

## Causes and Consequences of Migration in the 13th Century Tonto Basin

MIRIAM T. STARK

*Conservation Analytical Laboratory, Smithsonian Institution, Washington, DC, 20560*

AND

JEFFERY J. CLARK AND MARK D. ELSON

*Center for Desert Archaeology, Tucson, Arizona*

Archaeological evidence for migration into the Tonto Basin during the early Classic period (ca. A.D. 1150-1350) is examined in this study. The Tonto Basin, located in central Arizona, provides an ideal setting for investigating prehistoric migration for several reasons: (1) it is located in an interstitial zone in both environmental and cultural terms; (2) an enormous amount of archaeological information is now available for the Classic period; and (3) migrant groups can be differentiated from the local population based on material remains. In this study, concepts from the anthropology of technology are applied to architectural and ceramic data to examine migration patterns in the 13th-century Tonto Basin. The effects of migration on the sociopolitical organization of the local population are also discussed. © 1995 Academic Press, Inc.

The 13th and 14th centuries in the North American Southwest were a time of widespread reorganization of local populations from the Colorado Plateau to the Chihuahuan and Sonoran deserts (e.g., Cordell *et al.* 1994). Some areas were abandoned, while others felt the pressure of newly arrived populations. In regions that experienced continued occupation, formerly dispersed populations aggregated into large settlements along major drainage systems. The movement of peoples from the Four Corners area to the Rio Grande discussed in the other papers in this volume is one example of these processes. In this paper, we discuss similar, contemporary processes that resulted in the migration of small groups into the Tonto Basin of central Arizona during the mid to late 13th century (Fig. 1). The late prehistoric Tonto Basin was but one link in a chain of geographically disjunct districts where "local" sequences all took sharp turns (also see Lekson *et al.* 1992). Our study focuses on the changes in local Tonto Basin settle-

ment systems that coincided with migration into this area.

Models of aggregation and sociopolitical organization have long relied on migration processes to explain the relatively dramatic shifts in early Classic period (ca. A.D. 1150-1350) settlement in the Tonto Basin (Gladwin and Gladwin 1935; Haury 1945; Whittlesey and Reid 1982). Developments in the Classic period Tonto Basin, in many respects, paralleled those to the south in the core area of the Classic period Hohokam. Large, multisettlement communities, each containing one or more platform mounds, were evenly spaced along the Salt and Gila river networks in the Phoenix Basin (Doyel 1991). A platform mound is a structure that, regardless of original function, was deliberately filled for the purpose of constructing an elevated platform. Some Phoenix Basin platform mounds were topped by residential structures, while others lacked evidence for residential use (see Gregory 1987). These Classic period irrigation communities involved

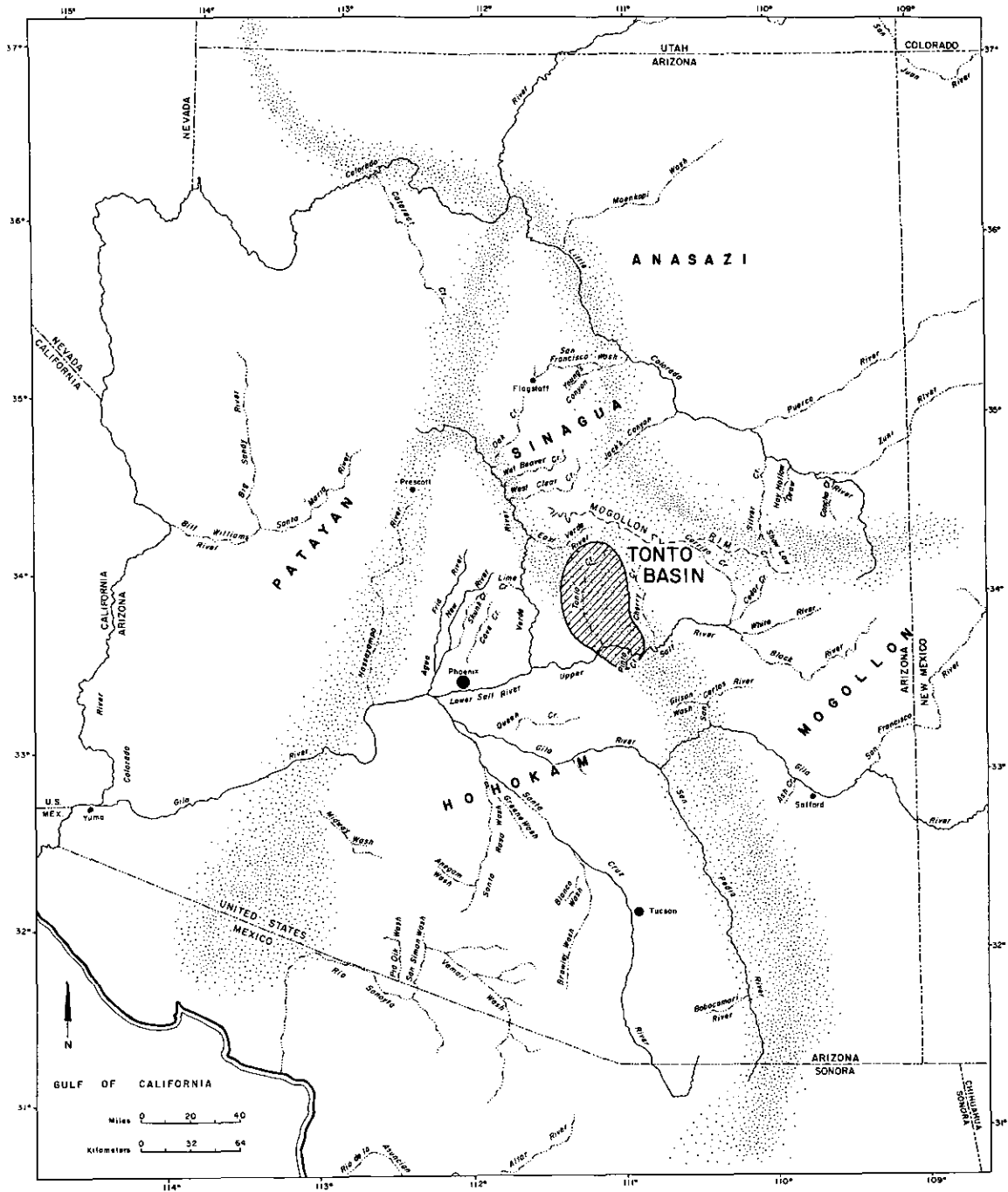


FIG. 1. The Tonto Basin in central Arizona with surrounding prehistoric culture areas as traditionally defined.

complex canal networks that linked settlements along individual systems to one another (e.g., Fish and Fish 1991: 162-166; Howard 1987).

Classic period developments occurred somewhat later in the Tonto Basin. Tree-ring dates from platform mounds suggest a date of approximately A.D. 1250 (Fig. 2). These changes included the construction of platform mound systems as well as eco-

nomics intensification and increased social integration at the local and regional levels. Archaeologically visible manifestations include the first appearance of masonry architecture and the replacement of Hohokam buffwares with northern-derived black-on-white and polychrome ceramics. The fact that these changes coincided with the emergence of the "Salado phenomenon" in the Tonto Basin has generated

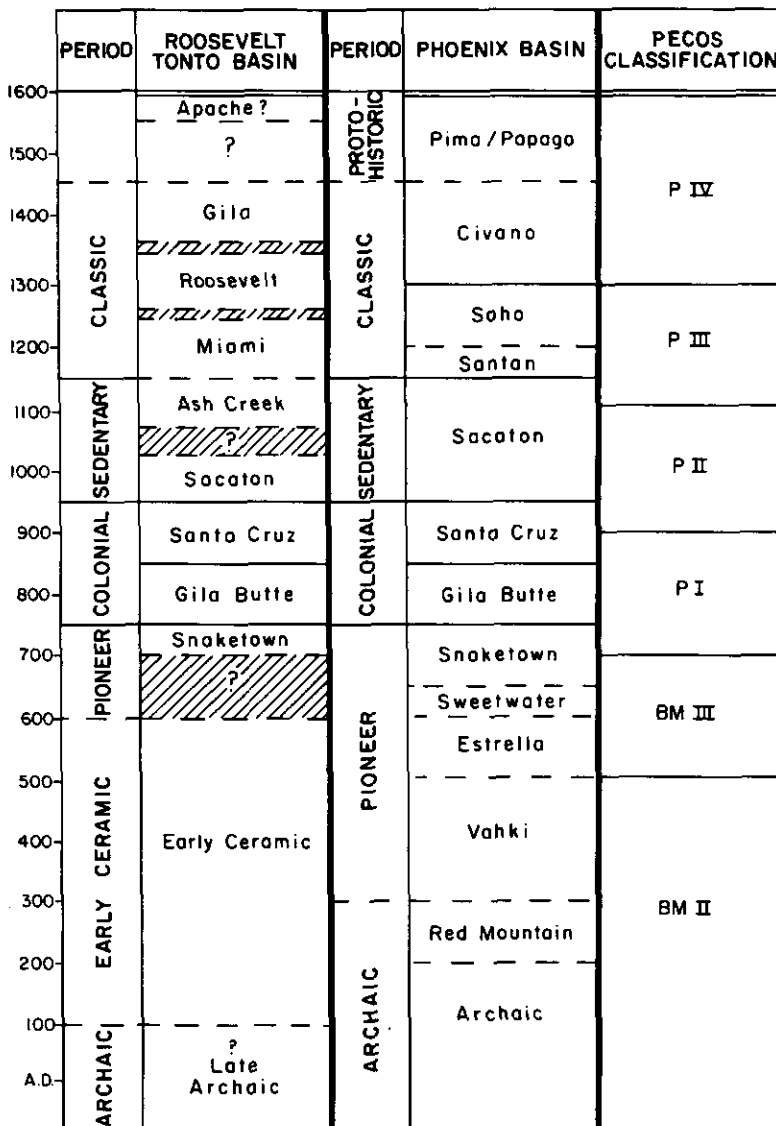


FIG. 2. Chronology and phase systematics for selected areas of the prehistoric Southwest.

continuous debate over the organizational scale of Classic period social integration. However, few studies have systematically examined migration through patterning in architecture, site structure, settlement, and ceramics as supporting lines of evidence.

Reasons suggested for the changes in Classic period settlement are varied and complex (Elson *et al.* 1995; Reid and Whittlesey 1990; G. Rice 1992; Whittlesey and Ciolek-Torrello 1992; Wood 1992). The earliest formulation, by Winifred and Harold Gladwin (1935), argued that Anasazi migrants from the Little Colorado River area entered a Tonto Basin that had already been abandoned by its previous Hohokam inhabitants. In this model, Anasazi migration into the region generated dramatically different settlement morphology, architectural form, and ceramic technology than those of the earlier Hohokam tradition. Subsequent models (e.g., Haury 1945; Whittlesey and Reid 1982) emphasized Mogollon (rather than Anasazi) origins for these migrants. Opponents of the migration model contended instead that Classic period changes in settlement and organization resulted from internal processes of differentiation (Doyel 1978; Hohmann and Kelley 1988; G. Rice 1992; Wood 1992). This debate remains unresolved.

Several questions regarding 13th-century settlement require investigation to understand this topic. First, did migrations in fact occur during the Classic period? If so, what was the scale of these migrations? And what impact did migrations have on the local population? Answering these questions is critical to formulating models of Tonto Basin development as well as of regional interaction in the late prehistoric Southwest.

The Tonto Basin is well-suited to studies of prehistoric migration for several reasons. The first lies in the abundance of archaeological research in the Tonto Basin, which provides an unrivaled thoroughness of archaeological coverage. The sec-

ond advantage lies in the fine-grained chronology that has been developed for the Classic period through the application of multiple absolute and relative dating techniques. The Tonto Basin is also located between several broad culture areas (i.e., Hohokam, Mogollon, Anasazi) about which much is known for the late prehistoric period. Differences between these areas are sufficiently distinct that comparisons can be made easily between patterning in the Tonto Basin and that observed in areas to the southwest (Hohokam) and to the north (Anasazi) and northeast (Mogollon). Finally, Tonto Basin archaeologists have long noted patterning in Classic period decorated ceramics that suggests the existence of multiple cultural groups in the area.

The greatest challenge in studying evidence for migrations into the prehistoric Tonto Basin lies in developing methods for identifying social groups in the archaeological record. Unlike most of the other papers in this issue, we cannot identify more than a general origin area for our migrants and must instead focus on differences in material culture within the Tonto Basin itself to posit migration. We therefore employ frameworks derived from the anthropology of technology (e.g., Lemonnier 1986, 1992; Pfaffenberger 1992) to investigate evidence for coresidence of the Classic period archaeological record. We first discuss methods for identifying social groups in the archaeological record, and then apply these methods to the Tonto Basin case study. Studies of technological variation in domestic architecture and utilitarian ceramics form the foundation of our analyses and the basis for our interpretations.

The central conclusion from our research is that Classic period migrations into the Tonto Basin involved a 25% increase in the local population (also see Doelle 1995). The exact source area of the migrants is unknown, although they almost certainly stemmed from pueblo-

building areas along or below the Mogollon Rim to the north of the Tonto Basin or from the Cibola region to the northeast. Perhaps most significantly, our research suggests that this well-dated migration had major impacts on the structure of the local settlement system. We explore the short-term impacts and long-term consequences of these migrations within the broader context of the Classic period Tonto Basin.

### MIGRATION AND SOCIAL GROUPS IN THE ARCHAEOLOGICAL RECORD

Throughout the history of Southwestern archaeology, identification of "ethnic groups" has been intimately linked with the broad culture area designations (e.g., Anasazi, Hohokam, Mogollon, Patayan) depicted in Fig. 1. Culture area definitions are based largely on distributions of ceramic types and wares. Intrusive ceramics are also commonly used to identify population movements (see, for example, Roney, this issue). These culture areas have blurred but perceptible boundaries identifiable in the gradient distributions of key artifact types and architectural traditions. However, links between archaeological trait distributions and prehistoric social boundaries remain weak (Dean 1988: 197). Southwestern archaeological culture area boundaries exceed the scale of ethnic boundaries observed in traditional small-scale societies. These prehistoric culture areas are not isomorphic with ethnic boundaries, nor are spatial distributions of decorated ceramics (contra Upham *et al.* 1994).

Southwestern archaeologists have used ceramic data as evidence of subregional differences in larger culture areas for several decades. One example is Harold S. Colton (1953) and his "index ware" approach. Joe Ben Wheat's (1955) classic study divided the Mogollon area into multiple "branches," each of which had some distinctive utilitarian pottery vessel forms. He reasoned that paste variations in locally

made ceramics reflected environmental resources, while "differences in vessel forms must reflect cultural factors" (Wheat 1955: 78). These examples illustrate that the concept of regional traditions—as these are manifested in ceramic technological variability—is not unfamiliar to archaeologists.

Earlier archaeological work in the Anasazi and Hohokam areas also identified regional traditions in material culture. Watson Smith's (1962) research on ceramics from the site of Awatovi on the Hopi Mesas, for example, led him to conclude that there were "schools" of potters, each of which was characterized by broad stylistic and technological traditions. Emil Haury identified particular vessel forms to subregions within the Hohokam core area (Haury 1945:87, 95–96, 1976:226). The identification of spatially discrete patterning in utilitarian goods (especially utilitarian ceramics), then, has a long tradition in Southwestern archaeology. What our study provides is a conceptual framework for interpreting this type of material culture patterning.

