerque.

Crown, Patricia L., and W. H. Wills
1996 Economic Intensification and the Origin of Ceramic Containers in the American Southwest. In *The Emergence of Pottery: Technology and Innovation in Ancient Societies,* edited by W. K. Barnett and J. W. Hoopes, pp. 241-256. Smithsonian Institution Press, Washington, D.C.

Curtin, L. S. M.
1949 *By the Prophet of the Earth: Ethnobotany of the Pima.* University of Arizona Press, Tucson.

Cushing, Frank H.
1974 *Zuni Fetishes.* Reproduced from the Second Annual Report of the Bureau of Ethnology, Ninth Printing. KC Publications, Las Vegas, New Mexico.

Cutler, Hugh C.
1952 A Preliminary Survey of Plant Remains of Tularosa Cave. In *Mogollon Cultural Continuity and Change, The Stratigraphic Analysis of Tularosa and Cordova Caves,* by P. S. Martin, J. B. Rinaldo, E. Bluhm, H. C. Cutler, and R. Grange, Jr., pp. 461-479. Fieldiana: Anthropology 40. Field Museum of Natural History, Chicago.

1956 The Plant Remains. In *Higgins Flat Pueblo, Western New Mexico,* by P. S. Martin, J. B. Rinaldo, E. A. Bluhm, and H. C. Cutler, pp. 174-183. Fieldiana: Anthropology 45. Field Museum of Natural History, Chicago.

1964 Plant Remains from the Carter Ranch Site. In *Chapters in the Prehistory of Eastern Arizona II,* by P. S. Martin, J. B. Rinaldo, W. A. Longacre, L. G. Freeman, Jr., J. A. Brown, R. H. Hevly, and M. E. Cooley, pp. 227-234. Fieldiana:Anthropology 55. Field Museum of Natural History, Chicago.

Dahlberg, A. A.
1960 The Dentition of the First Agriculturalists (Jarmo, Iraq). *American Journal of Physical Anthropology* 18:243-256.

Daifuku, Hiroshi
1952 A New Conceptual Scheme of Prehistoric Cultures in the Southwestern United States. *American Anthropologist* 54(2):191-200.

Dane, Charles H., and George O. Bachman
1965 *Geologic Map of New Mexico.* U.S. Geological Survey, Arlington, Virginia.

Danson, Edward D.
1957 *An Archaeological Survey of West Central New Mexico and East Central Arizona.* Papers of the Peabody Museum of American Archaeology and Ethnology, vol. 44, no. 1. Cambridge, Massachusetts.

Davis, Jonathan O.
1989 *Archeological Paleoenvironments of the Southwestern Division, U.S. Army Corps of Engineer.* Arkansas Archeological Survey, Technical Paper No. 8, Fayetteville.

Davis, M. K., T. L. Jackson, M. S. Shackley, T. Teague, and J. H. Hampil
1998 Factors Affecting the Energy-Dispersive X-Ray Fluorescence Analysis of Archaeological Obsidian. In Archaeological Obsidian Studies: Method and Theory, edited by M. S. Shackley, pp. 159-180. Plenum Press, New York.

Dean, Glenna, and Valli S. Powell
1991 Palynology. In *The Mogollon Village Archaeological Project, 1989,* by P. A. Gilman, R. P. Mauldin, and V. S. Powell, pp. 69-70. Report to U.S. Forest Service, Silver City, New Mexico.

Dean, Jeffrey S.
1969 *Chronological Analysis of Tsegi Phase Sites in Northeastern Arizona.* Papers of the Laboratory of Tree Ring Research No. 3. University of Arizona, Tucson.

1988 The View from the North: An Anasazi Perspective on the Mogollon. *Kiva* 53(2):197-199.

1989 Dendrochronology and Paleoenvironmental Reconstruction on the Colorado Plateaus. In *The Anasazi in a Changing Environment,* edited by G. J. Gumerman, pp. 119-167. Cambridge University Press, Cambridge.

Dean, Jeffrey S., William H. Doelle, and Janet D. Orcutt
1994 Adaptive Stress, Environment, and Demography. In *Themes in Southwest Prehistory,* edited by G. J. Gumerman, pp. 53-86. School of American Research Press, Santa Fe, New Mexico.

Dean, Jeffrey S., Robert C. Euler, George J. Gumerman, Fred Plog, Richard Hevley, and Thor N.V. Karlstrom
1985 Human Behavior, Demography, and Paleoenvironment on the Colorado Plateau. *American Antiquity* 50(3):537-554.

Dean, Jeffrey S., Alexander J. Lindsay, Jr., and William J. Robinson
1978 Prehistoric Settlement in Long House Valley, Northeastern Arizona. In *Investigations of the Southwestern Anthropological Research Group,* edited by Robert C. Euler and George J. Gumerman, pp. 25-44. Museum of Northern Arizona, Flagstaff.

Dean, Jeffrey S., and John Ravesloot
1993 The Chronology of Cultural Interaction in the Gran Chichimeca. In *Culture and Contact: Charles C. DiPeso's Gran Chichimeca*, edited by A. I. Woolsley and J. Ravesloot, pp. 83-103. University of New Mexico Press, Albuquerque.

Dean, Jeffrey S., and William J. Robinson
1977 *Dendroclimatic Variability in the American Southwest.* Laboratory of Tree-Ring Research, University of Arizona, Tucson.

Deaver, William L., and Richard Ciolek-Torrello
1995 Early Formative Period Chronology for the Tucson Basin. *Kiva* 60(4):481-529.

Dick, Herbert W.
1954 The Bat Cave Corn Complex: A Note on Its Distribution and Archaeological Significance. *El Palacio* 61:139-144.

1965 *Bat Cave.* School of American Research Monograph No. 27. Santa Fe, New Mexico.

Diehl, Michael W.
1994 *Subsistence Economies and Emergent Social Differences: A Case Study from the Prehistoric North American Southwest.* Ph.D. dissertation, State University of New York at Buffalo. University Microfilms, Ann Arbor, Michigan.

1996 The Intensity of Maize Processing and Production in Upland Mogollon Pithouse Villages, A.D. 200-1000. *American Antiquity* 61(1):102-115.

1997 Changes in Architecture and Land Use Strategies in the American Southwest: Upland Mogollon Pithouse Dwellers, A.D. 200-1000. *Journal of Field Archaeology* 24(2):179-194.

DiPeso, Charles C., John B. Rinaldo, and Gloria J. Fenner
1974 *Casa Grande: A Fallen Trading Center of the Gran Chichimeca,* vol. 7, *Stone and Metal.* Amerind Foundation Series No. 9. Northland Press, Flagstaff.

Dittert, Alfred E.
1959 *Cultural Changes in the Cebolleta Mesa Region, Central-Western New Mexico.* Ph.D. dissertation, University of Arizona, Tucson.

1968 Some Factors Affecting Southwestern Populations during the Period A.D. 900-1540. In *Contributions to Southwestern Prehistory,* edited by C. Irwin-Williams, pp. 14-15. Eastern New Mexico University, Contributions in Anthropology 1(1), Portales.

Dittert, Alfred E., Frank W. Eddy, and Beth L. Dickey
1963 Evidence of Early Ceramic Phases in the Navajo Reservoir District. *El Palacio* 70:5-12.

Doelle, William H.
1985 *Excavations at the Valencia Site: A Preclassic Hohokam Village in the Southern Tucson Basin.* Institute for American Research, Anthropological Papers No. 3. Tucson, Arizona.

Donaldson, Bruce R., and John R. Welch
1991 Western Apache Dwellings and Their Archaeological Correlates. In *Mogollon V, Proceedings of the Fifth Biannual Mogollon Conference,* edited by P. H. Beckett, pp. 93-105. COAS, Las Cruces, New Mexico.

Donart, Gary B., Donnell Sylvester, and Wayne Hickey
1978 A Vegetation Classification Systm for New Mexico, USA, pp/ 488-490. *Proceedings of the First International Rangeland Congress.*

Doyel, David E.
1980 Stylistic and Technological Analysis of the Dead Valley Ceramic Assemblages. In *Prehistory in Dead Valley, East-Central Arizona: The TG&E Springerville Report,* edited by D. E. Doyel and S. S. Debwoski, pp. 141-224. Arizona State Museum and University of Arizona, Archaeological Series No. 144. Tucson.

1991 Hohokam Exchange and Interaction. In *Chaco and Hohokam: Prehistoric Regional Systems in the American Southwest*, edited by Patricia L. Crown and W. James Judge, pp/ 225-252. School of American Research Press, Santa Fe.

Eddy, Frank W.
1972 Culture Ecology and the Prehistory of the Najajo Reservoir District. *Southwestern Lore* 38(1-2).

1983 Upland Anasazi Settlement Adaptations at

Chimney Rock Mesa, Southern Colorado. In *Proceedings of the Anasazi Symposium, 1981,* edited by J. E. Smith, pp. 141-152. Mesa Verde Museum Association, Mesa Verde National Park, Colorado.

Eder, James F.
1984 The Impact of Subsistence Change on Mobility and Settlement Patterns in a Tropical Forest Foraging Economy: Some Implications for Archaeology. *American Anthropologist* 86:837-853.

El-Najjar, M. Y.
1974 *People of Canyon de Chelly, A Study of Their Biology and Culture.* Ph.D. dissertation, Arizona State University, Tempe.

Elmore, F. H.
1976 *Shrubs and Trees of the Southwest Uplands.* Southwest Parks and Monuments Association, Tucson, Arizona.

Elston, Wolfgang E.
1989 Overview of the Mogollon-Datil Volcanic Field. In *Field Excursions to Volcanic Terranes in the Western United States,* vol. 1, *Southern Rocky Mountain Region,* edited by C. E. Chapin and J. Zidek, pp. 43-46. New Mexico Bureau of Mines and Mineral Resources, Memoir 46. Socorro.

Elyea, Janette M.
1992 The Navajo Lithic Assemblages. In *Archaeology of the San Juan Breaks: The Navajo Occupation,* edited by P. Hogan, pp. 39-48. Office of Contract Archeology, University of New Mexico, Albuquerque.

Elyea, Janette M., and Peter Eschman
1985a Appendix III: Methods and Results of the Lithic Analysis. In *The Excavation of the Cortez CO_2 Pipeline Project Sites, 1982-1983,* edited by M. Marshall, pp. 245-254. Office of Contract Archeology, University of New Mexico, Albuquerque.

1985b A Comparison of Archaic, Anasazi, and Navajo Lithics. In *The Excavation of the Cortez CO_2 Pipeline Project Sites, 1982-1983,* edited by M. Marshall, pp. 24-1 to 24-39. Office of Contract Archeology, University of New Mexico, Albuquerque.

Elyea, Janette M., and Patrick Hogan
1983 Regional Interaction: The Archaic Adaptation. In *Economy and Interaction along the Lower Chaco River,* edited by P. Hogan and J. Winter, pp. 393-402. Office of Contract Archeology and Maxwell Museum of Anthropology, University of New Mexico, Albuquerque.

Enloe, James, and Patrick Hogan
1985 Settlement Pattern Analysis: Environmental Parameters. In *Prehistoric Settlement Patterns in West-Central New Mexico: The Fence Lake Coal Lease Surveys,* pp. 175-196. Office of Contract Archeology, Albuquerque.

Erdtman, G.
1960 The Acetolysis Method: A Revised Description. *Svensk. botanisk Tidskrift* Bd. 54:561-564.

Eschman, Peter N.
1983 Archaic Site Typology and Chronology. In *Economy and Interaction along the Lower Chaco River,* edited by P. Hogan and J. C. Winter, pp.375-384. Office of Contract Archeology and Maxwell Museum of Anthropology, University of New Mexico, Albuquerque.

Euler, Robert C., and Henry F. Dobyns
1983 The Ethnoarchaeology of Pai Milling Stones. In *Collected Papers in Honor of Charlie Steen, Jr.,* edited by N. L. Fox, pp. 253-267. Papers of the Archaeological Society of New Mexico, No. 8. Albuquerque.

Feinman, Gary M.
1991 Hohokam Archaeology in the Eighties: An Outside View. In *Exploring the Hohokam: Prehistoric Desert Peoples of the American Southwest,* edited by G. J. Gumerman, pp. 461-483. An Amerind Fund Publication, Dragoon, Arizona.

Fenneman, Nevin M.
1931 *Physiography of Western United States.* McGraw-Hill Book Co., Inc., New York.

Ferdon, Edwin N.
1956 LA 2947: A Three Circle Phase Pithouse near Apache Creek New Mexico. In *Highway Salvage Archaeology,* vol. 2, edited by F. Wendorf, pp. 79-86. New Mexico State Highway Department and Museum of New Mexico, Santa Fe.

Ferg, Alan
1992 Western Apache and Yavapai Pottery and Features from the Rye Creek Project. In *The Rye Creek Project: Archaeology in the Upper Tonto Basin,* vol. 3., edited by M. D. Elson and D. B. Craig, pp. 3-27. Center for Desert Archaeology, Anthropological Papers No. 11. Tucson, Arizona.

1995 Western Apache and Yavapai Settlement in the Tonto Basin; and Appendix C. In *The Roosevelt Community Development Study: New Perspectives on Tonto Basin Prehistory,* edited by M. D. Elson, M. T. Stark, and D. A. Gregory, pp. 185-200, 499-512. Center for Desert Archaeology, Anthropological Papers No. 15. Tucson, Arizona.

Ferg, Alan, and William B. Kessel
1987 Subsistence. In *Western Apache Material Culture: The Goodwin and Guenther Collections,* edited by A. Ferg, pp. 49-86. University of Arizona, Arizona State Museum, University of Arizona Press, Tucson.

Ferguson, T. J., and E. Richard Hart
1985 *A Zuni Atlas.* University of Oklahoma Press, Norman.

Fewkes, Jesse W.
1909 *Antiquities of the Mesa Verde National Park, Spruce Tree House.* Bureau of American Ethnology Bulletin 41. Washington, D.C.

1914 *Archaeology of the Lower Mimbres Valley, New Mexico.* Smithsonian Miscellaneous Collections 63(10).

1915 *Prehistoric Remains in New Mexico: Explorations and Fieldwork of the Smithsonian Institution in 1913.* Smithsonian Miscellaneous Collections 63(10).

Findlow, Frank J., and Marisa Bolognese
1982 A Preliminary Analysis of Prehistoric Obsidian Use within the Mogollon Area. In *Mogollon Archaeology: Proceedings of the 1980 Mogollon Conference,* edited by P. Beckett, pp. 297-316. Acoma Books, Ramona, California.

Finnell, Tommy L.
1981- Geologic Map of the Luna Quadrangle.
1982 Archived at U.S. Forest Service, Quemado Ranger District, New Mexico.

Fish, Paul R., Suzanne K. Fish, George J. Gumerman, and J. Jefferson Reid
1994 Toward an Explanation for Southwestern "Abandonments." In *Themes in Southwest Prehistory,* edited by G. J. Gumerman, pp. 135-163. School of American Research Press, Santa Fe, New Mexico.

Fish, Paul R., Suzanne K. Fish, Austin Long, and Charles Miksicek
1986 Early Corn Remains from Tumamoc Hill, southern Arizona. *American Antiquity* 51:563-571.

Fish, Suzanne K., and Paul R. Fish
1993 An Assessment of Abandonment Processes in the Hohokam Classic Period of the Tucson Basin. In *Abandonment of Settlements and Regions*, edited by C. M. Cameron and S. A. Tomka, pp. 99-109. Cambridge University Press, Cambridge.

Fish, Suzanne K., Paul R. Fish, and John Madsen
1990 Sedentism and Settlement Mobility in the Tucson Basin Prior to A.D. 1000. In *Perspectives on Southwestern Prehistory,* edited by P. E. Minnis and C. L. Redman, pp. 76-91. Westview Press, Oxford.

Fitting, James E.
1972 *Chipped Stone from the 1967 Mimbres Area Survey, Part I.* Southwestern New Mexico Research Reports No. 8. Department of Anthropology, Case Western Reserve University, Cleveland, Ohio.

1973 *An Early Mogollon Community: A Preliminary Report on the Winn Canyon Site.* El Paso Archaeological Society, El Paso, Texas.

1974 The Preceramic Eaton Site. *American Philosophical Society Yearbook* 1972:578-579.

Fitting, James E., C. B. Hemphill, and D. R. Abbe
1982 *The Upper Gila Water Supply Study. A Class I Cultural Resources Overview.* Hemphill Associates, Springfield, Oregon.

Fitzsimmons, J. Paul
1959 The Structure and Geomorphology of West-Central New Mexico. In *Guidebook of West-Central New Mexico, 10th Field Conference,* edited by J. E. Weir, Jr. and E. H. Baltz, pp. 112-116. New Mexico Geological Society,

Sorocco.

Flannery, Kent V.
1973 The Origins of Agriculture. *Annual Review of Anthropology* 2:271-310.

Flenniken, Jeffery J., and Ervan G. Garrison
1975 Thermally Altered Novaculite and Stone Tool Manufacturing Techniques. *Journal of Field Archeology* 2:125-131.

Foix, Louis M., III, and Ronna J. Bradley
1985 Rhyolite: Studies in Use-Wear Analysis. In *Views of the Jornada Mogollon: Proceedings of the Second Jornada Mogollon Archaeology Conference,* edited by C. Beck, pp. 112-120. Eastern New Mexico University Contributions in Anthropology, vol. 12, Portales.

Fontana, Bernard L.
1979 *Tarahumara, Where Night is the Day of the Moon.* Northland Press, Flagstaff.

Forbes, Jack D.
1960 *Apache, Navaho, and Spaniard* (2d edition, 1994). University of Oklahoma Press, Norman.

1966 The Early Western Apache, 1300-1700. *Journal of the West* 5:336-354.

Ford, Richard I.
1972 *Barter, Gift, or Violence: An Analysis of Tewa Intertribal Exchange.* University of Michigan Museum of Anthropology, Anthropological Papers No. 46. Ann Arbor.

1981 Gardening and Farming before A.D. 1000: Patterns of Prehistoric Cultivation North of Mexico. *Journal of Ethnobiology* 1:6-27.

1983 Inter-Indian Exchange in the Southwest. In *Handbook of North American Indians,* vol. 10, *Southwest,* edited by Alfonso Ortiz, pp. 711-722. Smithsonian Institution, Washington, D.C.

1984 Ecological Consequences of Early Agriculture in the Southwest. In *Selected Papers on the Archaeology of Black Mesa,* edited by S. Plog and S. Powell, pp. 127-138. Southern Illinois University Press, Carbondale.

Formby, D. E.
1986 Pinto-Gypsum Complex Projectile Points from Arizona and New Mexico. *Kiva* 51:99-125.

Forrestal, Peter P.
1954 *Benavides' Memorial of 1630.* Academy of American Franciscan History, Washington, D.C.

Foster, Michael S.
1986 The Weicker Site: A Loma San Gabriel Hamlet in Durango, Mexico. *Journal of Field Archaeology* 13 (1):7-19.

Fowler, Andrew
1985 Ceramic Analysis: Prehistoric Settlement Patterns in West-Central New Mexico. In *The Fence Lake Coal Lease Surveys,* edited by P. Hogan, pp. 99-134. University of New Mexico, Office of Contract Archeology, Albuquerque.

1988 *Archaeological Testing of Site NM:12:K3:263 at Blackrock, Zuni Indian Reservation, McKinley County, New Mexico.* Zuni Archaeology Program Report No. 250. Zuni, New Mexico.

1994 Appendix C, 1: Ceramic Typology. In *Excavations at Early Puebloan Sites in the Puerco River Valley, Arizona: The N-2007 Project,* vol. 2., edited by M. B. Sant and M. Marek, pp. 689-724. Zuni Archaeology Program Report No. 271, Research Series 8. Zuni, New Mexico.

Franklin, Hayward H.
1980 Salmon Ruin Ceramics Laboratory Report, Part 5. In Investigations at the Salmon Site: The Structure of Chacoan Society in the Northern Southwest II, edited by C. Irwin-Williams and P. H. Shelley. Manuscript on file, Eastern New Mexico University, Portales.

French, Captain William
1990 *Recollections of a Western Ranchman.* Reprint 1928. High Lonesome Books, Silver City, New Mexico.

Friedman, Irving, Robert L. Smith, and Donovan Clark
1970 Obsidian Dating. In *Science in Archaeology: A Survey of Progress and Research* (revised edition), edited by D. Brothwell and E.

Higgs, pp. 62-75. Praeger, New York.

Friedman, Irving, F. Trembour, F. Smith, and G. Smith
1994 Is Obsidian Hydration Dating Affected by Relative Humidity? *Quaternary Research* 41:185-190.

