THE INTERPRETATION OF ARCHAEOLOGICAL FLOOR ASSEMBLAGES: A CASE STUDY FROM THE AMERICAN SOUTHWEST

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Analyses of the assemblages from the floors of Upland Mogollon pithouses show that variation in artifact frequencies may be attributed to differences in the intensity of abandonment and post-abandonment formation processes, such as caching, scavenging and trash dumping. The proportion of pithouses that contain caches or de facto assemblages is provocatively constant across sites—roughly 18 percent. This observation may be useful for refining estimates of the populations of sites or regions, for recognizing the size of social groups, or for identifying the abandonment sequences of pithouse villages. Prior studies that attribute variation in the frequencies of different classes of artifacts to functional differences in the uses of pithouses are rejected on the grounds of methodological inadequacy.

El análisis estadístico se emplea para examinar conjuntos de suelos de aldeas en la montañas Mogollón. Se atribuye variación en las frecuencias de tipos diferentes de instrumentos a los efectos diferenciales en procesos de formación tales como el tirado de basura, almacenamiento, y reciclado. La proporción de casas que contienen conjuntos de hecho (Schiffer 1987:89–97) es casi constante—18%. Esta observación es útil porque permite 1) estimar la población, 2) estimar los tamaños de grupos sociales, o 3) identificar el proceso de abandono de casas. Estudios previos (Hunter-Anderson 1986; Stafford and Rice 1981; que atribuyeron variación de frecuencia de tipos a diferencias funcionales) fallaron en considerar estos otros procesos. Esos estudios son rechazados porque usaron métodos inválidos.

The question of synchronic inter- and intra-site functional variation in the use of structures is an important concern for scholars who study diachronic changes in subsistence and social organization. The identification of camp sites, field houses and domestic structures helps archaeologists model the range of activities encompassed by the land use strategies of prehistoric groups. In the Upland Mogollon region of the American Southwest (see Figure 1, Table 1), some have suggested that pithouse sites included structures that enclosed a wide range of activities, and these are generally perceived to be “houses.” At the same time it has been suggested that other structures, often found at the same sites as residential structures, served as “field houses” or structures that enclosed a limited range of nonceremonial, usually subsistence-related activities. By extension, it has been argued that some sites that apparently lacked “houses” were never used for long-term domestic residence, but rather served as logistical support encampments or “field house clusters.” The empirical basis for the distinction between Upland Mogollon residential pithouses and limited activity pit structures has been provided by studies of the frequencies of different functional classes (for example, manos, metates, and projectile points) of artifacts found in intramural fill.

This paper challenges the interpretation of synchronic, intra- and intersite functional variation in Upland Mogollon pithouse use. Past interpretive efforts have underestimated the effects of prehistoric abandonment or postabandonment activities, such as caching, scavenging, and trash dumping, on floor assemblage (and “near-floor”) artifact frequencies. Since the frequencies of different artifact types do not provide an adequate basis for determining whether there were fundamental differences in the purposes for which structures were used, one must regard prior claims for functional variation as inconclusive.

This study demonstrates that postoccupation formation processes constitute strong forces that probably overwhelm or mask functional differences; uncritical reliance solely on the frequencies of different artifact types in floor assemblages to assess functional variation flies in the face of other
Figure 1. Locations of Upland Mogollon Pithouse Villages that are Considered in this Study.

demonstrable and potentially overwhelming formation processes, such as caching, scavenging, or trash dumping. Anecdotal evidence, and the analyses in this paper, shows that few pithouses fulfill the "Pompeii Premise" (see Binford 1981), and archaeologists are unlikely to excavate floor assemblages that provide pristine evidence of the activities that occurred within pithouses. Therefore, if there were functional differences in the use of pithouses, then archaeologists must devise discovery and recognition techniques that are not based on the relative frequencies of different functional types of artifacts.

Finally, this paper offers alternative interpretations for the observed artifact frequency variation in floor assemblages. This study demonstrates that the contents of pithouses may be useful for identifying sequences of house abandonment, for providing refined quantitative estimates of settlement or regional populations, or for identifying the size of social groups whose actions were determined by a common suite of decision makers (some kind of social group acting corporately).

Prior Studies of Mogollon Pithouse Assemblage Variation

Several studies have recognized intra- and intersite functional variation in pithouse use in the Upland Mogollon region of the American Southwest; the two most widely known are the Corduroy Creek Project (Stafford and Rice 1980) and Hunter-Anderson’s (1986) synthesis of Reserve Area sites (see also Gossett 1985; Stuart and Gauthier 1988:180).