#### *Technological Variability and the Archaeological Record*

Although "ethnicity" may be elusive in the material record of small-scale societies, other patterns of formal variation are not. As the foregoing discussion demonstrates, the archaeological record contains numerous examples of discontinuity in material culture distributions. Distributional patterning in material culture reflects variation in *technological style*. The term *technological style* refers to the "formal integration of the behaviors performed during the manufacture and use of material culture, which, in its entirety, expresses social information" (Childs 1991:332). At one level, it represents the outcome of repetitive and mundane activities associated with everyday life. The significance of technological style (e.g., Childs 1991; Lechtman 1977; Sackett 1990) to our analysis is that, as a

largely unconscious expression of a cultural tradition, it is inherently stable through time.

Although all goods possess technological styles, these styles are most easily studied on utilitarian goods. The cultural conservatism inherent in technological styles is one of its greatest strengths for use in studies of social boundaries. For example, technological style is more resistant to change than is stylistic variation, which is measured through decorative parameters (Gosselain 1992:582-583; P. Rice 1984:252; Wiessner 1985). Functional needs constrain the range of acceptable variance in design for utilitarian goods, from pots to house forms. Variation in technological styles reflects the outcome of a series of technical options that producers select during the operational sequence (Lemonnier 1986). Alternatives selected by artisans in their choice of materials, in the configuration of their products, and in their decorations reflect a thoroughly internalized understanding of the manufacturing tradition that is generally passed from one generation to the next (Gosselain 1992; Lechtmann 1977:15; Sackett 1986:268-269, 1990:33, 37).

Boundaries of technological styles do not conform precisely to those of ethnic groups, but use of this technological approach helps identify social groups that constitute local systems. Media on which technological style is most easily studied include ground stone tools, chipped stone tools, and utilitarian pottery (Dean 1988; Sackett 1985; Sterner 1989). Architecture, the most complex and least portable of all artifacts, also contains abundant information on technological style. Architectural traits that merit study include construction techniques, construction materials, and the use of space in domestic contexts (e.g., Baldwin 1987; Baker 1980; David *et al.* 1991; Ferguson 1992; McGuire 1982). Because utilitarian ceramics and domestic architecture are the two data classes used in this study, specific attributes of their

technological styles are briefly discussed below (see Stark *et al.* 1995 for a more thorough discussion).

#### *Utilitarian Ceramics and the Operational Sequence*

Several production steps are present in the operational sequence for a manufactured good, such as an earthenware pot (Table 1). The amount of technological variation encoded in each step varies in predictable ways. The first task is materials procurement and preparation, which is guided as much by availability of local materials as it is by cultural preference. The second task involves the actual forming of the vessel, which establishes the general shape of the object and its basic proportions. Forming techniques are particularly resistant to change (see P. M. Rice 1984) and are therefore a good indicator of social boundaries. The third task involves decorative techniques. The fourth and final task involves production steps that occur after the object has assumed its basic form and appearance. Some examples include smudging, texturing, painting, and glazing.

#### *Spatial Organization and Domestic Architecture*

Our interpretation of the Tonto Basin data suggests that domestic architecture was the domain of the household, or the smallest corporate and economic unit in a community. Architectural construction techniques reflect the technological style of its residents in much the same way as operational steps reflect technical choices in ceramic manufacture. These technical choices reflect cultural preferences that are also resistant to change. The same set of steps, from primary forming to finishing techniques, can be applied to traditions of house construction. Although technological constraints and environmental factors may influence construction techniques and house form in residential architecture,

conceptions of the proper organization of architecturally bounded space are highly conservative and often a good indicator of social boundaries (Collet 1987).

### IDENTIFYING MIGRATION IN THE ARCHAEOLOGICAL RECORD

Various researchers (Cameron, this issue; Cordell, this issue) discuss how the visibility of migrant groups in the material record decreases with time, and, presumably, with assimilation. It seems plausible that migration will be most visible in the archaeological record in the case of newly arrived migrant groups. Although these groups may share some aspects of material culture with the host population that reflect common ideological and exchange systems (e.g., decorated pottery, ritual items), patterned differences in the goods of everyday life should remain evident.

Differences in the technological styles of domestic architecture and of utilitarian ceramics should reflect the presence of new cultural groups: new technological traits that differ from the indigenous traits should appear in the archaeological record. These differences should be evident

in the technological style that shapes each artifact class. Technological differences can be studied systematically through the comparison of manufacturing sequences across numerous utilitarian goods, both portable and built.

If population influxes do not displace indigenous populations and rapid assimilation does not occur, then "islands" of migrants may be visible within a "sea" of local tradition and a much higher degree of variability might be expected in the overall settlement pattern, site structure, and material culture assemblage. Rapid and uneven change would be expected across the settlement systems and variability in material culture subsets between migrant and local settlements provide important clues on the relations that subsequently emerge.

Previous studies that have illustrated that prehistoric migration events have also generated spatial discontinuities in technological traits. One example involves a Kayenta Anasazi migration into the Point of Pines site, located in the Mogollon highlands of east central Arizona (Haury 1958; see also Lindsay 1987). A second example involves a Kayenta Anasazi migration into the Reeve Ruin of the San Pedro River

TABLE 1  
Steps in the Operational Sequence of Hand-Built Ceramic Manufacture (See Rye 1981)

Operational task	Types of production steps
Materials procurement	Collection of raw materials (clay, temper, slips, paints, glaze)
Materials preparation	Crushing (clay, temper, or both) Cleaning (clay) and/or size sorting (temper) Blending (clay and temper) Kneading (combination of clays or clay and temper mixture)
Primary forming techniques	Pinching and drawing Coiling
Secondary forming techniques	Beating/paddling Scraping
Decorative forming techniques	Smoothing → polishing Slipping Texturing (includes corrugation and incising) Painting or glazing
Drying and firing	Creation of fire clouds Use of reducing atmosphere
Postfiring treatments	Smudging

Valley in southeastern Arizona (DiPeso 1958). Each model relied on variability in traits that reflected everyday activities (particularly architectural construction and household tasks) to differentiate the indigenous from the migratory groups.

The foregoing sections have discussed several types of archaeological data that may identify social groups in the archaeological record. We focus on technological styles of domestic architecture and on utilitarian ceramics because such technologies are most resistant to changes associated with migration and acculturation. Comparative data are also available for these two classes of material culture. We turn now to our data from the Tonto Basin to present a case study using these concepts.

### THE TONTO BASIN IN THE 13TH CENTURY

The Tonto Basin of central Arizona lies in a transitional environmental zone bounded by high, rugged mountain ranges to the east and west, plateau uplands to the north, and the arid Sonoran desert to the south. The basin also lies within a cultural transition zone: it is surrounded by, and often included in, multiple culture areas (Hohokam, Sinagua, Anasazi, Mogollon). The well-watered and resource-rich environment encouraged the development of a large and dynamic prehistoric population. This culminated in the Classic period in what has been traditionally defined as the Salado culture (see Doyel and Haurly 1976; Lange and Germick 1992). The Salado were (and still are by some) believed to have strongly influenced, if not dominated, much of the central and southern Southwest for several centuries.

Data presented in this paper were recovered primarily from investigations undertaken by Desert Archaeology on the Roosevelt Community Development Study (RCD), which involved the investi-

gation of 27 prehistoric sites in the eastern portion of the Lower Tonto Basin (Doelle *et al.* 1992).

The RCD study was one of three related archaeological projects undertaken as part of the Bureau of Reclamation's Central Arizona Project prior to the raising of the water level of Roosevelt Lake. The largest project was the Roosevelt Platform Mound Study, undertaken by Arizona State University (Rice 1990). This study investigated over 100 archaeological sites and focused on the Classic period. The Roosevelt Rural Sites Study, undertaken by Statistical Research, Inc., investigated 29 small sites and agricultural field systems (Ciolek-Torrello *et al.* 1990). Researchers from these three institutions excavated portions of nearly 150 archaeological sites (Pedrick 1992). Approximately 400 additional sites are known through survey data. This provides one of the strongest regional data bases in the North American Southwest.

The sites investigated by Desert Archaeology are situated along a 6.5-km continuous stretch of the north bank of the Salt River, at the point where the river leaves the deeply cut canyons of the Sierra Ancha and enters the broad basin floodplain (Fig. 3). Sites within the Livingston and Schoolhouse Point Study areas investigated by Arizona State University (also shown in Fig. 3) lie just across the river (Jacobs 1994, Lindauer 1995), providing a relatively complete view of a single Tonto Basin local system. This system is separated from the next local system down the river by an area of limited prehistoric settlement extending approximately 5 km (Gregory 1995).

The Salt River is one of the largest perennial water courses in southern Arizona. Populations living along the Salt River practiced canal irrigation agriculture in both prehistoric and historic times (Ciolek-Torrello and Welch 1994; Craig 1995; Waters 1994). The project area is situated in the first place that irrigation water could have been taken off of the Salt River using

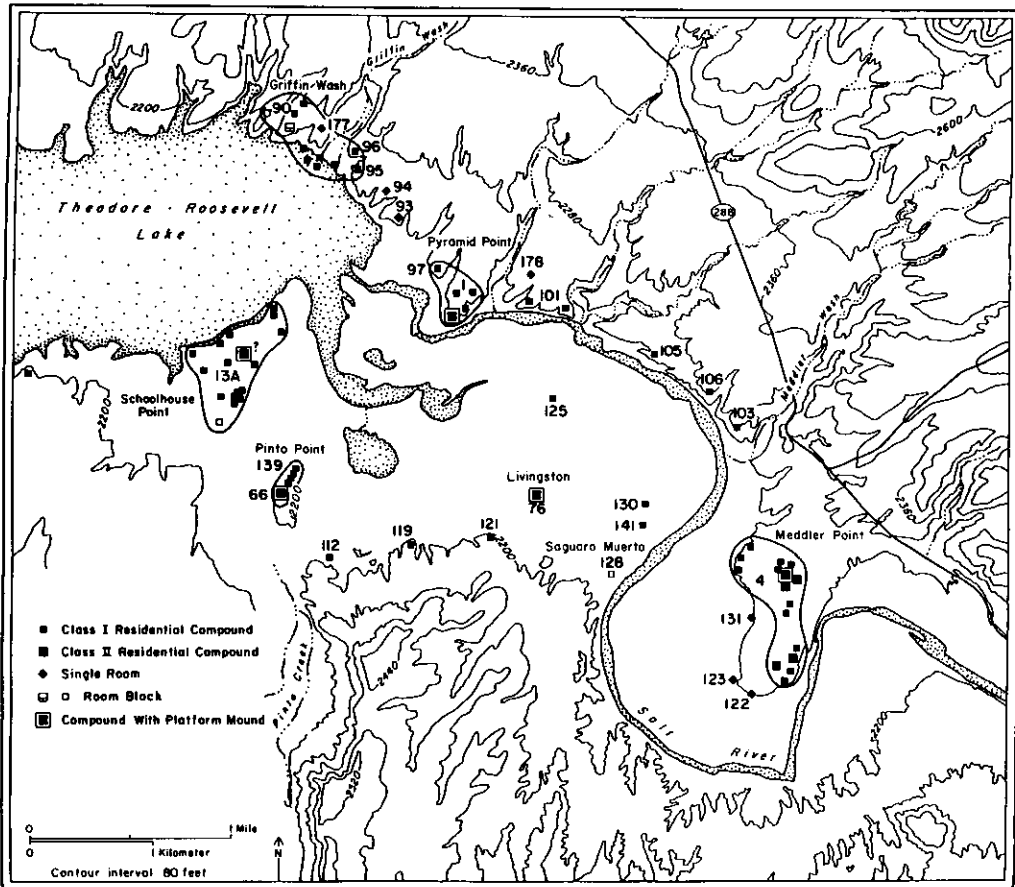


FIG. 3. The Roosevelt Community Development Study (RCD) and Livingston project areas and sites dating to the early Classic period (ca. A.D. 1150–1350).

canals (Gregory 1995). Elevational zonation within relatively short distances also provided a very wide and varied resource base.

A variety of site types was investigated in the RCD and Livingston project areas that range in time from the Early Ceramic period (ca. A.D. 100–600) to the end of the Roosevelt phase of the early Classic period (ca. A.D. 1150–1350). With few exceptions, settlement within the eastern portion of the Tonto Basin ended by the Gila phase of the late Classic period (ca. A.D. 1350–1450). Early Classic period settlements include sites with platform mounds and associated dispersed masonry compounds as well as sites with masonry room blocks

(Fig. 4). Other Roosevelt phase settlements include small masonry compounds, adobe-walled pitrooms, isolated masonry field houses, and areas of specialized or limited activity (Elson *et al.* 1994; Jacobs 1994; Lindauer 1995).

Findings from our study suggest a pattern of continuous, low-level population movement into and out of the Tonto Basin from the earliest periods of occupation onward (Clark 1995a; Elson *et al.* 1995). Our focus in this study rests on 13th-century population movements for reasons of archaeological visibility and because of the larger scale of these movements with resultant changes in local settlement and organization.

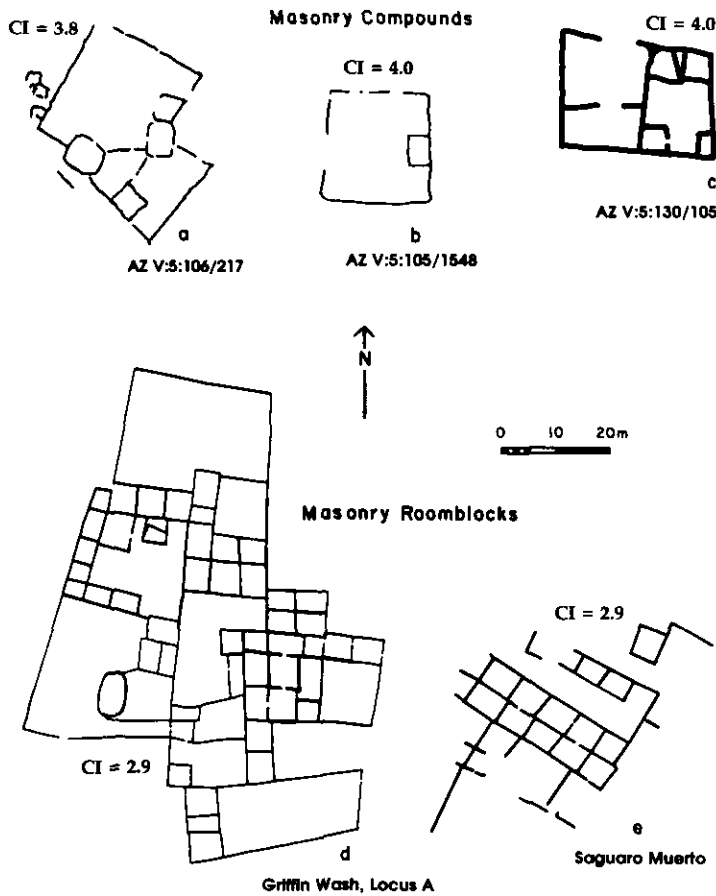


FIG. 4. Examples of masonry compound and room block architectural forms from the RCD and Livingston study areas (CI, Contiguity Index value). Figure 3 contains location of sites within project areas.

#### *The Early Classic Period Roosevelt Phase (A.D. 1250–1350)*

The local early Classic period settlement system in the eastern Tonto Basin stretched along both sides of the Salt River from the Meddler Point site to the Griffin Wash site. The eastern basin system initially centered on Meddler Point, the largest site in the area and the only site during the Preclassic period to even approach village size in dimensions (Craig and Clark 1994; Gregory 1995). Although a moderately sized platform mound was constructed at Meddler Point sometime around A.D. 1280, Meddler Point was only

one of several platform mound sites in the area. At least two other hamlet or village level populations (Schoolhouse Point and Griffin Wash) were also part of the local system during the early Classic period. Given proximity, the location of irrigation canals, and intervisibility of sites, settlements in this system probably functioned as part of an integrated whole (Elson *et al.* 1995).