Frisbie, Theodore R.
1978 High Status Burials in the Greater Southwest: An Interpretative Synthesis. In *Across the Chichimec Sea: Papers in Honor of J. Charles Kelley,* edited by C. L. Riley and B. C. Hedrick, pp. 202-227. Southern Illinois University Press, Carbondale.

1984 Zuni and the Mogollon: A New Look at an Old Question. In *Recent Research in Mogollon Archaeology,* edited by S. Upham, F. Plog, D. G. Batcho, and B. E. Kauffman, pp. 98-114. New Mexico State University, University Museum, Occasional Papers No. 10. Las Cruces.

Fuller, Steven L.
1988 *Archaeological Investigations in the Bodo Canyon Area, La Plata County, Colorado.* UMTRA Archaeological Report No. 25. Cortez, Colorado.

1989 *Research Design and Data Recovery Plan for the Animas-La Plata Project.* Four Corrners Archaeological Project Report No. 15. Complete Archaeological Service Associates, Cortez, Colorado.

Gabin, Vickie L., and Lee F. Lesperance
1977 *New Mexico Climatological Data: Precipitation, Temperature, Evaporation, and Wind, Monthly and Annual Means.* W. K. Summers and Associates, Socorro, New Mexico.

Gallagher, Susan
1994 Landslide Repairs on U.S. 180 between Mileposts 13 and 19, Near Luna, Catron County, New Mexico. In *Mogollon Slope, West-Central New Mexico and East-Central Arizona.* New Mexico Geological Society, Forty-Fifth Annual Field Conference. Socorro.

Gasser, Robin E.
1982 *The Coronado Project Archaeological Investigations.* Museum of Northern Arizona, Research Paper No. 23. Flagstaff.

Geib, Phil R., and Bruce B. Huckell
1994 Evidence of Late Preceramic Agriculture at Cibique, East-Central Arizona. *Kiva* 59:433-454.

Gerow, Peggy A.
1994 *The Boyd Land Exchange Survey: A Cultural Resources Inventory of Public Lands in West-Central New Mexico.* Office of Contract Archeology, University of New Mexico, Albuquerque.

Gifford, James C.
1980 *Archaeological Explorations in Caves of the Point of Pines Region, Arizona.* Anthropological Papers of the University of Arizona, No. 36. The University of Arizona Press, Tucson.

Gilman, Patricia A.
1983 *Changing Architectural Forms in the Prehistoric Southwest.* Ph.D. dissertation, Department of Anthropology, University of New Mexico. University Microfilms, Ann Arbor.

1987 Architecture as Artifact: Pit Structures and Pueblos in the American Southwest. *American Antiquity* 52:538-564.

1988 Architectural Measures of Agricultural Reliance. Paper presented at 53d meeting of the Society for American Archaeology, Phoenix, Arizona.

1990 Social Organization and Classic Mimbres Period Burials in the SW United States. *Journal of Field Archaeology* 17:457-469.

1995 Multiple Dimensions of the Archaic Pit Structure Period Transition in Southeastern Arizona. *Kiva* 60(4):619-632.

Gilman, Patricia A., Raymond P. Mauldin, and Valli S. Powell
1991 The Mogollon Village Archaeological Project, 1989. Manuscript on file, Laboratory of Anthropology, Museum of New Mexico, Santa Fe.

Gilman, Patricia A., Valli S. Powell, and Don L. Dycus
1996 The Role of Agriculture and Residential Movement in the Late Archaic and Early Pitstructure Periods of Southeastern Arizona. In *Early Formative Adaptations in the*

Southern Southwest, edited by B. Roth, pp. 73-84. Monographs in World Archaeology 25. Prehistory Press, Madison, Wisconsin.

Gladwin, Harold S.
1942 *Excavations at Snaketown, III: Revisions.* Medallion Papers, Gila Pueblo, Globe, Arizona.

1945 *The Chaco Branch: Excavation at White Mound and in the Red Mesa Valley.* Medallion Papers, Gila Pueblo, Globe, Arizona.

1948 *Excavations at Snaketown: Reviews and Conclusions.* Medallion Papers 38. Gila Pueblo, Globe, Arizona.

1957 *A History of the Ancient Southwest.* The Bond Wheelwright Co., Portland, Oregon.

Gladwin, Harold S., Emil W. Haury, E. B. Sayles, and Nora Gladwin
1937 *Excavations at Snaketown,* vol. 1*, Material Culture.* Medallion Papers 25. Gila Pueblo, Globe, Arizona.

Gladwin, Winifred J., and Harold S. Gladwin
1934 *A Method for Designation of Cultures and Their Variations.* Medallion Papers 24. Gila Puebo, Globe, Arizona.

Glascock, Michael D.
1991 *Tables for Neutron Activation Analysis* (3d edition). The University of Missouri Research Reactor Facility, Columbia.

Goetze, Christine E., and Barbara J. Mills
1993 Ceramic Chronometry. In *Across the Colorado Plateau: Anthropological Studies for the Transwestern Pipeline: Interpretation of Ceramic Artifacts,* edited by B. J. Mills, C. E. Goetze, and M. N. Zedeño, pp. 87-150. Office of Contract Archeology and Maxwell Museum of Anthropology, University of New Mexico, Albuquerque.

Goddard, Pliny E.
1907 Assimilation to Environment as Illustrated by Athapascan Peoples. *XVth Congres International Des Americanistes* 1:337-359. Dussault et Proucx, Quebec.

Goodwin, Grenville
1935 The Social Divisions and Economic Life of the Western Apache. *American Anthropologist* 37:55-64.

1937 The Characteristics and Function of Clan on a Southern Athapaskan Culture. *American Anthropologist* 39(3):394-407.

1942 *The Social Organization of the Western Apache.* University of Chicago Press, Chicago.

Gossett, Cye W.
1985 Projectile Points as Chronological Indicators. In *Class III Cultural Resource Survey, Upper Gila Water Supply Study, Central Arizona Project,* vol. 1, by R. Chapman, C. Gossert, and W. Gossett, pp. 104-129. Deul and Associates, Inc., Albuquerque.

Gould, F. N., and R. B. Shaw
1983 *Grass Systematics*. Texas A & M University Press, College Station.

Govindaraju, K.
1989 Compilation of Working Values and Sample Description for 272 Geostandards. *Geostandards Newsletter 13.*

Graeber, David
1996 Beads and Money: Notes Toward a Theory of Wealth and Power. *American Ethnologist* 23(1):4-24.

Graves, Henry S.
1919 *The Uses of Wood for Fuel.* USDA Bulletin 753. Washington, D.C.

Graves, Michael W.
1983 Growth and Aggregation at Canyon Creek Ruin: Implications for Evolutionary Change in East-Central Arizona. *American Antiquity* 48:290-315.

Graybill, Donald D.
1973 *Prehistoric Settlement Pattern Analysis in the Mimbres Region, New Mexico.* Ph.D. dissertation, Department of Anthropology, University of Arizona, Tucson. University Microfilms, Ann Arbor.

1975 *Mimbres-Mogollon Adaptations in the Gila National Forest, Mimbres District, New Mexico.* USDA Forest Service, Southwestern Region, Report 9.

Green, Jesse (editor)
1990 *Cushing at Zuni: The Correspondence and*

Journals of Frank Hamilton Cushing, 1879-1884. University of New Mexico Press, Albuquerque.

Gregory, David A.
1981 Southern Periphery: East. In *Handbook of North American Indians,* vol. 10, *Southwest,* edited by A. Ortiz, pp. 329-342. Smithsonian Institution, Washington, D.C.

Griffin, P. Bion, Mark P. Leone, and Keith H. Basso
1971 Western Apache Ecology: From Horticulture to Agriculture. In *Apachean Culture History and Ethnology,* edited by K. H. Basso and M. E. Opler, pp. 69-73. Anthropological Papers of the University of Arizona, No. 21. University of Arizona Press, Tucson.

Gumerman, George J.
1966 Two Basketmaker II Pithouse Villages in Eastern Arizona: A Preliminary Report. *Plateau* 39(2):80-87.

Gumerman, George J., and Emil W. Haury
1979 Prehistory: Hohokam. In *Handbook of North American Indians,* vol. 9, *Southwest,* edited by A. Ortiz, pp. 75-99. Smithsonian Institution, Washington, D.C.

Gunnerson, Dolores A.
1956 The Southern Athabascans: Their Arrival in the Southwest. *El Palacio* 63:346-365.

Guthe, C. E.
1925 *Pueblo Pottery Making, A Study at the Village of San Ildefonso.* Papers of the Phillips Academy, Southwestern Expedition, No. 2. New Haven, Connecticut.

Habicht-Mauche, Judith
1993 *The Pottery from Arroyo Hondo Pueblo, New Mexico: Tribalization and Trade in the Northern Rio Grande.* Arroyo Hondo Archaeological Series, vol. 8, School of American Research Press, Santa Fe, New Mexico.

1995 Changing Patterns of Pottery Manufacture and Trade in the Northern Rio Grande Region. In *Ceramic Production in the American Southwest,* edited by B. J. Mills and P. L. Crown, pp. 167-199. The University of Arizona Press, Tucson.

Hackett, Charles Wilson
1937 *Historical Documents Relating to New Mexico, Nueva Vizcaya, and Approaches Thereto, to 1773,* vol. 3. Carnegie Institution, Washington, D.C.

Hackett, Charles Wilson, and Charmion Clair Shelby
1942 *Revolt of the Pueblo Indians of New Mexico and Otermín's Attempted Reconquest, 1680-1682.* University of New Mexico Press, Albuquerque.

Hadlock, Harry L.
1962 Surface Surveys of Lithic Sites on the Gallegos Wash. *El Palacio* 69:174-184.

Hall, Edward D.
1950 Ceramic Traits and the Nature of Cultural Contacts between the Anasazi and Mogollon. In *For the Dean: Essays in Anthropology in Honor of Bryan Cummings,* pp. 63-76. Southwestern Monuments Association, Santa Fe, New Mexico.

Hall, Edward Twitchell, Jr.
1944 Recent Clues to Athapascan Prehistory in the Southwest. *American Anthropologist* 46(1).

Hall, S. A.
1981 Deteriorated Pollen Grains and the Interpretation of Quaternary Pollen Diagrams. *Review of Paleobotany and Palynology* 32:193-206.

Ham, Elizabeth J.
1989 *Analysis of the NAN Ranch (LA 15049) Burial Patterns: An Examination of Mimbres Social Structure.* M.A. thesis, Texas A & M University, College Station.

Hammack, Laurens C., Stanley D. Bussey, and Ronald Ice
1966 *The Cliff Highway Salvage Project.* Preliminary Report, Museum of New Mexico, Santa Fe.

Hammond, George P.
1931 The Zuñiga Journal, Tucson to Santa Fe: The Opening of a Spanish Trade Route. *New Mexico Historical Review* 6:40-65.

Hammond, George P., and Agapito Rey
1928 *Obregón's History of 16th Century Explorations in Western America.* Wetzel Publishing Company, Los Angeles.

1929 *Expedition into New Mexico made by Antonio de Espejo, 1582-1583, as Revealed in the*

Journal of Diego Pérez de Luxán. Quivira Society, Los Angeles.

1966 *The Rediscovery of New Mexico, 1580-1594.* Coronado Cuarto Centennial Publications, 3. University of New Mexico Press, Albuquerque.

Hampel, Joachim H.
1984 Technical Considerations in X-ray Fluorescence Analysis of Obsidian. In *Obsidian Studies in the Great Basin*, edited by R. E. Hughes, pp. 21-25. Contributions of the University of California Archaeological Research Facility 45. Berkeley.

Hancock, Patricia M.
1992 Evidence of the Dinetah Phase in the La Plata River Valley, San Juan County, New Mexico. In *Current Research on the Late Prehistory and Early History of New Mexico,* edited by B. J. Vierra, pp. 11-19. New Mexico Archaeological Council, Albuquerque.

Hanson, John A., and Michael Schiffer
1975 The Joint Site—a Preliminary Report. In *Chapters in the Prehistory of Eastern Arizona, IV,* edited by P. S. Martin, E. B. W. Zubrow, D. C. Bowman. D. A. Gregory, J. A. Hanson, M. B. Schiffer, and D. R. Wilcox, pp.47-87. Fieldiana: Anthropology 65. Field Museum of Natural History, Chicago.

Harbottle, German, and Phil C. Weigand
1992 Turquoise in Pre-Columbian America. *Scientific American* 266(2):78-85.

Hard, Robert J.
1983 A Model for Prehistoric Land Use, Ft. Bliss, Texas. *American Society for Conservation Archaeology Proceedings* 1983:41-51.

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

Harrington, John P.
1940 *The Ethnogeography of the Tewa Indians.* Bureau of American Ethnology Thirty-fifth Annual Report, 29. Government Printing Office, Washington, D.C.

Harrington, Mark R.
1933 *Gypsum Cave, Nevada.* Southwest Museum Papers No. 8. Los Angeles, California.

1957 *A Pinto Site at Little Lake, California.* Southwest Museum Papers No. 17. Los Angeles, California.

Haury, Emil W.
1931 Minute Beads from Prehistoric Pueblos. *American Anthropologist* 33 (1):80-87.

1936a *Some Southwestern Pottery Types.* Medallion Papers 19. Gila Pueblo, Globe, Arizona.

1936b *The Mogollon Culture of Southwestern New Mexico.* Medallion Papers 29. Gila Pueblo, Globe, Arizona

1941 *Excavations in the Forestdale Valley, East-Central Arizona.* University of Arizona Bulletin 20(4), Tucson.

1950 *The Stratigraphy and Archaeology of Ventana Cave, Arizona.* The University of Arizona Press and the University of New Mexico Press, Tucson and Albuquerque.

1957 An Alluvial Site on the San Carlos Indian Reservation. *American Antiquity* 23:2-27.

1962 The Greater American Southwest. In *Courses Toward Urban Life,* edited by R. Braidwood and G. Wiley, pp. 106-131. Viking Fund Publications in Anthropology 32.

1976 *The Hohokam: Desert Farmers and Craftsmen: Excavations at Snaketown 1964-1965.* University of Arizona Press, Tucson.

1985a Prologue: The Mogollon Concept. In *Mogollon Culture in the Forestdale Valley, East-Central Arizona,* pp. xv-xix. University of Arizona Press, Tucson.

1985b The Kii Ruin, Forestdale's Oldest Pueblo. In *Mogollon Culture in the Forestdale Valley, East-Central Arizona,* by E. W. Haury, pp. 281-372. University of Arizona Press, Tucson.

1985c The Forestdale Valley Cultural Sequence. In *Mogollon Culture in the Forestdale Valley, East-Central Arizona,* by E. W. Haury, pp. 373-402. University of Arizona Press, Tucson.

1986 Mogollon and Anasazi. In *Emil W. Haury's*

Prehistory of the American Southwest, edited by J. J. Reid and D. E. Doyel, pp. 451-456. University of Arizona Press, Tucson.

1988 Recent Thoughts of the Mogollon. *The Kiva* 53:195-196.

Haury, Emil W., and Carol A. Gifford
1959 A Thirteenth Century "Strongbox." *The Kiva* 24 (4):1-11.

Haury, Emil W., and Edwin B. Sayles
1947 *An Early Pit House Village of the Mogollon Culture, Forestdale Valley, Arizona.* University of Arizona, Social Science Bulletin 16, Tucson.

Hawley, Florence
1936 *Field Manual of Prehistoric Southwestern Pottery Types.* University of New Mexico Bulletin, Anthropology Series, vol. 1, no. 4.

Hayden, Brian
1981 Research and Development in the Stone Age: Technological Transitions among Hunter-Gatherers. *Current Anthropology* 22(5):519-548.

Hayden, David J., Lloyd A. Moiola, and Yvonne R. Oakes
1998 *The Datil Mountain Project: Archaic, Puebloan, and Athabascan Campsites along U.S. 60 near Datil Catron County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes No. 177, Santa Fe.

Hayden, Julian D.
1972 Hohokam Petroglyphs of the Sierra Pinacate, Sonora and the Hohokam Shell Expeditions. *The Kiva* 37(2):74-83.

Hayes, Alden C., and James A. Lancaster
1975 *Badger House Community.* Publications in Archeology 7E, Wetherill Mesa Series. U.S. Department of the Interior, National Park Service, Washington, D.C.

Haynes, C. Vance
1968 Geochronology of Late-Quaternary Alluvium. In *Means of Correlating Quaternary Successions,* edited by R. B. Morrison and H. E. Wright, pp. 591-631. University of Utah Press, Salt Lake City.

Hegmon, Michelle, Winston Hurst, and James R. Allison
1995 Production for Local Consumption and Exchange: Comparison of Early Red and White Ceramics in the San Juan Region. In *Ceramic Production in the American Southwest,* edited by B. J. Mills and P. L. Crown, pp. 30-62. University of Arizona Press, Tucson.

Hegmon, Michelle, and Hector Neff
1993 Sampling Ceramic Raw Materials for Chemical Analysis. *Pottery Southwest* 20:7-8.

Hegmon, Michelle, Margaret C. Nelson, and Susan M. Ruth
1998 Abandonment and Reorganization in the Mimbres Region of the American Southwest. *American Anthropologist* 100(1):148-162.

Hegmon, Michelle, and Stephen Plog
1996 Regional Social Interaction in the Northern Southwest: Evidence and Issues. In *Interpreting Southwestern Diversity: Underlying Principles and Overarching Patterns,* edited by P. R. Fish and J. J. Reid, pp. 23-34. Anthropological Research Papers 48. Arizona State University, Tempe.

Heidke, James M., and Miriam T. Stark
1995 Ceramic Chronology, Technology, and Economics in the Roosevelt Community Development Study Area. In *The Roosevelt Community Development Study,* vol. 2, *Ceramic Chronology, Technology, and Economics,* edited by J. M. Heidke and M. T. Stark, pp. 396-407. Anthropological Papers 14. Center for Desert Archaeology, Tucson, Arizona.

Heller, Maurice
1976 *Zooarchaeology of Tularosa Cave, Catron County, New Mexico.* M.A. thesis, University of Texas, El Paso.

Hernon, R. M., W. R., Jones, and S. L. Moore
1965 Some Geologic Features of the Santa Rita Quadrangle, New Mexico. In *Guidebook of Southwestern New Mexico, II.* New Mexico Geological Society, 17th Annual Field Conference, Socorro.

Hester, Thomas R.
1977 The Lithic Technology of Mission Indians in Texas and Northeastern Mexico. *Lithic*

Technology 6:9-12.

Hevly, Richard H.
1983 High-Altitude Biotic Resources, Paleoenvironments, and Demographic Patterns: Southern Colorado Plateaus, A.D. 500-1400. In *High Altitude Adaptations in the Southwest,* edited by J. C. Winter, pp. 22-40. Office of Contract Archeology, Cultural Resources Management Report 2, USDA Forest Service, Southwestern Region.

Hicks, Patricia A.
1986 A Temporally Oriented Analysis of Debitage Samples from the Abiquiu Area of New Mexico. In *Archaeological and Historical Research at the Abiquiu Dam Reservoir, Rio Arriba County, New Mexico,* edited by N. Cella, pp. 6-1 to 6-90. Chambers Consultants and Planners, Albuquerque.

1988 Results of Analysis: Lithics. In *Archaeological Resources of the Santa Teresa Study Area, South-Central New Mexico,* edited by J. Ravesloot, pp. 93-192. Arizona State Museum Cultural Resources Management Division, University of Arizona, Tucson.

Higgs, E. S., and C. Vita-Finzi
1972 Prehistoric Economies: A Territorial Approach. In *Papers in Economic Prehistory*, edited by E. S. Higgs, pp. 27-36. Cambridge University Press, Cambridge.

Hill, David V.
1993 Clay Resource Sampling and Petrographic Studies. *Pottery Southwest* 20:6-7.

Hill, James N.
1970 *Broken K Pueblo: Prehistoric Social Organization in the American Southwest.* University of Arizona Press, Tucson.

Hill, James N., and William N. Trierweiler
1986 *Prehistoric Response to Food Stress on the Pajarito Plateau, New Mexico: Technical Report and Results of the Pajarito Archaeological Research Project, 1977-1985.* Final report to the National Science Foundation, Grant No. BNS-78-08118.

Hill, W. W.
1940 *Navajo Salt Gathering.* The University of New Mexico Bulletin, Anthropological Series 3(4):3-25. University of New Mexico Press, Albuquerque.

Hitchcock, Robert K.
1982 *The Ethnoarchaeology of Sedentism: Mobility Strategies and Site Structure among Foraging and Food Producing Populations in the Eastern Kalahari Desert, Botswana.* Ph.D. dissertation, University of New Mexico, Albuquerque.