The Corduroy Creek Archaeological Project (Stafford and Rice 1980) identified archaeological sites that dated to episodes within an interval from A.D. 300 to A.D. 1200. In a plenary chapter, Rice (1980a) proposed that prehistoric Southwesterners may have, at any given time, engaged in one of two
possible subsistence and settlement strategies. The possibilities included an “extensive” subsistence and settlement system that relied on a diverse array of resources, mostly wild plants and game, and an “intensive” system that relied on few resources, mostly agricultural ones. Rice suspected that “extensive” systems were pursued by occupants of pithouse villages, and that such systems entailed the seasonal aggregation and dispersal of populations in response to the availability of both wild and domesticated plants.

Rice (1980b) suggested that some sites were used during different seasons, and for functionally different purposes, apparently validating the extensive versus intensive settlement system dichotomy. The conclusion was ostensibly supported by apparent differences in the diversity of surface assemblages from AZ P:16:5 [ASM] and AZ Q:13:9 [ASM] (two sites identified in their survey), and also by the observation that the best known Forestdale pithouse sites—the Bear Ruin and Bluff sites (Haury 1985), had different proportions (presence-absence) of intramural hearths and pits.

The other study of interest is Hunter-Anderson’s (1986) analysis of pit structure assemblages from the Upper Little Colorado river and Reserve areas. In the analysis of assemblages from Reserve area sites, Hunter-Anderson concluded that the SU site was a “residential” site and that the Promontory site functioned as a combined hunting-support camp and field house cluster (Hunter-Anderson 1986:83–86). In the analyses of individual house assemblages, a somewhat more complicated picture developed, in which houses were interpreted to have different functions based on their artifact assemblages. Seven statistical factors were identified, and when Hunter-Anderson (1986:190–101) converted the factors into a taxonomy of functional types, three were emphasized: “Perhaps the best way to state the difference is to say that house types 2 and 3 are more clearly specifically constructed for the protection of stored materials and closely associated food-processing activities, while type 1 houses were built to protect stored food and activities but also to house more generalized domestic activities as well” (Hunter-Anderson 1996:101).

Though they differ in the scope and nature of the analytical effort, interpretive statistics, and geographic subject areas, the two studies discussed some common features. Both purport to recognize intersite functional variation (residential hamlets, field house clusters, and logistical support encampments) in land use among Upland Mogollon pithouse dwellers, and both studies base that claim on intersite variation in the frequencies of different classes of artifacts in floor assemblages.

Methodological Problems

The studies discussed above share two methodological flaws. One problem that affected both was the use of manifestly asynchronous assemblages in order to infer, by induction, the presence of synchronic functional variation. Hunter-Anderson’s study included Reserve area sites that were occupied at widely separated intervals. Based on tree ring dates and ceramic cross-dating, roughly half of the Reserve area pithouses in that study were occupied during the Pine Lawn Phase (Early Pithouse Period), before A.D. 550, and the remaining houses were occupied during the Three Circle Phase after A.D. 850 (see Table 1; also see, Anyon et al. 1981; Diehl 1994). Similarly, the Bear and Bluff sites that figured prominently in Rice’s
model were occupied 300 years apart. Elsewhere it has been established that there were diachronic changes in the nature of subsistence and settlement, including increases in the proportional dependence on agricultural as compared with wild plants (Diehl 1996), and increases in the intensity of site occupation (Diehl 1997). It follows that the variation (in floor assemblage artifact frequencies) that has been attributed to synchronic functional variation may actually be a consequence of diachronic changes in land use.

The foregoing assemblage-based studies of functional variation in pithouse use share a second problem. Both assume that pithouse assemblages are unbiased samples of the artifacts that were commonly used within each pithouse. Assemblages from any pithouse are treated as though they were not substantially affected by abandonment or postabandonment formation processes. The potential effects of prehistoric caching, scavenging, trash dumping, or inadequate sampling were not considered.

The analyses presented in this paper show that caching, scavenging and trash dumping are likely alternative sources of the variation that previous scholars have attributed to functional differences. The techniques used in prior studies to demonstrate the presence of functional variation were inadequate, and prior claims for the presence of functional variation in the use of Mogollon pit-houses are rejected.

Abandonment and Postabandonment Processes and Assemblage Variation

Although the assessment of the relative effects of different prehistoric activities is the primary step in the interpretation of artifact assemblages, the recognition of caching, scavenging and trash dumping is largely an inductive process. There exists no unitary body of theory that calibrates the frequencies of different kinds of artifacts with the intensity of curation behavior or the manner of disposal. One must rely on a strategy of generating, from theory, a set of general conditions that one ought to observe given the assumption that certain processes affected artifact distributions. In effect, before studying artifact assemblages we must consider the question “What should a de facto assemblage look like, and what should that assemblage look like after it has been scavenged, rearranged, cached, or buried under garbage?” Here de facto is used in the sense described by Schiffer (1987:89–98), to refer to an assemblage that contains artifacts that were abandoned in the locations where they were used, and in frequencies that reflect the artifact inventories of the occupants of the houses in which they were found.