Changes in architectural form marked the beginning of the Classic period. The pithouse courtyard group functioned as the basic residential structure for Preclassic settlements throughout the Sonoran desert and probably housed nuclear or ex-

tended families (Wilcox *et al.* 1981). Pithouse courtyard groups commonly have 2–6 houses that open onto a courtyard or common work area (also see Fish and Fish 1991). Masonry compounds largely replaced the Preclassic period tradition of pithouse courtyard groups throughout the southern Southwest, and in the Tonto Basin in particular. Masonry compounds are walled residential units that contain several rooms (generally 3–10) in association with large open spaces (Elson and Craig 1994).

Similarities in growth sequences for Preclassic pithouse courtyard groups and Classic period compounds in the Lower Tonto Basin are illustrated in Fig. 5. These two residential arrangements are similar in orientation and use of space, despite dif-

ferences in architectural form (Gregory 1995; Figs. 4a–4c) and the addition of an enclosing wall in compounds. The compound courtyard group is functionally and spatially equivalent to the pithouse courtyard group and may represent a direct replacement and continuation of the Preclassic period residential tradition (Clark 1995b; Gregory 1995). The Meddler Point site, for example, contains 12 dispersed masonry compounds and an associated platform mound. Several masonry compounds are located directly on top of similarly sized Preclassic period pithouse courtyard groups, also suggesting continuity in the occupation (Craig and Clark 1994).

The second Classic period architectural form found in the Tonto Basin is the masonry room block, such as those at the

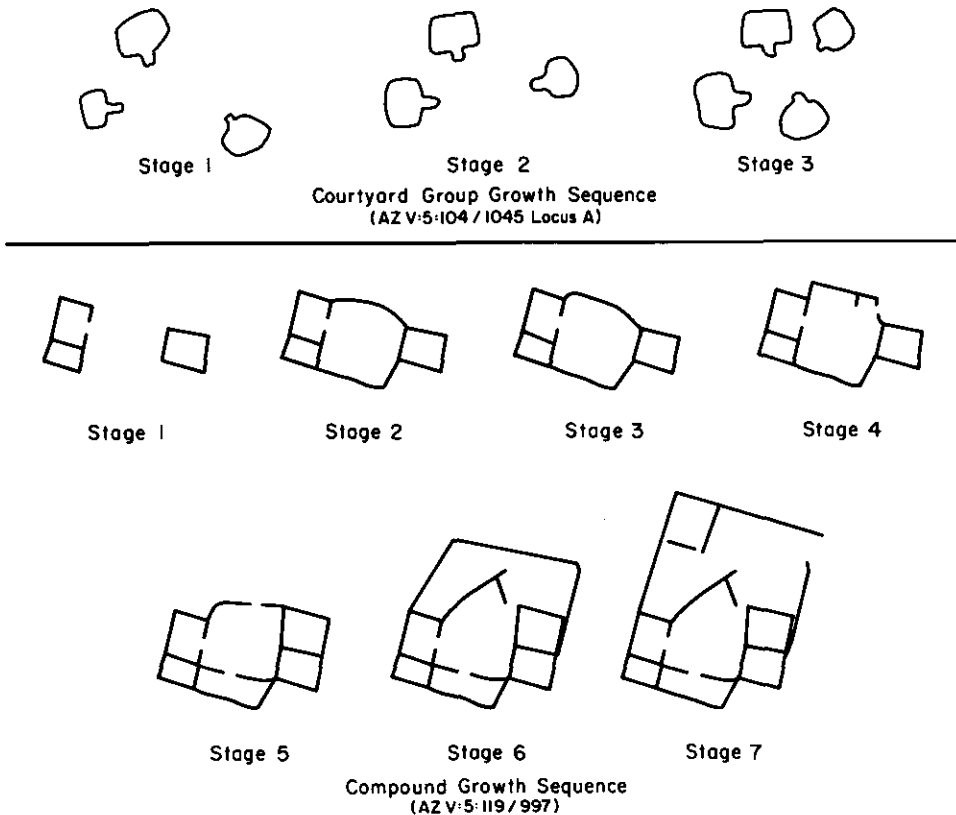


FIG. 5. Comparison of growth sequences for a Preclassic period pithouse courtyard group and a Classic period masonry compound in the eastern Tonto Basin.

Griffin Wash site and Saguaro Muerto (Figs. 4d, 4e). Griffin Wash, for example, is composed of three room blocks, the largest (Locus A) containing 48 rooms. Several dispersed small masonry compounds are also present at Griffin Wash but could not be investigated (they are currently inundated by Roosevelt Lake). Most significantly, room block architecture lacks any local antecedents and likely represents a movement into the Tonto Basin by a different cultural group. Ceramic and architectural evidence supporting this contention is presented in the following sections.

### PATTERNING IN CERAMIC TECHNOLOGICAL STYLES

Many changes in utilitarian ceramic production that began during the latter part of the Preclassic period fluoresced with the onset of the Classic period. Corrugation technology, introduced via intrusive wares in the previous century, became the predominant locally made culinary ware during the 12th and 13th centuries. Compositional analysis of unslipped (Tonto Corrugated) and slipped (Salado Red Corrugated) ceramics from Classic period contexts indicate that most were manufactured using tempering materials from the Sierra Ancha side of the Lower Tonto Basin (Miksa and Heidke 1995). The local procurement<sup>1,\*</sup> of the temper materials used in corrugated ceramics found on sites in the RCD project area in concert with the combination of previously uncommon surface treatments (exterior texturing, interior smudging) suggests the introduction of a new technological style by the Roosevelt phase. This style emulates, but does not perfectly replicate, corrugated traditions found in settlements below the Mogollon Rim, such as Grasshopper and Point of Pines.

The range of utilitarian vessel forms re-

covered from Classic period deposits is several times more diverse than that found in previous periods (Stark 1995). Many vessel forms found in the utilitarian ceramic collection—particularly the bowl forms—are shared with the Phoenix Basin and the Mogollon highlands. Some jar forms exhibit similarities to either of the two regions. For example, redware pottery (made with Tonto Basin temper) occurs in tall-necked forms that mirror those found in Gila and Salt Red ceramics from the Phoenix Basin (e.g., Abbott 1994; Haury 1945). Vessel forms of corrugated storage jars from RCD area sites resemble those found in contemporary sites in the Mogollon highlands (e.g., Rinaldo and Bluhm 1956).

One of the broadest spatial differences in ceramic technological styles lies in the use of corrugation as a surface treatment. Corrugation technology appeared several centuries earlier (shortly after A.D. 900) in the Cibola and Mimbres regions east of the Tonto Basin, as well as in the Kayenta Anasazi area to the north (LeBlanc 1982; Plog and Hantman 1986; Mills 1987). Corrugation technology—itself a decorative technique—was never widely practiced among Hohokam populations in the Sonoran desert. The technical knowledge required to corrugate ceramics was never successfully transferred into, or adopted by, this area. In contrast, corrugation was the preferred decorative forming technique for cooking pots throughout the mountain and Plateau regions during the late prehistoric period.

Small quantities of locally made corrugated ceramics were recovered from RCD sites that date to the 12th and early 13th centuries. Corrugated ceramics also appear on sites in the Globe/Miami area (approximately 50 km to the south) and the Q Ranch region (approximately 50 km to the northeast) during this time (e.g., Doyel 1978:195; Tuggle 1982:27–28). However, local production of utilitarian ceramics in the

\* See Notes section at end of paper for all footnotes.

Tonto Basin surged after A.D. 1250 (see also Wood 1987). Two styles characterize the Tonto Corrugated tradition. One is an unslipped variety that consists primarily of jars, while the other is a red-slipped corrugated tradition that commonly includes interior smudging on both bowl and jar forms. Corrugated ceramics were also recovered from Classic period contexts that

were made in the Mogollon regions to the north (Mogollon Rim) and to the northeast (east central Arizona). Examples of these three types—Tonto Corrugated, Linden Corrugated (Mogollon Rim), and McDonald Corrugated (east central Arizona)—are illustrated in Fig. 6.

The Tonto Basin corrugated ceramic tradition resembled, but did not duplicate,

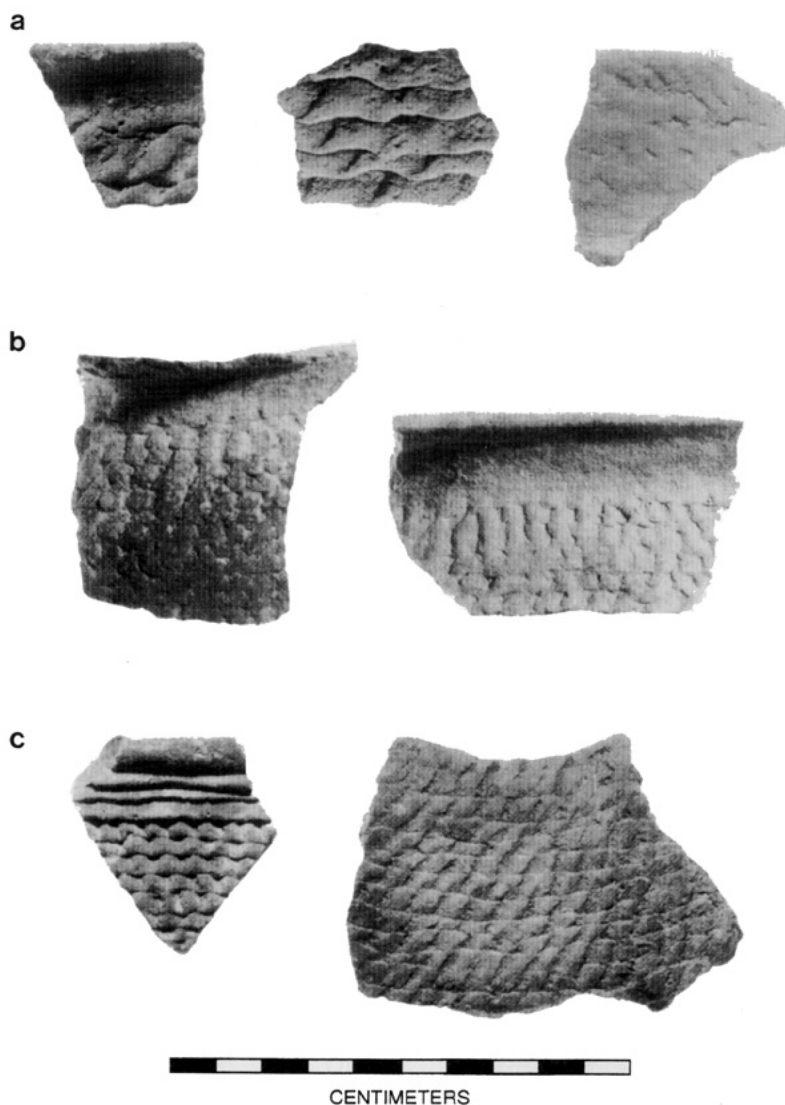


FIG. 6. Varieties of 13th-century corrugated ceramics recovered from Classic period contexts in project sites: (a) Tonto Basin (Tonto Corrugated); (b) Mogollon Rim (Linden Corrugated); (c) east-central Arizona (McDonald Corrugated).

technologies of neighboring traditions. Corrugation coils in Tonto Basin ceramics are wide and exhibit a smeared or obliterated appearance, unlike contemporary traditions in the Mogollon highlands to the northeast (Fig. 6). These technical traits (i.e., wide coils, uneven indentations, and obliteration) make the Tonto Corrugated pottery distinctive from traditions of surrounding regions. Differences in the nature of available clays may have affected the technical expression of locally made corrugated ceramics. Local ceramic traditions, developed by emerging communities of potters, probably also shaped the technological style seen in this pottery.

Not surprisingly, examination of technological styles in Classic period utilitarian ceramics yields no unidirectional area of influence. The eastern Tonto Basin technological style reflects influences from all neighboring areas, but with local twists. For example, corrugation techniques lack the expert execution of Mogollon Rim corrugated ceramics (Fig. 6). Few of the embellishments (e.g., zoned and patterned designs) found in the McDonald and Reserve pottery traditions (east central Arizona and west central New Mexico) are evident in utilitarian ceramics from the Lower Tonto Basin. Frequencies of different surface treatments, expressed in terms of ware classes, vary greatly from one portion of the basin to the next (e.g., Stark and Heidke 1992; Stark 1995). Several equivalent ceramic solutions apparently existed to meet challenges associated with food preparation and storage.<sup>2</sup>

#### PATTERNING IN TECHNOLOGICAL STYLES OF ARCHITECTURE

Surface masonry residential units, including both masonry compounds and room blocks, were common in the Lower Tonto Basin at least by the middle of the 13th century and possibly earlier (Clark 1995b). Although distinctions between the

two architectural types are visually apparent, few systematic methods have been devised to quantify these differences. Three measures were used in the architectural analyses: (1) room contiguity indexes, (2) measurements of the area of roofed versus unroofed space, and (3) a spatial analysis of circulation patterns or "gamma analysis," (Hillier and Hanson 1984). All three measures readily differentiated the two types of masonry architecture, in both the RCD and the Livingston project areas and in the general U.S. Southwest (see Clark 1995b; Stark *et al.* 1995). We focus here on the room contiguity index because it is the most robust method and the easiest to present in graphic form.

The room contiguity index was developed by Clark (1995b) in his analysis of the RCD project area architecture. Room contiguity measures the number of rooms that share walls with other rooms. The index is calculated by dividing the total number of room walls by the total number of rooms within an architectural unit, resulting in a value ranging between 2.0 and 4.0. A value of 4.0 represents a completely noncontiguous arrangement (each room has four separate walls), while a value of 2.0 represents an infinitely large grid of contiguous rooms. For example, room contiguity indexes for masonry compounds (Fig. 4a–4c) range between 3.8 and 4.0, whereas room contiguity indexes for masonry room blocks (Figs. 4d–4e) is 2.9.

Whether rooms are arranged contiguously or noncontiguously is believed to differentiate between two basic forms of residential layout. This distinction is found not only in the U.S. Southwest, but throughout the world, and appears to represent a very elemental cultural difference in conception of the proper use of space. For example, Hillier and Hanson (1984:78–79) view the distinction between a compound and a room block as fundamental in terms of the organization of architecturally

defined space, distinguishing the "clump growth process," where room contiguity determines settlement layout, from that of the "central space growth process," where a shared open space generates the overall pattern. Noncontiguous rooms and other forms of architectural segregation within residential units emphasize either separation of activities that took place within these areas, or separation of social units that resided within them. Contiguous room arrangements, on the other hand, suggest greater integration and perhaps a more keenly developed sense of community (Hegmon 1989).

Room contiguity values from the RCD and Livingston project areas and the greater Southwest are presented in Tables 2 and 3. These values are shown graphically in Figs. 7a-7b. Based on the RCD and Livingston data (Fig. 7a), which show clear breaks between classes, contiguity indexes within the 3.5-4.0 interval indicate largely noncontiguous room arrangements and were defined as compounds. Contiguity indices of 3.3 or lower were defined as room blocks. These designations, derived from Tonto Basin sites, were then applied to a sample of 37 contemporary sites located throughout the greater Southwest (Table 3; Figs. 7b and 8). As shown in Fig. 9, these values correspond very strongly with those of sites from southern Arizona with architecture previously defined as compounds (Group II), and sites from northern Arizona and parts of New Mexico and Colorado with architecture previously defined as pueblo room blocks (Group I).