Hodder, Ian
1982 Toward a Contextual Approach to Prehistoric Exchange. In *Contexts for Prehistoric Exchange,* edited by J. E. Ericson and T. K. Earl, pp. 199-212. Academic Press, New York.

Hodge, Frederick Webb
1895 The Early Navajo and Apache. *American Anthropologist* 8(3).

1920 *Hawikuh Bonework.* Indian Notes and Monographs 3(3). New York Museum of the American Indian, New York.

Hodge, Frederick Webb, George P. Hammond, and Agapito Rey
1945 *Fray Alonso de Benavides' Revised Memorial of 1634.* Coronado Cuarto Centennial Publications No. 4. University of New Mexico Press, Albuquerque.

Hofman, Jack L.
1984 Hunter-Gatherers in the Nashville Basin of Tennessee, 8000-5000 B.P. *Tennessee Anthropologist* 9(2):129-192

Hogan, Patrick
1985 *Prehistoric Settlement Patterns in West-Central New Mexico: The Fence Lake Coal Lease Surveys.* Office of Contract Archeology, University of New Mexico, Albuquerque.

1989 Dinetah: A Reevaluation of Pre-Revolt Navajo Occupation in Northwest New Mexico. *Journal of Anthropological Research* 45(1):51-67.

Holloway, Richard G.
1981 *Preservation and Experimental Diagenesis of the Pollen Exine*. Ph.D. dissertation, Texas A & M University, College Station.

1984 The Analysis of Surface Pollen from Alberta, Canada; by Polar Ordination. *Northwest*

Science 58:18-28.

1989 Experimental Mechanical Pollen Degradation and Its Application to Quaternary Age Deposits. *Texas Journal of Science* 41:131-145.

Holmer, Richard N.
1986 Common Projectile Points of the Intermountain West. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings,* edited by C. Condie and D. Fowler, pp. 89-115. University of Utah Anthropological Papers No. 110, Salt Lake City.

Honea, Kenneth
1969 The Rio Grande Complex and the Northern Plains. *Plains Anthropologist* 14(43):57-70.

Hough, Walter
1907 *Antiquities of the Upper Gila and Salt River Valleys in Arizona and New Mexico.* Bureau of American Ethnology, Bulletin 35. Washington, D.C.

1914 *Culture of the Ancient Pueblos of the Upper Gila Region, New Mexico and Arizona.* U.S. National Museum, Bulletin 87, Washington, D.C.

1919 *Exploration of a Pit House Village at Luna, New Mexico.* Proceedings of the United Stated National Museum 55:409-431.

1923 Pit Dwellings and Square Kivas of the Upper San Francisco River. *El Palacio* 15(1):3-9.

Hrdli…ka, Aleš
1905 Notes on the San Carlos Apache. *American Anthropologist* 7:480-495.

Huckell, Bruce B.
1978 *The Oxbow Hill-Payson Project: Archaeological Excavations South of Payson, Arizona.* Contributions to Highway Salvage Archaeology in Arizona, 48. Arizona State Museum, University of Arizona, Tucson.

1982 *The Distribution of Fluted Points in Arizona: A Review and an Update.* Arizona State Museum, University of Arizona, Archaeological Series 145, Tucson.

1984 The Paleo-Indian and Archaic Occupation of the Tucson Basin: An Overview. *The Kiva* 49(3-4):133-146.

1988 Late Archaic Archaeology of the Tucson Basin: A Status Report. In *Recent Research on Tucson Basin Prehistory: Proceedings of the Second Tucson Basin Conference,* edited by W. Doelle and P. Fish, pp.57-80. Institute for American Research, Anthropological Papers No. 10. Tucson, Arizona.

1990 *Late Preceramic Farmer-Foragers in Southeastern Arizona: A Cultural and Ecological Consideration of the Spread of Agriculture into the Arid Southwestern United States.* Ph.D. dissertation, Arid Lands Resource Sciences, University of Arizona, Tucson.

1995 *Of Marshes and Maize: Preceramic Agricultural Settlements in the Cienega Valley, Southeastern Arizona.* Anthropological Papers of the University of Arizona No. 59. The University of Arizona Press, Tucson.

1996 The Southwestern Archaic: Scale and Perception of Preceramic Hunter-Gatherers. In *Interpreting Southwestern Diversity: Underlying Principles and Overarching Patterns,* edited by P. Fish and J. Reid, pp. 7-15. Arizona State University Archaeological Research Papers No. 48, Tempe.

Huckell, Bruce B., and Lisa Huckell
1984 Excavations at Milagro, A Late Archaic Site in the Eastern Tucson Basin. Manuscript on file, Arizona State Museum, Tucson.

1985 New Light on the Late Archaic Period of the Southern Southwest. Paper delivered at the 50th Annual Meeting of the Society for American Archaeology, Denver, Colorado.

1992 The Investigation of Late Archaic Diet at Milagro, a Village Site in the Eastern Tucson Basin. *Glyph* 43(6):9-10.

Hughes, Richard E., and Robert L. Smith
1993 Archaeology, Geology, and Geochemistry in Obsidian Provenance Studies. In *Scale on Archaeological and Geoscientific Perspectives,* edited by J. K. Stein and A. R. Linse, pp: 79-91. Geological Society of America, Special Paper 283.

Hunt, Alice P., and Dallas Tanner
1960 Early Man Sites near Moab, Utah. *American Antiquity* 26:110-117.

Hunter-Anderson, Rosalind L.
1986 *Prehistoric Adaptation in the American Southwest.* Cambridge University Press, Cambridge.

Hurt, Wesley R., and Daniel McKnight
1949 Archaeology of the San Augustin Plains: A Preliminary Report. *American Antiquity* 14:172-194.

Huse, H., A. Noisat, and A. Halasi
1978 *The Bisti-Star Lake Project: A Sample Survey of Cultural Resources in Northwestern New Mexico.* Bureau of Land Management, Albuquerque District, Albuquerque.

Irwin-Williams, Cynthia
1967 Picosa: The Elementary Southwestern Culture. *American Antiquity* 32(4):441-457.

1973 *The Oshara Tradition: Origins of Anasazi Culture.* Contributions in Anthropology 5 (1). Eastern New Mexico University, Portales.

1979 Post-Pleistocene Archaeology, 7000-2000 B.C. In *Handbook of North American Indians,* vol. 10, *Southwest,* edited by A. Ortiz, pp. 31-42. Smithsonian Institution, Washington, D.C.

1994 The Archaic of the Southwestern United States: Changing Goals and Research Strategies in the Last Twenty Five Years, 1964-1989. In *Archaic Hunter-Gatherer Archaeology in the American Southwest,* edited by B. Vierra, pp. 566-670. Eastern New Mexico University Contributions in Anthropology 13(1), Portales.

Irwin-Williams, Cynthia, and C. Vance Haynes, Jr.
1970 Climatic Change and Early Population Dynamics in the Southwestern United States. *Quaternary Research* 1(1):59-71.

Ives, Ronald (editor)
1939 *Sedelmayr's Relacion of 1746.* Bureau of American Ethnology, Bulletin 123. Washington, D.C.

Ivey, James E.
1992 Pueblo and Estancia: The Spanish Presence in the Pueblo, A.D. 1620-1680. In *Current Research on the Late Prehistory and Early History of New Mexico,* edited by B. J. Vierra, 99.11-19. New Mexico Archaeological Council, Albuquerque.

James, Steven R.
1990 Monitoring Archaeofaunal Changes During the Transition to Agriculture in the American Southwest. *Kiva* 56(1):25-43.

1991 Faunal Remains. In *The Mogollon Village Archaeological Project, 1989*, edited by P. A. Gilman, R. P. Mauldin, and V. S. Powell, pp. 71-78. Report prepared for the Gila National Forest.

Janes, Joe
1981 Site survey files. Archeological Records Management Section, Historic Preservation Division, Santa Fe, New Mexico.

Jennings, Jesse D.
1967 Review of Bat Cave. *American Antiquity* 32:123.

Jernigan, E. Wesley
1978 *Jewelry of the Prehistoric Southwest.* School of American Research Southwest Indian Arts Series. University of New Mexico Press, Albuquerque.

Jewett, Roberta, and Kent G. Lightfoot
1986 The Intra-Site Spatial Structure of Early Mogollon Villages. In *Mogollon Variability,* edited by C. Benson and S. Upham, pp. 45-77. New Mexico State University, The University Museum Occasional Papers, No. 15, Las Cruces.

John, Elizabeth A. H.
1989 *Views of the Apache Frontier, Report on the Northern Provinces of New Spain by Jose Cortes.* University of Oklahoma Press, Norman.

Johnson, George
1996 *Social Strife May Have Exiled Indians.* The New York Times, August 20, 1996.

Johnson, Gregory A.
1989 Dynamics of a Southwestern Prehistory Far Outside—Looking In. In *Dynamics of Southwest Prehistory*, edited by L. Cordell and G. Gumerman, pp. 371-379. Smithsonian Institution Press, Washington, D.C.

Johnson, Jay K.
1979 Archaic Biface Manufacture: Production Failures, a Chronicle of the Misbegotten. *Lithic Technology* 8:25-35.

1981 Further Additional Biface Production Failures. *Lithic Technology* 10:26-28.

Johnston, F. E.
1962 Growth of the Long Bones of Infants and Young Children at Indian Knoll. *Human Biology* 23:66-81.

Jorde, L. B.
1983 Precipitation Cycles and Cultural Buffering in the Prehistoric Southwest. In *For Theory Building in Archaeology,* edited by L. R. Binford, pp. 385-396. Academic Press, New York.

Judd, Neil M.
1940 Progress in the Southwest. In *Essays in Historical Anthropology of North America.* Smithsonian Miscellaneous Collections, vol. 100. Washington, D.C.

1954 *The Material Culture of Pueblo Bonito.* Smithsonian Institution Miscellaneous Collections, vol. 124. Washington, D.C.

Judge, W. James
1979a The Paleo-Indian and Basketmaker Periods: An Overview and Some Research Problems. In *The San Juan Tomorrow,* edited by F. Plog and W. Wait, pp. 5-58. USDA National Park Service, Southwestern Region, Santa Fe, New Mexico.

1979b The Development of a Complex Cultural Ecosystem in the Chaco Basin, New Mexico. In *Proceedings of the First Conference on Scientific Research in the National Parks,* vol.1, edited by R. M. Linn, pp.901-905. USDI, National Park Service, Transaction and Proceedings Series 5, Washington, D.C.

Judge, W. James, H. Wolcott Toll, William B. Gillespie, and Stephen H. Lekson
1981 Tenth Century Developments in Chaco Canyon. In *Collected Papers in Honor of Erick Kellerman Reed,* edited by A. H. Schroeder, pp. 65-98. Papers of the Archaeological Society of New Mexico 6, Albuquerque.

Kane, Allen E.
1986 Prehistory of the Dolores River Valley. In *Dolores Archaeological Program: Final Synthetic Report,* compiled by D. A. Breternitz, C. K. Robinson, and G. T. Gross, pp. 353-435. U.S. Bureau of Reclamation, Engineering and Research Center, Denver.

Kaplan, Lawrence
1963 Archaeobotany of Cordova Cave, New Mexico. *Economic Botany* 18:350-359.

Kaut, Charles R.
1974 The Clan System as an Epiphenomenal Element of Western Apache Social Organization. *Ethnology* 13(1):45-70.

Kayser, David W.
1971 *Whiskey Creek Project: Archaeological Highway Salvage along State Highway 32 in Apache Creek Valley, Catron County, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Note No. 57. Santa Fe.

1972a *Whiskey Creek Project: Archaeological Highway Salvage along State Highway 32 in Apache Creek Valley, Catron County, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Note No. 57. Santa Fe.

1972b *Armijo Springs Project: Archaeological Salvage in the Harris Creek Valley Area of the Gallo Mountains.* Museum of New Mexico, Laboratory of Anthropology Note No. 56. Santa Fe.

1972c *Gallita Springs Project: Archaeological Exploration and Salvage in the Gallo Mountains, Apache National Forest, Catron County, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Note No. 69. Santa Fe.

1973 *Castle Rock Project: Archaeological Salvage along State Highway 32 in Agua Fria and Largo Creek Canyons, Catron County, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Note No. 71. Santa Fe.

1975 *The Mesa Top Mogollon: A Report on the Excavations at Gallita Springs, Gallo Mountains, Gila National Forest, Catron County, New Mexico.* Museum of New

Mexico, Laboratory of Anthropology Note No. 113. Santa Fe.

1976 *An Archaeological Clearance Survey and Mitigation Report of Construction Stations 482+00 to 501+00 of New Mexico State Highway Department RS-1153 (6) in Catron County, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Note No. 128. Santa Fe.

Kayser, David W., and Charles Carroll
1988 *Report of the Final Field Season—San Augustine Coal Area, Investigations in West-Central New Mexico.* Bureau of Land Management, Cultural Resource Series Monograph 5, Santa Fe.

Kayser, David W., and Donald C. Fiero
1970 Pipeline Salvage near Wilcox, Arizona. *The Kiva* 35(3):131-137.

Kearney, Thomas H., and Robert H. Peebles
1964 *Arizona Flora,* revised edition. University of California Press, Berkeley.

Kearns, Timothy M.
1996 Protohistoric and Early Historic Navajo Lithic Technology in Northwest New Mexico. In *The Archaeology of Navajo Origins,* edited by R. Towner, pp. 109-145. The University of Utah Press, Salt Lake City.

Kelly, Isabel T., and Catherine S. Fowler
1986 Southern Paiute. In *Handbook of North American Indians,* vol. 11, *Great Basin,* edited by W. d'Azevedo, pp. 368-398. Smithsonian Institution Press, Washington, D.C.

Kelly, M. A., T. G. Barrett, and S. D. Saunders
1987 Diet, Dental Disease, and Transition in Northeastern Native Americans. *Man Northeast* 33:113-125.

Kelly, Robert L.
1983 Hunter-Gatherer Mobility Strategies. *Journal of Anthropological Research* 39:277-306.

1985 *Hunter-Gatherer Mobility and Sedentism: A Great Basin Study.* Ph.D. dissertation, Department of Anthropology, University of Michigan. University Microfilms, Ann Arbor.

1988 The Three Sides of a Biface. *American Antiquity* 53:717-734.

1992 Mobility/Sedentism: Concepts, Archaeological Measures and Effects. *Annual Review Anthropology* 21:43-66.

Kent, Susan
1990 A Cross-Cultural Study of Segmentation, Architecture, and the Use of Space. In *Domestic Architecture and the Use of Space,* edited by S. Kent. Cambridge University Press, London.

1991 The Relationship between Mobility Strategies and Site Structure. In *The Interpretation of Spatial Patterning Within Stone Age Archaeological Sites,* edited by T. D. Price and E. Kroll, pp. 33-59. Plenum Publishing Co., New York.

Kerley, Janet M., and Patrick Hogan
1983 Preliminary Debitage Analysis. In *Economy and Interaction along the Lower Chaco River,* edited by P. Hogan and J. Winter, pp. 255-261. Office of Contract Archeology and Maxwell Museum of Anthropology, University of New Mexico, Albuquerque.

Kessell, John L.
1971 Campaigning on the Upper Gila, 1756. *New Mexico Historical Review* 46:133-160.

Kidder, Alfred V.
1924 *An Introduction to the Study of Southwestern Archaeology, with a Preliminary Account of the Excavations at Pecos.* Papers of the Phillips Academy Southwestern Expedition 1. Yale University Press, New Haven, Connecticut.

1927 Southwestern Archaeological Conference. *Science* 66:489-491.

1932 *The Artifacts of Pecos.* Papers of the Southwestern Expedition, No. 6. Phillips Academy, Andover, Massachusetts.

1939 Review of "Starkweather Ruin, a Mogollon-Pueblo Site in the Upper Gila Area of New Mexico, and Affiliative Aspects of the Mogollon Culture," by P. H. Nesbitt. *American Anthropologist* 41:314-316.

1954 Review of "Mogollon Cultural Continuity and Change, the Stratigraphic Analysis of Tularosa and Cordova Caves," by P. S.

Martin, J. B. Rinaldo, E. Bluhm, H. C. Cutler, and R. Grange, Jr. *American Antiquity* 19(3):298-300.

King, Frances B.
1985 Early Cultivated Cucurbits in Eastern North America. In *Prehistoric Food Production in North America,* edited by R. I. Ford, pp. 73-97. Anthropological Papers 75. Museum of Anthropology, University of Michigan, Ann Arbor.

Kinnaird, Lawrence (editor)
1958 *The Frontiers of New Spain: Nicolás de LaFora's Description, 1766-1768.* Quivira Society, Berkeley.

Kintigh, Keith W.
1984 Measuring Archaeological Diversity by Comparison with Simulated Assemblages. *American Antiquity* 49:44-54.

1990 Protohistoric Transitions in the Western Pueblo Area. In *Perspectives on Southwestern Prehistory,* edited by P. E. Minnis and C. L. Redman, pp. 258-275. Westview Press, Boulder, Colorado.

1994 Chaco, Communal Architecture, and Cibolan Aggregation. In *The Ancient Southwestern Community: Models and Methods for the Study of Prehistoric Social Organization,* edited by W. H. Wills and R. D. Leonard, pp. 131-140. University of New Mexico Press, Albuquerque.

Kintigh, Keith W., Todd L. Howell, and Andrew I. Duff
1985 *Settlement, Subsistence, and Society in Late Zuni Prehistory.* Anthropological Papers of the University of Arizona 44. University of Arizona Press, Tucson.

1996 Post-Chacoan Social Integration at the Hinkson Site, New Mexico. *Kiva* 61(3):257-274.

Koczan, Steven A.
1982 *Cultural Resource Investigations along U.S. 180 near Luna, New Mexico.* New Mexico State Highway and Transportation Department Project SP-(F)-013-2(205). Environmental Section/Technical Support Bureau, Santa Fe.

1983 *Cultural Resource Investigations along U.S. 180 from Luna, New Mexico to the Arizona State Line.* New Mexico State Highway and Transportation Department. Environmental Section/Technical Support Bureau, Santa Fe.

Kohler, Timothy A.
1993 News from the Northern American Southwest: Prehistory on the Edge of Chaos. *Journal of Archaeological Research* 1(4):267-321.

Kohler, Timothy A., and Meredith H. Matthews
1988 Long-Term Anasazi Land Use and Forest Reduction: A Case Study from Southwest Colorado. *American Antiquity* 53(3):537-564.

Kovach, W. L.
1990 *Multi-Variate Statistical Package Plus, Version 2.0.* Institute of Earth Studies, University College of Wales, Aberystwyth.

Ladd, Edmund J.
1983 Pueblo Use of High-Altitude Areas: Emphasis on the A:Shiwi. In *High-Altitude Adaptations in the Southwest,* edited by J. C. Winter, pp. 168-188. University of New Mexico, Office of Contract Archeology, Cultural Resources Management Report 2, USDA Forest Service, Southwestern Region.

Laidler, K.
1984 The Development of the Arrhenius Equation. *Journal of Chemical Education* 61:494-498.

Lambert, Marjorie F.
1956 Some Clay and Stone Figurines from the Mogollon-Mimbres Area, Luna County, New Mexico. *El Palacio* 63:259-283.

Lamb, Samuel H.
1975 *Woody Plants of the Southwest.* Sunstone Press, Santa Fe.

Lampe, Kenneth F.
1986 Contact Dermatitis from Sonoran Desert Plants. *Desert Plants* 8(1):32-37.

Lancaster, James W.
1983 *An Analysis of Manos and Metates from the Mimbres Valley, New Mexico.* M.A. thesis, University of New Mexico, Albuquerque.

Larralde, Signe
1988 Lithic Analysis. In *Archaeological Investigations in West-Central New Mexico,* vol. 1, *Report of the First Field Season,* by E.

Camilli, D. Ford, and S. Larralde, pp. 6-1 to 6-30. New Mexico Bureau of Land Management, Cultural Resource Series No. 3.

Larson, Daniel O., Hector Neff, Donald A. Graybill, Joel Michaelsen, and Elizabeth Ambos
1996 Risk, Climatic Variability, and the Study of Southwestern Prehistory: An Evolutionary Perspective. *American Antiquity* 61(2):217-241.

Laumbach, Karl W.
1980a *Emergency Survey and Excavation in Southwestern New Mexico.* New Mexico State University, Cultural Resources Management Division Report 354, Las Cruces.

1980b Lithic Artifacts. In *Prehistory and History of the Ojo Amarillo,* edited by D. Kirkpatrick, pp. 849-958. New Mexico State University Cultural Resources Management Division Report No. 276, Las Cruces.