“Floor Assemblages” Defined

This study compares the frequencies of different classes of artifacts that were found on or near the floors of different houses. In practice, these “floor” assemblages include artifacts from floor or floor-fill contexts (within 15 cm of the floor), since many excavation notes do not differentiate between artifacts that were physically in contact with the floor and those that were within 10 or 15 cm of the floor. There may be some risk entailed in this use of floor-fill artifacts; Schiffer (1987:294–298) noted that the inclusion of artifacts from floor-fill contexts may promote the creation of palimpsests that include significant proportions of trash, since (as many archaeologists have noted), pithouse fill often contains obvious trash deposits.

General Characteristics of Caching, Scavenging, and Trash Dumping

In considering the formation processes that promote frequency variation, one must assume that multiple processes may affect the distributions of artifacts in floor assemblages. Important prehistoric behaviors that are considered in this study include caching, scavenging, and trash dumping. Pithouse occupants who abandoned houses with the intention of returning would likely have cached valuable items inside the house in anticipation of later use. In general, caching promotes the creation of assemblages that have high frequencies of ground stone tools and pots. Scavenging reduces assemblages that contained cached items, possibly resulting in the near or complete depletion of some categories of items. Trash dumping adds artifacts to assemblages, regardless of the impact of other formation processes.

Most archaeologists agree that objects that are either rare or costly to manufacture or acquire, and that are in operating condition, should be cached for later use when people anticipate returning to a site. The same objects should be scavenged as
opportunity permits (Binford 1980, 1979; Schiffer 1987:89–98). In the American Southwest, serviceable ground stone tools are commonly assumed to have been objects that were routinely scavenged and reused by prehistoric groups (e.g., Schlanger 1991). This assumption is qualitatively supported by the observation that some well-known Northwestern archaeologists distributed prehistoric metates to local Native American women, and that such tools were prized. Other considerations also indicate that prehistoric scavenging should have affected ground stone tool assemblages; for example, Stone (1994) demonstrated that maintenance and material transport costs may promote scavenging in ground stone tools. In addition, Adams (1993) suggested that ground stone tools may require extensive wear management—an observation that implies high maintenance costs. The latter costs would also promote tool scavenging and reuse.

Scavenging was probably not limited to ground stone tools. Other valued objects may have included pots and construction timbers. This study treats whole ground stone tools and reconstructible pots as potentially salvageable items, and their frequency in an assemblage is used as an index of the combined effects of caching and scavenging.

Trash dumping is a process that can inflate the frequencies of artifact types that are cheap to manufacture. Since broken potsherds are common and easily worked into scrapers and the like, it is assumed that ceramic tools held little value for scavengers. The frequencies of other low value items such as bone tools (most of which were recovered in broken condition), ground stone tool fragments, and chipped-stone tool fragments are expected to be high in trash deposits. The frequencies of these artifacts in floor assemblages are treated as indices of trash dumping that occurred after abandonment (or trash that was incorporated into the earth walls of pithouses).

**Discussion**

It is widely recognized that the extent of caching is affected by many concerns, such as the portability of artifacts, the distance moved, and the intention to return (or not) to a house during an abandonment (Binford 1981; Nelson 1991). Variation in the intensity of caching between houses promotes differences in artifact frequencies that may be mis-taken by archaeologists for functionally driven variation in the use of houses. Similar concerns apply when one considers the effects of variation in the intensity of scavenging, or trash dumping. All of these processes may increase the inter-household variation in artifact frequencies. For example, in villages where some structures were occupied and others unoccupied, the empty structures may accumulate chipped stone debris, bone tools and food waste, ground stone tool fragments and other detritus. Archaeological confirmation of trash dumping in abandoned structures is provided by numerous instances of house pits with obvious middens superimposed on their collapsed roofs.

One requires a “yardstick”—cases of obvious de facto floor assemblages that may serve as anecdotal examples, against which others may be compared. The best examples may be drawn from those very infrequent cases that fulfill the “Pompeii premise.” These examples of “catastrophic abandonments” are identified by evidence of extreme burning, and large quantities of serviceable artifacts that suggest that the occupants fled precipitously in the face of a fire, and that during their hasty departure they abandoned whole suites of domestic tools. An examination of floor assemblages from other parts of the Upland Mogollon region suggests that burned pueblo rooms and pithouses with excellent preservation and obvious activity areas defined by artifact concentrations on the floor are extremely rare. Two examples are described below.