Interestingly, although the Tonto Basin data are spread over the entire spectrum, suggesting the presence of different cultural traditions, approximately 25% of the measured sites or site components fall within a sort of intermediate area between the two groups (Fig. 7a).<sup>3</sup> The two types of masonry residential units are also distinct in internal growth patterns, further sup-

TABLE 2  
Room Contiguity Indexes for Early Classic Period  
(ca. A.D. 1150-1350) Residential Units in the RCD  
and Livingston Project Areas

Site locus/ compound	Total no. of rooms	Room contiguity index
<b>RCD Project Area</b>		
Pyramid Point (AZ V:5:1)		
Locus A	16	3.3
Locus B	4	3.8
Locus C	2	4.0
Locus D	2-3	4.0
Meddler Point (AZ V:5:4)/Locus A		
Compound 2	7-8	3.9
Compound 3	3-4	3.7-3.8
Compound 4	4	4.0
Compound 5	4	3.8
Compound 6	1	4.0
Compound 7	4+	4.0
Meddler Point (AZ V:5:4)/Locus B		
Compound 8	8-10	2.8-3.1
Compound 9	1	4.0
Compound 10	2	4.0
Compound 11	9-11	3.5-3.8
Compound 12	4-5	3.1-3.5
Griffin Wash (AZ V:5:90)		
Locus A	48	2.9
Locus B	15?	3.5?
Locus C	26	2.9
AZ V:5:91	1	4.0
AZ V:5:95	2?	3.5
AZ V:5:96	3	3.3
AZ V:5:97	1?	4.0
Las Manos (AZ V:5:101)		
Locus C	2?	4.0
Locus D	3	3.7
AX V:5:103	2	4.0
AZ V:5:105	1	4.0
Porcupine (AZ V:5:106)	4	3.8
AZ V:5:110	2	4.0
AZ V:5:123	2	4.0
<b>Livingston Project Area</b>		
Sand Dune (AZ V:5:112)		
AZ V:5:119	8	4.0
AZ V:5:121	5	3.6
AZ V:5:121	4	3.8
AZ V:5:125	6-8	3.9-4.0
Saguaro Muerto (AZ V:5:128)		
AZ V:5:130	13-18	2.9
AZ V:5:130	5-6	4.0
AZ V:5:139	4?	4.0
AZ V:5:141	6	4.0

TABLE 3  
 Room Contiguity Indexes for Pueblo II/Pueblo III and Early Classic Period Sites (ca. A.D. 1050–1350) in the General American Southwest. Figure 8 provides locations of subregions and Fig. 9 provides site locations.

Area/site <sup>a</sup>	Total no. of rooms	Room contiguity index	Literature reference
<b>Mimbres Region (MI)</b>			
1. NAN Ranch Ruin	43 +	2.8	Shafer 1988
2. Galaz Ruin	ca. 125	2.6	Anyon and LeBlanc 1984
3. Swarts Ruin	ca. 113	2.7	Cosgrove and Cosgrove 1932
<b>Chaco Canyon (CC)</b>			
4. Pueblo Alto through Stage 5	ca. 78 + 4 kivas	2.7	Lekson 1984
5. Wijiji	ca. 106 + 2 kivas	2.4	Lekson 1984
6. Kin Kletso, east	26 + 1 kiva	2.9	Lekson 1984
<b>Rio Abajo Province, Rio Grande (RA)</b>			
7. Bowling Green Pueblo	20 +	3.0	Marshall and Walt 1984
8. La Hija del Nido	43 +	3.1	Marshall and Walt 1984
9. Piedras Negras	ca. 150	2.9	Marshall and Walt 1984
<b>Tularosa–Quemado Region (TQ)</b>			
10. Sandstone Hill Pueblo Ruin	18	2.5	Barnett 1974
11. Mariana Mesa, Site 481	34 + 1 kiva	2.6	McGimsey 1980
12. Higgins Flat Pueblo	22 +	2.6	Martin et al. 1956
13. Starkweather Ruin	12	2.7	Nesbitt 1938
<b>Four Corners Region (FC)</b>			
14. San Canyon Pueblo	ca. 420 + at least 95 kivas	2.8	Bradley 1992
15. The Green Lizard Site	ca. 19	3.1	Huber and Lipe 1992
<b>Upper Little Colorado River (UC)</b>			
16. Broken K Pueblo	91 + 2 kivas	2.7	Martin et al. 1967
17. Carter Ranch Pueblo	ca. 38	2.5	Martin et al. 1964
<b>White Mountain Region (WM)</b>			
18. Chodistaas	18	2.9	Montgomery 1993
19. Tla Kii Ruin	24 +	2.8	Haury 1985
20. AZ P:6:10	5	3.0	Reid (ed.) 1982
<b>San Carlos Region (SC)</b>			
21. Turkey Creek Pueblo	314 +	2.4	Lowell 1991
22. AZ W:10:37 (Point of Pines outlier)	26 +	2.7	Olson 1959
<b>Bylas Area (B)</b>			
23. AZ V:16:10	62 +	3.4	Johnson and Wasley 1966
24. AZ V:16:8 (unit 1)	9	3.2	Johnson and Wasley 1966
<b>Tonto Rim (TR)</b>			
25. Shoofly Village	72	3.4	Redman 1993
26. The Mayfield Canyon Site	ca. 34	3.0	Lindauer 1991
27. Risser Ranch	ca. 47	3.4	Redman 1993

TABLE 3—Continued

Area/site <sup>a</sup>	Total no. of rooms	Room contiguity index	Literature reference
<b>Lower Verde River (LV)</b>			
28. Roadhouse Run (AZ U:2:73)	13	3.9	Deaver <i>et al.</i> 1994
<b>Middle Gila River (MG)</b>			
29. Sacaton 9:6	ca. 10	3.5	Gladwin 1929
30. Las Fosas	13	4.0	Sires 1987
31. Escalante Ruin Group			
—AZ U:15:22	5	4.0	Doyel 1974
—Sidewinder Ruin (AZ U:15:32)	6	4.0	Doyel 1974
32. The Columbus Site (AZ V:9:57)	ca 6	3.8	Doyel 1978
<b>Santa Cruz River and Tucson Basin (ST)</b>			
33. Cerro Prieto	288	4.0	Downum <i>et al.</i> 1993
34. Sabino Canyon Ruin (AZ BB:9:32)	23+	3.9	Wallace and Holmlund 1984
35. Loma Alta (AZ BB:14:10)	ca. 26	3.9	Wallace and Holmlund 1984
36. Whiptail Ruin (AZ BB:10:3)	ca. 36	3.8	Wallace and Holmlund 1984
<b>Agua Fria River (AF)</b>			
37. Casa de Piedras	12	4.0	Nelson 1993

<sup>a</sup> Subregions are depicted in Fig. 8. Numbers preceding sites represent map reference numbers in Fig. 9.

porting the presence of different traditions of arranging residential space in the eastern Tonto Basin. Reconstruction of circulation patterns and growth sequences suggests a developmental sequence among types of compounds. Courtyard groups containing one to three noncontiguous structures facing a common unroofed area occur repeatedly in compound residential units (Figs. 4–5). The pithouse courtyard group is the basic unit of site structure with deep historical roots in Southern Arizona. Large Classic period village sites are often composed of a number of distinct compounds separated from each other by distances of up to 100 m. The Meddler Point site, for example, has isolated compounds dispersed over a linear distance of close to 1 km. The Meddler Point pattern contrasts markedly with the spatial arrangement of room blocks, like those at the Griffin Wash site, which may contain a

similarly sized population within a much more restricted area. We focus on these contrasts later in our discussion.

Another architectural distinction in the Classic period settlements lies in differences in wood used for construction. The Griffin Wash site had unusually large quantities of high elevation wood species. Of the 90 early Classic period rooms sampled by the RCD study, wood species found at an elevation of under 1500 m (5000 feet) such as mesquite, juniper, palo verde, cottonwood, and creosote were the most common construction materials. Resource areas for all of these materials lay within a day's walk from project area settlements. Mesquite, for example, was recovered from most sampled contexts and is plentiful in bosques along the Salt River. At the Griffin Wash site, however, half of the intensively excavated rooms were constructed using a "high-elevation" wood

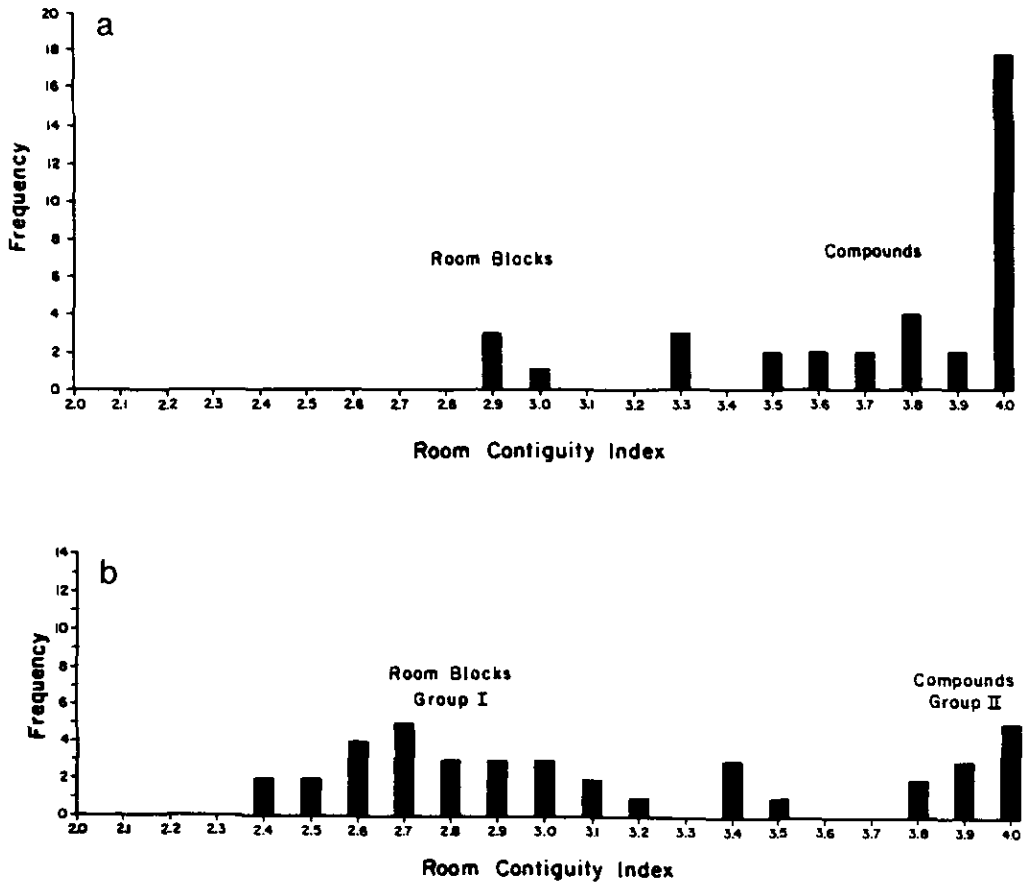


FIG. 7. Room contiguity indexes for: (a) the RCD and Livingston project areas; and (b) the general American Southwest.

assemblage, containing primarily Douglas and white fir and ponderosa pine, with little or no mesquite. Only one other excavated context in the project area contained a high elevation assemblage: one of the two rooms on top of the Meddler Point platform mound.

This type of long-distance importation of high-elevation conifers has been reported from other sites in the prehistoric Southwest, most notably at several platform mound sites (Charles Miksicek, Henry Wallace, personal communication 1994) and at the Chacoan site of Chetro Keti (Betancourt *et al.* 1986). At Chaco during the 11th century, procurement distances for spruce and fir construction tim-

bers may have exceeded 75 km. The quantity of the high-elevation woods at Griffin Wash, the size of the beams, and their selective distribution within rooms suggest that they were not procured as driftwood from the Salt River or its tributaries (Miksicek 1995). Both firs are found only at elevations above 2100 m (7000 feet), and ponderosa above 1800 m (6000 feet), and the closest source is at the top of the Sierra Ancha over 25 km (straight-line distance) from the eastern Tonto Basin. These materials would have been expensive from the perspective of labor acquisition, necessitating at least a 2-day excursion. Yet they were common in Griffin Wash residential construction in rooms of all sizes.

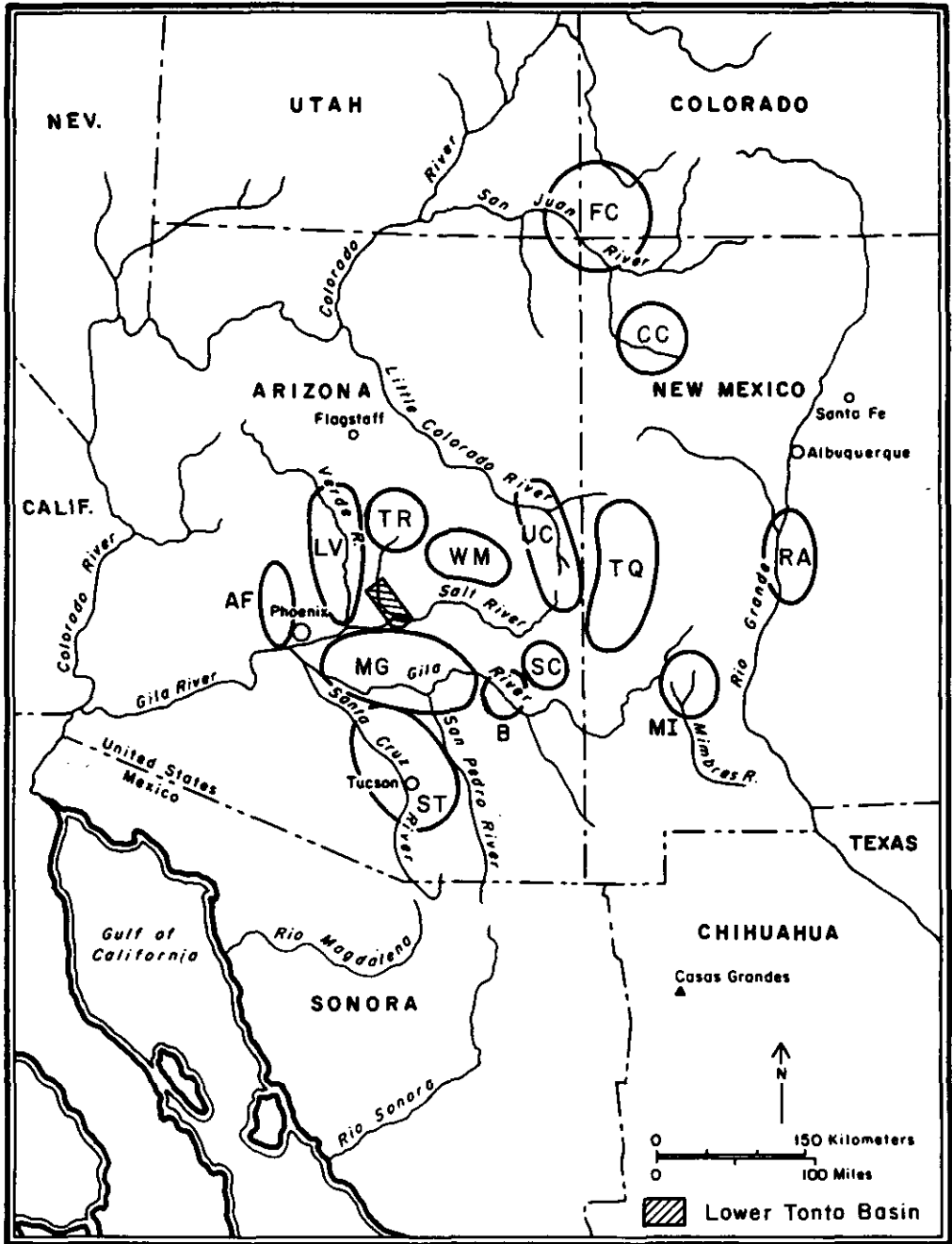


FIG. 8. Subregions used in the tabulation of room contiguity indexes. Table 3 lists sites included within each subregion.