LeBlanc, Steven A.
1982a The Advent of Pottery in the Southwest. In *Southwestern Ceramics: A Comparative Review,* edited by A.H. Schroeder, pp. 27-51. Arizona Archaeologist 15, Arizona Archaeological Society, Phoenix.

1982b Temporal Change in Mogollon Ceramics. IN *Southwestern Ceramics: A Comparative Review,* edited by A. H. Schroeder, pp. 107-127. Arizona Archaeologist 15, Arizona Archaeological Society, Phoenix.

1983 *The Mimbres People.* Thames and Hudson, London.

1986 Development of Archaeological Thought on the Mimbres Mogollon. In *Emil W. Haury's Prehistory of the American Southwest,* edited by J. J. Reid and D. E. Doyel, pp. 297-304. University of Arizona Press, Tucson.

1989a Cibola: Shifting Cultural Boundaries. In *Dynamics of Southwest Prehistory,* edited by L. S. Cordell and G. J. Gumerman, pp. 337-369. Smithsonian Institution Press, Washington, D.C.

1989b Cultural Dynamics in the Southern Mogollon Area. In *Dynamics of Southwestern Prehistory,* edited by L. S. Cordell and G. J. Gumerman, pp. 179-207. Smithsonian Institution Press, Washington, D.C.

LeBlanc, Steven A., and Michael E. Whalen
1980 *An Archaeological Synthesis of South Central and Southwestern New Mexico.* USDA Forest Service and USDA Bureau of Land Management, Albuquerque and Santa Fe.

Lee, R.
1969 Chemical Temperature Integration. *Journal of Applied Meteorology* 8:423-430.

Lekson, Stephen H.
1983 Chacoan Architecture in Continental Context. In *Proceedings of the Anasazi Symposium, 1981*, edited by Jack E. Smith, pp. 183-194. Mesa Verde Museum Association, Mesa Verde, Colorado.

1984 *Great Pueblo Architecture of Chaco Canyon, New Mexico.* University of New Mexico Press, Albuquerque.

1986 The Mimbres Region. In *Mogollon Variability,* edited by C. Benson and S. Upham, pp. 141-146. New Mexico State University, University Museum Occasional Papers 15, Las Cruces.

1988a The Idea of the Kiva in Anasazi Archaeology. *The Kiva* 53 (3): 213-234.

1988b Regional Systematics in the Later Prehistory of Southern New Mexico. In *Fourth Jornada Mogollon Conference, Collected Papers,* edited by M. S. Duran and K. W. Laumbach, pp. 1-37. Human Systems Research, Inc., Tularosa.

1990 *Mimbres Archaeology of the Upper Gila, New Mexico.* The University of Arizona Press, Tucson.

1992a *Archaeological Overview of Southwestern New Mexico.* Final Draft. Human Systems Research, Inc., Las Cruces.

1992b Warm Spring Apache Subsistence. Manuscript in possession of author.

1992c Salado of the East. In *Proceedings of the Second Salado Conference,* edited by R. D. Lange and S. Germick, pp. 17-22. Arizona Archaeological Society, Occasional Papers, Phoenix.

1995 Mangus Redivivus: The Dinwiddie Site and Mimbres Unit Pueblos. Manuscript in possession of the author.

1996 Southwestern New Mexico and Southeastern Arizona, A.D. 900 to 1300. In *The Prehistoric Pueblo World, A.D. 1150-1350,* edited by M. A. Adler, pp. 170-176. University of Arizona Press, Tucson.

1997a Rewriting Southwestern Prehistory. *Archaeology* 50(1):52-55.

1997b Points, Knives, and Drills of Chaco Canyon. In *Ceramics, Lithics, and Ornaments of Chaco Canyon,* edited by F. Mathien, pp. 659-697. Publications in Archeology 18G, Chaco Canyon Studies. USDI National Park Service, Santa Fe, New Mexico.

Leonard, Robert D.
1989 Resource Specialization, Population Growth, and Agricultural Production in the American Southwest. *American Antiquity* 54:491-503.

Leopold, Luna B.
1951 Rainfall Frequency: An Aspect of Climatic Variation. *Transactions of the American Geophysical Union* 32:347-357. Washington, D.C.

Leslie, Robert H.
1978 Projectile Point Types and Sequence of the Eastern Jornada Mogollon, Extreme Southeastern New Mexico. *Transactions of the 13th Regional Archaeological Symposium for Southeastern New Mexico and Western Texas,* pp. 81-157.

Levine, Daisy E., and Linda J. Goodman
1990 *An Archaeological and Ethnographic Survey within the Cerrillos Mining District, Santa Fe County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Note 508. Santa Fe.

Libby, Arnold
1955 *Radiocarbon Dating.* University of Chicago Press, Chicago.

Lightfoot, Kent G.
1979 Food Redistribution among Prehistoric Pueblo Groups. *The Kiva* 44 (4):319-339.

1983 Resource Uncertainty and Buffering Strategies in an Arid, Marginal Environment. In *Ecological Models in Economic Prehistory,* edited by G. Bronitsky, pp.189-218. Arizona State University, Anthropological Research Papers No. 29. Tempe.

1984 *The Duncan Project: A Study of the Occupation Duration and Settlement Pattern of an Early Mogollon Pithouse Village.* Arizona State University, Anthropological Research Papers No. 31. Tempe.

Lightfoot, Kent G., and Gary M. Feinman
1982 Social Differentiation and Leadership Development in Early Pithouse Villages in the Mogollon Region of the American Southwest. *American Antiquity* 47:64-86.

Lightfoot, Kent G., and Roberta Jewett
1986 The Shift to Sedentary Life: A Consideration of the Occupational Duration of Early Mogollon Pithouse Villages. In *Mogollon Variability,* edited by C. Benson and S. Upham, pp. 9-44. Occasional Papers No. 15, New Mexico State University, Las Cruces.

Lightfoot, Kent G., and Fred Plog
1984 Intensification along the North Side of the Mogollon Rim. In *Prehistoric Agricultural Strategies in the Southwest,* edited by S. K. Fish and P. R. Fish, pp. 179-195. Arizona State University, Anthropological Research Papers No. 33. Tempe.

Liljeblad, Sven, and Catherine S. Fowler
1986 Owens Valley Paiute. In *Handbook of North American Indians,* vol. 11, *Great Basin,* edited by W. d'Azevedo, pp. 412-434. Smithsonian Institution Press, Washington, D.C.

Lillios, Katina
1993 Regional Settlement Abandonment at the End of the Copper Age in the Lowlands of West-Central Portugal. In *Abandonment of Settlements and Regions,* edited by C. M. Cameron and S. A. Tomka, pp. 110-120. Cambridge University Press, Cambridge.

Linares, Olga F.
1976 "Garden Hunting" in the American Tropics. *Human Ecology* 4:331-349.

Linsky, Patricia K.
1975 Cochise and Mogollon Hunting Patterns in West-Central New Mexico. In *Collected*

Papers in Honor of Florence Hawley Ellis, edited by T. R. Frisbie, pp. 246-271. Papers of the Archaeological Society of New Mexico, vol. 2. Albuquerque.

Lipe, William D.
1995 The Depopulation of the Northern San Juan: Conditions in the Turbulent 1200s. *Journal of Anthropological Archaeological Archaeology* 14(2):143-169.

Lipe, William D., and Michelle Hegmon
1989 Historical and Analytical Perspectives on Architecture and Social Integration in the Prehistoric Pueblos. In *The Architecture of Social Integration in Prehistoric Pueblos,* edited by W. D. Lipe and M. Hegmon, pp. 15-34. Crow Canyon Archaeological Center, Occasional Papers No. 1. Cortez, Colorado.

1992 *The Sand Canyon Archaeological Project: A Progress Report.* Crow Canyon Archaeological Center, Occasional Paper 2. Dolores, Colorado.

Longacre, William A.
1976 Population Dynamics at the Grasshopper Pueblo, Arizona. In *Demographic Anthropology: Quantitative Approaches,* edited by E. B. W. Zubrow, pp. 169-184. University of New Mexico Press, Albuquerque.

Logan, David
1980 Western New Mexico Telephone Co. Archaeological Survey. Archeological Records Management Section, Historic Preservation Division, Santa Fe, New Mexico.

Lowell, Edith S.
1990 Paletas and Tabletas: Comparison of Hohokam Stone Palettes with Snuff Trays of South America. *Kiva* 55(4):321-353.

Lowell, Julia C.
1988 The Social Use of Space at Turkey Creek Pueblo: An Architectural Analysis. *The Kiva* 53(2):85-100.

1991 *Prehistoric Households at Turkey Creek Pueblo.* University of Arizona Anthropological Papers No. 54. University of Arizona Press, Tucson.

1995 Illuminating Fire-Feature Variability in the Grasshopper Region of Arizona. *Kiva* 60(3):351-369.

Lucius, William A.
1981 Modeling Anasazi Origins: The Frontier Approach. In *Proceedings of the Anasazi Symposium 1981,* edited by J. E. Smith, pp. 51-68. Mesa Verde National Park, Colorado.

Luedtke, Barbara E.
1992 *An Archaeologist's Guide to Chert and Flint.* Archaeological Research Tools 7. Institute of Archaeology, University of California, Los Angeles.

Lyman, R. Lee
1994 *Vertebrate Taphonomy.* Cambridge University Press, Cambridge.

Mabry, Jonathan B.
1994 Recent Excavations at Vacas Muertas, a Large Late Preceramic Village in the Tucson Basin. *Arizona Archaeological Council Newsletter* 18(3):2-3.

Mabry, Jonathan B., and Jeffrey L. Clark
1994 Early Village Life on the Santa Cruz River. *Archaeology in Tucson* 8(1):1-5.

MacNeish, Richard S. (editor)
1993 *Preliminary Investigations of the Archaic in the Region of Las Cruces, New Mexico.* Historic and Natural Resources Report No. 9, Cultural Resources Management Branch, Directorate of Environment, United States Army Air Defense Artillery Center, Fort Bliss, Texas.

MacNeish, Richard S., and Patrick H. Beckett
1987 *The Archaic Chihuahua Tradition of South-Central New Mexico and Chihuahua, Mexico.* COAS Monograph No. 7. Las Cruces, New Mexico.

1994 The Archaic Chihuahua Tradition of South-Central New Mexico and Chihuahua, Mexico. In *Archaic Hunter-Gatherer Archaeology in the American Southwest,* edited by B. Vierra, pp. 335-371. Eastern New Mexico University Contributions in Anthropology 13(1). Portales.

Madsen, David B.
1979 The Fremont and the Sevier: Defining Prehistoric Agriculturalists North of the Anasazi. *American Antiquity* 44(4):711-722.

Mahood, Gail A., and James A. Stimac
1990 Trace-Element Partitioning in Pantellerites and Trachytes. *Geochemica et Cosmochimica Acta* 54:2257-2276.

Maker, H. J., R. E. Neher, and J. U. Anderson
1972 *Soil Associations and Land Classification for Irrigation, Catron County.* Agricultural Experiment Station Research Report 229. Las Cruces, New Mexico.

Mann, R. W., and S. P. Murphy
1990 *Regional Atlas of Bone Disease.* Charles C. Thomas, Springfield, Illinois.

Markgraf, Vera, J. Platt Bradbury, R. M. Forester, G. Singh, and R. S. Sternberg
1984 San Agustin Plains, New Mexico: Age and Paleoenvironmental Potential Reassessed. *Quaternary Research* 22:336-343.

Marshall, Larry G.
1989 Bone Modification and "The Laws of Burial." In *Bone Modification,* edited by R. Bonnichsen and M. Hong, pp. 7-24. Center for the Study of the First Americans, University of Maine, Orono.

Marshall, Michael P.
1991 Ceramic Analysis. In *The Prehistoric Cebolla Canyon Community: An Archaeological Class III Inventory of 320 Acres of BLM Land at the Mouth of Cebolla Canyon,* edited by F. E. Wozniak and M. P. Marshall, pp. 6-1 to 42. Office of Contract Archaeology, University of New Mexico, Albuquerque.

Marshall, Michael P., and Henry J. Walt
1984 *Rio Abajo: Prehistory and History of a Rio Grande Province.* Office of Cultural Affairs, Historic Preservation Division, Santa Fe, New Mexico.

Martin, Paul S.
1963 *The Last 10,000 Years.* University of Arizona Press, Tucson.

Martin, Paul S.
1939 *Modified Basketmaker Sites in the Ackman-Lowry Area, Southwestern Colorado.* Fieldiana: Anthropology 23(3). Field Museum of Natural History, Chicago.

1940 *The SU Site: Excavations at a Mogollon Village, Pine Lawn Valley, Western New Mexico.* Fieldiana: Anthropology Series 32 (1). Field Museum of Natural History, Chicago.

1943 *The SU Site, Excavations at a Mogollon Village, Western New Mexico, Second Season, 1941.* Fieldiana: Anthropology 32(2). Chicago.

1954 The Mogollon Culture in Western New Mexico. *Southwestern Lore* 20(1). Colorado Archaeological Society.

1959 *Digging into History: A Brief Account of Fifteen Years of Archaeological Work in New Mexico.* Chicago Natural History Museum, Popular Series, Anthropology 38. Chicago.

1979 Prehistory: Mogollon. In *Handbook of North American Indians,* vol. 9, *Southwest,* edited by A. Ortiz, pp. 61-74. Smithsonian Institution, Washington, D.C.

Martin, Paul S., and P. J. Mehringer
1965 Pleistocene Pollen Analysis and Biogeography of the Southwest. In *The Quaternary of the United States,* edited by H. E. Wright, Jr. and D. G. Frey, pp. 433-451. Princeton University Press, Princeton, New Jersey.

Martin, Paul S., and Fred Plog
1973 *The Archaeology of Arizona: A Study of the Southwest Region.* American Museum of Natural History Press, New York.

Martin, Paul S., and John B. Rinaldo
1947 *The SU Site, Excavations at a Mogollon Village, Western New Mexico: Third Season, 1946.* Fieldiana: Anthropology 32(3). Field Museum of Natural History, Chicago.

1950a *Sites of the Reserve Phase, Pine Lawn Valley, Western New Mexico.* Fieldiana: Anthropology 38(3). Field Museum of Natural History, Chicago.

1950b *Turkey Foot Ridge Site, a Mogollon Village, Pine Lawn Valley, Western New Mexico.* Fieldiana: Anthropology 38(2). Field Museum of Natural History, Chicago.

1951 The Southwestern Co-Tradition. *Southwestern Journal of Anthropology* 7:215-229.

1954 The Mogollon Culture in Western New

Mexico. *Southwestern Lore* 20(1). Colorado Archaeological Society.

1960a Excavations in the Upper Little Colorado Drainage, Eastern Arizona. Fieldiana: Anthropology 51(1). Field Museum of Natural History, Chicago.

1960b *Table Rock Pueblo, Arizona.* Fieldiana: Anthropology 51(2). Field Museum of Natural History, Chicago.

Martin, Paul S., John B. Rinaldo, and Ernst Antevs
1949 *Cochise and Mogollon Sites, Pine Lawn Valley, Western New Mexico.* Fieldiana: Anthropology 38(1). Field Museum of Natural History, Chicago.

Martin, Paul S., John B. Rinaldo, and E. R. Barter
1957 *Late Mogollon Communities: Four Sites of the Tularosa Phase.* Fieldiana: Anthgropology 49(1). Field Museum of Natural History, Chicago.

Martin, Paul S., John B. Rinaldo, and Elaine A. Bluhm
1954 *Caves of the Reserve Area.* Fieldiana: Anthroplogy 42. Field Museum of Natural History, Chicago.

Martin, Paul S., John B. Rinaldo, Elaine A. Bluhm, Hugh C. Cutler, and Roger Grange, Jr.
1952 *Mogollon Cultural Continuity and Change.* Fieldiana: Anthropology 40. Field Museum of Natural History, Chicago.

1956 *Higgins Flat Pueblo, Western New Mexico.* Fieldiana: Anthropology 45. Field Museum of Natural History, Chicago.

Martin, Paul S., John B. Rinaldo, and Majorie Kelly
1940 *The SU Site, Excavations at a Mogollon Village, Western New Mexico, First Season.* Fieldiana: Anthropology 32(1). Field Museum of Natural History, Chicago.

Martin, Paul S., John B. Rinaldo, and William A. Longacre
1961 *Mineral Creek Site and Hooper Ranch Pueblo, Eastern Arizona.* Fieldiana: Anthropology 52. Field Museum of Natural History, Chicago.

Martin, Paul S., John B. Rinaldo, William A. Longacre, Constance Cronin, Leslie G. Freeman, Jr., and James Schoenwetter
1962 *Chapters in the Prehistory of Eastern Arizona, I.* Fieldiana: Anthropology 40. Field Museum of Natural History, Chicago.

Martin, Paul S., John B. Rinaldo, William A. Longacre, L. G. Freeman, J. A. Brown, Richard H. Hevly, and M. E. Cooley
1964 *Chapters in the Prehistory of Eastern Arizona, II.* Fieldiana: Anthropology 55. Field Museum of Natural History, Chicago.

Martin, William C., and Robert Hutchins
1981 *Flora of New Mexico.* Braunschweig, Germany.

Mathian, Frances J.
1993 Exchange Systems and Social Stratification among the Chaco Anasazi. In *The American Southwest and Meso America: Systems of Prehistoric Exchange,* edited by J. E. Ericson and T. G. Baugh, pp. 65-94. Plenum Publishing Corporation, New York.

Matthew, A. J., A. J. Woods, and C. Oliver
1991 Spots Before the Eyes: New Comparison Charts for Visual Percentage Estimation in Archaeological Material. In *Recent Developments in Ceramic Petrology,* edited by A. Middleton and I. Freestone, pp. 211-264. British Museum Occasional Paper 81. British Museum Research Laboratory, London.

Matson, Daniel S., and Albert H. Schroeder
1957 Cordero's Description of the Apache—1796. *New Mexico Historical Review* 32(4).

Matson, R. G.
1991 *The Origins of Southwestern Agriculture.* The University of Arizona Press, Tucson.

Matson, R. G., and Brian Chisolm
1986 Basketmaker II Subsistence: Carbon Isotopes and Other Dietary Indicators from Cedar Mesa, Utah. Paper presented at the Third Anasazi Conference, Monument Valley.

Matson, R. G., William D. Lipe, and William R. Haase
1983 Adaptational Continuities and Occupational Discontinuities: The Cedar Mesa Anasazi. Paper presented at the 1983 Anasazi Symposium, Bloomfield, New Mexico.

Mauldin, Raymond
1991 Agricultural Intensification in the Mogollon Highlands. In *Mogollon V,* edited by P. H. Beckett, pp. 62-74. COAS Publishing and Research, Las Cruces, New Mexico.

1993 The Relationship between Groundstone and Agricultural Intensification in Western New Mexico. *Kiva* 58(3):317-330.

1996 Exploring Patterns in Late Archaic and Early Ceramic Residential Occupation in the Northern Chihuahuan Desert. In *Early Formative Adaptations in the Southern Southwest,* edited by B. Roth, pp. 85-97. Monographs in World Archaeology No. 25. Prehistory Press, Madison, Wisconsin.

Mauldin, Raymond, Patricia A. Gilman, and Christopher M. Stevenson
1996 Mogollon Village Revisited: Recent Chronometric Results and Interpretations. *Kiva* 61(4):365-400.

McCarthy, J. J., and F. H. Schamber
1981 Least-Squares Fit with Digital Filter: A Status Report. In *Energy Dispersive X-ray Spectrometry,* edited by K. F. J. Heinrich, D. E. Newbury, R. L. Myklebust, and C. E. Fiori, pp. 273-296. National Bureau of Standards Special Publication 604. Washington, D.C.

McFarland, Elizabeth Fleming
1974 *Wilderness of the Gila.* Crest Press, Inc., Silver City, New Mexico.

McGimsey, Charles R., III
1980 *Mariana Mesa: Seven Prehistoric Settlements in West-Central New Mexico.* Papers of the Peabody Museum of Archaeology and Ethnology, vol. 72. Cambridge, Massachusetts.

McGregor, John C.
1941 *Winona and Ridge Ruin, Part I.* Museum of Northern Arizona, Bulletin 18. Flagstaff.

1943 Burial of an Early American Magician. *Proceedings of the American Philosophical Society* 86(2). Philadephia, Pennsylvania.

McGuire, Randall H.
1980 The Mesoamerican Connection in the Southwest. *The Kiva* 46(1):3-38.

1992 The Structure and Organization of Hohokam Exchange. In *The American Southwest and Mesoamerica: Systems of Prehistoric Exchange,* edited by J. E. Ericson and T. G. Baugh, pp.95-119. Plenum Press, New York.