**Compelling Anecdotal Examples of de Facto Assemblages**

One possible de facto assemblage was identified at Point of Pines pueblo (AZ W:10:50 [ASM])—a 21 room surface structure that included two rooms with very rich floor assemblages (Wendorf 1950:91–92). Two of the excavated rooms contained very high frequencies of artifacts that offered compelling opportunities to scavenge valuable, intact tools. Despite their potential for scavenging, these assemblages appear to have been left undisturbed until they were excavated. Room Twelve contained 21 intact or reconstructible jars (but no bowls), four bone awls, six metates, 12 manos or hand stones, two hand axes, and a pestle (Wendorf 1950:21). Room Seven contained two jars, three bowls, 22 manos or hand stones, three
metates (two resting in mealing bins), five hand axes, one pestle, two bone awls, and a quartz crystal. In light of the large number of storage jars, the absence of bowls, and the absence of a hearth, Wendorf suggested that Room Twelve was a storage room (Wendorf 1950:23). The combined assemblages of Rooms Twelve and Seven might constitute a reasonably complete inventory of the domestic utensils commonly used by a single household. If so, then the complete inventory of a household living in a surface structure might include tens of jars and ground stone tools, and low frequencies of smaller items (such as bone tools). Notably, each room contained far more artifacts than other rooms at the site.

Examples of de facto pithouse floor assemblages are also offered by Features 9 and 12 at LA 5407 (Kaysor 1975:15; NMCRIS LA 5407 n.d.). Both pithouses burned and collapsed onto a range of artifacts. Feature 9 contained five vessels, two manos, four metates, and two mano fragments. Feature 12 contained two jars, five manos, two metates, two mauls, a hand axe, a paint slab, a shell bracelet, “other stone tools” and a fragment of woven cloth made of hair. Unlike other “burned” Mogollon pithouses (which are generally recognized by the presence of a few charred beams and patches of oxidized floor plaster), the fill above the floor of both pithouses was replete with charred roof beams, collapsed vertical posts, and matting. The fractured pots contained kilos of charred maize, beans, and amaranth seeds. It should be noted that the discovery of charred maize, beans and small starchy seeds in pots is unique among the Upland Mogollon pithouses that are considered in this study. The value of the intact pots may have been enhanced by their contents.

Upland Mogollon Pithouse Assemblages Reconsidered

In this study, cluster analyses are used to compare floor assemblages from different pithouses within Upland Mogollon pithouse sites. Inspection of clusters suggests that very few pithouses have assemblages that seem like good examples of caches or de facto assemblages. Among pithouses that seem to contain de facto assemblages, there remains the possibility that high frequencies of reusable items are merely a consequence of higher frequencies of trash dumping. Accordingly, a second test is used to demonstrate that these assemblages are not conclusively a consequence of trash dumping. Instead, they are attributed to the common abandonment of multiple households that might reflect the abandonment decisions of household groups; alternatively, the roughly constant proportion of cache assemblages on Upland Mogollon sites may allow archaeologists to refine their estimates of the populations of sites or regions.

Sites Used in This Study

This study makes use of artifact assemblages from pithouses at the following sites: Crooked Ridge Village (AZ W:10:15; Wheat 1954), Diablo Village (LA 6538; Hammack 1966), Harris Village (LA 1867; Haury 1936), Lee Village (LA 5779; Bussey 1973), the SU site (LA 64931; Martin 1943, 1940; Martin and Rinaldo 1947), and the Turkey Foot Ridge site (LA 9709; Martin et al. 1949; Martin and Rinaldo 1950). The tabulated data are available elsewhere (Diehl 1994:399–411). Lists of the artifacts from pithouses were compiled by examining published reports and excavation notes, and by inspecting collections and accession catalogs in museums. Houses that were disturbed (superimposed houses intruded on the floor assemblages), partially excavated, or structures that the excavators described as kivas or “ceremonial structures” were omitted from the analysis. Although some may question the validity of the “ceremonial” category, most agree that the architecture of these structures differs qualitatively and quantitatively from other pit structures, and the ceremonial function is a commonly used interpretation (e.g., Stuart and Gauthier 1988:178–195).

Although other Upland Mogollon pithouse villages have been excavated, they were not included in the present study. For the Bear (Haury 1985), Bluff (Haury 1985), Mogollon Village (Haury 1936), and Promontory (Martin et al. 1949) sites, excavation notes were insufficiently detailed to allow one to distinguish between artifacts found on or near floors and those that were recovered from roof layers or postoccupational house-pit fill. Cameron Creek Village (Bradfield 1931) and Winn Canyon (Fitting 1973) were excluded because there are no detailed records of the artifact assemblages or their contexts. The Duncan (Lightfoot 1984) and Flattop (Wendorf 1953) sites are, with
regard to architecture and ceramics, not clearly affiliated with Upland Mogollon occupations. LA 5407 (Kayser 1975) was not extensively sampled and few pithouses were excavated. Detailed records of artifact provenances and frequencies are not available for excavations conducted at Galaz in the 1930s; and only five complete and intact pithouses were identified by the Mimbres Foundation during the 1970s (Anyon and LeBlanc 1984).

The sites were excavated by different principal investigators over an interval of five decades. Excavation goals and recovery methods varied, therefore the assemblages are not directly comparable. For example, there is a marked improvement in the recovery rates and notes recorded by archaeologists associated with Emil Haury’s Point-of-Pines area research in the late 1940s, as compared with Haury’s first excavations in 1933. Other advances in excavation methods included the use of forms for recording observations in the 1940s, and the use of screens by the Mimbres Foundation crews in the 1970s.