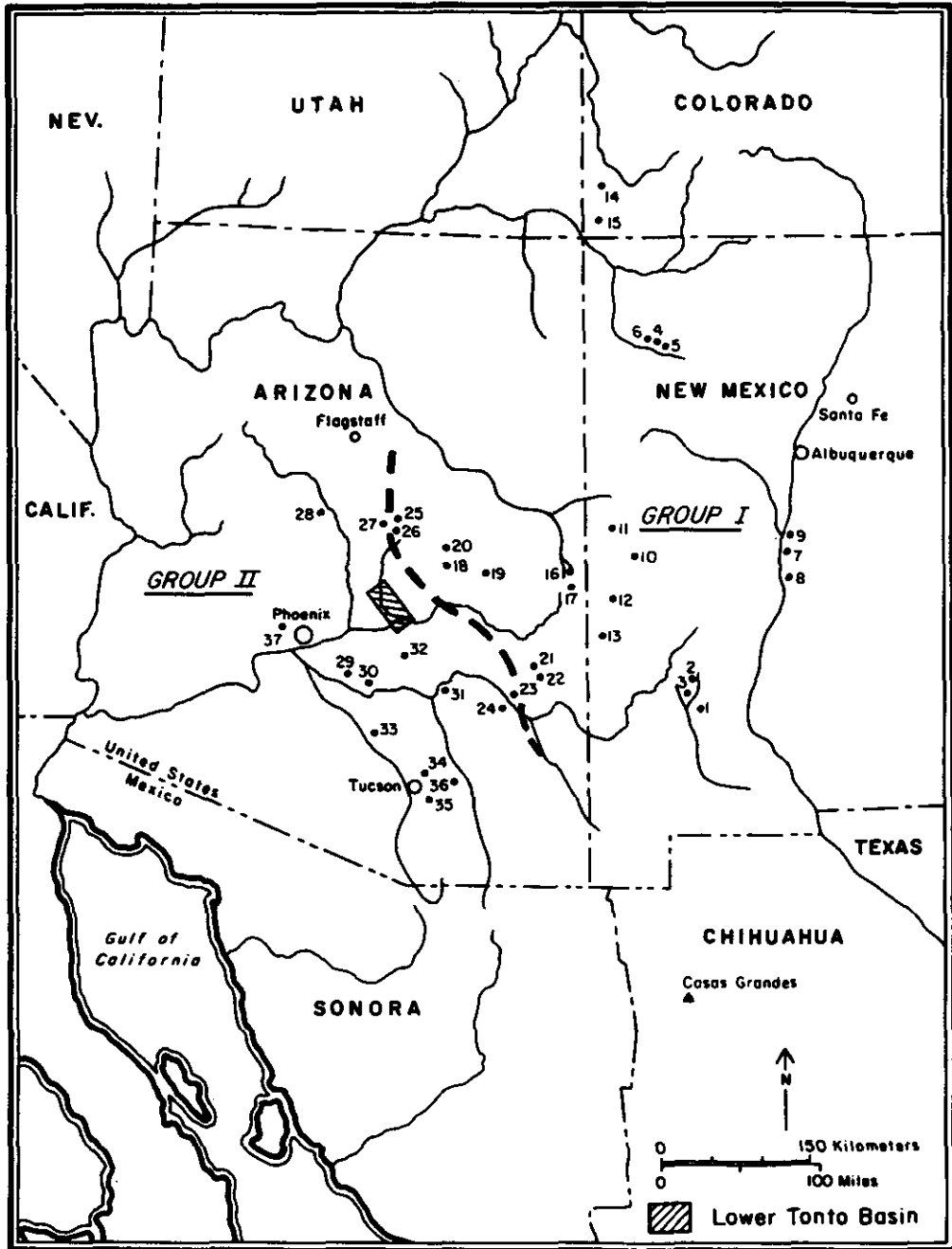


FIG. 9. Spatial distribution of Group I (room block) and Group II (compound) residential units defined by the room contiguity index for PIII/Early Classic period. Table 3 provides a correlation of site number and contiguity index.

Long-distance wood importation in the Chaco case probably resulted from a lack of locally available timber. This, however, was not the case in the Tonto Basin. Construction demands of a different architectural construction style at settlements like Griffin Wash demanded the use of high-elevation wood species. The presence of these differences in wood use is consistent with the hypothesis of a nonlocal origin for some inhabitants at the Griffin Wash settlement.

## DISCUSSION

The era that began with the Classic period in the Tonto Basin marks a watershed throughout the greater Southwest. The period between A.D. 1250 and A.D. 1300, when platform mounds first appear in the eastern Tonto Basin, was a time of widespread environmental stress and interregional population movement and resettlement (e.g., Crown 1994; Dean *et al.* 1994; Cordell *et al.* 1994). In the northern Southwest, aggregation processes operating during the 12th and 13th centuries concentrated populations along major waterways and resulted in abandonment of large areas. In the southern Southwest, platform mound systems may have linked groups and communities into larger regional economies. Residential mobility, insofar as this involved small group abandonment of particular regions and aggregation in others, was a common adaptive strategy (e.g., Dean *et al.* 1985, 1994).

The Tonto Basin Roosevelt phase is roughly contemporaneous with the early Classic period in the Hohokam area to the south. The phase is also contemporaneous with the late Pueblo III and early Pueblo IV periods in the Mogollon and Anasazi areas to the north (Fig. 2). This 75 to 100-year interval was a period of accelerated cultural change on an interregional scale that coincided with dramatic shifts in climate

and populations (e.g., Adams 1991; Crown 1994; Dean *et al.* 1994; Lindsay 1987; S. Plog 1980). Developments within the eastern Tonto Basin during this period reflect pan-regional demographic processes, notably regional abandonments and population dislocations.

### *Archaeological Evidence for Migration*

Patterning of architectural technological styles in the Lower Tonto Basin support the hypothesis that several Classic period settlements experienced immigration events, in which room block construction formed the migrants' primary architectural style. These sites include Griffin Wash, Saguaro Muerto, and possibly several compounds within Locus B of the Meddler Point site. Another room block, located within the Schoolhouse Point complex, may also have housed a migrant group. In each case, portions of the settlement contain spatial configurations that were anomalous for the Tonto Basin.

Differing conceptions of space among these settlements are most apparent when site structure is compared between the Meddler Point and Griffin Wash sites (Figs. 10–13). Meddler Point contains dispersed masonry compounds and an associated platform mound (Fig. 10). In morphology and appearance (Fig. 11), Meddler Point represents the continuation of the Preclassic local tradition. Griffin Wash, in contrast, represents a very different use of social and architectural space (Fig. 12). This site contains nucleated room blocks, lacks a platform mound, and has a pueblo-like appearance (Fig. 13). These settlements were occupied at the same time and were located in the same local system in the Lower Tonto Basin.

If physical distance and barriers to circulation translate into social distance (see review in Hegmon 1989), then the relations among the basic social units living in room

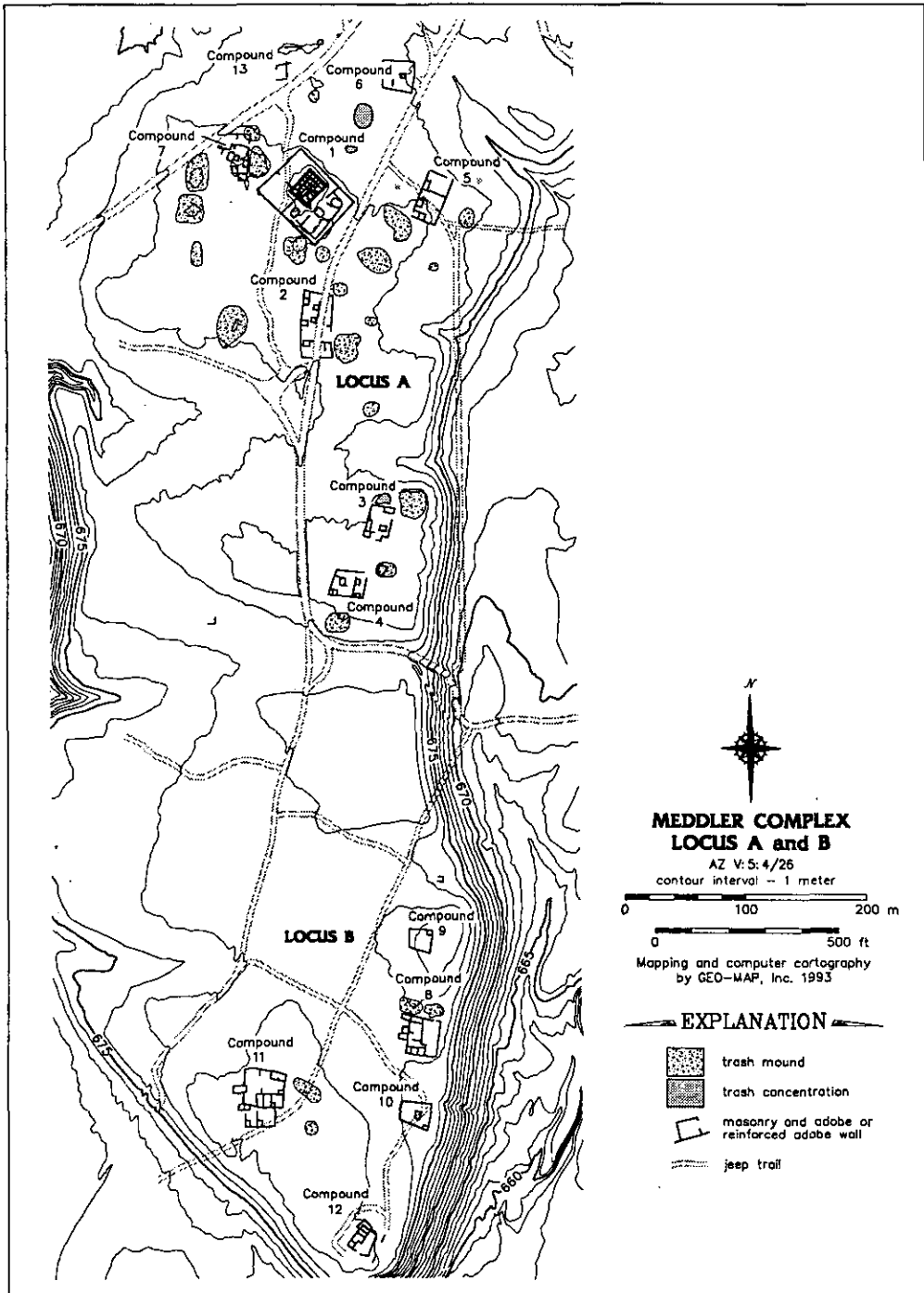


FIG. 10. Plan of the Meddler Point site (AZ V:5:4). The platform mound is located within Compound 1.

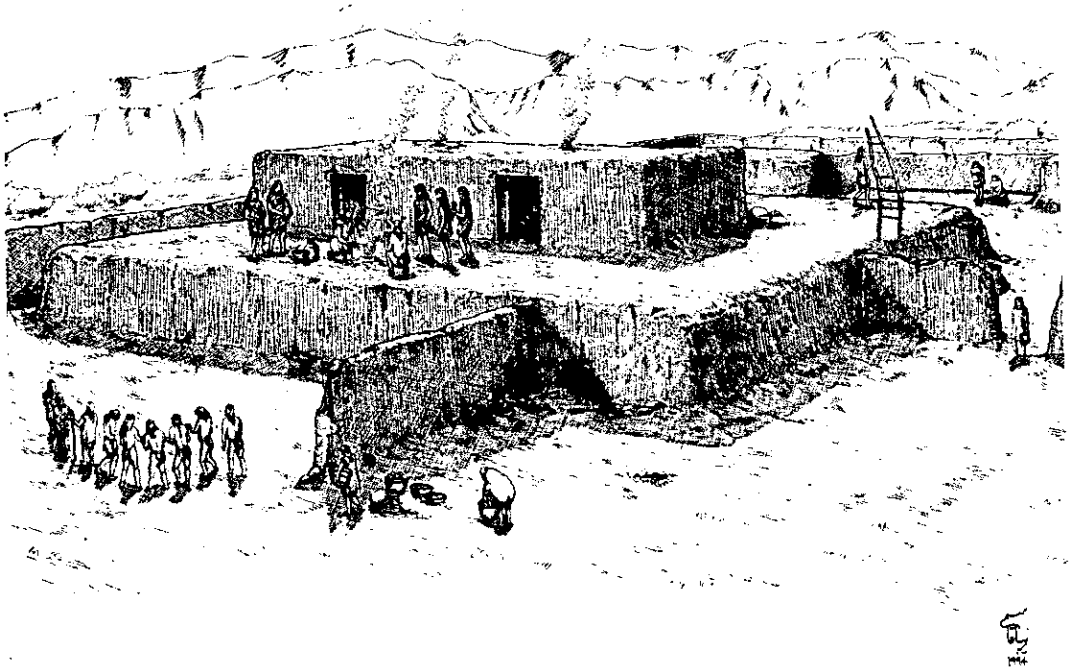


FIG. 11. Architectural reconstruction of the Meddler Point platform mound within Compound 1, facing east. Reconstruction by Ziba Ghassemi.

blocks must have differed substantially from relations between residents of compounds. The architectural data fit well with data from the ceramic analysis, which suggest that residents of the Griffin Wash site also specialized in the production of corrugated ceramics (Stark and Heidke 1995). Similar patterns are apparent at the site of Saguaro Muerto as well (Simon 1994).

Differences in ethnobotanical remains of mustard and corn pollen between project area sites provide an additional line of evidence for ethnic coresidence in the eastern Tonto Basin. No mustard pollen was recovered from the Griffin Wash site, although almost twice as many contexts were analyzed there than at any other site. Since the ubiquity of mustard pollen at other contemporary sites in the project area averaged just over 40% (Fish 1995), the absence of such remains at Griffin Wash may reflect a cultural food prefer-

ence (Gasser and Kwiatkowski 1991:218). Different cultural preferences might also explain patterning in the corn pollen. Corn pollen ubiquity values at Griffin Wash were several times higher than any other site in the project area and virtually unsurpassed in southern Arizona (Fish 1995). This suggests the possibility of different methods of corn storage (full unhusked cobs instead of as kernels off the cob common at the other sites) or different use of corn pollen.