McGuire, Randall H., and Dean J. Saitta
1996 Although They Have Petty Captains, They Obey Them Badly: The Dialectics of Prehispanic Western Pueblo Social Organization. *American Antiquity* 61(2):197-216.

McGuire, Randall H., and Michael B. Schiffer
1983 A Theory of Architectural Design. *Journal of Anthropological Archaeology* 2:277-303.

McNeil, Jimmy D.
1986 *Ornaments of Salmon Ruin, San Juan County, New Mexico.* Master's thesis, Eastern New Mexico University, Portales.

Meindl, R. S., and C. O. Lovejoy
1985 Ectocranial Suture Closure: A Revised Method for the Determination of Skeletal Age at Death based on the Lateral-Anterior Sutures. *American Journal of Physical Anthropology* 68:57-66.

Mera, H. P.
1934 *Observations on the Archaeology of the Petrified Forest National Monument.* Museum of New Mexico, Laboratory of Anthropology, Technical Series Bulletin 7. Santa Fe.

Merbs, Charles F.
1989 Patterns of Health and Sickness in the Precontact Southwest. In *Columbian Consequences*, edited by D. H. Thomas, pp. 41-55. Smithsonian Institution Press, Washington, D.C.

Miles, Judith
1987 Bone Artifacts from Pueblo Alto. In *Investigations at the Pueblo Alto Complex, Chaco Canyon, New Mexico, 1975-1979,* vol. 3, part 2, edited by F. J. Mathian and T. C. Windes, pp. 651-677. Chaco Canyon Studies, Publications in Archaeology 18F, National Park Service, USDI. Santa Fe, New Mexico.

Mills, Barbara J.
1987 Ceramic Production and Distribution Patterns. In *Archaeological Investigations at Eight Small Sites in West-Central New*

Mexico: Data Recovery at the Fence Lake No. 1 Mine, edited by P. Hogan, pp. 145-154. University of New Mexico, Office of Contract Archeology, Albuquerque.

1989 The Organization of Ceramic Production in Household Economies. Paper presented at symposium in honor of Lewis R. Binford, University of New Mexico, Albuquerque.

1995 The Organization of Protohistoric Zuni Ceramic Production. In *Ceramic Production in the American Southwest,* edited by B. J. Mills and P. L. Crown, pp. 200-230. The University of Arizona Press, Tucson.

Mills, Peter R.
1993 An Axe to Grind: A Functional Analysis of Anasazi Stone Axes from Sand Canyon Pueblo Ruin (5MT765), Southwestern Colorado. *Kiva* 58(3):393-413.

Mindeleff, Victor
1891 *A Study of Pueblo Architecture.* Eighth Annual Report of the Bureau of American Ethnology. Washington, D.C.

Minnis, Paul E.
1978 Early Prehistoric Ethnobotany in Chaco Wash: Plant Remains from the Tsaya Project, New Mexico. Manuscript on file, Laboratory of Anthropology, Museum of New Mexico, Santa Fe.

1984 Macroplant Remains. In *The Galaz Ruin: A Prehistoric Mimbres Village in Southwestern New Mexico,* by R. Anyon and S. A. LeBlanc, pp. 193-200. Maxwell Museum of Anthropology and University of New Mexico Press, Albuquerque.

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

1992 Earliest Plant Cultivation in the Desert Borderlands of North America. In *The Origins of Agriculture*, edited by C. W. Cowan and P. J. Watson, pp. 121-141. Smithsonian Institution Press, Washington, D.C.

Minnis, Paul E., and Stephen E. Plog
1976 A Study of the Site Specific Distribution of *Agave parryi* in East Central Arizona. *The Kiva* 41(3-4):299-308.

Moermann, D. E.
1986 *Medicinal Plants of Native America,* vols. 1 and 2. Technical Reports 19. University of Michigan Museum of Anthropology, Ann Arbor.

Mohr, Albert, and L. L. Sample
1959 San Jose Sites in Southeastern Utah. *El Palacio* 66:109-119.

Moore, Bruce M.
1978 Are Pueblo Field Houses a Function of Urbanization? In *Limited Activity and Occupation Sites: A Collection of Conference Papers,* edited by A. Ward, pp. 9-16. Center for Anthropological Studies, Albuquerque, New Mexico.

Moore, James L.
1980 Archaic Settlement and Subsistence. In *Human Adaptations in a Marginal Environment: The UII Mitigation Project,* edited by J. Moore and J. Winter, pp. 358-381. Office of Contract Archeology, University of New Mexico, Albuquerque.

1988 *Archaeological Test Excavations at the Cherry Creek Site near Tyrone, Grant County, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Note No. 462. Santa Fe.

1989 *Data Recovery Plan for Three Sites along State Road 502, Santa Fe County, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Note No. 495. Santa Fe.

1993 *Testing at Nine Archaeological Sites along State Road 502 near San Ildefonso, Santa Fe County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Note 35. Santa Fe.

1994 Chipped Stone Artifact Analysis. In *Studying the Taos Frontier: The Pot Creek Data Recovery Project (vol. 2),* by J. Boyer, J. Moore, D. Levine, L. Mick-O'Hara, and M. Toll, pp. 287-338. Museum of New Mexico, Office of Archaeological Studies, Archaeology Note 68. Santa Fe.

1996 *Archaeological Investigations in the Southern Mesilla Bolson: Data Recovery at the Santa Teresa Port-of-Entry Facility.* Museum of New Mexico, Office of

Archaeological Studies, Archaeology Note 188. Santa Fe.

1997 The Feldman Site (LA 74138). In *Historic Occupation of the Glorieta Valley in the Seventeenth and Nineteenth Centuries: Excavations at LA 76138, LA 76139, and LA 990129,* by J. Moore, J. Gaunt, and L. Mick-O'Hara. Museum of New Mexico, Office of Archaeological Studies. Santa Fe.

n.d.a Analysis of the Chipped Stone Assemblages. In *Prehistoric and Historic Occupation of Los Alamos and Guaje Canyons: Data Recovery at Three Sites near the Pueblo of San Ildefonso,* by J. Moore, J. Gaunt, D. Levine, and L. Mick-O'Hara. Museum of New Mexico, Office of Archaeological Studies, Santa Fe.

n.d.b An Archaic Workshop Site: LA 65006. In *Prehistoric and Historic Occupation of Los Alamos and Guaje Canyons: Data Recovery at Three Sites near the Pueblo of San Ildefonso,* by J. Moore, J. Gaunt, D. Levine, and L. Mick-O'Hara. Museum of New Mexico. Office of Archaeological Studies, Santa Fe.

Moore, Roger A.
1994 Archaic Projectile Point Typology/Chronology in Northern New Mexico and the Four Corners. In *Archaic Hunter-Gatherer Archaeology in the American Southwest,* edited by B. Vierra, pp. 456-477. Eastern New Mexico University Contributions in Anthropology 13(1), Portales.

Morris, Earl H.
1939 *Preliminary Account of the Antiquities of the Region Between the Mancos and La Plata Rivers in Southwest Colorado.* Annual Report, Bureau of American Ethnology: 1911-1912, Report 23. Government Printing Office, Washington, D.C.

Morris, Elizabeth Ann
1980 High Altitude Sites in the Mogollon Rim Area of Arizona and New Mexico. Paper presented at the 1980 Mogollon Conference, Las Cruces, New Mexico.

Morris, Percy A.
1975 *A Field Guide to Shells of the Atlantic and Gulf Coasts and the West Indies* (3d edition), edited by William J. Clench. The Peterson Field Guide Series, Houghton Mifflin Co., Boston.

Most, Rachel, and Jeffrey L. Hantman
1984 Hunting Strategies and Lithic Variability: Inferring Patterns of Puebloan Economic Diversity. In *Recent Research in Mogollon Archaeology,* edited by S. Upham, F. Plog, D. G. Batcho, and B. E. Kauffman, pp. 1-12. New Mexico State University, Occasional Papers No. 10. Las Cruces.

Mount, James E., Stanley J. Olson, George A. Teague, John W. Olson, and B. Dean Treadwell
1993 *Wide Reed Ruin, Hubbell Trading Post National Historic Site.* Southwest Cultural Resources Center, Professional Papers 51.

Mueller-Dombois, D., and H. Ellenberg
1974 *Aims and Methods of Vegetation Ecology.* John Wiley & Sons, Inc., New York.

Murdock, George P.
1967 *Ethnographic Atlas.* University of Pittsburgh, Pennsylvania.

Murphy, Lynne M.
1988 A Palynological Study of Six Archaeological Features from the SU Site, Southwestern New Mexico. Paper on file, Office of Archaeological Studies, Santa Fe, New Mexico.

Neely, James, and D. Logan
1980 Western New Mexico Telephone Co. Archaeological Survey. Archeological Records Management Section, Historic Preservation Division, Santa Fe.

Neff, Hector
1992 Ceramics and Evolution. In *Archaeological Method and Theory,* vol. 4, edited by M. B. Schiffer, pp. 141-193. University of Arizona Press, Tucson.

1993 Theory, Sampling, and Analytical Techniques in the Archaeological Study of Prehistoric Ceramics. *American Antiquity* 58:23-44.

Nelson, Ben A.
1990 Comments: Southwestern Sedentism Reconsidered. In *Perspectives in Southwestern Prehistory,* edited by P. E. Minnis and C. L. Redman, pp. 157-163.

Westview Press, Boulder, Colorado.

Nelson, Ben A., and Roger Anyon
1996 Fallow Valleys: Asynchronous Occupations in Southwestern New Mexico. *Kiva* 61(3):275-294.

Nelson, Ben A., and Steven LeBlanc
1986 *Short-Term Sedentism in the American Southwest: The Mimbres Valley Salado.* University of New Mexico Press, Albuquerque.

Nelson, Ben A., Margaret C. Rugge, and Steven A. LeBlanc
1978 LA 12109: A Small Classic Mimbres Ruin, Mimbres Valley. In *Limited Activity and Occupation Sites,* edited by A. E. Ward, pp. 191-206. Center for Anthropological Studies, Contributions to Anthropological Studies 1. Albuquerque, New Mexico.

Nelson, Margaret C.
1986 Chipped Stone Analysis: Food Selection and Hunting Behavior. In *Short-Term Sedentism in the American Southwest: The Mimbres Valley Salado,* by B. Nelson and S. LeBlanc, pp. 141-176. University of New Mexico Press, Albuquerque.

1990 Comments: Sedentism, Mobility, and Regional Assemblages: Problems Posed in the Analysis of Southwestern Prehistory. In *Perspectives on Southwestern Prehistory,* edited by P. E. Minnis and C. L. Redman, pp. 150-156. Westview Press, Boulder, Colorado.

Nesbitt, Paul H.
1931 *The Ancient Mimbreños: Based on Investigations at the Mattocks Ruin, Mimbres Valley, New Mexico.* Logan Museum Publications in Anthropology, Bulletin 4. Beloit, Wisconsin.

1938 *Starkweather Ruin.* Logan Museum Publications in Anthropology, Bulletin 6. Beloit College, Beloit, Wisconsin.

Nightengale, Christopher
1980 Site survey files. Archeological Records Management Section, Historic Preservation Division, Santa Fe.

Oakes, Yvonne R.
1981 *Prehistoric Subsistence Adaptations on White Sands Missile Range.* Museum of New Mexico, Laboratory of Anthropology Notes No. 277. Santa Fe.

1989 *Archaeological Survey of the Mogollon Highlands along U.S. 180, Catron County, New Mexico.* Museum of New Mexico, Laboratory of Anthropology Notes No. 500. Santa Fe.

1990 *Testing Results and Data Recovery Plan for Sites in the Mogollon Highlands, Catron County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 3. Santa Fe.

1991 *Testing Results and Data Recovery Plan for Sites in the San Francisco Mountains, Catron County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 20. Santa Fe.

1992 *Damage Assessment and Testing on Two Sites along the Old Luna Road, Gila National Forest, Catron County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 105. Santa Fe.

1993a Data Recovery Plan for LA 39968, LA 39969, LA 39972, and LA 43766. In *The State Road 12 Archaeological Project: Results of Testing at Ten Sites and Data Recovery Plan for Four Sites near Reserve, New Mexico, by Y. Oakes and R. Wiseman, pp. 49-62.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 118. Santa Fe.

1993b *Test Excavations at East Ridge Pueblo (AR-03-06-03-373) on the Gila/Apache National Forest.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 135. Santa Fe.

1996 Expanding Athabaskan Chronometric Boundaries in West-Central New Mexico. In *La Jornada, Papers in Honor of William F. Turney,* edited by M. S. Duran and D. T. Kirkpatrick, pp. 139-149. The Archaeological Society of New Mexico, Albuquerque.

1998 Dating of the Sites. In *The Datil Mountain Project: Archaic, Puebloan, and Athabaskan Campsites along U.S. 60, near Datil, Catron County, New Mexico,* edited by D. J. Hayden,

L. A. Moiola, and Y. R. Oakes. Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 177. Santa Fe.

Oakes, Yvonne R., and Lewis Kimmelman
1995 *Archaeological Survey for Reserve Area Arroyos, Gila National Forest, Catron County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 66. Santa Fe.

Oakes, Yvonne R., and Regge N. Wiseman
1993 *The State Road 12 Archaeological Project: Results of Testing at Ten Sites and Data Recovery Plan for Four Sites near Reserve, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 118. Santa Fe.

Oakes, Yvonne R., and Dorothy A. Zamora
1993 *Archaeological Testing and Data Recovery Plan for Four Sites along U.S. 180 near Luna, Catron County, New Mexico.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 139. Santa Fe.

O'Brien, Michael J., Thomas D. Holland, Robert J. Hoard, and Gregory L. Fox
1994 Evolutionary Implications of Design and Performance Characteristics of Prehistoric Pottery. *Journal of Archaeological Method and Theory* 1(3):259-304.

Office of Archaeological Studies Staff
1994 *Standardized Lithic Analysis: Attributes and Variable Code Lists.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 24c, Santa Fe.

Ogle, Ralph Hedrick
1970 *Federal Control of the Western Apaches, 1848-1886.* University of New Mexico Press, Albuquerque.

O'Hara, James
1988a Projectile Point Analysis. In *The Border Star 85 Survey: Toward an Archeology of Landscapes,* edited by T. Seaman, W. Doleman, and R. Chapman, pp. 191-208. Office of Contract Archeology, University of New Mexico, Albuquerque.

1988b Collected Projectile Points. In *The Border Star 85 Survey: Toward an Archeology of Landscapes,* edited by T. Seaman, W. Doleman, and R. Chapman, pp. 191-208. Office of Contract Archeology, University of New Mexico, Albuquerque.

O'Hara, James, and Janette Elyea
1985 Projectile Point Typology. In *Prehistoric Settlement Patterns in West-Central New Mexico: The Fence Lake Coal Lease Surveys,* edited by P. Hogan, pp. 75-98. Office of Contract Archeology, University of New Mexico, Albuquerque.

O'Laughlin, Thomas C.
1980 *The Keystone Dam Site and Other Archaic and Formative Sites in Northwest El Paso.* Anthropological Paper No. 8. Centennial Museum, University of Texas, El Paso.

Olsen, Sandra L., and John W. Olsen
1996 An Analysis of Faunal Remains from Wind Mountain. In *Mimbres Mogollon Archaeology,* edited by A. I. Woosley and A. J. McIntyre, pp. 389-406. University of New Mexico Press, Albuquerque.

Opler, Morris E.
1983 The Apachean Culture Pattern and Its Origins. In *Handbook of North American Indians,* vol. 10, *Southwest,* edited by A. Ortiz, pp. 368-392. Smithsonian Institution, Washington, D.C.

1987 Grenville Goodwin. In *Western Apache Material Culture: The Goodwin and Guenther Collections,* edited by A. Ferg, pp. 27-40. University of Arizona Press, Tucson.

Ortner, Donald J., and Walter G. J. Putschar
1985 *Identification of Pathological Conditions in Human Skeletal Remains.* Smithsonian Institution Press, Washington, D.C.

Palmer, Jay W.
1992 Migrations of the Apachean Dineh. *North American Archaeologist* 13:195-218.

Parry, William J., and Robert L. Kelly
1987 Expedient Core Technology and Sedentism. In *The Organization of Core Technology,* edited by J. Johnson and C. Morrow, pp. 285-304. Westview Press, Boulder, Colorado.

Paynter, Robert W.
1983 Expanding the Scope of Settlement Analysis. In *Archaeological Hammers and Theories,* edited by J. A. Moore and A. S. Keene, pp. 233-275. Academic Press, New York.

Peckham, Stewart
1957 The Switchback Site: A Stratified Ruin near Reserve, New Mexico. In *Highway Salvage Archaeology 3,* edited by S. Peckham, pp. 10-30. Museum of New Mexico and New Mexico State Highway Department, Santa Fe.

1958 Hillside Pueblo: Early Masonry Architecture in the Reserve Area, New Mexico. *El Palacio* 65(3):81-94.

1963 The Luna Junction Site: An Early Pithouse in the Pine Lawn Valley, New Mexico. *Highway Salvage Archaeology 4:4-17,* edited by F. Wendorf. New Mexico State Highway Department and Museum of New Mexico, Santa Fe.

Peckham, Stewart, Fred Wendorf, and E. N. Ferdon
1956 Excavations near Apache Creek, New Mexico. *Highway Salvage Archaeology 4:41-55.* Museum of New Mexico and New Mexico State Highway Department, Santa Fe.

Pepper, George H.
1920 *Pueblo Bonito.* Anthropological Papers of the American Museum of Natural History 28, New York.

Perry, Richard J.
1991 *Western Apache Heritage: People of the Mountain Corridor.* University of Texas Press, Austin.

Peterson, John A.
1988a Settlement and Subsistence Patterns in the Reserve Phase and Mountain Mogollon: A Test Case in Devil's Park, New Mexico. *The Kiva* 53(2):113-127.

1988b Change or Continuity? Pithouse to Pueblo Transition along the Middle San Francisco River, West Central New Mexico. Paper presented at the 53rd Annual Meeting of the Society for American Archaeology, Phoenix.

Peterson, K. T.
1992 *A Warm and Wet Little Climatic Optimum and a Cold and Dry Little Ice Age in the Southern Rocky Mountains, USA.* Report No. WHC-SA-1382-FP. Westinghouse Hanford County, Richland, Washington.

Plog, Fred, George J. Gumerman, Robert C. Euler, Jeffrey S. Dean, Richard H. Hevly, Thor Karlstrom
1988 Anasazi Adaptive Strategies: The Model, Predictins, and Results. In The Anasazi in a Changing Environment, edited by G. J. Gumerman, pp. 230-276. Cambridge University Press, Cambridge.

Plog, Fred, Jon Scott Wood, and Jeffrey L. Hantman
1978 The Little Colorado Planning Unit, Eastern Sector: A Summary. In *An Analytical Approach to Cultural Resource Management: The Little Colorado Planning Unit,* edited by F. Plog, pp. 9-16. Arizona State University, Anthropological Research Papers No. 13 and USDA Forest Service, Cultural Resources Report No. 9. Tucson.

Plog, Stephen
1986 Change in Regional Trade Networks. In *Spatial Organization and Exchange: Archaeological Survey on Northern Black Mesa,* edited by S. Plog, pp. 282-309. Southern Illinois University Press, Carbondale.

1990 Agriculture, Sedentism, and Environment in the Evolution of Political Systems. In *The Evolution of Political Systems: Sociopolitics in Small-Scale Sedentary Societies,* edited by S. Upham, pp. 177-199. Cambridge University Press, Cambridge.

Pogue, Joseph E.
1972 *Turquoise.* Memoirs of the National Academy of Sciences, vol. 12, pt. 2 (2d printing). The Rio Grande Press, Inc. Glorieta, New Mexico.

Pool, Christopher A.
1992 Integrating Ceramic Production and Distribution. In *Ceramic Production and Distribution: an Integrated Approach,* edited by G. J. Bey, III and C. A. Pool, pp. 275-314, Westview Press, Boulder, Colorado.

Pool, Michael David
1985 *The Western Apache Settlement System and Its Implications for the Prehistoric Early Mogollon Period.* Master's thesis, The University of Texas at Austin.

Pool, Michael David, and J. Howard
1980 Site survey files. Archeological Records Management Section, Historic Preservation Division, Santa Fe.

Powell, Shirley
1989 Anasazi Demographic Patterns and

Organizational Responses: Assumptions and Interpretive Difficulties. In *The Anasazi in a Changing Environment,* edited by G. J. Gumerman, pp.168-191. Cambridge University Press, Cambridge.

Powell, Valli Sue
1990 *Regional Diversity in Mogollon Red-on-brown Pottery.* Unpublished Master's thesis, University of Oklahoma, Norman.