Pithouse floor assemblages were examined, and the frequencies of different classes of artifacts were recorded for each pithouse. Artifact classes included whole manos, whole metates, miscellaneous small, whole ground stone tools (axes, mauls, pipes, palettes, mortars, and pestles), whole or reconstructible pots, ground stone tool fragments, chipped stone tools (all formal bifacial and unifacial tools and fragments), worked potsherds, bone tools (whole tools and fragments), and other items (fragments of pigment, turquoise, and shell).

Most of the bone tools, chipped stone tools, worked sherds, and decorative items were broken.

### Analytical Methods

Floor assemblages from pithouses were compared on a site-by-site basis. Groups of pithouses with similar artifact frequency distributions were identified using cluster analyses. Cluster algorithms are preferable over simple judgment, since they are replicable and provide a nonjudgmental way for classifying difficult cases. Moreover, cluster algorithms do not require normal frequency distributions (Statsoft 1994:3165).

The following analyses use a hierarchical, joining (tree cluster) technique, with complete linkage. Euclidian distances provide the measure of similarity. Some of the variables (for example, mano frequency; see Table 2) used to cluster cases are of manifestly greater magnitude than other variables—a situation that may produce results that are biased toward a single variable (Aldenderfer and Blashfield 1984:24–28; Statsoft 1994:3167).

To mitigate this effect, all of the frequency scores in the assemblages were converted to “unit vectors.” Unit vector transformation gives each variable the same magnitude. The unit vector score for an artifact class is determined by dividing the observed frequency from each structure by the maximum observed frequency from any structure. For example, if a site was composed of two floor assemblages that contained five and 10 manos respectively, the unit vector scores for the “mano” variable are, respectively, .5 and 1.0.
Results

Table 2 presents the mean artifact frequencies from different kinds of assemblages in the sites that were considered in this study. Specific interpretations of the clusters recognized at individual sites are discussed below.

**Crooked Ridge Village.** The cluster analysis produced two coherent clusters of houses (Figure 2). Houses 2, 5, 7 and 16 were found to contain possible *de facto* assemblages. The houses all contained at least one reconstructible pot, and a suite of intact manos, metates, and axes, mortars or pestles.

Other clusters contained fewer valuable tools. Houses 3 and 11 contained high frequencies of manos and metates, but lacked intact vessels, suggesting that the floor assemblages in these houses were either caches or scavenged *de facto* assemblages. In the remaining houses, intact valuable items were infrequent or absent. It is suggested that these assemblages were heavily scavenged or entirely cleaned out during abandonment. House 8 was isolated from other clusters because it contained an obvious cache of 12 pestles that were stacked in a pile, but no other artifacts.

**Diablo Village.** In the Diablo Village assemblage, only House 13 provided a possible *de facto* assemblage (see Figure 3). It contained four whole pots, 13 manos, two metates, and other tools in low frequencies. House 11 contained eight manos and one metate—a large number of ground stone tools when contrasted with the remaining houses at the site. Houses 24 and 3 contained reconstructible vessels, but few manos (zero and two respectively). If Houses 3, 11 and 24 were abandoned with *de facto* assemblages, then they were probably scavenged after their occupants left the area. The remaining houses lacked vessels entirely, and had few ground stone tools.

**Harris Village.** The Harris Village houses formed three major clusters (see Figure 4). One cluster included two *de facto* assemblages. House 11 contained two manos, two metates, one pestle, and two vessels; House 1 contained four manos, a metate, and a single vessel. Other houses contained few tools that could have been scavenged, and three of them contained no such tools at all.

**Lee Village.** The 25 pithouses from Lee Village provided the largest set of data from a single site that were examined in this study, and their assemblages formed two strong clusters (see Figure 5). Houses 2, 21, 25, 33, and 37 provided good examples of possible *de facto* assemblages, since they contained high frequencies of ground stone tools that include manos, metates, and high frequencies of intact or reconstructible vessels. House 41 may
have begun its postabandonment history as a *de facto* assemblage, since it contained eight manos and a metate; however, the absence of vessels suggests that it may have been partially scavenged. The remaining houses generally lacked ground stone tools or intact vessels; where found, these occurred in low frequencies.

**SU Site.** Nineteen Early Pithouse Period SU site assemblages were examined (see Figure 6). Houses N, T, and U contained exceptionally high
frequencies of ground stone tools, and one reconstructible vessel each. The remaining houses had low frequencies of ground stone tools.

Turkey Foot Ridge. The final assemblage considered by this study formed two clusters (see Figure 7). Houses E and M contained possible de facto assemblages that were composed of high frequencies of intact ground stone tools and whole vessels. House N may have been a de facto assemblage that was scavenged for manos, since it con-
tained three vessels but few ground stone tools, or it may have been a cache. The remaining houses generally contained low frequencies of intact artifacts of all kinds.