Variability in architectural patterns, construction materials and techniques, ethnobotanical resources, and patterns in the distribution of locally produced utilitarian ceramics identify intrusive populations with probable northern or northeastern origins. One other line of evidence is the fact that both Griffin Wash and Saguaro Muerto are located on the margins of the local settlement system (Fig. 3). This suggests that the migrant groups entered an

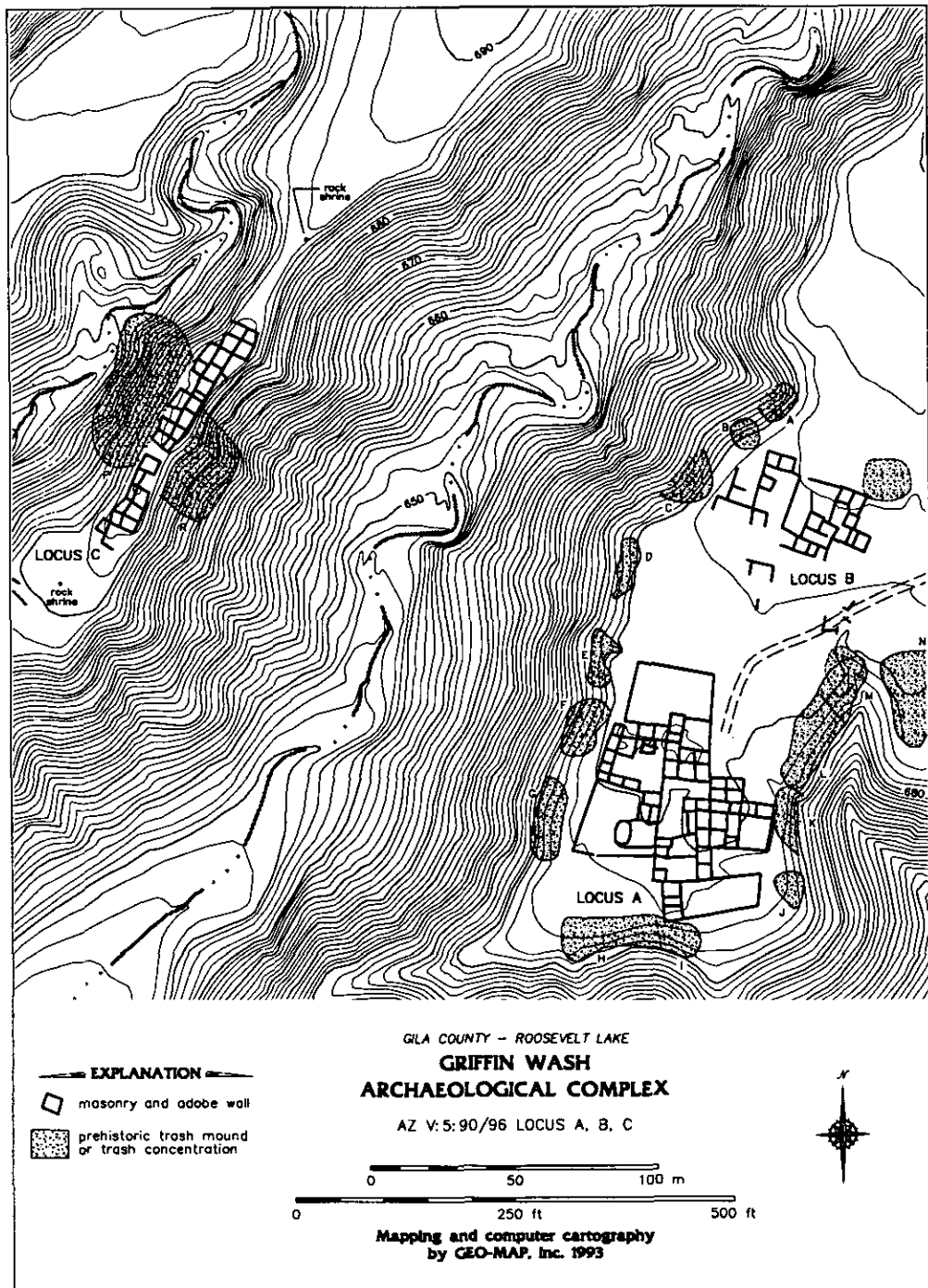


FIG. 12. Plan of the Griffin Wash site (AZ V:5:90).

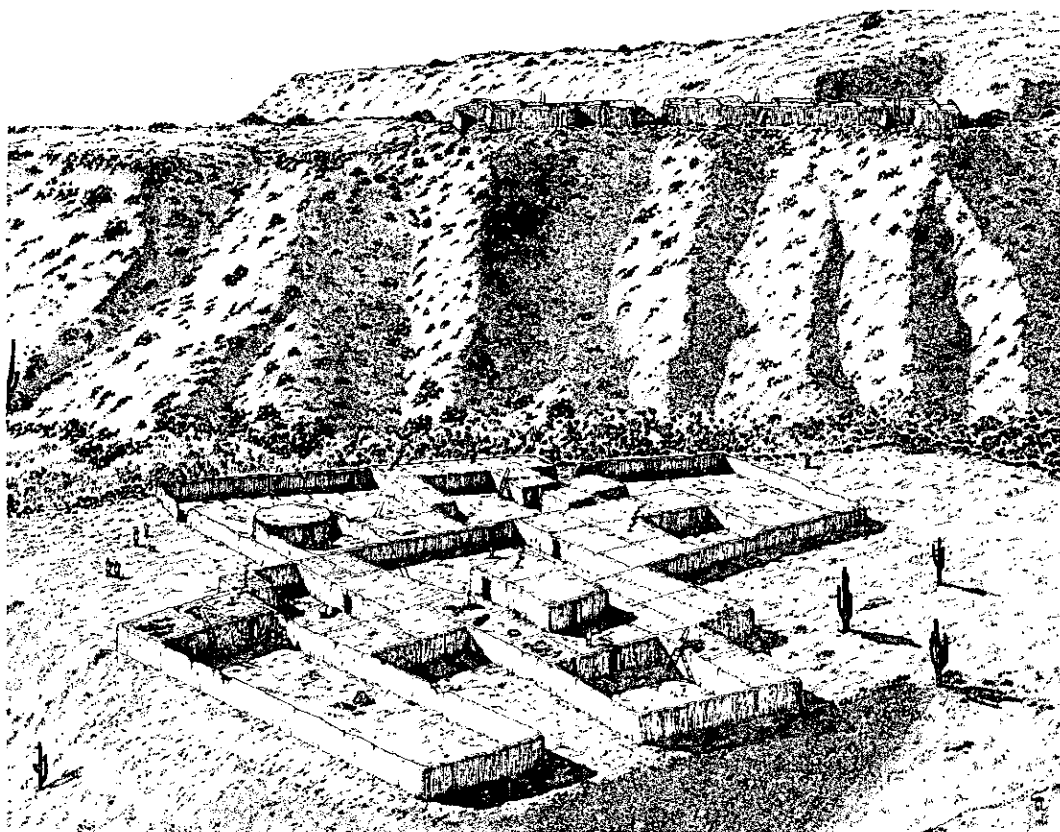


FIG. 13. Architectural reconstruction of Locus A (with Locus C in background) of the Griffin Wash site, facing west. Reconstruction by Ziba Ghassemi.

already established land tenure system and that the migrants may have therefore lacked adequate access to good irrigable land. Smaller enclave settlements may have been more readily assimilated into the local system (such as Locus B at Meddler Point), providing labor for irrigation systems that may have intensified and expanded during this period.

The "pull factors" that lured groups into the Tonto Basin during the Roosevelt phase were partly environmental and partly social (see Ahlstrom *et al.*, this issue). Probably the most critical factor was a continuous and dependable water source, even during periods of major drought that characterized the late 13th-century Southwest. Settlement data at this time also suggest that relatively large areas

of land in the Basin were unoccupied and presumably available for migratory groups. However, the land may not have been of the highest quality for irrigation farming. Little evidence exists for conflict early in the Lower Tonto Basin during this time, unlike other areas of the northern Southwest (see Wilcox and Haas 1994). Nevertheless, conflict to the north may have been a "push" factor that motivated groups to emigrate.

Social relations between residents of the Lower Tonto Basin and those in the Cibola region may have been well established a century in advance of migrations. A dramatic shift occurred in the RCD decorated ceramic collections between A.D. 1050 and A.D. 1100, as Hohokam buffwares were replaced with Cibola whitewares during

this time. This timing coincides with the collapse of the Sedentary period Hohokam system in areas to the south of the study area. Cross-boundary relationships between the Tonto Basin and the Cibola areas, as Cameron (this issue) notes, would have provided knowledge of possible migration routes and target destinations. The existence of such relationships might also have provided some assurance that migrants would be integrated peacefully into their new homes.

### IMMEDIATE IMPACT OF CLASSIC PERIOD MIGRATIONS

There are two different viewpoints from which to assess the immediate impact of these Classic period migrations: from that of migrant population and from that of the indigenous (or host) population. From the perspective of migrant groups, the destination area may have had limited arable or irrigable land and required flexibility in economic strategies. From the host population's perspective, some migrant groups were more easily assimilated than others into the local system of the Lower Tonto Basin.

#### *Pursuit of Alternative Subsistence Strategies*

Settlement pattern data from the RCD study area suggest that all of the best irrigable land was already occupied by the local population by the time of the 13th-century migrations. Migrant groups therefore had to settle on the periphery of the established settlement system. Even though migrants into the Griffin Wash site appear to have joined a small indigenous group, the dramatic increase in population would have strained the established resources. The northern origins of these groups suggests a prior residential pattern of movement and short-term aggregation associated with Pueblo III populations (Lekson 1990; Mills 1994:61). They may

thus have had a markedly different lifestyle and adaptation than that of the sedentary indigenous Tonto Basin population (Dean *et al.* 1994:70). Access to arable land and different residential mobility patterns can be added to the list of differences between local and migrant groups in the late 13th-century Tonto Basin and may have been a source of friction.

It is reasonable to assume that migrant households turned to other economic strategies to make ends meet, such as craft specialization (e.g., Arnold 1985; Stark 1991). The introduction of red-slipped corrugated pottery (Salado Red Corrugated) coincides with the entry of these migrant groups into the area. Within the study area, only one site complex—Griffin Wash—shows a predominance of locally derived tempering materials in corrugated ceramics as well as in all other categories of utilitarian ceramics (Stark and Heidke 1995, Fig. 16.7). The widespread distribution of Salado Corrugated wares in the Lower Tonto Basin and the evidence for local production at Griffin Wash suggests that the inhabitants of the site were producing slipped corrugated wares for exchange as a community-based specialization.

A similar scenario might characterize the migrant populations at the Saguaro Muerto site that lies on the opposite bank of the Salt River (Fig. 3). There, slipped corrugated wares were predominantly tempered with a nonlocal sand. However, nearly 70% of the unslipped corrugated wares contained materials from local temper resource zones (Stark and Heidke 1995, Fig. 16.8). The percentage of unslipped corrugated wares in the utilitarian ceramic assemblage from the Saguaro Muerto enclave was higher than any other Livingston site by a factor of nearly 10, except for the closest residential compound (AZ V:5:130) which was only slightly lower (Simon 1994, Table 18.2). Local production of utilitarian ceramics for exchange may

have provided residents of Saguaro Muerto with one economic alternative to intensive cultivation as well.

Specialization in other subsistence goods is also a possibility, although the data are not as clear as those for corrugated ceramics. In the RCD project area, Locus A of Griffin Wash has higher ubiquity values for agave (over 80% of the flotation samples contained agave) than any other Roosevelt phase site. Because agave is one crop that is grown without irrigation, it is possible that the Griffin Wash inhabitants concentrated on growing this species, either for exchange for other (irrigated) crops or simply for their own use.

#### *Emergence of Platform Mound Communities*

At least during the initial stages of the Roosevelt phase, immigration of puebloan households into the Lower Tonto Basin did not disrupt the local settlement system, nor was the local population displaced. Settlement of migrant groups on the margins of the local system indicates that local land tenure relationships probably changed little with the entry of new groups during the early Classic period. Some of these groups were smoothly incorporated into the local social systems, and in the case of Griffin Wash, apparently into a small local settlement complex. Increasing numbers of migrant groups, however, may have gradually created friction between local and nonlocal groups over the course of two or three generations.

Four platform mounds, including one tower-like mound at Pyramid Point, were erected within 5 km of each other in the late 13th century (Doelle *et al.* 1995). This constitutes the densest concentration of contemporaneous mounds within the Tonto Basin during any interval in the Classic Period. The emergence of platform mound constructions at nearly the identical time that migrant groups entered the

region suggests correlation, if not causation. Exhaustive architectural analyses of the Meddler Point platform mound (Craig and Clark 1994:112–119) suggests that the mound functioned primarily as a locus for ceremonial activities that in part involved public display and participation. Platform mounds in the eastern Tonto Basin probably served as high-level integrative facilities (cf. Adler 1989). Groups of culturally diverse backgrounds who now inhabited the region probably used these mounds for public ceremonies associated with ideological systems (also see Crown 1994). These communal rituals may have served similar purposes to those practiced as part of the kachina religion in the historic western Pueblos (see Adams 1991 for a similar view on public integrative features).

Integration at this time may have been desirable for the organization of irrigation farming and other subsistence-related tasks to feed a steadily increasing population and for communication, particularly for common defensive purposes. The integrative function of the platform mounds is tentatively supported by the pattern of room construction on top of the Meddler Point mound. One of the two rooms was constructed with a high-elevation wood assemblage (identical to the assemblages at Griffin Wash), while the other room contained a very typical mesquite-dominated desert assemblage (identical to the assemblages at most of the project area compounds). This duality further suggests the mound's integrative function in a multicultural local system.

#### **LONG-TERM CONSEQUENCES OF MIGRATION**

Short-term impacts of the early Classic period migrations affected individuals and settlements in the lower Tonto Basin. The timing of migration events and platform mound construction suggests that new so-

cial institutions were embraced to integrate the population as well as to mediate differences between diverse groups. A powerful but evanescent ideological system, whose tenets were publicly practiced at platform mound settlements throughout the eastern Tonto Basin, may have generated a regional sense of unity as well. However, by A.D. 1325, most portions of the eastern Tonto Basin had been abandoned in favor of other locations in the basin or elsewhere. Although some of the population probably aggregated into the Schoolhouse Point site, that site was not large enough to have accommodated even half of the eastern Tonto Basin's early Classic period population (Lindauer 1995).

Reasons for the Roosevelt phase abandonment of the eastern Tonto Basin are complex. It seems likely that both environmental factors (Craig and Clark 1994:197; Masse 1991:220–221; Waters 1994) and social factors caused most of the population to leave the eastern basin. The role played by migrant groups in the disruption of the settlement system at the end of the Roosevelt phase is still unclear. It is possible that integration through the platform mound system simply failed, and cooperation needed for successful procurement of subsistence goods to feed an increasing population became unfeasible (see also Whittlesey and Ciolek-Torrello 1992). The widespread and intense burning encountered in many late Roosevelt phase structures in the eastern Tonto Basin suggests that conflict may have also played a role in the Roosevelt phase abandonments (Elson *et al.* 1995).

During the late Classic period, larger aggregations formed than had been seen previously throughout the Tonto Basin. These large local systems collapsed, too, within 75 years. By the mid-15th century, most of the Tonto Basin had been emptied of its populations. Another migration—one that took people out of the basin—marked the

end of the prehistoric period in the Tonto Basin.

### CONTRIBUTIONS OF THE STUDY

This study has made several contributions to the study of migration in Southwestern archaeology. The first is in the analytical constructs that it has offered as alternative methods of identifying social groups in the archaeological record. The second is a clear documentation of population movement into the Tonto Basin from points north or northeast. The introduction of a technological approach—with an emphasis on differences in technological style—enables us to reexamine old data in a new light. Using such techniques, we found that patterning in domestic architecture and utilitarian ceramics strongly suggests that migratory groups moved into the eastern Tonto Basin soon after the mid-13th century.

We return to some of our initial questions to illustrate other contributions of our study. One question concerned the scale of Classic period migrations. Demographic data suggest that the migrations represented a 25% increase over previous population levels (Doelle 1995). Research through the Roosevelt Community Development Study suggests that this population increase had a profound effect on the local population. Tonto Basin farmers at A.D. 1250 had struck at least an uneasy balance with their environment, and lived in settlements that had changed little in hundreds of years. This balance was disrupted by climatic stress and the influx of populations who sought their own means of subsistence. To say that population migrations in the late 13th century affected the local population in the Tonto Basin is not to place all responsibility for Classic period changes on these migrant groups, nor is it to argue that his population increase heightened the level of sociopoliti-

cal complexity in the eastern Tonto Basin, since the area was abandoned within a few generations. Migration was only one part of a larger process that forced Tonto Basin populations to readjust in social and economic ways.

### ACKNOWLEDGMENTS

Research for this paper was conducted by Desert Archaeology, Inc., for the Bureau of Reclamation in connection with modifications to the Roosevelt Dam. Fieldwork for the Roosevelt Community Development Study was conducted under terms of a permit from the Tonto National Forest. Special thanks are due to William Doelle, Catherine Cameron, and Stephen Lekson for their astute commentary on an earlier draft of this paper and to David Gregory for thoughtful conversations on the topic. Ronald Beckwith and Ellen Knight drafted Figs. 1–6; James Holmlund of Geo-Map, Inc. generated Figs. 7 and 8; Irina Hynes, Donna Breckenridge, and Elizabeth Black aided in the production process. We take full responsibility, however, for ideas expressed in this study.