Price, T. Douglas, and James A. Brown
1985 *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity.* Academic Press, New York.

Prinz, Martin, George Harlow, and Joseph Peters (editors)
1978 *Simon and Schuster's Guide to Rocks and Minerals.* Simon and Schuster, New York.

Pruecel, Robert W.
1990 Seasonal Circulation and Dual Residence in the Puebloan Southwest. Paper presented at the Small Sites in the Big Picture Symposium. 55th Annual Meeting of the Society for American Archaeology, Las Vegas, Nevada.

Pryor, Frederic L.
1996 The Adoption of Agriculture: Some Theoretical and Empirical Evidence. *American Anthropologist* 88:879-897.

Quimby, George I.
1949 Excavations. In *Cochise and Mogollon Sites: Pine Lawn Valley, Western New Mexico*, edited by P. S. Martin, J. B. Rinaldo, and E. Antevs, pp. 26-33. Fieldiana: Anthropology 38(1). Field Museum of Natural History, Chicago.

Rafferty, Janet E.
1985 The Archaeological Record on Sedentariness: Recognition, Development, and Implications. In *Advances in Archaeological Method and Theory,* vol. 8, edited by M. B. Schiffer, pp. 113-156. Academic Press, New York.

Rapoport, Amos
1969 *House Form and Culture.* Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Ratté, James C.
1989 Geologic Map of the Bull Basin Quadrangle, Catron County, New Mexico. New Mexico Bureau of Mines and Mineral Resources, Socorro.

Ratté, James C., D. J. Bove, Steven M. Cather, Richard M. Chamberlin, S. G. Crews, and William C. McIntosh
1994 *Third-Day Road Log, from Alpine, Arizona to Luna, Reserve, Apache Creek, Horse Springs and Datil, New Mexico.* In Mogollon Slope, West-Central New Mexico and East-Central Arizona, edited by R. M. Chamberlin, B. S. Kues, S. M. Cather, J. M. Barker, and W. C. McIntosh, pp. 79-86. New Mexico Geological Society, Forty-Fifth Annual Field Conference. Socorro.

Ratté, James C., and T. L. Finnell
1978 Third Day Road Log from Silver City to Reserve via Glenwood and the Mogollon Mining District. In *Field Guide to Selected Caldrons and Mining Districts of the Datil-Mogollon Volcanic Field, New Mexico,* edited by C. E. Chapin and W. E. Elston, pp. 49-63. New Mexico Geological Society, Special Publication 7.

Reagan, Albert B.
1928 Plants Used by the White Mountain Apache of Arizona. *The Wisconsin Archaeologist* 8(4):143-161.

Redding, Richard W.
1988 A General Explanation of Subsistence Change: From Hunting and Gathering to Food Production. *Journal of Anthropological Archaeology* 7:56-97.

Reed, Erik K.
1942 Implications of the Mogollon Concept. *American Antiquity* 8:27-31.

1946 The Distinctive Features and Distribution of the San Juan Anasazi Culture. *Southwestern Journal of Anthropology* 2:295-305.

1948 The Western Pueblo Archaeological Complex. *El Palacio* 5(1):9-15.

1950 East-Central Arizona Archaeology in Relation to the Western Pueblos. *Southwestern Journal of Anthropology* 6:120-138.

1951 Types of Stone Axes in the Southwest. *Southwestern Lore* 17(3):45-51.

1956 Types of Village-Plan Layouts in the Southwest. In *Prehistoric Settlement Patterns in the New World,* edited by G. R. Wiley, pp.11-17. Viking Fund Publications in Anthropology 23, New York.

Reed, Heidi E.
1994 Temporal Analysis of Ceramic Assemblages, Boyd Land Exchange. In *The Boyd Land Exchange Survey,* by P. A. Gerow, pp. 167-206. University of New Mexico, Office of Contract Archeology, Albuquerque.

Reed, Lori, C. Dean Wilson, and Kelley Hays Gillpin
1997 Basketmaker Ceramic Technology: From Early Ceramic Horizon to the Development of Regional Traditions. Paper in possession of authors.

Reed, Paul F.
1992 *Upland Adaptations in Lower Glen Canyon during the Archaic and Pueblo Periods.* Navajo Nation Papers in Anthropology No. 28. Navajo Nation Archaeology Department, Window Rock, Arizona.

Reid, J. Jefferson
1989 A Grasshopper Perspective on the Mogollon of the Arizona Mountains. In *Dynamics of Southwestern Prehistory,* edited by L. S. Cordell and G. J. Gumerman, pp.65-97. Smithsonian Institution Press, Washington, D.C.

1994 Rethinking Mogollon Pueblo. In *Mogollon VII: The Collected Papers of the 1992 Mogollon Conference,* edited by P. H. Beckett, pp. 3-7. COAS Publishing and Research, Las Cruces, New Mexico.

1998 Wickiup 2 at the Grasshopper Spring Site and the Dating of Western Apache Occupation. In *Vanishing River: Landscapes and Lives of the Lower Verde Valley,* edited by S. M. Whittlesey, R. Ciolek-Torrello, and J. H. Altschul, pp. 197-199. SRI Press, Tucson, Arizona.

Reid, J. Jefferson, Barbara Klie Montgomery, and Maria Nieves Zedeño
1995 Refinements in Dating Late Cibola White Ware. *Kiva* 61(1):31-44.

Reid, J. Jefferson, John R. Welch, Barbara K. Montgomery, and Maria Nieves Zedeño
1996 A Demographic Overview of the Late Pueblo III Period in the Mountains of East-Central Arizona. In *The Prehistoric Pueblo World, A.D. 1150-1350,* edited by M. A. Adler, pp. 73-85. University of Arizona Press, Tucson.

Reynolds, Ralph
1991 *Growing Up Cowboy: Confessions of a Luna Kid.* Fulcrum Publishing, Golden, Colorado.

Reynolds, William E.
1980 *Final Report of the Cultural Resources Survey of Block VI and VII of the Navajo Indian Irrigation Project.* ESCA-TECH. Costa Mesa, California.

Rhodes, Rodney C., and Eugene I. Smith
1976 Stratigraphy and Structure of the Northwestern Part of the Mogollon Plateau Volcanic Province, Catron County, New Mexico. In *Cenozoic Volcanism in Southwestern New Mexico,* edited by W. E. Elston and S. A. Northrup, pp. 57-62. New Mexico Geological Society, Special Publication 5.

Rice, Glen E.
1975 *A Systematic Explanation of a Change in Mogollon Settlement Patterns.* Ph.D. dissertation, University of Washington, Seattle. University Microfilms, Ann Arbor, Michigan.

1980 An Analytical Overview of the Mogollon Tradition. In *Studies in the Prehistory of the Forestdale Region, Arizona,* edited by C. R. Stafford and G. E. Rice, pp. 9-40. Arizona State University, Anthropological Field Studies No. 1. Tempe.

Ridings, Rosanne
1991 Obsidian Hydration Dating: The Effects of Mean Exponential Ground Temperature and Depth of Artifact Recovery. *Journal of Field Archaeology* 18:77-85.

Riley, Carroll L.
1954 *A Survey of Navajo Archaeology.* University of Colorado Studies, Series in Anthropology 4:45-60. Boulder.

Rinaldo, John B.
1941 Conjectures on the Independent Development of the Mogollon Culture. *American Antiquity* 7(1):5-19.

1956 The Artifacts of Higgins Flat Pueblo. In

Higgins Flat Pueblo, Western New Mexico, by P. S. Martin, J. B. Rinaldo, E. A. Bluhm, H. C. Cutler, and R. Grange, Jr. Fieldiana: Anthropology 45. Field Museum of Natural History, Chicago.

1959 *Foote Canyon Pueblo, Eastern Arizona.* Fieldiana: Anthropology 49 (2). Field Museum of Natural History, Chicago.

Rinaldo, John B., and Elaine Bluhm
1956 *Late Mogollon Pottery Types of the Reserve Area.* Fieldiana: Anthropology 36(7):149-187. Field Museum of Natural History, Chicago.

Rindos, David
1980 Symbiosis, Instability, and the Origins and Spread of Agriculture: A New Model. *Current Anthropology* 21(6):751-772.

Roberts, Frank H. H., Jr.
1930 *Early Pueblo Ruins in the Piedra District, Southwestern Colorado.* Bureau of American Ethnology, Bulletin 26, Smithsonian Institution, Washington, D.C.

1937 Archaeology in the Southwest. *American Antiquity* 3:3-33.

Robinson, William J., and Catherine M. Cameron
1991 *A Directory of Tree-Ring Dated Prehistoric Sites in the American Southwest.* Laboratory of Tree-Ring Research, University of Arizona, Tucson.

Rocek, Thomas R.
1996 Sedentism and Mobility in the Southwest. In *Interpreting Southwestern Diversity: Underlying Principles and Overarching Patterns,* edited by P. R. Fish, and J. J. Reid, pp. 17-22. Arizona State University, Anthropological Research Papers No. 48, Tempe.

Rogge, A. Eugene, Melissa Keane, and D. Lorne McWatters
1994 *The Historical Archaeology of Dam Construction Camps in Central Arizona,* vol. 1. Dames and Moore Intermountain Cultural Resource Services, Research Paper 10. Phoenix, Arizona.

Rogge, A. Eugene, Whitney Smith, and Glenn P. Darrington
1998 *An A.D. 1500 Apache Mescal Camp? Archaeological Investigation of Site LA 112354 in the Upper Mimbres Region of Grant County, New Mexico.* Research Paper No. 52, Dames and Moore, Phoenix, Arizona.

Roth, Barbara J.
1989 *Late Archaic Settlement and Subsistence in the Tucson Basin.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Arizona, Tucson.

1996a *Early Formative Adaptations in the Southern Southwest.* Monographs in World Archaeology No. 25. Prehistory Press, Madison, Wisconsin.

1996b Introduction: Early Hunters, Gatherers, and Farmers in the Southern Southwest. In *Early Formative Adaptations in the Southern Southwest,* edited by B. Roth, pp.1-4. Monographs in World Archaeology No. 25. Prehistory Press, Madison, Wisconsin.

1996c Regional Land Use in the Late Archaic of the Tucson Basin: A View from the Upper Bajada. In *Early Formative Adaptations in the Southern Southwest,* edited by B. Roth, pp. 37-48. Monographs in World Archaeology No. 25. Prehistory Press, Madison, Wisconsin.

Roth, Barbara, and Bruce B. Huckell
1992 Cortaro Points and the Archaic of Southern Arizona. *Kiva* 57 (4): 353-370.

Rovner, Irwin
1971 Potential of Opal Phytoliths for Use in Paleoecological Reconstruction. *Quaternary Research* 1 (3):343-359.

Rozen, Kenneth C.
1981 Patterned Associations among Lithic Technology, Site Content, and Time: Results of the TEP St. Johns Project Lithic Analysis. In *Prehistory of the St. Johns Area, East Central Arizona: the TEP St. Johns Project,* by D. Westfall, pp. 157-232. Arizona State Museum, Cultural Resource Management Division Archaeological Series No. 153. University of Arizona, Tucson.

Ruppé, R.J.
1966 The Archaeological Survey: A Defense. *American Antiquity* 31:313-333.

Saitta, Dean J.
1991 Room Use and Community Organization at the Pettit Site, West Central New Mexico. *Kiva* 56 (4):385-409.

1994 Class and Community in the Prehistoric Southwest. In *The Ancient Southwestern Community: Models and Methods for the Study of Prehistoric Social Organization,* edited by W. H. Wills and R. D. Leonard, pp. 25-43. University of New Mexico Press, Albuquerque.

Sampson, C. Garth
1988 *Stylistic Boundaries among Mobile Hunter-Gatherers.* Smithsonian Institution Press, Washington, D.C.

Sandor, Jonathan Andrew
1983 *Soils at Prehistoric Agricultural Terracing Sites in New Mexico.* Ph.D. dissertation, University of California at Berkeley, Berkeley.

Sayles, E. B.
1945 *The San Simon Branch: Excavations at Cave Creek and in the San Simon Valley: I. Material Culture.* Medallion Papers No. 34. Gila Pueblo, Globe, Arizona.

1983 *The Cochise Cultural Sequence in Southeastern Arizona.* Anthropological Papers of the University of Arizona No. 42. University of Arizona Press, Tucson.

Sayles, E. B., and Ernst Antevs
1941 *The Cochise Culture.* Medallion Papers No. 29. Gila Pueblo, Globe, Arizona.

Sayles, E. B., and Gladys Sayles
1948 The Pottery of Ida Redbird. *Arizona Highways,* January:28-31.

Schaafsma, Curtis F.
1981 Early Apacheans in the Southwest: A Review. In *The Protohistoric Period in the North American Southwest, A.D. 1450-1700,* edited by D. R. Wilcox and W. B. Masse, pp. 291-320. Arizona State University, Anthropological Research Papers No. 24. Tempe.

Schamber, F. H.
1977 A Modification of the Linear Least-Squares Fitting Method which Provides Continuum Suppression. In *X-ray Fluorescence Analysis of Environmental Samples,* edited by T. G. Dzubay, pp. 241-257. Ann Arbor Science Publishers, Michigan.

Schiffer, Michael B.
1976 *Behavioral Archaeology.* Academic Press, New York.

1992 *Technological Perspectives on Behavioral Change.* The University of Arizona Press, Tucson.

Schiffer, Michael B., and James M. Skibo
1987 Theory and Experiment in the Study of Technological Change. *Current Anthropology* 28:595-622.

Schlanger, Sarah H.
1988 The Roles of Structure Configuration and Agricultural Dependence in the Transition from Pithouse to Pueblo. Paper presented at the Annual Meeting of the American Anthropological Association, Phoenix.

1990 Artifact Assemblage Composition and Site Occupation Duration. In *Perspectives on Southwestern Prehistory*, edited by P. E. Minnis and C. L. Redman. Westview Press, Boulder, Colorado.

1992 Recognizing Persistent Places in Anasazi Settlement Systems. In *Space, Time, and Archaeological Landscapes,* edited by J. Rossignol and L. Wandsnider, pp. 91-112. Plenum Press, New York.

Schlanger, Sarah H., and Richard H. Wilshusen
1993 Local Abandonments and Regional Conditions in the North American Southwest. In *Abandonment of Settlements and Regions: Ethnoachaeological and Archaeological Approaches,* edited by C. M. Cameron and S. A. Tomka, pp. 85-98. Cambridge University Press, Cambridge.

Schoenwetter, James
1962 The Pollen Analysis of Eighteen Archaeological Sites in Arizona and New Mexico. In *Chapters in the Prehistory of Eastern Arizona I,* edited by P. S. Martin, J. B. Rinaldo, W. A. Longacre, C. Cronin, L. G. Freeman, Jr., and J. Schoenwetter. Fieldiana Anthropology 53:168-193. Chicago Natural History Museum, Chicago.

Scholes, France V.
1930 Documents for the History of the New Mexican Missions in the Seventeenth Century. *New Mexico Historical Review* 5(2).

Schroeder, Albert H.
1952 Documentary Evidence Pertaining to the Early Historic Period of Southern Arizona. *New Mexico Historical Review* 27(2):137-167.

1962 A Study of the Apache Indians, Part 4: The Mogollon, Copper Mine, Mimbres, Warm Spring, and Chiricahua Apache. Manuscript on file, University of New Mexico Library, Albuquerque.

1963 Navajo and Apache Relationships West of the Rio Grande. *El Palacio* 70(3).

1973 The Mescalero Apache. In *Technical Manual: Survey of the Tularosa Basin: The Research Design.* Human Systems Research, Inc., Albuquerque, New Mexico.

1974 A Study of the Apache Indians: Part V, Tonto and Western Apache Indians. In *American Indian Ethnohistory: Indians of the Southwest, Apache Indians IV,* pp.327-645. Garland Publishing Co., New York.

Schroeder, A. H., and Fred Wendorf
1954 Excavations near Aragon, New Mexico. *Highway Salvage Archaeology 1(5):53-65.* Museum of New Mexico, Santa Fe.

Schroedl, Alan R.
1976 *The Archaic of the Northern Colorado Plateau.* Ph.D. dissertation, Department of Anthropology, University of Utah, Salt Lake City.

Schulman, Edmund
1938 Nineteen Centuries of Rainfall History in the Southwest. *American Meterological Society Bulletin* 19:211-215.

Schutt, Jeanne A.
1980 The Analysis of Wear Patterns Resulting from the Use of Flake Tools in Manufacturing and Processing Activities: A Preliminary Report. In *Human Adaptations in a Marginal Environment: The UII Mitigation Project,* edited by J. Moore and J. Winter, pp.66-93. Office of Contract Archeology, University of New Mexico, Albuquerque.

1991 Projectile Point Analysis. In *Landscape Archeology in the Southern Tularosa Basin,* vol. 2, *Testing, Excavation, and Analysis,* edited by W. Doleman, R. Chapman, J. Schutt, M. Swift, and K. Morrison, pp. 421. Office of Contract Archeology, University of New Mexico, Albuquerque.

Schutt, Jeanne, Richard C. Chapman, June-el Piper
1994 *On the Periphery of the Mimbres-Mogollon: The Cuchillo Negro Archeological Project.* University of New Mexico, Office of Contract Archeology, Albuquerque.

Sebastian, Lynne
1989 The Archaic Period. In *Living on the Land: 11,000 Years of Human Adaptation in Southeastern New Mexico,* edited by L. Sebastian and S. Larralde, pp. 41-57. Office of Contract Archeology, University of New Mexico, Albuquerque.

1992 *The Chaco Anasazi: Sociopolitical Evolution in the Prehistoric Southwest.* Cambridge University Press, Cambridge.

Sense, Richard
1967 A Prehistoric Quarry near Ray, Arizona. *The Kiva* 32(4):170-174.

Seymour, Deni J.
1988 An Alternative View of Sedentary Period Hohokam Shell-Ornament Production. *American Antiquity* 53(4):812-829.

Shackley, M. Steven
1988 Sources of Archaeological Obsidian in the Southwest: An Archaeological, Petrological, and Geochemical Study. *American Antiquity* 53(4):752-772.

1990 *Early Hunter-Gatherer Procurement Ranges in the Southwest: Evidence from Obsidian Geochemistry and Lithic Technology.* Unpublished Ph.D. dissertation, Department of Anthropology, Arizona State University, Tempe.

1992 The Upper Gila River Gravels as an Archaeological Obsidian Source Region: Implications for Models of Exchange and Interaction. *Geoarchaeology* 7(4):315-326.

1994 Intersource and Intrasource Geochemical Variability in Two Newly Discovered Archaeological Obsidian Sources in the

Southern Great Basin. *Journal of California and Great Basin Anthropology* 16(1):118-129.

1995 Sources of Archaeological Obsidian in the Greater American Southwest: An Update and Quantitative Analysis. *American Antiquity* 60(3):531-551.

1996a An Energy Dispersive X-Ray Fluorescence (EDXRF) Analysis of Obsidian Artifacts from 19 Prehistoric Sites in Catron County, New Mexico. Report prepared for the Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

1996b Range and Mobility in the Early Hunter-Gatherer Southwest. In *Early Formative Adaptations in the Southern Southwest,* edited by B. Roth, pp. 5-16. Monographs in World Archaeology No. 25. Prehistory Press, Madison, Wisconsin.

1997 Intrasource Chemical Variability and Secondary Depositional Processes: Lessons from the American Southwest. In *Archaeological Obsidian Studies: Method and Theory*, edited by M. S. Shackley. Plenum Press, New York.

Shafer, Harry J.
1995 Architecture and Symbolism in Transitional Pueblo Development in the Mimbres Valley, SW New Mexico. *Journal of Field Archaeology* 22(1):23-47.

Shafer, Harry J., and Robbie L. Brewington
1995 Microstylistic Changes in Mimbres Black-on-white Pottery: Examples from the Nan Ruin, Grant County, New Mexico. *Kiva* 61(1):5-29.

Shaffer, Brian S., and Christopher P. Schick
1995 Environment and Animal Procurement by the Mogollon of the Southwest. *North American Archaeologist* 16(2):117-132.

Shelley, Phillip H.
1980 Statistical Analysis of Projectile Point Data. In *Investigations at the Salmon Site,* vol. 3, edited by C. Irwin-Williams and P. Shelley, pp. 75-95. Eastern New Mexico University, Portales.

Shepard, Anna O.
1942 *Rio Grande Glaze Paint Ware: A Study Illustrating the Place of Ceramic Technological Analysis in Archaeological Research.* Smithsonian Institution, Contributions to American Anthropology and History, vol. 39. Washington, D.C.

1965 *Ceramics for the Archaeologist.* Carnegie Institution of Washington, Publication 609. Washington, D.C.