Are They "De Facto Assemblages" or Simply Rich Trash Deposits?

It is clear that two general categories of floor assemblages are found in Upland Mogollon pithouses. One category includes floor assemblages that contained high frequencies of salvageable items (de facto assemblages), such as ground stone tools and whole pots; the occurrence of several categories of intact, potentially reusable, valuable tools, and the comparatively high frequencies that were represented, corresponds with the anecdotal example of catastrophically abandoned de facto assemblages contained in burned pit structures at LA 5407.

Other floor assemblages contained very low frequencies of ground stone tools and vessels. A few assemblages included obvious caches, but most lacked large quantities of valuable items. These assemblages do not contain artifacts in frequencies that are reasonably representative of the items used by the occupants of the houses from which they were recovered.

These results may be interpreted with caution. In particular, it is noted that none of the de facto assemblages are entirely devoid of trash. A consideration of the mean frequencies of artifacts in the different kinds of clusters formed at each site (Table 2), shows that in general, houses with de facto assemblages contain higher frequencies of trash (broken ground stone tools, and the miscellaneous encompassed by the category "other") than the scavenged or sterile assemblages.

Given these observations one might suggest that all of the floor assemblages used in this study were the consequence of trash dumping. In a challenge to an earlier study of pithouse assemblages, Schiffer (1987:294–298) examined the frequencies of broken potsherds from Crooked Ridge Village and found a strong association between house size and artifact frequency. Schiffer suggested that most if not all of the assemblages from Crooked Ridge Village were deposited in the context of trash dumping. Schiffer also suggested that the high frequencies of exotic potsherds and rare items (shell, turquoise, crystals and the like) that Lightfoot and Feinman (1982) attributed to the presence of emergent social elites in certain houses, could be explained by a simple rule; larger houses have more artifacts because larger houses can hold more trash.
To determine whether or not the *de facto* assemblages that were identified in this study should be attributed to trash dumping, a statistical test was performed. Following Schiffer (1987:294–298), it is assumed that, *if* trash dumping was the formation process that primarily determined the artifact frequencies in pithouse floor assemblages, *then* there should be a strong relationship between cluster

Figure 8. Floor Surface Areas for the Population of Early Pithouse Period Pithouses.

Figure 9. Floor Surface Areas for the Population of Georgetown Phase Pithouses.
For this test, floor surface area was used as a proxy for house pit volume; the use of floor area rather than pit volume was mandated by the lack of clear statements in excavation notes that allow one to determine the depth of the house pit. For virtually all of the sites considered by this study, excavators did not differentiate between the depth of the house pit below the prehistoric ground surface and its depth below the modern ground surface.

A Spjotvoll-Stoline analysis of variance of means test was used to examine the relationship between floor area and cluster membership. This test requires only that the distributions of floor surface areas are normal. As Figures 8, 9, and 10 indicate, the surface areas of Early Pithouse Period, Georgetown and Three Circle phase pithouses used in this study are almost normally distributed. In this analysis, if there is a significant difference in the mean floor areas of the cache assemblages and the trash assemblages, and if houses that contained \textit{de facto} floor assemblages have larger mean surface areas, then trash dumping remains a strong explanation for variation in artifact frequencies. The absence of a significant difference in the mean house areas of different types of assemblages indicates that one may not attribute the variation in the artifact frequencies of different clusters to trash dumping.

Table 3 describes a Spjotvoll-Stoline (Tukey’s HSD for unequal sample sizes) analysis of variance of mean pithouse floor area by assemblage type. In that table, \( p \) is the significance of the difference of means for different assemblage types from the same occupation period. The test indicates that the mean floor areas of cache assemblages and other assemblages do not statistically differ, and we cannot conclusively attribute to trash dumping the differences between the \textit{de facto} assemblages and the others.

A Constant?

Table 3 shows that few pithouses contain assemblages that may be used to determine whether or not pithouses were used for manifestly different activities. Of the 98 assemblages that were considered, only 16 contained likely \textit{de facto} assemblages. At most sites, roughly 18 percent of the houses contained such assemblages. This proportion is interesting because it is consistent at all levels of detail. At Lee Village, five of 25 (20 percent) houses contained \textit{de facto} assemblages; at SU,
three of 18 (17 percent); at Turkey Foot Ridge, two of nine (22 percent); at Crooked Ridge, four of 18 (22 percent). Diablo Village and Harris Village had low proportions of de facto assemblages, at 11 percent (one of nine) and 14 percent (two of 14) respectively. At a higher scale of analysis one sees that all Early Pithouse Period structures, three of 24 (12.5 percent) contained de facto assemblages. Five of 27 (19 percent) Georgetown Phase structures, and eight of 47 (17 percent) Three Circle Phase structures contained de facto assemblages. If we allow some leeway for sampling error to produce the low proportions at the Diablo and Harris villages, the 18 percent value is a believable constant.