### NOTES

<sup>1</sup> In this study "local" is defined as temper sources found within 3 km of the site area. This is based on cross-cultural research on distance to temper resources of 29 traditional pottery-making communities (see Heidke and Miksa 1995, Table 9.1).

<sup>2</sup> Only some aspects of the operational sequence can be examined in utilitarian ceramics from the RCD collections (see, for example, Stark and Heidke 1992). More work, however, is needed to document differences in forming techniques (expressed in vessel form variability) within the Tonto Basin as well as in neighboring regions for this period. Technological studies from the RCD study have identified differences in decorative techniques and postfiring treatments that likely reflect multiple technological traditions. Tonto Basin potters alternately burnished, slipped, and textured their pots during the Roosevelt phase, and certain suites of these techniques correlate with spatially discrete temper resource zones in the Tonto Basin.

<sup>3</sup> Joining some of the sites in the Tonto Basin within this area are two of three sites from the Tonto Rim (TR) area and one of the two sites from the Bylas (B) area (Table 3 and Fig. 5), suggesting the possibility of a northwest to southeast trending "mixed" zone between the two architecturally defined areas. Some of the sites within this zone, such as the Shoofly Ruin, contain areas of both contiguous and noncontiguous architecture (and therefore an intermediate

index score). Redman (1993:171–172) uses the mixed architecture as one line of evidence to argue that Shoofly was inhabited by culturally diverse groups. This may also explain why some Tonto Basin room block styles, like that of Locus A at Griffin Wash (Fig. 4d), are difficult to place within specific neighboring architectural traditions.

### REFERENCES CITED

- Abbott, David R. (editor)  
1994 *Pueblo Grande Project: Pueblo Grande ceramics, pottery production, and exchange in the Central Phoenix Basin*. Vol. 3. Publications in Archaeology 20. Soil Systems Inc., Phoenix.
- Adams, E. Charles  
1991 *The origin and development of the Pueblo Katsina cult*. University of Arizona Press, Tucson.
- Adler, Michael A.  
1989 Ritual facilities and social integration in nonranked societies. In *The architecture of social integration in prehistoric pueblos*, edited by W. D. Lipe and M. Hegmon, pp. 35–52. Occasional Papers No. 1. Crow Canyon Archaeological Center, Cortez, CO.
- Anyon, Roger, and Steven A. LeBlanc  
1984 *The Galaz ruin, a prehistoric Mimbres village in Southwestern New Mexico*. Maxwell Museum of Anthropology and the University of New Mexico Press, Albuquerque.
- Arnold, Dean  
1985 *Ceramic theory and culture process*. Cambridge University Press, Cambridge, MA.
- Baker, Vernon G.  
1980 Archaeological visibility of Afro-American culture: An example from Black Lucy's Garden, Andover. In *Archaeological perspectives on ethnicity in America: Afro-American and Asian American culture history*, edited by R. L. Schuyler, pp. 29–37. Baywood Publishing, New York.
- Baldwin, Stuart J.  
1987 Roomsize patterns: A quantitative method for approaching ethnic identification in architecture. In *Ethnicity and culture*, edited by R. Auger, M. F. Glass, S. MacEachern, and P. H. McCartney, pp. 163–174. The University of Calgary Archaeological Association.
- Barnett, Franklin  
1974 *Sandstone Hill pueblo ruin: Cibola culture in Catron County, New Mexico*. Albuquerque Archaeological Society, Albuquerque, NM.
- Betancourt, Julio, Jeffrey S. Dean, and Herbert M. Hull  
1986 Prehistoric long-distance transport of construction beams, Chaco Canyon, New Mexico. *American Antiquity* 51(2):370–375.

- Bradley, Bruce A.  
 1992 Excavations at Sand Canyon pueblo. In *The Sand Canyon Archaeological Project: A progress report*, edited by W. D. Lipe, pp. 79–104. Occasional Paper No. 2, Crow Canyon Archaeological Center, Cortez, CO.
- Childs, S. Terry  
 1991 Style, technology, and iron smelting furnaces in Bantu-speaking Africa. *Journal of Anthropological Archaeology* 10:332–359.
- Ciolek-Torrello, Richard S., Steven D. Shelley, Jeffrey H. Altschul, and John Welch  
 1990 *The Roosevelt Rural Sites Study research design*, Vol. 1, Technical Series 28. Statistical Research, Inc., Tucson, AZ.
- Ciolek-Torrello, Richard, and John R. Welch (editors)  
 1994 *The Roosevelt Rural Sites study: Changing land use in the Tonto Basin*, Vol. 3. Technical Series 28. Statistical Research, Inc., Tucson, AZ.
- Clark, Jeffery J.  
 1995a Reassessing the role of migration in social change during the early Classic period. In *The Roosevelt Community Development Study: New perspectives on Tonto Basin prehistory*, edited by M. D. Elson, M. T. Stark, and D. A. Gregory. Anthropological Papers No. 15. Center for Desert Archaeology, Tucson, AZ. In press.  
 1995b The construction and organization of space in domestic architecture. In *The Roosevelt Community Development Study: New perspectives on Tonto Basin prehistory*, edited by M. D. Elson, M. T. Stark, and D. A. Gregory. Anthropological Papers No. 15. Center for Desert Archaeology, Tucson, AZ. In press.
- Collett, David  
 1987 A contribution to the study of migrations in the archaeological record: The Ngoni and Kololo as a case study. In *Archaeology as long-term history*, edited by I. Hodder, pp. 105–116. Cambridge Univ. Press, Cambridge.
- Colton, Harold S.  
 1953 *Potsherds: An introduction to the study of prehistoric Southwestern ceramics and their use in historic reconstruction*. Bulletin 25. Museum of Northern Arizona, Flagstaff, AZ.
- Cordell, Linda S., David E. Doyel, and Keith W. Kingtigh  
 1994 Processes of aggregation in the prehistoric Southwest. In *Themes in Southwestern prehistory*, edited by G. J. Gumerman, pp. 109–134. School for American Research Press, Santa Fe, NM.
- Cosgrove, H. S., and C. B. Cosgrove  
 1932 *The Swarts ruin: A typical Mimbres site in Southwestern New Mexico*. Papers of the Peabody Museum of American Archaeology and Ethnology 15(1). Harvard University, Cambridge, MA.
- Craig, Douglas B.  
 1995 The social consequences of irrigation agriculture: A perspective from Meddler Point. In *The Roosevelt Community Development Study: New perspectives on Tonto Basin prehistory*, edited by M. D. Elson, M. T. Stark, and D. A. Gregory. Anthropological Papers 15. Center for Desert Archaeology, Tucson, AZ. In press.
- Craig, Douglas B., and Jeffery J. Clark  
 1994 The Meddler Point site. In *The Roosevelt Community Development Study: Meddler Point, Pyramid Point, and Griffin Wash Sites*, edited by M. D. Elson, D. L. Swartz, D. B. Craig, and J. J. Clark, Vol. 2. pp. 1–198. Anthropological Papers 13. Center for Desert Archaeology, Tucson, AZ.
- Crown, Patricia L.  
 1994 *Ceramics and ideology: Salado polychrome pottery*. Univ. of New Mexico Press, Albuquerque.
- David, Nicholas, Kodzo Gavua, A. Scott MacEachern, and Judy Sterner  
 1991 Ethnicity and material culture in north Cameroon. *Canadian Journal of Archaeology* 15:171–177.
- Dean, Jeffrey S.  
 1988 The view from the north: An Anasazi perspective on the Mogollon. *The Kiva* 53:197–199.
- Dean, Jeffrey S., Robert C. Euler, George J. Gumerman, Fred Plog, Richard H. Hevly, and Thor N. V. Karlstrom  
 1985 Human behavior, demography, and paleoenvironment on the Colorado plateaus. *American Antiquity* 50(3):537–554.
- 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, Santa Fe, NM.
- Deaver, William L., Robert B. Neily, Su Benaron, Richard Ciolek-Torrello, Jeffrey A. Homburg, Robert P. Jones, Lee W. Lindsay, Jr., and Steven D. Shelley  
 1994 Roadhouse ruin (AZ U:2:73/01–167). In *The Lower Verde Archaeological Project: Site descriptions for habitation and nonagricultural sites*. Vol. 2, Technical Reports. Statistical Research, Inc., Tucson, AZ. Submitted for publication.

- Di Peso, Charles C.  
1958 *The Reeve ruin of southeastern Arizona: A study of prehistoric western pueblo migration into the Middle San Pedro Valley*. Amerind Foundation Series 8. The Amerind Foundation, Dagoon, AZ.
- Doelle, William H.  
1995 Tonto basin demography in a regional perspective. In *The Roosevelt Community Development Study: New perspectives on Tonto Basin prehistory*, edited by M. D. Elson, M. T. Stark, and D. A. Gregory. Anthropological Papers 15. Center for Desert Archaeology, Tucson, AZ. In press.
- Doelle, William H., David A. Gregory, and Henry D. Wallace  
1995 Classic period platform mound systems in southern Arizona. In *The Roosevelt Community Development Study: New perspectives on Tonto Basin prehistory*, edited by M. D. Elson, M. T. Stark, and D. A. Gregory. Anthropological Papers 15. Center for Desert Archaeology, Tucson, AZ. In press.
- Doelle, William H., Henry D. Wallace, Mark D. Elson, and Douglas B. Craig  
1992 *Research design for the Roosevelt Community Development Study*. Anthropological Papers 12. Center for Desert Archaeology, Tucson, AZ.
- Downum, Christian E., John E. Douglas, and Douglas B. Craig  
1993 The Cerro Prieto site. In *Between desert and river: Hohokam settlement and land use in the Los Robles community*, edited by C. E. Downum, pp. 53–95. Anthropological Papers 57. University of Arizona Press, Tucson.
- Doyel, David E.  
1974 *Excavations in the Escalante ruin group, southern Arizona*. Archaeological Series 37. Arizona State Museum, University of Arizona, Tucson.  
1978 *The Miami Wash Project: Hohokam and Salado in the Globe–Miami area, central Arizona*. Contribution to Highway Salvage Archaeology in Arizona 52. Arizona State Museum, University of Arizona, Tucson.  
1991 Hohokam cultural evolution in the Phoenix basin. In *Exploring the Hohokam*, edited by G. J. Gumerman, pp. 231–278. School of American Research, Santa Fe, NM.
- Doyel, David E., and Emil W. Haury (editors)  
1976 The 1976 Salado Conference. *The Kiva* 42:1–134.
- Elson, Mark D., and Douglas B. Craig  
1994 Project methods. In *The Roosevelt Community Development Study: Introduction and small sites*, by Mark D. Elson and Deborah L. Swartz, Vol. 1. pp. 13–22. Anthropological Papers 13. Center for Desert Archaeology, Tucson, AZ.
- Elson, Mark D., David A. Gregory, and Miriam T. Stark  
1995 New perspectives on Tonto basin prehistory. In *The Roosevelt Community Development Study: New perspectives on Tonto Basin prehistory*, edited by M. D. Elson, M. T. Stark, and D. A. Gregory. Anthropological Papers 15. Center for Desert Archaeology, Tucson, AZ. In press.
- Elson, Mark D., Deborah L. Swartz, Douglas B. Craig, and Jeffery J. Clark  
1994 *The Roosevelt Community Development Study: Meddler Point, Pyramid Point, and Griffin Wash sites*, Vol. 2. Anthropological Papers 13. Center for Desert Archaeology, Tucson, AZ.
- Ferguson, Leland  
1992 *Uncommon ground: Archaeology and early African America, 1650–1800*. Smithsonian Institution Press, Washington, DC.
- Fish, Paul, and Suzanne K. Fish  
1991 Hohokam political and social organization. In *Exploring the Hohokam*, edited by G. J. Gumerman, pp. 151–175. School of American Research, Santa Fe, NM.
- Fish, Suzanne K.  
1995 Pollen results from Roosevelt Community Development Study sites. In *The Roosevelt Community Development Study: Paleobotanical and osteological analyses*, edited by M. D. Elson, and J. J. Clark, Vol. 3. Anthropological Papers 14. Center for Desert Archaeology, Tucson, AZ. In press.
- Gasser, Robert E., and Scott M. Kwiatkowski  
1991 Regional signatures of Hohokam plant use. *Kiva* 56(3):207–226.
- Gladwin, Harold S.  
1929 Field notes on file at Arizona State Museum, University of Arizona, Tucson.
- Gladwin, Winifred, and Harold S. Gladwin  
1935 *The Eastern range of the Red-on-Buff culture*. Medallion Papers 16. Gila Pueblo, Globe, AZ.
- Gosselain, Olivier P.  
1992 Technology and style: Potters and pottery among the Bafia of Cameroon. *Man (N.S.)* 27:559–586.
- Gregory, David A.  
1987 The morphology of platform mounds and the structure of Classic period Hohokam sites. In *The Hohokam village: Site structure and organization*, edited by D. E. Doyel, pp. 183–210. Southwestern and Rocky Mountain Division of the American Association

- for the Advancement of Science, Glenwood Springs, CO.
- 1995 Prehistoric settlement patterns in the RCD study area. In *The Roosevelt Community Development Study: New perspectives on Tonto Basin prehistory*, edited by M. D. Elson, M. T. Stark, and D. A. Gregory. Anthropological Papers 15. Center for Desert Archaeology, Tucson, AZ. In press.
- Haury, Emil W.
- 1945 *The Excavation of Los Muertos and neighboring ruins in the Salt River Valley, southern Arizona*. Papers of the Peabody Museum of American Archaeology and Ethnology 24(1). Harvard University, Cambridge, MA.
- 1958 Evidence at Point of Pines for a prehistoric migration from Northern Arizona. In *Migrations in new world culture history*, edited by R. H. Thompson, pp. 1-6. University of Arizona Bulletin 29(2), Social Science Bulletin 27. University of Arizona, Tucson.
- 1976 *The Hohokam: Desert farmers and craftsmen. Excavations at Snaketown, 1964-1965*. Univ. of Arizona Press, Tucson.
- 1985 The Kii ruin: Forestdale's oldest pueblo. In *Mogollon culture in the Forestdale Valley, east-central Arizona*, pp. 7-133. Univ. of Arizona Press, Tucson.
- Hegmon, Michelle
- 1989 The styles of integration: Ceramic style and Pueblo I integrative architecture in Southwestern Colorado. In *The architecture of social integration in prehistoric pueblos*, edited by W. D. Lipe and M. Hegmon, pp. 125-142. Occasional Papers 1. Crow Canyon Archaeological Center, Cortez, CO.
- Heidke, James M.
- 1995 Overview of the ceramic collection. In *The Roosevelt Community Development Study: Ceramic chronology, technology, and economics*, edited by J. M. Heidke and M. T. Stark, Vol. 2, Anthropological Papers 14. Center for Desert Archaeology, Tucson, AZ. In press.
- Hillier, William, and Julienne Hanson
- 1984 *The social logic of space*. Cambridge Univ. Press, Cambridge.
- Hohmann, John W., and Linda B. Kelley
- 1988 *Erich F. Schmidt's investigations of Salado sites in central Arizona: The Mrs. W. B. Thompson archaeological expedition of the American Museum of Natural History*. Bulletin 56. Museum of Northern Arizona, Flagstaff, AZ.
- Howard, Jerry
- 1987 The Lehi canal system: Organization of a Classic period community. In *The Hohokam village: Site structure and organization*, edited by D. E. Doyel, pp. 211-222. Southwestern and Rocky Mountain Division of the American Association for the Advancement of Science, Glenwood Springs, CO.
- Huber, Edgar K., and William D. Lipe
- 1992 Excavations at the Green Lizard site. In *The Sand Canyon Archaeological Project: A progress report*, cited by W. D. Lipe, pp. 69-78. Occasional Paper 2. Crow Canyon Archaeological Center, Cortez, CO.
- Jacobs, David
- 1994 *Report on the Livingston Management Group (final draft)*. Roosevelt Monograph Series 3, Anthropological Field Studies 32. Office of Cultural Resource Management, Arizona State University, Tempe, AZ. Submitted for publication.
- Johnson, Alfred E., and William W. Wasley
- 1966 Archaeological Excavations Near Bylas, Arizona. *The Kiva* 31:205-253.
- Lange, Richard C., and Stephen Germick (editors)
- 1992 *Proceedings of the Second Salado Conference, Globe, AZ*. Occasional Paper. Arizona Archaeological Society, Phoenix.
- LeBlanc, Steven A.
- 1982 The advent of pottery in the Southwest. In *Southwestern ceramics: A comparative review*, edited by A. H. Schroeder, pp. 27-51. *The Arizona Archaeologist* 15. Arizona Archaeological Society, Phoenix.
- Lechtman, Heather
- 1977 Style in technology—Some early thoughts. In *Material culture: Styles, organization, and dynamics of technology*, edited by H. Lechtman and R. Merrill, pp. 3-20. West Publishing, New York.
- Lekson, Stephen H.
- 1984 *Great pueblo architecture of Chaco Canyon, New Mexico*. Publications in Archaeology 18B. National Park Service, Albuquerque, NM.
- 1990 Sedentism and aggregation in Anasazi archaeology. In *Perspectives on Southwestern prehistory*, edited by P. E. Minnis and C. L. Redman, pp. 333-340. Westview Press, Boulder, CO.
- 1995 Shaping the pueblo world: The Southwest after A.D. 1150. In *Interpreting Southwestern diversity: Underlying principles and overarching patterns*, edited by P. R. Fish and J. J. Reid. Anthropological Papers, Arizona State University, Tempe. In press.
- Lekson, Stephen H., Mark D. Elson, and Douglas B. Craig
- 1992 Previous research and culture history. In *Research design for the Roosevelt Community Development Study*, edited by W. H. Doelle, H. D. Wallace, M. D. Elson, and D. B.