Shoberg, Marilyn Browne
1998 *Gallita Canyon: A Cibola Mogollon Community in the Gallo Mountains, West-Central New Mexico.* Master's thesis, University of Texas at Austin, Austin.

Sigleo, Anne
1970 *Trace Element Geochemistry of Southwestern Turquoise.* Master's thesis, Department of Geology, University of New Mexico, Albuquerque.

Simmons, Alan H.
1982 *Prehistoric Adaptive Strategies in the Chaco Canyon Region, Northwestern New Mexico.* Navajo Nation Papers in Anthropology No. 9. Window Rock, Arizona.

1984 The San Juan Basin Archaic—Archaeological and Environmental Context. In *Archaic Prehistory and Paleoenvironments in the San Juan Basin, New Mexico: The Chaco Shelters Project,* edited by A. H. Simmons, pp. 5-29. University of Kansas, Museum of Anthropology Project Report Series No. 53. Lawrence.

1986 New Evidence for the Early Use of Cultigens in the American Southwest. *American Antiquity* 51:73-89.

1989 The Unknown Archeology of the Southwest: The Archaic. In *Human Adaptations and Cultural Change in the Greater Southwest: An Overview of Archeological Resources in the Basin and Range Province,* edited by A. H. Simmons, A. L .W. Stodder, D. D. Dykeman, and P. A. Hicks, pp. 39-74. Arkansas Archeological Survey, Research Series No. 32, Fayetteville.

Simpson, B. B., and M. C. Ogorzaly
1986 *Economic Botany, Plants in Our World*. McGraw-Hill Book Co., New York.

Skibo, James M., and Eric Blinman
1996 Exploring the Origins of Pottery on the Colorado Plateau. Paper presented at the Pottery and People Conference, Normal, Illinois.

Smiley, Francis E., IV
1985 *The Chronometrics of Early Agricultural Sites in Northeastern Arizona: Approaches to the Interpretation of Radiocarbon Dates.* Ph.D. dissertation, University of Michigan. University Microfilms, Ann Arbor.

1994 The Agricultural Transition in the Northern Southwest: Patterns in the Current Chronometric Data. *Kiva* 60(2):165-189.

Smiley, Terah L.
1952 *Four Late Prehistoric Kivas at Point of Pines, Arizona.* University of Arizona Bulletin 23(3). Tucson.

Smith, Watson
1952 *Excavations in the Black Hawk Valley, Wupatki National Monument, Arizona.* Museum of Northern Arizona, Bulletin No. 24, Flagstaff.

1971 *Painted Ceramics of the Western Mound at Awatovi.* Papers of the Peabody Museum of Archaeology and Ethnology, vol. 38. Cambridge, Massachusetts.

1973 *The Williams Site: A Frontier Mogollon Village in West-Central New Mexico.* Papers of the Peabody Museum of Archaeology and Ethnology, vol. 39(2). Cambridge, Massachusetts.

1990 *When Is a Kiva? And Other Questions about Southwestern Archaeology,* edited by R. H. Thompson. The University of Arizona Press, Tucson.

Snow, David H.
1991 Upland Prehistoric Maize Agriculture in the Eastern Rio Grande and Its Peripheries. In *Farmers, Hunters, and Colonists: Interaction Between the Southwest and Southern Plains,* edited by K. A. Spielmann, pp. 71-88. University of Arizona Press, Tucson.

Sollberger, J. B.
1986 Lithic Fracture Analysis: A Better Way. *Lithic Technology* 15:101-105.

South, Stanley
1977 *Method and Theory in Historical Archaeology.* Academic Press, New York.

Spencer, Katherine
1947 *Reflection of Social Life in the Navaho Origin Myth.* University of New Mexico Publication in Anthropology No. 3. Albuquerque.

Speth, John D.
1988 Do We Need Concepts Like "Mogollon," "Anasazi," and "Hohokam" Today? A Cultural Anthropological Perspective. *The Kiva* 53:201-204.

1990 The Study of Hunter-Gatherers in the American Southwest: New Insights from Ethnology. In *Perspectives on Southwestern Prehistory,* edited by P. E. Minnis and C. L. Redman, pp. 15-25. Westview Press, Boulder, Colorado.

Speth, John D., and Susan L. Scott
1989 Horticulture and Large-Game Hunting: The Role of Resource Depletion and the Constraints of Time and Labor. In *Farmers as Hunters*, edited by S. Kent, pp. 71-79. Cambridge University Press, Cambridge.

1990 Introduction: Hunters and Gatherers. In *Perspectives on Southwestern Prehistory,* edited by P. E. Minnis and C. L. Redman, pp. 9-25. Westview Press, Boulder, Colorado, and Oxford.

Stafford, C. Russell
1980 Aspects of the Variability in Ceramics from the Forestdale Region. In *Studies in the Prehistory of the Forestdale Region, Arizona,* edited by C. R. Stafford and G. E. Rice, pp. 298-332. Arizona State University, Anthropological Field Studies 1, Tucson.

Stark, Miriam T.
1995 The Early Ceramic Horizon and Tonto Basin Prehistory. In *The Roosevelt Community Development Study,* vol. 2, *Ceramic Chronology, Technology, and Economics,* edited by J. M. Heidke and M. T. Stark, pp. 249-296. Center for Desert Archaeology, Anthropological Papers No. 14. Tucson, Arizona.

Stark, Miriam T., Jeffery J. Clark, and M. D. Elston
1995 Causes and Consequences of Migration in the

13th Century Tonto Basin. *Journal of Anthropological Archaeology* 14(2):212-246.

Stein, Walter T.
1963 Mammal Remains from Archaeological Sites in the Point of Pines Region, Arizona. *American Antiquity* 29:213-220.

Stephen, Alexander M.
1936 *Hopi Journal of Alexander M. Stephen,* edited by E. W. C. Parsons. Columbia University Contributions to Anthropology, New York.

Stephens, David W., and John R. Krebs
1986 *Foraging Theory.* Princeton University Press, Princeton, Connecticut.

Sterling, Christine L.
1992 Historic Irrigation Ditch and Culvert Study. In *Archaeological Survey and Testing Proposal for Sites along U.S. 180, Luna to the Arizona State Line, Catron County, New Mexico,* by D. Zamora and C. Sterling, pp. 20-34. Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 104. Santa Fe.

Stevenson, Christopher, E. Knaus, J. Mazer, and J. Bates
1993 Homogeneity of Water Content in Obsidian form the Coso Volcanic Field: Implications for Obsidian Hydration Dating. *Geoarchaeology* 8(5):371-384.

Stevenson, Christopher, P. Sheppard, and D. Sutton
1996 Advances in the Hydration Dating of New Zealand Obsidian. *Journal of Archaeological Science* 23:233-242.

Stevenson, M. S.
1915 *Ethnobotany of the Zuni Indians.* 30th Annual Report of the Bureau of American Ethnology. U.S. Government Printing Office, Washington, D.C.

Stiger, Mark A.
1979 Mesa Verde Subsistence Patterns from Basketmaker to Pueblo III. *The Kiva* 44:133-144.

Stockton, Charles W.
1975 *Long-Term Streamflow Records Reconstructed from Tree Rings.* Papers of the Laboratory of Tree-Ring Research, 5. University of Arizona Press, Tucson.

Stone, Connie L., and Todd W. Bostwick
1996 Environmental Contexts and Archaeological Correlates: The Transition to Farming in Three Regions of the Arizona Desert. In *Early Formative Adaptations in the Southern Southwest,* edited by B. Roth, pp. 17-26. Monographs in World Archaeology No. 25. Prehistory Press, Madison, Wisconsin.

Stone, Tammy
1986 An Examination of Mogollon Corrugated Pottery. In *Mogollon Variability,* edited by C. Benson and S. Upham, pp. 89-106. New Mexico State University Museum, Occasional Papers No. 15. Las Cruces.

Stuart, David E., and Robin E. Farwell
1983 Out of Phase: Late Pithouse Occupation in the Highlands of New Mexico. In *High-Altitude Adaptations in the Southwest,* edited by J. C. Winter, pp. 115-158. Cultural Resources Management Report 2, USDA Forest Service, Albuquerque.

Stuart, David E., and Rory Gauthier
1981 *Prehistoric New Mexico: Background for Survey.* New Mexico State Historic Preservation Division, Santa Fe.

Sullivan, Alan P.
1982 Mogollon Agrarian Ecology. *The Kiva* 48 (1-2):1-15.

Swank, G. R.
1932 *The Ethnobotany of the Acoma and Laguna Indians.* Unpublished Master's thesis, Department of Anthropology, University of New Mexico, Albuquerque.

Szuter, Christine R.
1989 Spatial and Temporal Intrasite Variability in the Faunal Assemblage form Las Colinas. In *The 1982-1984 Excavations at Las Colinas: Environment and Subsistence,* edited by D. A. Graybill, D. A. Gregory, F. L. Nials, S. K. Fish, R. E. Gasser, C. H. Miksicek, and C. R. Szuter. Arizona State Museum, Archaeological Series 162(5). University of Arizona, Tucson.

Szuter, Christine R., and Frank E. Bayham
1989 Sedentism and Prehistoric Animal Procurement among Desert Horticulturalists of the North American Southwest. In

Farmers as Hunters: The Implications of Sedentism, edited by S. Kent, pp. 80-95. Cambridge University Press, Cambridge.

Tagg, Martyn D.
1985 *Tonto National Monument: An Archeological Survey.* Publications in Anthropology No. 31. Western Archeological and Conservation Center, National Park Service, USDI, Tucson.

1996 Early Cultigens from Fresnal Shelter, Southeast New Mexico. *American Antiquity* 61(2):311-324.

Tainter, Joseph A.
1982 Symbolism, Interaction, and Cultural Boundaries: The Anasazi-Mogollon Transition Zone in West-Central New Mexico. In *Mogollon Archaeology: Proceedings of the 1980 Mogollon Conference,* edited by P. H. Beckett, pp. 3-9. Acoma Books, Ramona, California.

1984 Perspectives on the Northern Mogollon Boundary Phenomenon. In *Recent Research in Mogollon Archaeology,* edited by S. Upham, F. Plog, D. G. Batcho, and B.E. Kaufman, pp. 45-58. University Museum, New Mexico State University, Occasional Paper No. 10. Las Cruces.

Tainter, Joseph A., and David A. Gillio
1980 *Cultural Resource Overview, Mt. Taylor Area, New Mexico.* USDA Forest Service, Southwestern Regional Office and USDFI Bureau of Land Management, Santa Fe.

Tainter, Joseph A., and Fred Plog
1994 Structure and Patterning: The Formation of Puebloan Archaeology. In *Themes of Southwest Prehistory,* edited by G. J. Gumerman, pp. 165-182. School of American Research Press, Santa Fe.

Teague, George A.
1986 Stone Artifacts. In *The Archeology of Gila Cliff Dwellings,* by K. Anderson, G. Fenner, D. Morris, G. Teague, and C. McKusick, pp. 131-161. Western Archeological and Conservation Center Publications in Anthropology 36, Tucson, Arizona.

Terrell, John Upton
1974 *Apache Chronicle.* Thomas Y. Crowell Co., New York.

Terry, R. D. and V. G. Chilingar
1955 Summary of "Concerning Some Additional Aids in Studying Sedimentary Formations," by M. S. Shvetsov. *Journal of Sedimentary Petrology* 25:229-234.

Thomas, Alfred Barnaby
1959 *The Chiricahua Apache 1695-1876.* A report of the Mescalero-Chiricahua Land Claims Project, University of New Mexico, Albuquerque.

Thomas, Cyrus
1907 Primary Indian Migrations in North America. *XVth Congres International Des Americanistes* 1:189-204. Dussault et Proucx, Quebec.

Thomas, David Hurst
1978 Arrowheads and Atlatl Darts: How the Stones Got the Shaft. *American Antiquity* 43:461-472.

1981 How to Classify the Projectile Points of Monitor Valley, Nevada. *Journal of California Great Basin Anthropology* 3(1):7-43.

1988 *The Archaeology of Monitor Valley: 3, Survey and Additional Excavations.* Anthropological Papers of the American Museum of Natural History, vol. 66, pt 2. New York.

Thomas, David H., and Susan L. Bierwirth
1983 Material Culture of Gatecliff Shelter: Projectile Points. In *The Archaeology of Monitor Valley: 2, Gatecliff Shelter,* by D. Thomas, pp. 177-194. Anthropological Papers of the American Museum of Natural History, vol. 59, pt. 1. New York.

Thompson, Raymond H.
1987 Early Settlements in Western North America: The Southwest. Paper, Eleventh International Congress of Pre-and Protohistoric Sciences, Mainz, Germany.

Thrapp, Dan L.
1967 *The Conquest of Apacheria.* University of Oklahoma Press, Norman.

Toll, H. Wolcott
1978 Quartzite Lithic Material in Archaeology: Qualities and Quandries with Special Reference to Use Wear. *Plains*

Anthropologist 23(79):43-67.

1981 Ceramic Comparisons Concerning Redistribution in Chaco Canyon, New Mexico. In *Production and Distribution: A Ceramic Viewpoint,* edited by H. Howard and E. L. Morris, pp. 83-121. BAR International Series 120, British Archaeological Reports, Oxford.

1985 *Pottery Production, Public Architecture, and the Chaco System.* Ph.D. dissertation, Department of Anthropology, University of Colorado, Boulder.

Toll, H. Wolcott, and Peter J. McKenna
1987 The Ceramography of Pueblo Alto. In *Investigations at the Pueblo Alto Complex, Chaco Canyon, New Mexico, 1975-1979,* vol. 3, *Artifactual and Biological Analysis,* edited by F. J. Mathien and T. C. Windes, pp. 19-230. National Park Service, Publications in Archaeology 18F, Chaco Canyon Studies, Santa Fe.

Toll, Mollie S.
1983 Changing Patterns of Plant Utilization for Food and Fuel: Evidence from Flotation and Macrobotanical Remains. In *Economy and Interaction along the Lower Chaco River: The Navajo Mines Archeological Program, Mining Area III,* edited by P. Hogan and J. C. Winter, Office of Contract Archeology, University of New Mexico, Albuquerque.

1985 An Overview of Chaco Canyon: Macrobotanical Materials and Analyses to Date. In *Environment and Subsistence of Chaco Canyon, New Mexico,* edited by F. J. Mathien. Publications in Archeology 18E, Chaco Canyon Series. National Park Service, USDI, Albuquerque.

Toll, Mollie S., and Pamela J. McBride
1996 *Flotation and Macrobotanical Materials from Early Pithouse and Early Pueblo Sites of the Quemado Area, NM: The Gallo Mountain Project.* Museum of New Mexico, Office of Archaeological Studies, Ethnobotany Lab Technical Series 37. Santa Fe.

Torrance, Robin
1983 Time Budgeting and Hunter-Gatherer Technology. In *Pleistocene Hunters and Gatherers in Europe,* edited by G. Bailey, pp. 11-22. Cambridge University Press, New York.

Tower, Donald B.
1945 The Use of Marine Molluscs and Their Value in Reconstructing Prehistoric Trade Routes in the American Southwest. *Papers of the Excavators Club* 2(3):1-56. Cambridge.

Towner, Ronald H.
1996 *The Archaeology of Navajo Origins.* The University of Utah Press, Salt Lake City.

Towner, Ronald H., and Jeffrey S. Dean
1996 Questions and Problems in Pre-Fort Sumner Navajo Archaeology. In *The Archaeology of Navajo Origins,* edited by R. H. Towner, pp. 3-18. University of Utah Press, Salt Lake City.

Trewartha, Glen T.
1961 *The Earth's Problem Climate.* University of Wisconsin Press, Madison.

Tuggle, H. David, and J. Jefferson Reid
1982 Cross-Dating Cibola White Wares. In *Ceramic Studies, Cholla Project Archaeology,* vol. 5, edited by J. J. Reid, pp. 8-17. Arizona State Museum, Archaeological Series No. 161, Tempe.

Tuggle, H. David, J. Jefferson Reid, and Robert C. Cole, Jr.
1984 Fourteenth Century Mogollon Agriculture in the Grasshopper Region of Arizona. In *Prehistoric Agricultural Strategies in the Southwest,* edited by S. K. Fish and P. R. Fish, pp. 101-110. Arizona State University, Anthropological Research Papers No. 33. Tempe.

Twiss, Page C.
1987 Grass-Opal Phytoliths as Climatic Indicators of the Great Plains Pleistocene. In *Quaternary Environments of Kansas,* edited by W. C. Johnson, pp. 179-188. Kansas Geological Survey Guidebook Series 5.

Tyler, S. Lyman, and H. Darrel Taylor
1958 The Report of Fray Alonso de Posada in Relation to Quivira and Teguayo. *New Mexico Historical Review* 33(4):285-314.

USDA
1986 *Terrestrial Ecosystem Handbook.* USDA

Forest Service R3.

Ubelaker, D. H.
1989 *Human Skeletal Remains: Excavation, Analysis, Interpretation.* Taraxacum, Washington, D.C.

Unknown
1961 Report on file. Reserve Range District, Reserve, New Mexico.

Upham, Steadman
1982 *Polities and Power: An Economic and Political History of the Western Pueblo.* Academic Press, New York.

1984 Adaptive Diversity and Southwestern Abandonment. *Journal of Anthropological Research* 40:235-256.

Upham, Steadman, Patricia L. Crown, and Stephen Plog
1994 Alliance Formation and Cultural Identity in the American Southwest. In *Themes in Southwest Prehistory,* edited by G. J. Gumerman, pp. 183-210. School of American Research Press, Santa Fe, New Mexico.

Upham, Steadman, Kent G. Lightfoot, and Gary M. Feinman
1981 Explaining Socially Determined Ceramic Distributions in the Prehistoric Plateau Southwest. *American Antiquity* 46:822-833.

Upham, Steadman, R. S. MacNeish, and Christopher M. Stevenson
1987 Evidence Concerning the Origin of Maiz de Ocho. *American Anthropologist* 90:683-684.

Upham, Steadman, Christopher M. Stevenson, Richard E. Newton, and Michael Johnson
1986 Chronometric Dating of San Pedro Style Projectile Points in Southern New Mexico. In *Mogollon Variability,* edited by C. Benson and S. Upham, pp. 79-87. New Mexico State University, University Museum Occasional Papers No. 15. Las Cruces.

Van Devender, T. R., and W. G. Spaulding
1979 Development of Vegetation and Climate in the Southwestern United States. *Science* 204:701-710.

Van West, Carla R.
1990 *Modeling Prehistoric Climatic Variability and Agricultural Production in Southwestern Colorado: A GIS Approach.* Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman. University Microfilms, Ann Arbor.

Varien, Mark
1990 Ceramics. In *Excavations at Three Prehistoric Sites along Pia Mesa Road,* prepared by M. Varian, pp. 88-106. Zuni Archaeology Program, Research Series No. 4. Zuni, New Mexico.

Vaughan, Patrick C.
1985 *Use-Wear Analysis of Flaked Stone Tools.* University of Arizona Press, Tucson.

Venn, Tasmin
1984 Shell Artifacts from Arroyo Hondo Pueblo. In *The Faunal Remains from Arroyo Hondo Pueblo, New Mexico: A Study in Short-Term Subsistence Change,* edited by R. W. Lang and A. H. Harris. Arroyo Hondo Archaeological Series, vol. 5, pp. 227-242. School of American Research Press, Santa Fe, New Mexico.

Vierra, Bradley J.
1980 A Summary and Comparison of Excavated Archaic and Anasazi Sites. In *Human Adaptations in a Marginal Environment: The UII Mitigation Project,* edited by J. L. Moore and J. C. Winter, pp. 382-386. Office of Contract Archeology, University of New Mexico, Albuquerque.

1990 Archaic Hunter-Gatherer Archaeology in Northwestern New Mexico. In *Perspectives on Southwestern Prehistory,* edited by P. Minnis and C. Redman, pp.57-67. Westview Press, Boulder, Colorado.

1994 Archaic Hunter-Gatherer Archaeology in the American Southwest. In *Archaic Hunter-Gatherer Archaeology in the American Southwest,* edited by B. Vierra, pp. 5-61. Eastern New Mexico University Contributions in Anthropology 13(1), Portales.

1996 Late Archaic Settlement, Subsistence and Technology: An Evaluation of Continuity vs. Replacement Arguments for the Origins of Agriculture in the Northern Southwest. Paper presented at the Conference on the Archaic Prehistory of the North American Southwest, Albuquerque.

Vierra, Bradley J., and William H. Doleman
1994 The Organization of Archaic Subsistence-Settlement Systems in the Northern Southwest. In *Archaic Hunter-Gatherer Archaeology in the American Southwest,* edited by B. Vierra, pp. 76-102. Eastern New Mexico University Contributions in Anthropology 13(1), Portales.