Implications for the Assessment of Intersite Functional Variation

It has been observed that roughly 18 percent of pithouses contain assemblages with de facto assemblages. This observation has important implications for future efforts to determine the extent of intersite functional variation. Assume that two pithouse sites, Site A and Site B, were the locations of manifestly different activities. For example, Site A could be a residential site at which a full range of domestic activities occurred, and Site B could be a field house cluster, in which houses were ephemerally occupied, and in which only limited activities occurred. Site A might include households with floor assemblages that look like the de facto assemblages that were identified through cluster analysis in this study. Site B might include households with floor assemblages in which certain tools, manos or metates for example, might be infrequent or absent.

The recognition of functional differences might begin with the simplest of statistical tests such as Chi-Square; such a test would require approximately 10 pithouses from each site that contain de facto assemblages that are composed of de facto refuse. Under these circumstances, an archaeologist would have to excavate approximately 50 pithouses at each site in order to develop adequate samples sizes for intersite comparison. The implications of this observation are somewhat grim. Large scale excavation projects of this scope have not been conducted in the Upland Mogollon region since the 1920s (e.g., Bradfield 1931). More importantly, few Upland Mogollon pithouse villages may be expected to contain 50 pithouses (Blake et al. 1986; Lekson 1992).

Alternatively, one may suppose that all of the pithouses at our hypothetical sites A and B were used for functionally identical purposes (houses for example). If only one out of every five houses may be expected to contain a de facto floor assemblage, then the different “types” of floor assemblages that Hunter-Anderson (1986) observed may easily be attributed to inadequate sample sizes rather than functional variation in the use of houses. It is interesting to note that the SU (26 pithouses) and Turkey Foot Ridge (15 pithouses) sites were interpreted as residential sites, or at least included many pit structures that Hunter-Anderson (1986) interpreted as residences; in contrast, the Promontory site was interpreted as a cluster of structures that contained a limited (nondomestic) range of activities. Since only 4.5 structures were excavated at the Promontory site, it is quite likely (32 percent chance) that any Promontory pithouses that contained de facto assemblages were randomly avoided by the excavators.

Implications and New Interpretive Directions

If one agrees that the foregoing analyses demonstrate that most pithouses contain assemblages that do not accurately represent the tool inventories of their occupants, then one must seek alternative explanations of the observed variation in the composition of floor assemblages. Processes of caching,
scavenging, and trash dumping have been invoked as proximal explanations of variation. However, it is suggested that a higher order interpretation may follow. This study proposes that the proportions of houses that contain de facto assemblages may be a consequence of three possibilities. First, houses with de facto assemblages may be the last houses that were occupied at a site. Second, the apparent spatial clustering of houses with de facto assemblages may allow archaeologists to identify corporate social groups such as households. Finally, the relatively constant proportion of houses with de facto assemblages may allow archaeologists to refine population estimates of sites or regions.

The Recognition of Abandonment Sequences

The identification of houses that contain high frequencies of valued items—caches or de facto assemblages—may be useful for identifying the houses that were most recently occupied at a site. As has already been noted, variations in the intensity of caching, scavenging and trash dumping are the proximate causes for variations in artifact frequencies in pithouse assemblages. But who caches objects, or scavenges caches? The obvious answer is “the last occupants of the site.” It is possible that some households remained at the site, scavenging assemblages from abandoned pithouses and dumping trash into the depressions until at last they too abandoned the site. Since no one remained behind, nonmovable items or caches were left behind in a few houses and were never scavenged.

Although insufficient data are available to test this hypothesis, future research efforts could be designed to corroborate or refute this interpretation. Intensive sampling for dendrochronological specimens, high quality radiocarbon samples (such as the outermost rings from cottonwood timbers, or annual tissues such as seeds found in hearths), and archaeological samples obtained from hearths could be used to identify the windows of structure occupation. Although tree ring dates are available for some Reserve area structures, none of the sites that were considered in this study were thoroughly sampled; the data that are presently available are insufficient for recognizing the construction and abandonment sequences of Upland Mogollon pithouses.

The Identification of Social Groups

Were the final occupants of a site governed by a common decision to remain or leave? In other words, were they members of a household or some higher level corporate group? That question is difficult to answer at the present stage of this investigation. However, it is noted that at the few sites that were intensively sampled, houses that contained de facto assemblages are located close to each other—a pattern that is possibly indicative of the presence of social heterogeneity within sites, such as discrete household compounds.