- Craig, pp. 19–33. *Anthropological Papers* 12. Center for Desert Archaeology, Tucson, AZ.
- Lemonnier, Pierre  
 1986 The study of material culture today: Towards an anthropology of technical systems. *Journal of Anthropological Archaeology* 5:147–186.  
 1992 *Elements for an anthropology of technology*. Museum of Anthropology, University of Michigan, Ann Arbor.
- Lindauer, Owen  
 1991 Site AR-003-12-04-22 (TNF), the Mayfield Canyon site. In *The archaeology of Star Valley, Arizona: Variations in small communities*, edited by O. Lindauer, R. J. Bradley, and C. L. Redman, pp. 146–153. *Anthropological Field Studies* 24. Office of Cultural Resource Management, Arizona State University, Tempe.  
 1995 *The place of the storehouses: Report on the Schoolhouse Point Mound, Pinto Creek Complex, Roosevelt Platform Mound Study*. Roosevelt Monograph Series 3, *Anthropological Field Studies* 35. Office of Cultural Resource Management, Arizona State University, Tempe. Submitted for publication.
- Lindsay, Alexander Johnston, Jr.  
 1987 Anasazi population movements to southern Arizona. *American Archaeology* 6(3):190–198.
- Lipe, William D.  
 1989 Social scale of Mesa Verde Anasazi Kivas. In *The architecture of social integration in prehistoric pueblos*, edited by W. D. Lipe and M. Hegmon, pp. 53–72. *Occasional Papers* 1. Crow Canyon Archaeological Center, Cortez, CO.
- Lowell, Julie C.  
 1991 *Prehistoric households at Turkey Creek Pueblo, Arizona*. *Anthropological Papers* 54. Univ. of Arizona Press, Tucson.
- Marshall, Michael P., and Henry J. Walt  
 1984 *Rio Abajo: Prehistory and history of a Rio Grande province*. Edited by L. Sebastian, J. Piper, and M. R. Cote. Historic Preservation Division, Santa Fe, NM.
- Martin, Paul S., William A. Longacre, and James N. Hill  
 1967 *Chapters in the prehistory of eastern Arizona, III*. Fieldiana: Anthropology 57. Field Museum of Natural History, Chicago, IL.
- Martin, Paul Sidney, John B. Rinaldo, Elaine A. Bluhm, and Hugh C. Cutler  
 1956 *Higgins Flat Pueblo, western New Mexico*. Fieldiana: Anthropology 45. Chicago Natural History Museum, Chicago, IL.
- Martin, Paul S., John B. Rinaldo, William A. Longacre, Leslie G. Freeman, Jr., James A. Brown, Richard H. Hevly, and M. E. Cooley  
 1964 *Chapters in the prehistory of eastern Arizona, II*. Fieldiana: Anthropology 55. Chicago Natural History Museum, Chicago, IL.
- Masse, W. Bruce  
 1991 The question for subsistence, sufficiency, and civilization in the Sonoran desert. In *Chaco and Hohokam: Prehistoric regional systems in the American Southwest*, edited by P. L. Crown and W. J. Judge, pp. 195–223. School of American Research, Santa Fe, NM.
- 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. Harvard University, Cambridge, MA.
- McGuire, Randall H.  
 1982 The study of ethnicity in historical archaeology. *Journal of Anthropological Archaeology* 1:159–178.
- Miksa, Elizabeth, and James M. Heidke  
 1995 Drawing a line in the sands: Models of ceramic temper provenance. In *The Roosevelt Community Development Study: Ceramic chronology, technology, and economics*, edited by J. M. Heidke and M. T. Stark, Vol. 2. *Anthropological Papers* 14. Center for Desert Archaeology, Tucson, AZ. In press.
- Miksicek, Charles H.  
 1995 Community development in the Tonto basin: An archaeobotanical perspective. In *The Roosevelt Community Development Study: Paleobotanical and osteological analyses*, edited by M. D. Elson and J. J. Clark, Vol. 3. *Anthropological Papers* 14. Center for Desert Archaeology, Tucson, AZ. In press.
- Mills, Barbara J.  
 1987 Ceramic analysis. 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. 83–143. Office of Contract Archaeology, University of New Mexico, Albuquerque.  
 1994 Community dynamics and archaeological dynamics: Some considerations of middle range theory. In *The ancient southwest community: Models and methods for the study of prehistoric social organization*, edited by W. H. Wills and R. D. Leonard, pp. 55–65. University of New Mexico Press, Albuquerque.
- Montgomery, Barbara K.  
 1993 Ceramic analysis as a tool for discovering processes of pueblo abandonment. In *Abandonment of settlements and regions: Ethnoar-*

- chaecological and archaeological approaches*, edited by C. M. Cameron and S. A. Tomka, pp. 157–164. Cambridge Univ. Press, New York.
- Nelson, Ruben H.  
 1993 *Casa de Piedras Site Report: Archaeological Investigations in the Agua Fria River Valley of Arizona*. Occasional Paper No. 3. Arizona Archaeological Society, Phoenix.
- Nesbitt, Paul H.  
 1938 *Starkweather Ruin: A Mogollon-Pueblo site in the Upper Gila area of New Mexico, and affiliative aspects of the Mogollon Culture*. Publications in Anthropology Bulletin 6. The Logan Museum, Beloit College, Beloit, WI.
- Olson, Alan P.  
 1959 *An evaluation of the phase concept in Southwestern archaeology: As applied to the eleventh and twelfth century occupations at Point of Pines, east-central Arizona*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Arizona, Tucson.
- Pedrick, Kathryn E.  
 1992 Introduction. In *Developing perspectives on Tonto Basin prehistory*, edited by C. L. Redman, G. E. Rice, and K. Pedrick, pp. 1–4. Roosevelt Monograph Series 2, Anthropological Field Studies 26. Office of Cultural Resource Management, Arizona State University, Tempe.
- Pfaffenberger, Brian  
 1992 Social anthropology of technology. *Annual Review of Anthropology* 21:491–516.
- Plog, Stephen  
 1980 *Stylistic variation in prehistoric ceramics: Design analysis in the American Southwest*. Cambridge Univ. Press, New York.
- Plog, Stephen, and Jeffrey L. Hantman  
 1986 Multiple regression analysis as a dating method in the American southwest. In *Spatial organization and exchange: Archaeological survey on northern Black Mesa*, edited by S. Plog, pp. 87–113. Southern Illinois Univ. Press, Carbondale.
- Redman, Charles L.  
 1993 *People of the Tonto Rim*. Smithsonian Institution Press, Washington, DC.
- Reid, J. Jefferson (editor)  
 1982 *Cholla Project archaeology: The Chevelon region*, Vol. 2. Archaeological Series 161. Arizona State Museum, University of Arizona, Tucson.
- Reid, J. Jefferson, and Stephanie M. Whittlesey  
 1990 The complicated and the complex: Observations on the archaeological record of large pueblos. In *Perspectives on Southwestern prehistory*, edited by P. E. Minnis and C. L. Redman, pp. 184–195. Westview Press, Boulder, CO.
- Rice, Glen E. (editor)  
 1990 *A design for Salado research*. Roosevelt Monograph Series 1, Anthropological Field Studies 22. Office of Cultural Resource Management, Arizona State University, Tempe.
- Rice, Glen E.  
 1992 Modeling the development of complexity in the Sonoran desert of Arizona. In *Developing perspectives on Tonto Basin prehistory*, edited by C. L. Redman, G. E. Rice, and K. Pedrick, pp. 11–26. Roosevelt Monograph Series 2, Anthropological Field Studies 26. Office of Cultural Resource Management, Arizona State University, Tempe.
- Rice, Prudence M.  
 1984 Change and conservatism in pottery producing systems. In *The many dimensions of pottery*, edited by S. E. van der Leeuw and A. C. Pritchard, pp. 231–288. University of Amsterdam, Amsterdam.
- Rinaldo, John B., and Elaine A. Bluhm  
 1956 *Late Mogollon pottery types of the reserve area*. Fieldiana: Anthropology 36(7). Chicago Natural History Museum, Chicago, IL.
- Rye, Owen, S.  
 1981 *Pottery technology: Principles and reconstruction*. Manuals on Archaeology 4. Taraxacum, Washington, DC.
- Sackett, James R.  
 1985 Style and ethnicity in the Kalahari: A reply to Wiessner. *American Antiquity* 50(1):154–159.  
 1986 Isochrestism and style: A clarification. *Journal of Anthropological Archaeology* 5:266–277.  
 1990 Style and ethnicity in archaeology: The case for isochrestism. In *The uses of style in archaeology*, edited by M. W. Conkey and C. A. Hastorf, pp. 32–43. Cambridge Univ. Press, Cambridge, MA.
- Shafer, Harry J.  
 1988 *Archaeology at the Nan Ranch ruin: The 1987 season*. Department of Anthropology, Texas A&M University, College Station.
- Simon, Arleyn W.  
 1994 Compositional analysis of the Livingston ceramic assemblage. In *Report on the Livingston Management Group (final draft)*, edited by D. Jacobs, Chap. 19. Roosevelt Monograph Series 3, Anthropological Field Studies 32. Office of Cultural Resource Management, Arizona State University, Tempe. Submitted for publication.
- Sires, Earl W., Jr.  
 1987 Hohokam architectural variability and site structure during the Sedentary–Classic

- transition. In *The Hohokam village: Site structure and organization*, edited by D. E. Doyel, pp. 171-182. American Association for the Advancement of Science, Denver, CO.
- Smith, Watson  
1962 Schools, pots, and potters. *American Anthropologist* 64(6):1165-1178.
- Stark, Miriam T.  
1991 Ceramic production and community specialization: A ceramic ethnoarchaeological study. *World Archaeology* 23(1):64-78.  
1995 The utilitarian ceramic collection: Plainware, redware, and corrugated ceramics. In *The Roosevelt Community Development Study: Ceramic chronology, technology, and economics*, edited by J. M. Heidke, and M. T. Stark, Vol. 2. Anthropological Papers 14. Center for Desert Archaeology, Tucson, AZ. In press.
- Stark, Miriam T., and James M. Heidke  
1992 The plainware and redware ceramic assemblages. In *The Rye Creek Project: Archaeology in the Upper Tonto Basin: Artifact and specific analyses*, by M. D. Elson, and D. B. Craig, Vol. 2, pp. 89-214. Anthropological Papers 11. Center for Desert Archaeology, Tucson, AZ.  
1995 Early Classic period variability in utilitarian ceramic production and distribution. In *The Roosevelt Community Development Study: Ceramic chronology, technology, and economics*, Edited by J. M. Heidke, and M. T. Stark, Vol. 2. Anthropological Papers 14. Center for Desert Archaeology, Tucson, AZ. In press.
- Stark, Miriam T., Jeffery J. Clark, and Mark D. Elson  
1995 Social boundaries and cultural identity in the Tonto Basin. In *The Roosevelt Community Development Study: New perspectives on Tonto Basin prehistory*, edited by M. D. Elson, M. T. Stark, and D. A. Gregory. Anthropological Papers 15. Center for Desert Archaeology, Tucson, AZ. In press.
- Sterner, Judy  
1989 Who is signalling whom? Ceramic style, ethnicity and taphonomy among the Sirak Bulahay. *Antiquity* 63:451-459.
- Tuggle, H. David  
1982 Q Ranch ceramic and site chronology. In *Cholla Project archaeology: The Q Ranch Region*, edited by J. J. Reid, Vol. 3. pp. 23-32. Archaeological Series 161. Arizona State Museum, University of Arizona, Tucson.
- 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, NM.
- Wallace, Henry D., and James P. Holmlund  
1984 The Classic period in the Tucson Basin. *The Kiva* 49:167-194.
- Waters, Michael R.  
1994 Geoarchaeological investigation of the Tonto Basin, Arizona. Ms. on file, Desert Archaeology, Inc.
- Wheat, Joe Ben  
1955 Mogollon culture prior to A.D. 1000. Memoir 82 (Occasional Paper) *American Anthropologist* 57(3).
- Whittlesey, Stephanie M., and Richard Ciolek-Torrello  
1992 A revolt against rampant elites: Toward an alternative paradigm. In *Proceedings of the Second Salado Conference, Globe, AZ 1992*, edited by R. C. Lange and S. Germick, pp. 312-324. Occasional Paper. Arizona Archaeological Society, Phoenix.
- Whittlesey, Stephanie M., and J. Jefferson Reid  
1982 Cholla project perspectives on Salado. In *Cholla Project archaeology: Introduction and special studies*, edited by J. J. Reid, Vol. 1, pp. 63-80. Archaeological Series 161. Arizona State Museum, University of Arizona, Tucson.
- Wiessner, Polly  
1985 Style or isochrestic variation? A reply to Sackett. *American Antiquity* 50(1):160-166.
- Wilcox, David R., Thomas R. McGuire, and Charles Sternberg  
1981 *Snaketown revisited: A partial cultural resource survey, analysis of site structure, and an ethnohistoric study of the proposed Hohokam-Pima National Monument*. Archaeological Series 155. Arizona State Museum, University of Arizona, Tucson.
- Wilcox, David R., and Jonathan Haas  
1994 The scream of the butterfly. Competition and conflict in the prehistoric Southwest. In *Themes in Southwestern prehistory*, edited by G. J. Gumerman, pp. 211-238. School of American Research, Santa Fe, NM.
- Wood, J. Scott  
1987 *Checklist of pottery types for the Tonto National Forest: An introduction to the archaeological ceramics of central Arizona*. The Arizona Archaeologist 21. Phoenix, AZ.  
1992 Toward a new definition of Salado: Comments and discussion on the Second Salado Conference. In *Proceedings of the Second Salado Conference, Globe, AZ 1992*, edited by R. C. Lange and S. Germick, pp. 337-344. Occasional Paper. Arizona Archaeological Society, Phoenix.