Vines, Robert A.
1960 *Trees, Shrubs, and Woody Vines of the Southwest.* University of Texas Press, Austin.

Vivian, R. Gordon
1959 *The Hubbard Site and Other Tri-Wall Structures in New Mexico and Colorado.* National Park Service, Archaeological Research Series No. 5. USDI, Washington, D.C.

1970 An Apache Site on Ranch Creek, Southeast Arizona. *The Kiva* 35(3):125-130.

Wait, Walter K.
1983 A Preliminary Model for the Preceramic at Star Lake. In *The Star Lake Archaeological Project: Anthropology of a Headwaters Area of Chaco Wash, New Mexico,* edited by W. Wait and B. Nelson, pp. 131-152. Southern Illinois University Press, Carbondale.

Wallace, Henry D.
1995 Decorated Buffware and Brownware Ceramics. In *The Roosevelt Community Development Study,* vol. 2, *Ceramic Chronology, Technology, and Economics,* edited by J. M. Heidke and M. T. Stark, pp. 185-232. Center for Desert Archaeology, Anthropological Papers No. 14. Tucson, Arizona.

Wallace, Laurel T.
1998 *The Ormand Village: Final Report on the 1965-1966 Excavation.* Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 229. Santa Fe.

Warren, A. H.
1972 Geology and Mineral Resources of the Apache Creek Area. In *Whiskey Creek Project: Archaeological Highway Salvage along State Highway 32 in Apache Creek Valley, Catron County, New Mexico,* by D. Kayser, pp. 18-35. Museum of New Mexico, Laboratory of Anthropology Notes No. 57. Santa Fe.

1976 An Archaeological Survey of the Occidental Minerals Corporation Proposed Mining Project Area in the Cerrillos District, Santa Fe County, New Mexico. 1974. In *ROMCOE Environmental Study, OXYMIN Cerrillos Project, April 1976.* Rocky Mountain Center on the Environment, Denver, Colorado.

Warren, A. H., and Frances Joan Mathien
1985 Prehistoric and Historic Turquoise Mining in the Cerrillos District: Time and Place. In *Southwestern Culture History: Papers in Honor of Albert H. Schroeder,* pp. 93-127. Archaeological Society of New Mexico No. 10. Albuquerque.

Washburn, Dorothy K.
1977 *A Symmetry Analysis of Upper Gila Area Ceramic Designs.* Papers of the Peabody Museum of Archaeology and Ethnography, vol. 68. Cambridge, Massachusetts.

Wasley, William W.
1960 Temporal Placement of Alma Neck Banded. *American Antiquity* 25(4):599-603.

Waters, Michael R.
1986 *The Geoarchaeology of the Whitewater Draw, Arizona.* Anthropological Papers of the University of Arizona No. 45. University of Arizona Press, Tucson.

1998 The Sulphur Spring Stage of the Cochise Culture and It's Place in Southwestern Prehistory. *Kiva* 64(2):115-135.

Waters, Michael R., and Anne I. Woosley
1990 The Geoarchaeology and Preceramic Prehistory of the Wilcox Basin, SE Arizona. *Journal of Field Archaeology* 17:163-175.

Weber, Robert H.
1994 Pluvial Lakes of the Plains of San Agustin. In *Mogollon Slope, West-Central New Mexico and East-Central Arizona,* edited by R. M. Chamberlin, B. S. Kues, S. M. Cather, J. M. Barker, and W. C. McIntosh, pp. 9-12. New Mexico Geological Society, Forty-Fifth Annual Field Conference, Socorro.

Weber, Robert H., and Max E. Willard
1956 Reconnaissance Geologic Map of the Reserve 30 Minute Quadrangle. New Mexico Bureau of Mines and Mineral Resources. Socorro.

1958 Reconnaissance Geologic Map of the Cañon Largo 30 Minute Quadrangle. New Mexico Bureau of Mines and Mineral Resources. Socorro.

Webster's New World Dictionary of the American Language
1974 World Publishing Co., Inc., Cleveland, Ohio.

Weigand, Phil C.
1982 Mining and Mineral Trade in Prehispanic Zacatecas. *Anthropology* 6 (1-2), edited by P. C. Weigand and G. Gwynne, pp. 87-134. Department of Anthropology, State University of New York at Stony Brook, Stony Brook.

Weigand, Phil C., Garman Harbottle, and Edward V. Sayre
1977 Turquoise Sources and Source Analysis: Mesoamerica and the Southwestern USA. In *Exchange Systems in Prehistory,* edited by T. K. Earle and J. E. Ericson. Academic Press, New York.

Welch, John R.
1991 From Horticulture to Agriculture in the Late Prehistory of the Grasshopper Region, Arizona. In *Mogollon V,* edited by P. H. Beckett, pp. 75-92. COAS Publishing and Research, Las Cruces.

1994 Ethnographic Models for Tonto Basin Land Use. In *The Roosevelt Rural Sites Study,* vol. 3, edited by R. S. Ciolek-Torrello and J. R. Welch, pp. 79-120. Statistical Research, Technical Series 28, Tucson.

Wendorf, Fred
1950 *A Report on the Excavation of a Small Ruin near Point of Pines, East Central Arizona.* University of Arizona Social Sciences Bulletin 19, Tucson.

1953 *Archaeological Studies in the Petrified Forest National Monument.* Museum of Northern Arizona Bulletin 27, Flagstaff.

1954 Sites 11 and 12. In *Highway Salvage Archaeology,* vol. 1, edited by F. Wendorf, pp. 88-104. New Mexico State Highway Department and the Museum of New Mexico, Santa Fe.

1956a Some Distributions of Settlement Patterns in the Pueblo Southwest. In *Prehistoric Settlement Patterns in the New World,* edited by G. R. Wiley, pp. 18-25. Viking Fund Publications in Anthropology 23. New York.

1956b Excavations near Apache Creek, New Mexico. *Highway Salvage Archaeology,* vol. 2, pp. 17-86. New Mexico State Highway Department and Museum of New Mexico, Santa Fe.

1957 A Mimbres Pueblo near Glenwood, New Mexico. In *Highway Salvage Archaeology,* vol. 3, edited by S. Peckham, pp. 71-84. New Mexico State Highway Department and Museum of New Mexico.

Wendorf, Fred, Edward N. Ferdon, Jr., and John Bradbury
1963 A Tularosa Phase Pueblo near Luna, New Mexico. In *Highway Salvage Archaeology,* vol. 4, pp. 29-40.

Wendorf, Fred, and Tully Thomas
1951 Early Man Sites near Concho, Arizona. *American Antiquity* 17:107-114.

Wening, Karen
1992 Ground Stone. In *Investigations Into the Prehistory and History of the Upper Rio Bonito, Lincoln County, Southeastern New Mexico,* by R. E. Farwell, Y. R. Oakes, and R. N. Wiseman, pp. 81-105. Museum of New Mexico, Laboratory of Anthropology Notes No. 297. Santa Fe.

Westfall, Deborah A.
1981 *Prehistory of the St. Johns Area, East-Central Arizona: The TEP St. Johns Project.* Cultural Resource Management Division, Archaeological Series No. 153, Arizona State Museum, University of Arizona. Tempe.

Whalen, Michael E.
1987 The Bruton Bead Site and Pueblo Period Exchange in Southern New Mexico. *American Antiquity* 6 (3):173-178.

Whalen, Michael E., and Patricia A. Gilman
1990 Introduction: Transitions to Sedentism. In *Perspectives on Southwestern Prehistory,* edited by P. E. Minnis, and C. L. Redman, pp. 71-75. Westview Press, Boulder, Colorado.

Whalen, Norman M.
1971 *Cochise Culture Sites in the Central San*

Pedro Drainage, Arizona. Ph.D. dissertation, University of Arizona. University Microfilms, Ann Arbor, Michigan.

1973 Agriculture and the Cochise. *The Kiva* 39:89-96.

Wheat, Joe B.
1954 *Crooked Ridge Village.* University of Arizona Bulletin 25(3), Social Science Bulletin 24, Tucson.

1955 *Mogollon Culture Prior to A.D. 1000.* Memoirs of the American Anthropological Association 82 and Memoirs of the Society for American Archaeology 10. Menasha and Salt Lake City.

White, Tim, and P. Folkens
1991 *Human Osteology.* Academic Press, San Francisco.

Whiting, Alfred F.
1939 *Ethnobotany of the Hopi.* Museum of Northern Arizona, Bulletin 15. Northern Arizona Society of Science and Art, Flagstaff.

Whittlesey, Stephanie
1995 Mogollon, Hohoham, and O'otam: Rethinking the Early Formative Period in Southern Arizona. *Kiva* 60(4):465-480.

1998 Western Apache Archaeology. IN *Vanishing River: Landscapes and Lives of the Lower Verde Valley,* edited by S. M. Whittlesey, R. Ciolek-Torrello, and J. H. Altschul, pp. 196-197. SRI Press, Tucson.

Whittlesey, Stephanie, and Richard Ciolek-Torrello
1996 The Archaic-Formative Transition in the Tucson Basin. In *Early Formative Adaptations in the Southern Southwest,* edited by B. Roth, pp. 49-64. Monographs in World Archaeology No. 25. Prehistory Press, Madison, Wisconsin.

Whittlesey, Stephanie, Richard Ciolek-Torrello, and William L. Deaver
1994 Resurrecting the Ootam: The Early Formative Period in Arizona. Paper presented at the seventh Mogollon Conference, Las Cruces.

Wiens, Ruth
1994 The Early Archaic in Northwestern New Mexico: A Re-evaluation Based on Data from Gallegos Mesa. In *Archaic Hunter-Gatherer Archaeology in the American Southwest,* edited by B. Vierra, pp. 62-75. Eastern New Mexico University Contributions in Anthropology 13(1), Portales.

Wilcox, David R.
1978 The Theoretical Significance of Fieldhouses. In *Limited Activity and Occupation Sites,* edited by A. Ward, pp. 25-32. Center for Anthropological Study, Albuquerque.

1979 The Entry of Athapaskans into the American Southwest: The Problem Today. Paper presented at the Proto-Historic Conference, Arizona State University, Tempe.

1981 The Entry of Athapaskans into the American Southwest: The Problem Today. In *The Protohistoric Period in the American Southwest, A.D. 1450-1700,* edited by D. R. Wilcox and W.B. Masse, pp. 213-256. Arizona State University Anthropological Research Papers 24. Arizona State University, Tempe.

1988 Rethinking the Mogollon Concept. *The Kiva* 53:205-209.

Willey, Gordon R.
1966 *An Introduction to American Archaeology,* vol. 1, *North and Middle America.* Prentice-Hall, Englewood Cliffs.

Willey, Gordon R., and Jeremy A. Sabloff
1974 *A History of American Archaeology.* W. H. Freeman and Co., San Francisco.

Wills, W. H.
1985 *Early Agriculture in the Mogollon Highlands of New Mexico.* Ph.D. dissertation, Department of Anthropology, University of Michigan, Ann Arbor.

1988a *Early Prehistoric Agriculture in the American Southwest.* Cambridge University Press, Cambridge.

1988b Early Agriculture and Sedentism in the American Southwest: Evidence and Interpretations. *Journal of World Prehistory* 2(4):445-488.

1989 Patterns of Prehistoric Food Production in West-Central New Mexico. *Journal of*

Anthropological Research 45(1):139-157.

1990 Cultivating Ideas: The Changing Intellectual History of the Introduction of Agriculture in the American Southwest. In *Perspectives on Southwestern Prehistory,* edited by P. E. Minnis and C. L. Redman. Westview Press, Boulder and Oxford.

1994 The Late Archaic to Early Ceramic Period Transition in the Mogollon Highlands: New Investigations at the SU Site. Department of Anthropology, University of New Mexico. Paper in possession of author.

1995 Archaic Foraging and the Beginning of Food Production in the American Southwest. In *Last Hunters—First Farmers: New Report on the Prehistoric Transition to Agriculture,* edited by T. D. Price and A. B. Gebauer, pp. 215-242. School of American Research Press, San Francisco.

1996 The Transition from the Preceramic to Ceramic Period in the Mogollon Highlands of Western New Mexico. *Journal of Field Archaeology* 23: 1-25.

Wills, W. H., Patricia L. Crown, Jeffrey S. Dean, and Christopher G. Langston
1994 Complex Adaptive Systems and Southwestern Prehistory. In *Understanding Complexity in the Prehistoric Southwest,* edited by G. J. Gumerman and M. Gell-Mann, pp. 297-339. Addison-Wesley Publishing Co., Reading, Pennsylvania.

Wills, W. H., Yvonne Oakes, and Dean Wilson
1997 Architectural Variation and Regional Demographic Change: The Reserve Phase in the Mogollon Highlands. Paper presented at the Society of American Archaeology Annual Meeting, Nashville.

Wills, W. H., and Thomas C. Windes
1989 Evidence of Population Aggregation and Dispersal During the Basketmaker III Period in Chaco Canyon, New Mexico. *American Antiquity* 54(2):347-369.

Wilshusen, Richard H.
1988 An Introduction to Architectural Supporting Studies. In *Dolores Archaeological Program: Supporting Studies; Additive and Reductive Technologies,* compiled by E. Blinman, C. J. Phagan, and R. H. Wilshusen. USDI, Bureau of Reclamation, Denver, Colorado.

1989 Unstuffing the Estufa: Ritual Floor Features in Anasazi Pit Structures and Pueblo I Villages. In *The Architecture of Social Integration in Prehistoric Pueblos,* edited by W. D. Lipe and M. Hegmon, pp. 89-111. Occasional Papers 1, Crow Canyon Archaeological Center, Cortez, Colorado.

1992 Pueblo I Village Formation: A Reevaluation of Sites Recorded by Earl Morris on Mountain Ute Tribal Lands. *The Kiva* 57:251-269.

Wilson, John P., and A. H. Warren
1995 Notes on Archaeological Sites in Cibola and Catron Counties, New Mexico. In *Of Pots and Rocks: Papers in Honor of A. Helene Warren,* edited by M. S. Duran and D. T. Kirkpatrick, pp. 211-230. The Archaeological Society of New Mexico No. 21. Albuquerque.

Wilson, C. Dean
1994 Implications of Ceramic Resource Surveys in the Northern Mogollon Country. In *The Collected Papers of the 1992 Mogollon Conference, Las Cruces, New Mexico.* COAS Pub., Las Cruces.

1996 Implications of Dating Reevaluations of Reserve Black-on-white. Paper presented at Mogollon Conference, Silver City, New Mexico.

1998 Ceramic Assemblage. In *The Datil Mountain Project: Archaic, Puebloan, and Athabascan Campsites along U.S. 60, near Datil, Catron County, New Mexico,* by D. J. Hayden, L. A. Moiola, and Y. R. Oakes, pp. 87-99. Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes No. 177. Santa Fe.

Wilson, C. Dean, and Eric Blinman
1995 Changing Specialization of White Ware Manufacture in the Northern San Juan Region. In *Archaeological Investigations at Eight Small Sites in West-Central New Mexico: Data Recovery at the Fence Lake No. 1 Mine,* edited by P. Hogan, pp. 145-154. Office of Contract Archeology, University of New Mexico, Albuquerque.

Wilson, C. Dean, Eric Blinman, and Vickie Clay
1988 Clay Resource Use. In *Dolores Archaeological Program Supporting Studies: Additive and Reductive Technologies,* edited by E. Blinman, C. J. Phagan, and R. H. Wilshusen, pp. 375-394. USDI, Bureau of Reclamation, Denver, Colorado.

Wilson, C. Dean, Eric Blinman, James M. Skibo, and Michael B. Schiffer
1996 Designing Southwestern Pottery: A Technological and Experimental Approach. In *Interpreting Southwestern Diversity: Underlying Principles and Overarching Patterns,* edited by P. R. Fish and J. J. Reid, pp. 249-256. Arizona State University, Anthropological Research Papers No. 28. Tempe.

Windes, Thomas C.
1977 Typology and Technology of Anasazi Ceramics. In *Settlement and Subsistence along the Lower Chaco River,* edited by C. S. Rehr, pp. 270-369. University of New Mexico, Albuquerque.

Windmiller, Ric
1972 Ta-e-wun: A Colonial Period Campsite in East-Central Arizona. *The Kiva* 38(1):1-26.

1973 The Late Cochise Culture in the Sulphur Spring Valley, Southeastern Arizona: Archaeology of the Fairchild Site. *Kiva* 39:131-169.

Winship, George P.
1896 *The Journey of Coronado, 1540-1542.* Fulcrum Publishing, Inc., Golden, Colorado.

Wiseman, Regge N.
1993 Site Descriptions. In *The State Road 12 Archaeological Project: Results of Testing at Ten Sites and Data Recovery Plan for Four Sites near Reserve, New Mexico*, by Y. R. Oakes and R. N. Wiseman. Office of Archaeological Studies, Museum of New Mexico, Archaeology Notes 118. Santa Fe.

Wiseman, Regge N., and J. Andrew Darling
1986 The Bronze Trail Site Group: More Evidence for a Cerrillos-Chaco Turquoise Connection. In *By Hands Unknown: Collected dpapers in Honor of James G. Bain,* edited by A. V. Poore, pp. 115-143. Papers of the Archaeological Society of New Mexico 12. Ancient City Press, Santa Fe.

Withers, Arnold
1985 Three Circle Red-on-white: An Alternative to Oblivion. In *Southwestern Culture History: Collected Papers in Honor of Albert H. Schroeder,* edited by C. Lange, pp. 1-14. Ancient City Press, Santa Fe.

Wood, Jon Scott
1978 Migration, Development, and Abandonment: Evidence and Hypotheses. In *An Analytical Approach to Cultural Resource Management: The Little Colorado Planning Unit,* edited by F. Plog, pp. 200-210. Arizona State University, Anthropological Research Papers No. 13 and USDA Forest Service, Cultural Resources Report 9, Tucson.

1987 *Checklist of Pottery Types for the Tonto National Forest: An Introduction to the Archaeological Ceramics of Central Arizona.* The Arizona Archaeologist No. 21, Arizona Archaeological Society, Phoenix.

Woosley, Anne I., and Allan J. McIntyre
1996 *Mimbres Mogollon Archaeology: Charles C. Di Peso's Excavations at Wind Mountain.* University of New Mexico Press, Albuquerque.

Woosley, Anne I., and Michael R. Waters
1990 Reevaluation of Early Cochise Artifact Associations with Pleistocene Lake Cochise, Southeastern Arizona. *American Antiquity* 55(2):360-366.

Wormington, H. M.
1947 *Prehistoric Indians of the Southwest.* Denver Museum of Natural History Popular Series 7, Denver, Colorado.

Wozniak, Frank E.
1985 History of the Nations Draw Area. In *Prehistoric Settlement Patterns in West-Central New Mexico: The Fence Lake Coal Lease Surveys,* by Patrick Hogan, pp. 13-28. Office of Contract Archeology, University of New Mexico, Albuquerque.

Wright, Mona
1993 Simulated Use of Experimental Maize Grinding Tools from Southwestern Colorado. *Kiva* 58(3):345-355.

Young, Lisa C.
1993 Mobility and Farmers: Adaptive Diversity in the American Southwest. Dissertation

research proposal, University of Michigan, Ann Arbor.

Young, Robert W.
1983 Apachean Languages. In *Handbook of North American Indians,* vol. 10, *Southwest,* edited by A. Ortiz, pp. 393-400. Smithsonian Institution, Washington, D.C.

Zamora, Dorothy A., and Christine L. Sterling
1992 *Archaeological Survey and Testing Proposal for Sites along U.S. 180, Luna to the Arizona State Line, Catron County, New Mexico.* Office of Archaeological Studies, Museum of New Mexico, Archaeology Notes 104. Santa Fe.

Zedeño, Maria N.
1994 *Sourcing Prehistoric Ceramics at Chodistaas Pueblo, Arizona: The Circulation of People and Potters in the Grasshopper Region.* University of Arizona, Anthropological Papers No. 58. Tucson.

Zedeño, Maria N., and Barbara J. Mills
1993 Ceramic Production and Distribution: Introduction and Problem Definition. In *Across the Colorado Plateau: Anthropological Studies for the Transwestern Pipeline Expansion Project,* vol. 16, *Interpretation of Ceramic Artifacts,* edited by B. J. Mills, C. E. Goetze, and M. J. Nieves, pp. 175-271. University of New Mexico, Office of Contract Archeology and Maxwell Museum of Anthropology, Albuquerque.

Zier, Anne Hummer
1981 *An Experiment in Ground Stone Use-Wear Analysis.* Unpublished Master's thesis, University of Colorado, Boulder.