If spatial proximity can be used as a measure of social distance, then the site maps give qualitative support to the suggestion that the houses that contained caches were members of a corporate group. Three sites contained several pithouses, and the relative locations of these pithouses with respect to the rest of the houses on their respective sites show that they are in close spatial proximity. At Lee Village, Houses 2, 32 and 33 are located close to each other, as are Houses 21 and 25 (see Bussey 1973: Map 2). Inspection of the SU site reports (Martin 1943; Martin and Rinaldo 1947) shows that Houses T and U are located in close proximity to each other near the west end of the site. Finally, examination of the Crooked Ridge Village map (Wheat 1954: Figure 2) shows that Houses 2, 5, 7 and 16 are located in close proximity to each other near the center of the northeastern group of pithouses.

One must however view the apparent proximity of pithouses that contain de facto assemblages with considerable interpretive caution. Since few Upland Mogollon sites have been thoroughly excavated, extant data prevent one from obtaining the interpretive satisfaction that one derives from quantitative analyses (based for example on nearest neighbor or other density measures) and strong patterning. The possibility must be raised however, since archaeologists working in other areas may have access to better data sets.

The Refinement of Population Estimates

The results achieved in the foregoing analyses may also be useful for refining estimates of the populations of sites or regions. In the American Southwest, estimates of the populations of sites or regions are generally achieved by counting or estimating the number of residential structures on sites that were identified in surveys (e.g., Blake et al. 1986; Lekson 1992). A constant is derived from
the analyst's assumptions about the number of people who may have lived in typical households, and may consider floor areas and notions of individual space when some excavated structures are available (e.g., Hill 1970; LeBlanc 1971; Longacre 1976).

Despite the refinement, many analysts suggest that one can at best hope to achieve relative estimates of population change. The absence of detailed assessments of the contemporaneity of house occupations is regarded as a serious problem when demographic estimates are primarily based on survey data (Blake et al. 1986; Lekson 1992; Plog 1975). Although the empirical strength of the 18 percent constant requires independent verification testing, it may be useful for further refining population estimates of sites and regions. Increasingly accurate censuses may be achievable simply by multiplying estimates that are based on total surface area or numbers of rooms by .18.

The Problem of Equifinality and Directions for Future Research

Although this study has demonstrated that abandonment and postabandonment formation processes are likely sources of artifact variation in pithouse assemblages, the effects of functional variation may not be simply dismissed. The potential for equifinality exists, to the extent that heavily scavenged assemblages might be expected to produce artifact distributions that are similar to those produced by activities that were limited in range or intensity. Scavenged assemblages should contain proportionally low frequencies of valued items such as ground stone tools and pots, as compared with less costly items made of bone or chipped stone. Yet these are the same characteristics that one might expect from an assemblage that was produced by a limited range of activities such as sewing, hide processing or butchering, as was suggested by Hunter-Anderson.

It is suggested that the recognition of functional differences between assemblages from different houses must rely on analyses of artifact attributes rather than solely or primarily on analyses of artifact frequency distributions. If one compares the frequencies of different types of artifacts from floor assemblages in order to assess the amount of functional variation, then one must assume that all of the cases in the analysis were not substantially affected by other formation processes. Although compelling examples of entire sites or villages that meet the assumption might be found, one expects such examples to be rare indeed (volcanic eruptions that lead to the catastrophic abandonment of sites or regions come to mind).

Alternative approaches to the identification of functional variation may yield more accurate results than type-frequency based approaches. In particular, analyses that promote the identification of specific activities through the examination of use-wear on stone and bone tools should offer great potential. To the extent that certain activities are over- or underrepresented in some structures, one may infer that activities occurred at varying intensities in different houses. Such variation might be interpreted as the consequence of functional variation in pithouse use.

Conclusion

This study has demonstrated that the variation in Upland Mogollon pithouse assemblages may be attributed to the combined, varying effects of caching, scavenging and trash dumping. It has been suggested that most pithouses contain trash or scavenged caches, rather than de facto refuse abandoned by the occupants of the house.

This study has also demonstrated that 18 percent of the structures at any site may be expected to contain de facto assemblages. The number is remarkably consistent across sites if one allows for small amounts of variation in the recovery rates of artifacts from sites that were excavated over an interval of 50 years. It has been suggested that this constant may be useful for refining population estimates for sites or areas or for estimating the size of social groups who made, in common, decisions about the abandonment of sites. It has also been suggested that the recognition of houses with de facto assemblages may be useful for recognizing the abandonment sequence of pithouse villages.

Finally, this study has shown that prior analyses of pithouse assemblages that attributed artifact frequency variation to functional differences in the uses of pit-structures or sites are flawed by methodological oversights and statistical errors. The present study attributes variation in pithouse assemblages to differences in caching, scavenging, and trash dumping, rather than functional variation. Notably, this study does not allege that func-
tional variation did not exist, but rather that its effects (if any) are masked by the more pervasive effects of abandonment and postabandonment formation processes.

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Notes

1. Hunter-Anderson’s study used factor analyses on assemblages in which the frequency distributions of most artifact types were manifestly far from normal. Since normal distributions are an assumption of factor analysis, that study is further obviated.

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